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THE TEXAS COMPANY

RESEARCH AND TECHNICAL DEPARTMENT

REPORT ON

MONTEBELLO RUNS NO. 58, 59, 60, 61, AND 62

CM AND S CATALYST

Laboratory Montebello

Report No. 2001-1-P

Date September 15, 1955

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BRIEF OF PARTIAL REPORT

Laboratory Montebello
Date Approved September 15, 1955
Date Work Completed October 13, 1951

Experiment No. 2001
Partial Report No. 1
Subject: Hydrocarbon Synthesis

Subject: Hydrocarbon Synthesis: Montebello Runs No. 58, 59, 60, 61, and 62; CM&S Catalyst.

Object: To test ammonia-synthesis catalysts for hydrocarbon synthesis.

History: Hydrocarbon Research, Inc., obtained high sustained liquid yields in a pilot unit using a powdered ammonia-synthesis catalyst for synthesizing hydrocarbons from carbon monoxide and hydrogen. Since this yield level had never been attained at Montebello using other catalysts, the decision was made for Montebello Laboratory to test some ammonia-synthesis catalysts for hydrocarbon synthesis.

Experimental Work: Runs 58, 59, 60, 61, and 62 were made between May 4, 1951, and October 13, 1951, using both new and spent catalysts of the fused iron-alumina-silica-potassia type prepared by Consolidated Mining and Smelting Company. The catalysts were charged to Montebello reactor 5S, reduced with hydrogen at 200 psi and 700 to 800°F. Synthesis feed gas was obtained by using the Texaco Synthesis Gas Generation Process with natural gas and oxygen in a 2-cubic-foot generator. A water wash tower was used to remove traces of carbon and to cool the feed gas to facilitate measurement.

Conclusions:

1. The five runs made with CM&S catalysts resulted in wide variations in yield of liquid product.
2. The liquid yields did not show the same correlation with space velocity and catalyst particle size that was exhibited with magnetite and mill scale catalysts.
3. The best run, Number 59, had a C_3+ yield of approximately 9.0 lbs/MCF H_2+CO. The distinguishing features of the catalyst in Run 59 were:
   a) The catalyst had previously been used in ammonia synthesis.
   b) It was essentially fully reduced when received at Montebello.
   c) No potassium carbonate was added to the catalyst as received.

FHH-(WEK-WAMcM)-GK-WJC(2)-RWH-HDM(2)-RLSr(2)-duBE(2)
JCW-CEL
RP
WMS

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HYDROCARBON SYNTHESIS

PARTIAL REPORT NO. 1

Montebello Research Laboratory — Experiment No. 2001
Work Completed: October 13, 1951 — Report Approved: Sept. 15, 1955

MONTEBELLO RUNS NO. 58, 59, 60, 61, and 62

CM AND S CATALYST

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HYDROCARBON SYNTHESIS

PARTIAL REPORT NO. 1

Montebello Research Laboratory — Experiment No. 2001
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MONTEBELLO RUNS NO. 58, 59, 60, 61, AND 62

CM AND S CATALYST

I. INTRODUCTION

Hydrocarbon Research, Inc.[1] obtained high sustained liquid yields in a pilot unit using a powdered ammonia-synthesis catalyst for synthesizing hydrocarbons from carbon monoxide and hydrogen. For example, the average yield of C_3 and heavier product was 9.5 lb/MCF H_2+CO[2] for the interval of 275 hours to 299 hours. Since this yield level had never been attained by other laboratories using other catalysts, the decision was made for Montebello Laboratory to test some ammonia synthesis catalysts for hydrocarbon synthesis. This work was performed in Runs 58, 59, 60, 61, and 62, made between May 4, 1951, and October 13, 1951.

II. EQUIPMENT AND MATERIALS

Reactor 5S was used for the runs which are the subject of this report. This vessel, which has been described previously[3], was 12 inches by 30 feet and contained three 2-inch cooling tubes joined together at the ends by spherical headers. The gas inlet at the bottom was equipped with a sparger to promote uniform distribution.

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[1] HRI Run 19-6
[2] This corresponded to about 7,300 BPD of total liquid product basis Brownsville design feed rate of 9,488 MCFH of H_2+CO.
[3] TDC-802-50-P pages 2 and 20.

Both new and spent ammonia-synthesis catalysts were used as base stocks for preparing the hydrocarbon synthesis catalysts. Spent ammonia catalyst was used in Run 59; new catalysts were used in the other runs.

In all cases the original catalysts were the fused iron, alumina, silica, potassia type prepared by Consolidated Mining and Smelting Company. The material as received at Montebello Laboratory was in lumps approximately $\frac{1}{4}$-inch in diameter. It was ground in a Braun Chipmunk ore-sample crusher to pass a 14-mesh sieve.

In Run 58 and 59 the ground and screened material was used without further treatment except for reduction with hydrogen. For Runs 60, 61, and 62, potassium carbonate solution was added to the catalyst in the amount of 3.5 pounds of K_2CO_3 for 1000 pounds of dry catalyst. The mixture was then dried in a heated concrete mixer and reduced with hydrogen.

The usual procedure was to charge 2500 pounds of unreduced catalyst to the reactor and reduce it by circulating preheated cylinder hydrogen at 200 psi and 700 to 800°F. The makeup catalyst was reduced in a similar manner in a separate smaller vessel described in a previous report.[1]

The synthesis feed gas was obtained by using the Texaco Partial Oxidation Process with natural gas and oxygen in a 2-cubic-foot generator. A water wash tower, described in a previous report[2], was used during all runs to remove traces of carbon and to cool the feed gas to facilitate measurement.

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[1] TDC-802-32-P

[2] TDC-802-33-P

III. RESULTS AND DISCUSSION

Operations - Run 58

The reduction of new CM&S catalyst for Run 58 was conducted in the reactor with a hydrogen flow of 1 ft./sec. velocity through the bed which was maintained at 670°-760°F for 44 hours. The initial charge of catalyst was 2500 pounds, but the carryover of fines was 424 pounds during the first 18 hours of reduction. This made it necessary to load an additional 400 pounds of unreduced catalyst to the reactor. The 88 pounds of water made during the first 18 hours of reduction was considerably less than normal (usually about 170 pounds of water from 2500 pounds of mill scale or magnetite after 18 hours at temperatures above 650°F). The reduction was so slow that the supply of hydrogen was depleted before the reduction was finished, because of normal loss of hydrogen from blowing down cyclones, water accumulators, etc. It was necessary to cut in the synthesis gas prematurely rather than shut down and run the risk of plugging the reactor inlet. The total catalyst charged was 2900 pounds, the catalyst carried over was 871 pounds, and the water removed was 290.5 pounds. The raw material was analyzed as 67.1 per cent iron and the partially reduced catalyst was 78.3 per cent iron.

Run 58 lasted only 83 hours because a leak developed in the product condenser tube bundle. It was planned to reduce the catalyst more completely and continue the run after the condenser was repaired, but the bottom of the reactor became plugged while standing idle. Therefore the catalyst was removed from the unit and discarded.

Operations - Run 59

The catalyst for Run 59 had been previously used in ammonia synthesis at Trail, B. C. before shipment to Montebello Laboratory. Analysis of the material as received showed 84 per cent iron but there was no indication of its being pyrophoric. The initial charge of catalyst to the reactor was 2514 pounds, but more than 700 pounds blew over during the ensuing reduction with hydrogen. Since the catalyst was already essentially reduced, further reduction in the reactor at 750° to 775°F produced only 37 pounds of water.

During the initial 178 hours of the run, the trend was toward a decline in catalyst density and inventory. The catalyst bed temperatures increased daily even though no preheat was used and the steam pressure in the cooling tubes was kept lower than normal.

Run 59 was interrupted after 178 hours (Period H) by a failure of the recycle compressor engine. This caused the reactor inlet to plug, and it was necessary to remove the catalyst (988 pounds) to clear the plug. The catalyst was recharged and reduced with hydrogen until water production ceased. This second treatment produced 138 pounds of water.

After the catalyst was reduced again, the catalyst density and inventory were increased by periodic additions of reduced catalyst. The bed temperatures were gradually brought down to the normal 650°F level.

There was another shutdown after 781 hours, between periods HH and II, in order to conduct a scheduled insurance

inspection of the plant boiler. During this time hydrogen was circulated through the bed at 660°F and 1 ft./sec. inlet velocity. The run was terminated voluntarily after 843 hours.

Operations - Runs 60 and 61

These two runs have been grouped together because the operating conditions were very similar. The catalysts were obtained in separate shipments, but after grinding and reduction, the particle size distributions were identical. The average particle size of the reduced catalyst was 185 microns for Runs 60 and 61 in contrast to 350 microns or more in the other runs.

In both Runs 60 and 61 the initial charge was 2500 pounds, the carryover of fines was 800 pounds, and the reduced catalyst analyzed 87 per cent iron. The reduction time was 104 hours in Run 60 and 90 hours in Run 61.

After only 25 hours on stream a slug of water carried over into the reactor system from the synthesis gas scrubber because of a failure in the water level control system. The bed temperatures dropped from 650°F to 450°F, but the catalyst meters gave no indication of loss of "fluidization", that is, the meter fluctuations continued at the same frequency and amplitude.

The run was discontinued long enough to reduce the catalyst again but after the second reduction the yields were never as high again as in Period A.

Run 61 was a duplicate of Run 60, without the water carry-over, but the yields were higher. There was no catalyst addition during the run. The density of the fluidized catalyst was 104 lbs./cu.ft. at the end of Period A and declined after that. This was comparable to the 106 lbs./cu.ft. density at end of Period A

in Run 60, but after the contamination with water and subsequent reduction in Run 60, the density increased to the 160 lbs./cu.ft. level.

As in Run 59 the low catalyst density in Run 61 was accompanied by difficulty in controlling the bed temperatures except to a much greater extent. After 239 hours Run 61 was terminated when the upper bed temperatures were in the 900°-950°F range and out of control. When the catalyst was removed from the reactor, it was found to contain many loosely consolidated lumps which were easily crumbled with the fingers. There was little change in particle size during the run, but the density declined because the carbon content increased from about 5 per cent at the beginning of the run to about 20 per cent at the end.

Operations - Run 62

With the thought that the instability of Run 61 may have been the result of high catalyst activity and low inlet velocity, Run 62 was made with 15 MSCFH fresh feed rate instead of the 10 MSCFH rate used in Runs 60 and 61.

After Run 61 the reactor steam system had been cleaned with inhibited hydrochloric acid to eliminate the possibility of boiler scale in the cooling tubes causing difficulty in controlling the catalyst bed temperature.

Run 62 was made with fresh CM&S catalyst ground to pass through a 14-mesh sieve. The initial charge to the reactor was 2500 pounds. The reduction required 90 hours, the catalyst carry-over was 624 pounds, and 572 pounds of water was formed.

After 542 hours of stable operations, the run was voluntarily terminated.

Table I

OPERATING CONDITIONS AND YIELD DATA SUMMARY

Period	Hours on Stream	Average Catalyst Age, Hrs	Rates, MSCFH Fresh Feed	Rates, MSCFH Recycle	Bed Depth, Feet	Catalyst Size 50% Point, Microns	Space Velocity v/hr/v	Reactor Back Pressure PSIG(1)	Conversion H_2 + CO Per Cent	Selectivity, C_3+/C_1+ Per Cent	Activity Index(2)	C_3+, lbs/MCF H_2+CO Fed	Barrels/Day Basis Brownsville Design Feed Rate
58-0	0-93	47	15.31	16.67	15.2	350	1563	361	71.16	79.33	21.35	7.60	5595
59-0	0-86	43	16.96	14.62	17.0	547	1472	375	87.13	82.50	34.16	9.24	7316
59-1	86-178	132	17.30	15.00	15.4	494	1657	372	84.84	81.68	33.35	8.66	6811
59-2	178-291	166	15.60	15.47	12.0	323	1813	375	84.65	79.78	34.66	8.96	7068
59-3	291-445	211	13.30	16.18	15.7	331	1225	375	84.51	80.06	28.35	8.60	6674
59-4	445-541	228	14.58	15.83	20.2	320	1057	372	85.64	81.18	27.40	9.14	7196
59-5	541-661	303	14.44	14.47	19.7	385	1072	365	85.03	80.38	27.00	9.12	7084
59-6	661-781	376	14.64	14.41	19.6	345	1095	361	86.45	78.60	28.73	9.19	7154
59-7	781-843	432	14.58	14.74	19.1	430	1114	373	86.53	79.12	29.06	9.38	7288
60-0	0-88	40	11.17	16.55	11.9	180(3)	1431	369	75.46	84.07	23.08	8.89	6924
60-1	88-160	97	11.21	16.95	13.5	--	1222	366	73.56	84.91	20.20	8.56	6557
61-0	0-89	45	11.45	14.50	22.6	180	754	382	92.08	85.78	27.84	10.75	8553
61-1	89-239	164	11.27	15.49	24.2	168	692	378	85.29	83.71	21.90	9.49	7426
62-0	0-94	44	16.69	16.57	17.8	340	1385	375	77.32	83.27	23.98	8.66	6739
62-1	94-206	138	15.63	16.62	19.2	--	1192	373	75.48	83.15	21.08	8.58	6632
62-2	206-303	243	15.70	17.00	18.9	--	1226	372	73.39	83.06	20.13	8.08	6395
62-3	303-399	339	15.44	17.33	17.6	--	1309	371	68.77	81.66	18.29	7.43	5815
62-4	399-543	416	15.56	17.03	15.1	--	1513	370	71.32	82.45	21.10	7.74	6141

(1) Reactor inlet pressure was usually 25 to 40 psi greater than the back pressure.

(2) Activity Index = $\sqrt{v/hr/v} \log\left(\frac{100}{100 - \text{conversion}}\right)$

(3) Estimated.

IV. YIELD AND CATALYST ACTIVITY

The data have been averaged daily and also in groups of four or five days according to run conditions.[1] The water soluble acids have been included in the total liquid yields only in the group averages. Table I, opposite, summarizes the data from the group averages to facilitate comparison of the five runs.

The effect of catalyst age on liquid yield is shown in Figure 1, page 9. The yields have been projected as barrels per day of finished liquid product based on the Brownsville design feed rate of 9488 MCFH of H_2+CO. This method of expressing the yields has been retained for purposes of comparison with previous reported data even though The Texas Company no longer has a direct interest in the Carthage Hydrocol synthetic fuels plant at Brownsville, Texas.

The data from Run 49, made with Alan Wood magnetite, also have been shown in Figure 1 because they represent a run which produced high, consistent yields over a long period of time.

The yields from Run 58 were very low. This can be attributed to the poorly reduced catalyst. Run 61 produced the highest yields but at a sharply diminishing rate and had to be discontinued because of loss of control of catalyst temperature. This run, as well as Run 60, was made with a fresh feed rate of only 11 MSCFH instead of the normal 15 MSCFH.

The only run which was superior to Run 49 was Run 59 which produced a higher liquid yield for a longer time and showed no signs of weakening after 843 hours on stream. The throughput was similar to Run 49; namely, 13 to 17 MSCFH of H_2+CO and 1:1 recycle to fresh

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[1] Daily calculation and data sheets are in the Appendix.

Figure 1

EFFECT OF CATALYST AGE ON LIQUID YIELD

CM&S Catalyst

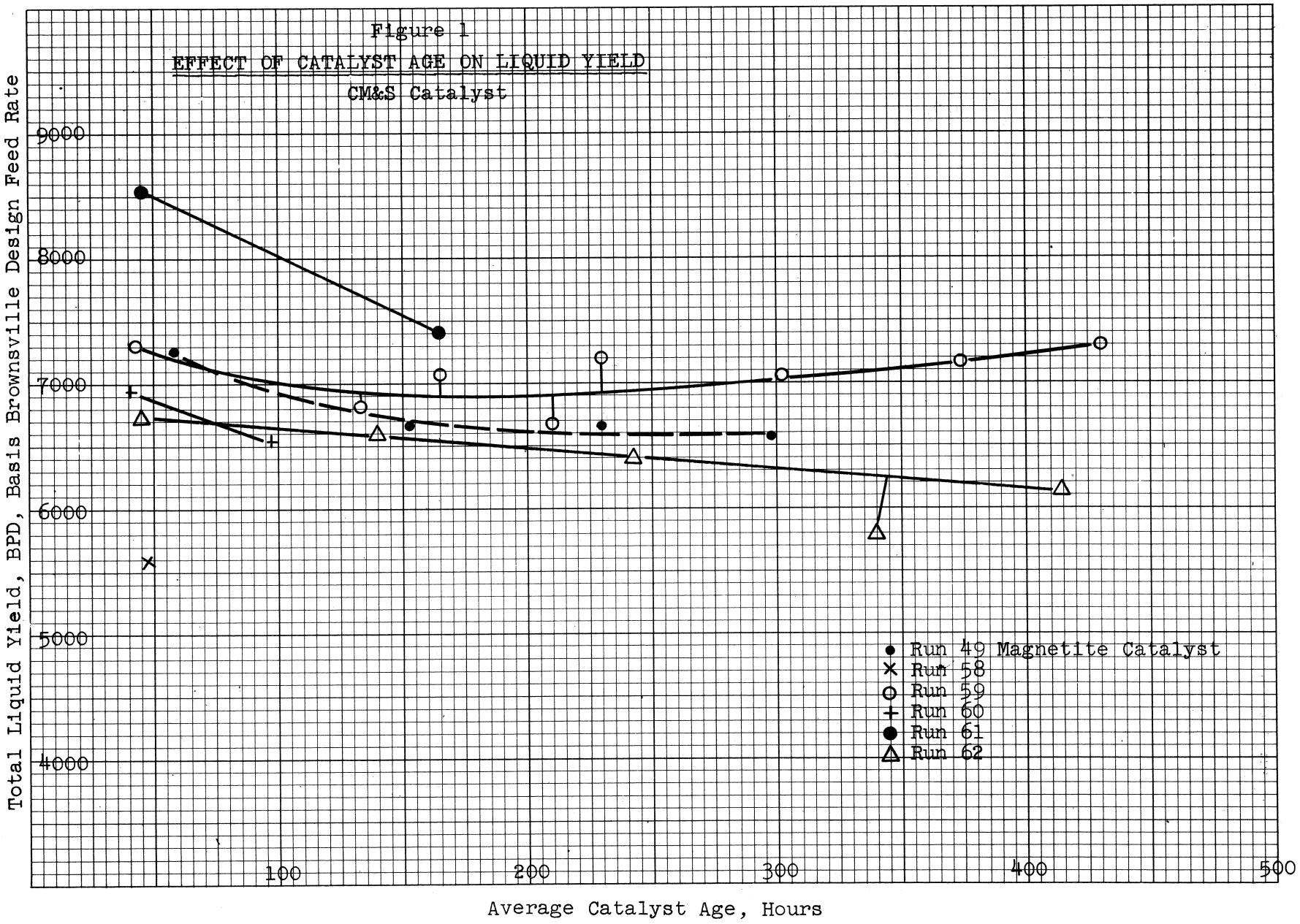
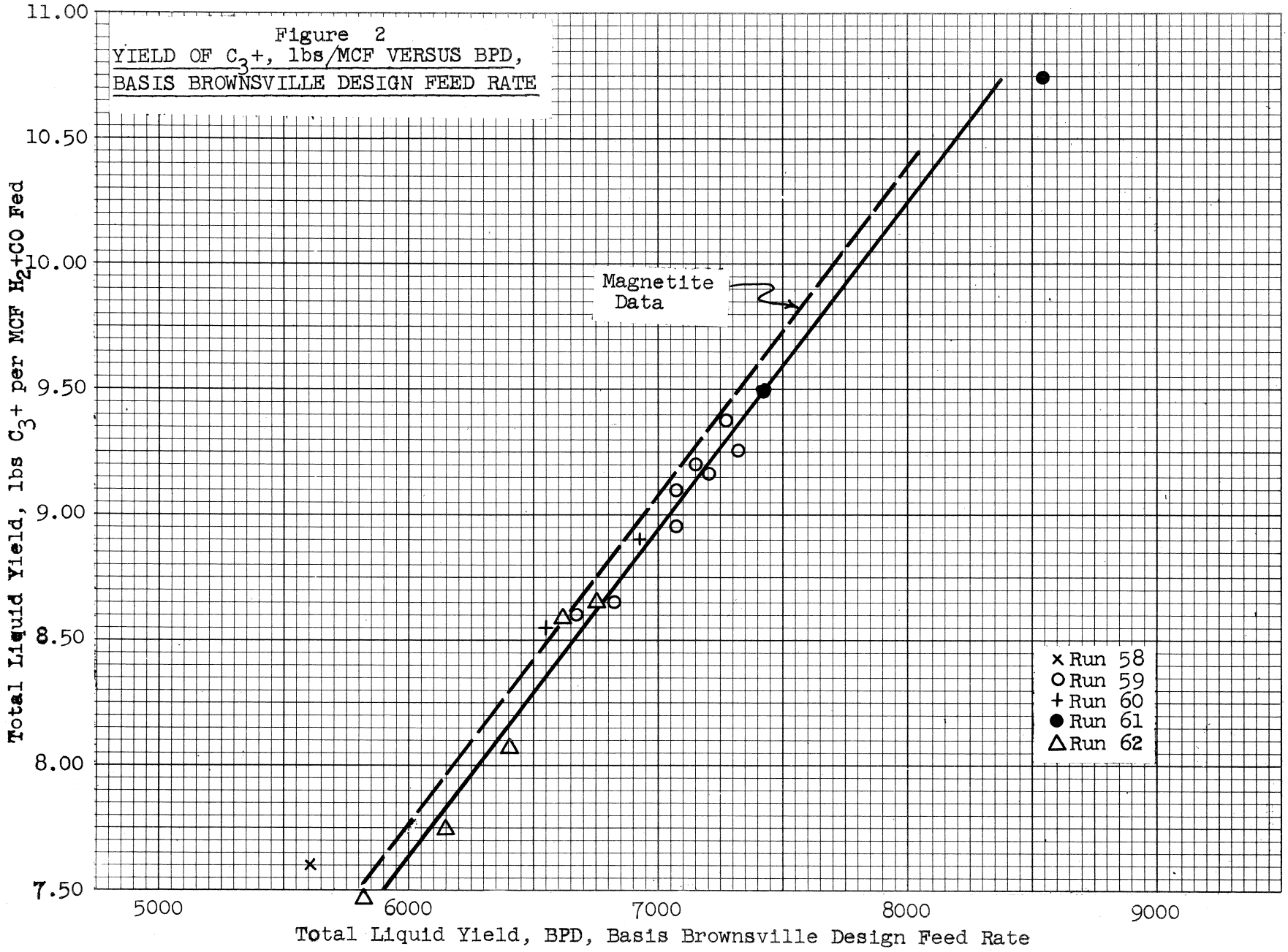


Figure 2
YIELD OF C_3+, lbs/MCF VERSUS BPD,
BASIS BROWNSVILLE DESIGN FEED RATE



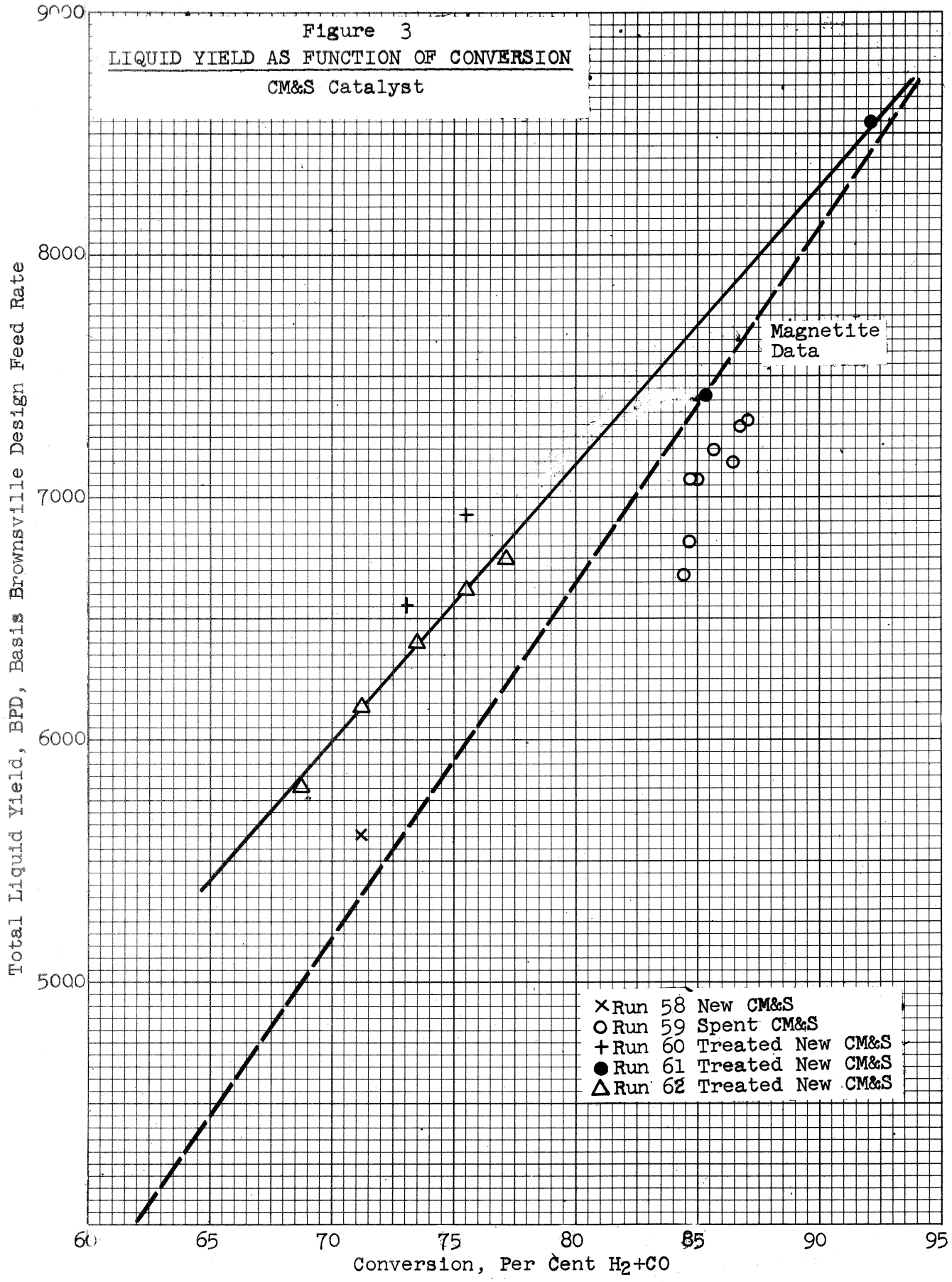


Figure 3
LIQUID YIELD AS FUNCTION OF CONVERSION
CM&S Catalyst
Total Liquid Yield, BPD, Basis Brownsville Design Feed Rate
9000
8000
7000
6000
5000
60
65
70
75
80
85
90
95
Conversion, Per Cent H2+CO
Magnetite Data
×Run 58 New CM&S
○Run 59 Spent CM&S
+Run 60 Treated New CM&S
●Run 61 Treated New CM&S
△Run 62 Treated New CM&S

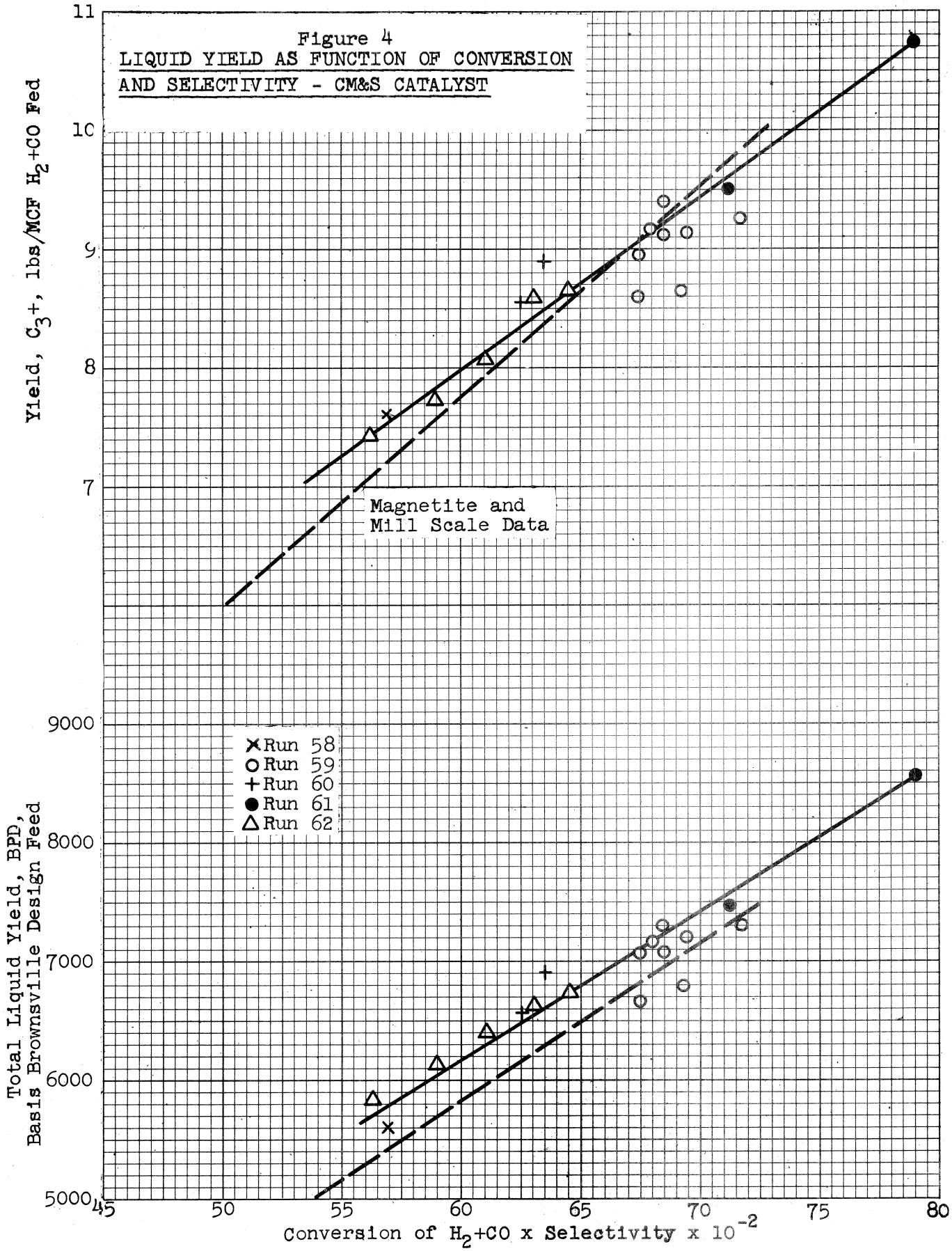


Figure 4
LIQUID YIELD AS FUNCTION OF CONVERSION AND SELECTIVITY - CM&S CATALYST
Yield, C_3+, lbs/MCF H_2+CO Fed
Total Liquid Yield, BPD, Basis Brownsville Design Feed
Conversion of H_2+CO x Selectivity x 10^{-2}
Magnetite and Mill Scale Data
Run 58
Run 59
Run 60
Run 61
Run 62
11
10
9
8
7
9000
8000
7000
6000
5000
45
50
55
60
65
70
75
80

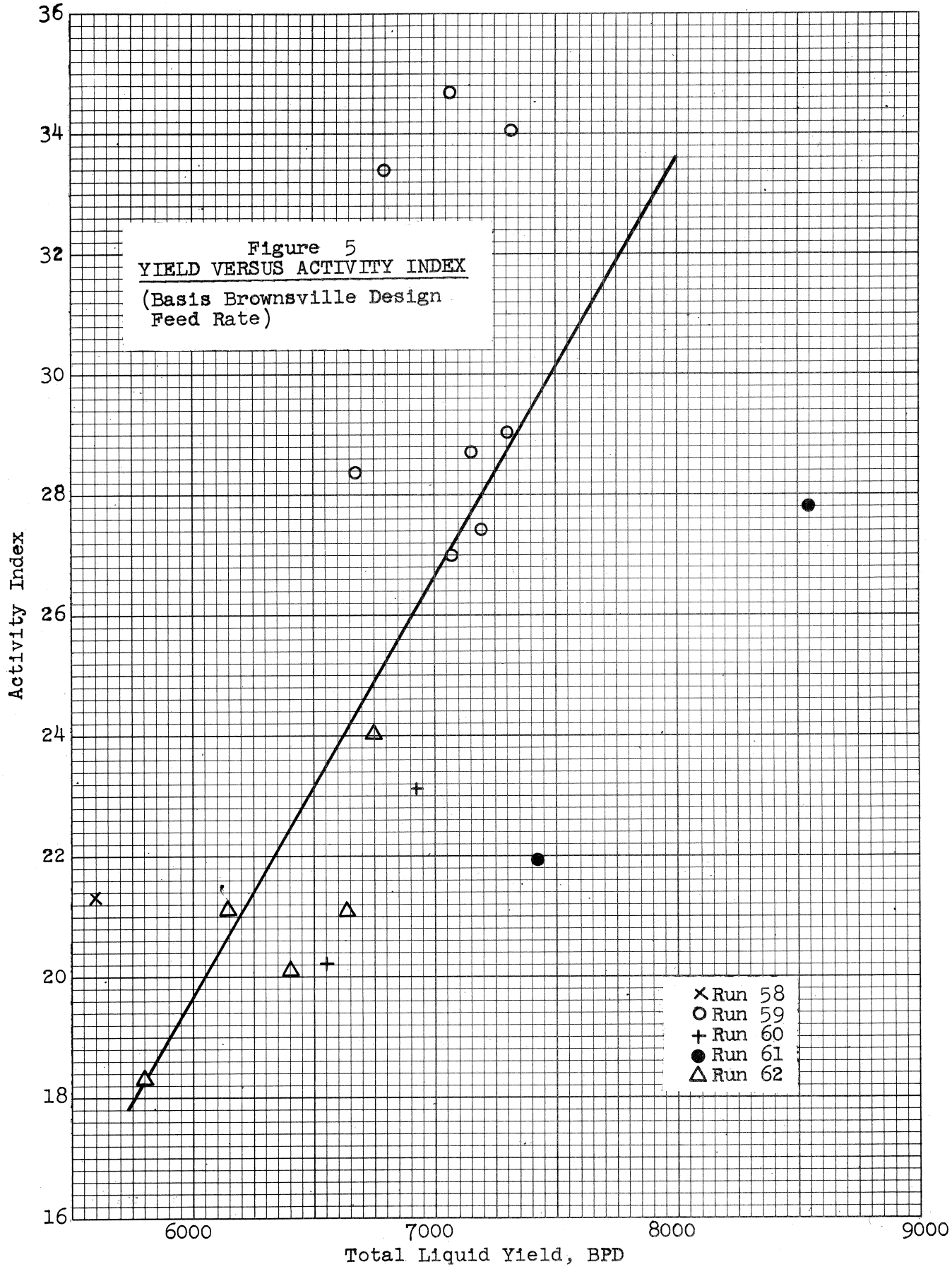
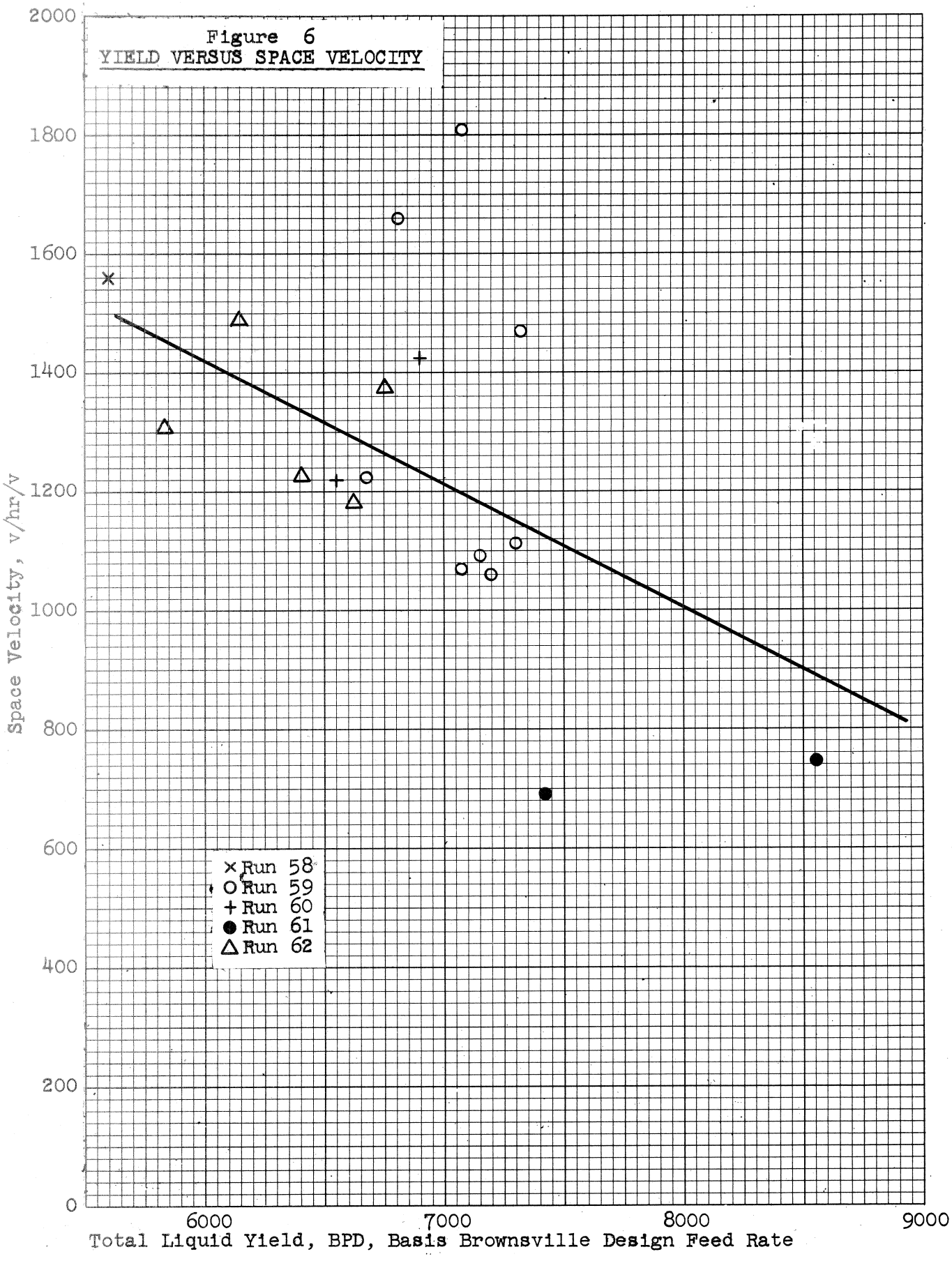


Figure 5
YIELD VERSUS ACTIVITY INDEX
(Basis Brownsville Design Feed Rate)
Activity Index
36
34
32
30
28
26
24
22
20
18
16
6000
7000
8000
9000
Total Liquid Yield, BPD
Run 58
Run 59
Run 60
Run 61
Run 62

Figure 6
YIELD VERSUS SPACE VELOCITY



feed ratio. The unique factor of this run was the use of reduced catalyst which had been previously used in ammonia synthesis. This catalyst was essentially fully reduced when received at Montebello Research Laboratory.

In Figure 2, page 10, is shown the relationship between the yield of C_3+ product and the yield basis Brownsville design. This relationship for CM&S catalyst is:

$$BPD = 780(C_3+, \text{ lbs/MCF})$$

The conversion factor, 780, is within 2 per cent of the factor for magnetite[1], 770, and is probably within the experimental error. It means that the data presented in this report on the Brownsville basis would show the same correlations, or lack of them, if presented in terms of yield of C_3+.

In Figures 3 and 4, pages 11 and 12, the liquid yield is shown as a function of conversion and of the product of conversion and selectivity. The yield data for CM&S catalyst are not very consistent as a function of conversion alone. When viewed as a function of both conversion and selectivity, they are consistent and in good agreement with previous data from magnetite and mill scale.[2] Plotting the yield as a function of the product of conversion and selectivity gives a check on the overall accuracy of the yield measurements and calculations.

The liquid yield is shown as a function of activity index[3] in Figure 5, page 13. The data points are quite widely scattered. They are scattered almost as badly in Figure 6, page 14, which shows the plot of yield versus space velocity, v/hr/v. Space velocity data are calculated using catalyst bed measurements which are

[1] TDC-802-40-P
[2] TDC-802-50-P
[3] $A = \sqrt{v/hr/v} \log\left(\frac{100}{100-\text{conversion}}\right)$

subject to some uncertainty. It is probable that some of the space velocity data are unreliable, and consequently the activity indices are doubtful.

The catalyst sample taps were plugged during all of Run 60 and most of Run 62 so that the particle size data are incomplete. Correlation of yield with catalyst particle size and space velocity has been made with magnetite and mill scale catalysts[1], but the combination of incomplete catalyst data and unreliable space velocity measurements rules out such a correlation with CM&S catalysts. With the former catalysts, higher yields were obtained with larger particle sizes and lower space velocities. With CM&S catalysts, however, in the two runs which produced high yields, one was made with coarse catalyst and high space velocity, and the other with fine catalyst and low space velocity.

V. CONCLUSIONS

1. The five runs made with CM&S catalysts resulted in wide variations in yield of liquid product.

2. The liquid yields did not show the same correlation with space velocity and catalyst particle size that was exhibited with magnetite and mill scale catalysts.

3. The best run, Number 59, had a C_3+ yield of approximately 9.0 lbs/MCF H_2+CO. The distinguishing features of the catalyst in Run 59 were:

a) The catalyst had previously been used in ammonia synthesis.

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[1] TDC-802-40-P and TDC-802-50-P

b) It was essentially fully reduced when received at Montebello.

c) No potassium carbonate was added to the catalyst as received.

REPORT PREPARED BY Signed: W. L. Slater

WLS-EW

REPORT APPROVED BY Signed: duBois Eastman/RAB

(WEK-WAMcM)-GK-WJC(2)-RWH-RLSr(2)-HDM(2)-duBE(2)
JCW-CEL
WMS

Exp. No. 2001-1-P-18

WORK DONE BY

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Gerald Scott	Operator
Willard Herrick	Operator
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REPORT WRITTEN BY

W. L. Slater — Chemical Engineer

(WEK-WAMcM)-GK-WJC(2)-RWH-RLSr(2)-HDM(2)-duBE(2)
JCW-CEL
WMS

VI. APPENDIX

THE TEXAS COMPANY — MONTEBELLO LABORATORY

YIELD CALCULATIONS

RUN NO. 58-0(A-E)
HOURS 0-93
CATALYST Fresh CM&S

	FRESH FEED			WET GAS			RECYCLE	COMBINED FEED	EFFLUENT	NET CHANGE		YIELD BASIS H_2+CO FED			
					At Wt. Balance							CONDENSATE			
	%	m/hr	#/hr	%	m/hr	#/hr	m/hr	m/hr	m/hr	m/hr	#/hr	#/MCF	#/gal	gal/hr	gal/MCF
CO 28.010		14.862						21.710		-12.101	-338.95				
H_2 2.016		24.440						45.962		-15.868	-31.99				
CO_2 44.010										2.925	128.73	8.631			
N_2 28.016															
CH_4 16.042										0.990	15.88	1.065			
C_2H_6 28.052										0.291	8.16	0.547			
C_2H_4 28.036										0.183	5.50	0.369			
C_1+C_2											29.54	1.981			
C_3H_8 42.078										0.344	14.47	0.970	4.32	3.350	0.225
C_3H_6 42.094										0.045	1.98	0.133	4.24	0.467	0.031
C_4H_{10} 58.104										0.198	11.11	0.745	5.00	2.222	0.149
C_4H_{10} 58.120										0.065	3.78	0.253	4.86	0.778	0.052
C_5H_{12} 70.130										0.074	5.19	0.348	5.45	0.952	0.064
C_6H_{14} 72.146										0.011	0.79	0.053	5.25	0.150	0.010
C_6H_{12} 84.156										0.013	1.09	0.073	5.54	0.020	0.001
C_3-C_6											38.41	2.575		7.939	0.532
TOTAL															
H_2+CO		39.302		14915 SCFH				67.672		-27.969					
H_2/CO		1.64		Factor 670465											

YIELDS BASIS BROWNSVILLE DESIGN FEED RATE*				
	CORRECTED HEMPEL, %	gal/hr	TREATING RECOVERY,%	gal/hr
400 EP	76.6	6.522	98.0	6.392
400-550	14.3	1.218	91.4	1.113
550 +	9.1	0.775	114.6	0.888
	RECOVERY %	#/hr	gal/hr	
PROPYLENE	3.32	4.804		
C_3 POLY GASO.	87.5	4.203	0.703	
C_3 POLY TAR	12.5	0.601	0.080	
	#/gal	#/hr	gal/hr	RVP
C_4H_8	5.00	0.25	0.050	68.0
C_4 POLY GASO.	5.98	9.50	1.589	1.5
C_4H_{10}	4.86	3.78	0.778	68.0
C_4-FREE GASO.			8.217	5.8
C_4 POLY TAR	7.58	1.36	0.181	
	gal/hr	gal/MCF	Bbl/Day	
10 # RVP 400 EP GASOLINE	10.634	0.7130	3866	
GAS OIL	1.113	0.0746	404	
FUEL OIL	0.888	0.0595	323	
POLY TAR	0.261	0.0175	95	
TOTAL	12.896	0.8646	4688	
W.S. CHEM.	0.712 1.784	0.0477 0.1196	259 648	
TOTAL	15.392	1.0320	5595	

Weight Recovery, %	94.85	Catalyst Age, hrs.	Ave. 46.5	Space Velocity, vhv	1563	RECOVERED OIL		54.67	3.665		8.515	0.571
Reactor Back Pressure, psig	361	Inlet Velocity, Ft/sec	0.87	Catalyst Vol., CF	10.17	TOTAL OIL		93.08	6.240		16.454	1.103
Temperature, °F	649	Bed Depth, Ft	15.2	Weight, #	1671	WATER SOLUBLE CHEMICALS	Acid Alcohol	5.79 14.50	0.388 0.972		0.712 1.784	0.048 0.120
Recycle Ratio	1.09	Bed Density, #/CF	168	Effluent shift Ratio $\frac{(H_2)(CO_2)}{(H_2O)(CO)}$ =		TOTAL LIQUID PRODUCTS C_5+		113.37	7.601		18.950	1.271
						NET WATER		97.07	6.508		11.635	0.780
						GROSS WATER		117.36	7.869		14.131	0.947
						HYDROCARBON TOTAL—C_1+		142.91	9.588			

FRESH FEED CONVERSION — %				TOTAL FEED CONVERSION — %			SELECTIVITY
Contraction	CO	H_2	H_2+CO	CO	H_2	$CO+H_2$	C_3+/C_1+
56.43	81.42	64.93	71.16	55.74	34.52	41.33	79.33

Form ML—11 AI = (39.53)(0.5400)=21.35 Acid = Neut No. x 0.117 g/NCM = 16.91 × #/MCF *9488 MCFH H_2+CO, Bbl/Day = 5421.6 × gal/MCF

THE TEXAS COMPANY — MONTEBELLO LABORATORY
YIELD CALCULATIONS

RUN NO. 58-A
HOURS 0-7
CATALYST AGE 7

	FRESH FEED %	FRESH FEED m/hr	FRESH FEED #/hr	WET GAS %	WET GAS At Wt. Balance m/hr	WET GAS At Wt. Balance #/hr	RECYCLE m/hr	COMBINED FEED m/hr	EFFLUENT m/hr	NET CHANGE m/hr	NET CHANGE #/hr	CONDENSATE #/MCF	CONDENSATE #/gal	CONDENSATE gal/hr	CONDENSATE gal/MCF
CO 28.010	33.585	13.761	385.47	7.080	0.800	22.41	3.018	16.779	3.818	-12.961	-363.06				
H_2 2.016	63.275	25.928	52.27	41.700	4.714	9.50	17.779	43.707	22.493	-21.214	42.77				
CO_2 44.010	2.475	1.014	44.63	29.305	3.313	145.80	12.493	13.507	15.806	2.299	101.17	6.717			
N_2 28.016	0.560	0.229	6.42	1.380	0.156	4.37	0.588	0.817	0.744						
CH_4 16.042	0.105	0.043	0.69	10.640	1.203	19.30	4.536	4.579	5.739	1.160	18.61	1.236			
C_2H_4 28.052				2.560	0.289	8.11	1.091	1.091	1.380	0.289	8.11	0.538			
C_2H_6 30.068				1.390	0.157	4.72	0.593	0.593	0.750	0.157	4.72	0.313			
C_1+C_2											31.44	2.087			
C_3H_6 42.078				3.055	0.346	14.56	1.302	1.302	1.648	0.346	14.56	0.967	4.32	3.370	0.223
C_3H_8 44.094				0.340	0.039	1.72	0.145	0.145	0.184	0.039	1.72	0.114	4.24	0.406	0.027
C_4H_8 56.104				1.460	0.165	9.26	0.622	0.622	0.787	0.165	9.26	0.615	5.00	1.852	0.123
C_4H_{10} 58.120				0.500	0.057	3.31	0.213	0.213	0.270	0.057	3.31	0.220	4.86	0.681	0.045
C_5H_{10} 70.130				0.445	0.050	3.51	0.190	0.190	0.240	0.050	3.51	0.233	5.45	0.644	0.043
C_5H_{12} 72.146				0.080	0.009	0.65	0.034	0.034	0.043	0.009	0.65	0.043	5.25	0.124	0.008
C_6H_{12} 84.156				0.065	0.007	0.58	0.028	0.028	0.035	0.007	0.58	0.039	5.54	0.105	0.007
C_3-C_6											33.59	2.231		7.182	0.477
TOTAL		40.975	489.48		11.305	247.80	42.632	83.607	62.531						
H_2+CO	96.860	39.689	15062	SCFH	5.514		20.797	60.486	26.311	-34.175					
H_2/CO		1.88	Factor.	663922	5.89		5.89	2.60	5.89	1.64					
RECOVERED OIL										0.615**	86.36	5.734		13.370	0.888
TOTAL OIL											119.95	7.965		20.552	1.365
WATER SOLUBLE CHEMICALS										0.330**	17.52	1.163		2.107	0.140
TOTAL LIQUID PRODUCTS C_3+											137.47	9.128		22.659	1.505
NET WATER										7.649**	137.80	9.149		16.543	1.098
GROSS WATER											155.32	10.312		18.650	1.238
HYDROCARBON TOTAL—C_1+											168.91	11.214			

YIELD BASIS H_2+CO FED

YIELDS BASIS BROWNSVILLE DESIGN FEED RATE*	CORRECTED HEMPEL, %	gal/hr	TREATING RECOVERY, %	gal/hr
400 EP	67.5	9.025	98.0	8.845
400-550	20.0	2.674	91.4	2.444
550 +	12.5	1.671	114.6	1.915
	RECOVERY %	#/hr	gal/hr	
PROPYLENE	52.6	7.66		
C_3 POLY GASO.	87.5	6.70	1.120	
C_3 POLY TAR	12.5	0.96	0.127	
	#/gal	#/hr	gal/hr	RVP
C_4H_8	5.00	1.37	0.274	68.0
C_4 POLY GASO.	5.98	6.90	1.154	1.5
C_4H_{10}	4.86	3.31	0.681	68.0
C_4-FREE GASO.			10.838	5.8
C_4 POLY TAR	7.53	0.99	0.131	
	gal/hr	gal/MCF	Bbl/Day	
10 # RVP 400 EP GASOLINE	12.947	0.8596	4660	
GAS OIL	2.444	0.1623	880	
FUEL OIL	1.915	0.1271	689	
POLY TAR	0.358	0.0238	129	
TOTAL	17.664	1.1728	6358	
W. S. CHEM.	2.107	0.1399	758	
TOTAL	19.771	1.3126	7116	

OPERATING DATA

Pressure, psig	414	Inlet Velocity, Ft/sec	0.98	Catalyst	New CM&S
Temperature, °F	652	Bed Depth, Ft	20.6	Weight, #	1709
Recycle Ratio	1.04	Bed Density, #/CF	126	Volume, Cu ft	13.56

FRESH FEED CONVERSION — % Contraction	CO	H_2	H_2+CO	TOTAL FEED CONVERSION — % CO	H_2	CO+H_2	SELECTIVITY C_3+/C_1+
72.41	94.19	81.82	86.11	77.25	48.54	56.50	81.39

Form ML-11 ** Included in Reactor Effluent Total g/NCM = 16.91 × #/MCF *9488 MCFH H_2 + CO, Bbl/Day = 5421.6 × gal/MCF

OPERATING CONDITIONS

PRESSURES PSIG		RATES S.C.F.H.	
Oxygen	434	Fresh Feed	15550
Natural Gas	433	Recycle	16179
Generator Outlet	419	Combined Feed	31729
Reactor Inlet	414	Wet Gas—Measured	3629
Condenser Inlet		Adjusted	4290
Product Accumulator	360	Loss	661
TEMPERATURES—°F.		Recycle/Fresh Feed	1.04
Oxygen	400	Inlet Velocity—ft./sec.	0.98
Natural Gas	773	Fresh Feed Rate—S.C.F.H. H_2 + CO	15062
Generator	2287	per Cu. Ft. Dense Bed	1181
Quench Accumulator		per Lb. Catalyst	8.81
Reactor Inlet	346	per sq. ft.	22821
Condenser Inlet			
Product Accumulator	54	HEAT TRANSFER CALCULATIONS	
Catalyst No. Height		Steam Rate = 330#/hr.	
1 0'0"	599	@715 psia & 505°F =	
2 0'9"	660	1201 Btu/#	
3 1'9"	660	Water in @40°F = 8.28 Btu/#	
4 4'5"	660	Net Btu/# steam = 1192	
5 7'0"	661	1192 x 330 = 393,360	
6 12'3"	662	Ave. Bed Temp.= 652°F.	
7 17'5"	654	dT = 652-505 = 147°F.	
8 20'0"	656	Tube Area = 35.5 sq. ft.	
9 22'7"	706	$K = \frac{393,360}{(35.5)(147)}$ = 75.4 Btu/°F/sq. ft.	
10 25'2"	724		
11 26'11"	666		

PRODUCT TESTS

	OIL	WATER
°API	50.9	10.0
Neut. No.	22.3	18.9
Sap. No.	36.4	28.0
Hydrox. No.		
Bromine No.	95	
Pour °F.		
Chemicals, % by K_2CO_3		11.3
HEMPEL, DIST. %		°API
205 °F.	[illegible]	[illegible]
400	86.5	57.8
400-550	20.0	38.2
550+	13.5	
A. S. T. M. DIST. ON Naphtha °F.		
IBP	108	
10%	140	
50%	236	
90%	352	
EP	392	
Rec.	96.5	

CATALYST DATA

INVENTORY DATA		
In Reactor at Start of Period		
Fresh Catalyst Added		
Total		
Catalyst Recovered		97
In Reactor at End of Period		
REACTOR d-p, Inches H_2O		
No.	Height, Inch.	
0	0-21 3/8	37
1	21 3/8-52 3/4	64
2	52 3/4-84	62
3	84-115 3/8	75
4	115 3/8-353 1/8	260
Total		498
CALCULATED FROM dp		
Density, Lbs./Cu.Ft.		134
Inventory, Lbs.		1709
Bed Depth, Ft.		19.32
Volume, cu. ft.		12.75
CATALYST ANALYSIS		
Before Reduction 67.15% Fe		
" " 1.04% K_2O		
" " 0.68% SiO_2		
After Reduction		
Prior to Period A 78.35% Fe		

PARTICLE SIZE

Screen Analysis Mesh	Microns	%	Sedimentation Microns	%
On 40	419+	48.9	80+	
100	150	39.1	40—80	
150	105	6.8	20—40	
200	74	4.2	10—20	
250	62	0.6	0—20	
325	44	0.2		
<325		0.2		

CATALYST	
Bulk Density, Lbs./Cu.Ft.	
Aerated	155
Settled	155
Compacted	188
Particle Density, gm./cc.	4.41
NH_3 Value, ml./gm.	
N_2 Surface, m²/gm.	
CHEMICAL ANALYSIS	
Fe	
C	1.89
O	
H	
K_2O, W+, % basis Fe	
X-Ray Analysis—	
$Fe_{20}C_9$	
Fe_3O_4	
Fe	

GAS ANALYSES / GENERATOR BALANCE

HOUR	0200	0600		AVERAGE	M/HR	C	H	O
FRESH FEED								
CO 28.010	33.43	33.74		33.585	13.761	13.761		13.761
H_2 2.016	63.41	63.14		63.275	25.928		51.856	
CO_2 44.010	2.44	2.51		2.475	1.014	1.014		2.028
N_2 28.016	0.53	0.59		0.560	0.229			
CH_4 16.042	0.19	0.02		0.105	0.043	0.043	0.172	
			M. W.	11.9458				
			H_2O 18.016				6.163	3.082
					40.975	14.818	58.191	18.871
			BALANCE			94.44	103.77	94.70

	Mol %	M/Hr	C	H	O
O_2 32.000	0.17	9.808 0.022			19.660
CO_2 44.010	1.05	0.134	0.134		0.268
N_2 28.016	1.15	0.147			
CH_4 16.042	83.25	10.643	10.643	42.572	
C_2H_6 30.068	7.21	0.922	1.844	5.532	
C_3H_8 44.094	5.16	0.660	1.980	5.280	
C_4H_{10} 58.120	1.53	0.196	0.784	1.960	
C_5H_{12} 72.146	0.48	0.061	0.305	0.732	
TOTAL MW=	19.8723	12.785	15.690	56.076	19.928

WEIGHT BALANCE

	#/hr Measured	At Wt. Balance
WET GAS	209.62	247.80
OIL	86.36	86.36
WATER	155.32	155.32
TOTAL	451.30	489.48
FRESH FEED	489.48	
WEIGHT BALANCE	92.1998	
WET GAS FACTOR	1.182139	
INDICATED LOSS—S C F H	661	

WET GAS	0200	0600		AVERAGE
CO 28.010	7.98	6.18		7.080
H_2 2.016	45.55	37.85		41.700
CO_2 44.010	24.15	34.46		29.305
N_2 28.016	1.41	1.35		1.380
CH_4 16.042	11.93	9.35		10.640
C_2H_4 28.052	2.33	2.79		2.560
C_2H_6 30.068	1.45	1.33		1.390
C_3H_6 42.078	2.77	3.34		3.055
C_3H_8 44.094	0.36	0.32		0.340
C_4H_8 56.104	1.23	1.69		1.460
C_4H_{10} 58.120	0.41	0.59		0.500
C_5H_{10} 70.130	0.32	0.57		0.445
C_5H_{12} 72.146	0.07	0.09		0.080
C_6H_{12} 84.156	0.04	0.09		0.065
			M. W.	21.92009

GAS FLOW RATES

	$\sqrt{H}$	PRESSURE	TEMP.	M. W.	S. C. F. H.	M/HR
FRESH FEED 79.31	6.250	414.1 20.707	89.0 0.9732	2423445 1.5567	15550	40.975
WET GAS 158.44	4.913	1.56 4.032	53.7 1.0061	1320706 1.1492	3629	9.563
RECYCLE 79.31	8.513	415.1 20.732	120.7 0.9462	1.1492	15221	40.108
BLEED 5.02	8.463	20.732	0.9462	1.1492	958	2.524
NATURAL GAS 28.43	7.525	432.6 21.149	198.7 0.8885	1.2070	14568 4852	12.785
OXYGEN 27.07	6.475	433.6 21.173	57.1 1.0028		3722	9.808
STEAM 215.7	5.325	40.6 0.3303		330 #/hr.		

LIQUID PRODUCT RATES 4 hours basis

HOUR	GAGE	GAL.	°F	FACTOR	GAL. AT 60	API° #/GAL.	#	#/HR GAL/HR
OIL	6'-11"	366.77	54	1.0030	367.87	50.9 6.459	2376.07	
	5'-11"	314.39	60	1.0000	314.39		2030.65	
					+53.48		+345.42	86.36
								13.370
WATER	2'-4½"	126.59	60	1.00000	126.59	10.0 8.328	1054.24	
	1'-0"	52.00	62	0.99982	51.99		432.97	
					74.60		621.27	155.32
								18.650

THE TEXAS COMPANY — MONTEBELLO LABORATORY

YIELD CALCULATIONS

RUN NO. 58-B
HOURS 7-31
CATALYST AGE

FRESH FEED	%	m/hr	#/hr
CO 28.010	36.94	14.973	419.38
H_2 2.016	60.49	24.518	49.43
CO_2 44.010	1.84	0.746	32.83
N_2 28.016	0.46	0.186	5.21
CH_4 16.042	0.27	0.109	1.75
C_2H_4 28.052			
C_2H_6 30.068			
C_3+C_4			
C_3H_6 42.078			
C_3H_8 44.094			
C_4H_8 56.104			
C_4H_{10} 58.120			
C_5H_{10} 70.130			
C_5H_{12} 72.146			
C_6H_{12} 84.156			
C_5-C_6			
TOTAL		40.532	508.60
H_2+CO	97.43	39.491	14987 SCFH
H_2/CO		1.64	Factor. 667244

WET GAS	%	At Wt. Balance m/hr	At Wt. Balance #/hr
CO 28.010	15.08	2.664	74.63
H_2 2.016	49.68	8.775	17.69
CO_2 44.010	21.84	3.858	169.79
N_2 28.016	0.56	0.099	2.77
CH_4 16.042	6.32	1.116	17.90
C_2H_4 28.052	1.68	0.297	8.33
C_2H_6 30.068	1.08	0.191	5.74
C_3H_6 42.078	1.57	0.277	11.66
C_3H_8 44.094	0.15	0.026	1.15
C_4H_8 56.104	1.01	0.178	9.99
C_4H_{10} 58.120	0.37	0.065	3.78
C_5H_{10} 70.130	0.53	0.094	6.59
C_5H_{12} 72.146	0.06	0.011	0.79
C_6H_{12} 84.156	0.07	0.012	1.01
C_5-C_6			
TOTAL		17.663	331.82
H_2+CO	11.439		29.936
H_2/CO	Factor. 67244	3.29	3.29

RECYCLE m/hr	COMBINED FEED m/hr	EFFLUENT m/hr	NET CHANGE m/hr	NET CHANGE #/hr
6.970	21.943	9.634	-12.309	-344.75
22.966	47.484	31.741	-15.743	-31.74
10.096	10.842	13.954	3.112	136.96
0.259	0.445	0.353		
2.922	3.031	4.038	1.007	16.15
0.777	0.777	1.074	0.297	8.33
0.499	0.499	0.690	0.191	5.74
				30.22
0.726	0.726	1.003	0.277	11.66
0.069	0.069	0.095	0.026	1.15
0.467	0.467	0.645	0.178	9.99
0.171	0.171	0.236	0.065	3.78
0.245	0.245	0.339	0.094	6.59
0.028	0.028	0.039	0.011	0.79
0.032	0.032	0.044	0.012	1.01
				34.97
46.227	86.759	70.298		
29.936	69.427	41.375	-28.052	
3.29	2.16	3.29	1.28	

YIELD BASIS H_2+CO FED

CONDENSATE #/MCF	#/gal	gal/hr	gal/MCF
9.139			
1.078			
0.556			
0.383			
2.017			
0.778	4.32	2.699	0.180
0.077	4.24	0.271	0.018
0.667	5.00	1.998	0.133
0.252	4.86	0.778	0.052
0.440	5.45	1.209	0.081
0.053	5.25	0.150	0.010
0.067	5.54	0.182	0.012
2.334		7.287	0.486

YIELDS BASIS BROWNSVILLE DESIGN FEED RATE*	CORRECTED HEMPEL, %	gal/hr	TREATING RECOVERY, %	gal/hr
400 EP	74.0	6.897	98.0	6.759
400-550	13.2	1.230	91.4	1.124
550 +	12.8	1.193	114.6	1.367

	RECOVERY %	#/hr	gal/hr
PROPYLENE	32.4	3.78	
C_3 POLY GASO.	87.5	3.31	0.554
C_3 POLY TAR	12.5	0.47	0.062

	#/gal	#/hr	gal/hr	RVP
C_4H_8	5.00	0.35	0.070	68.0
C_4 POLY GASO.	5.98	8.43	1.410	1.5
C_4H_{10}	4.86	3.78	0.778	68.0
C_4-FREE GASO.			8.854	5.8
C_4 POLY TAR	7.53	1.21	0.161	

	gal/hr	gal/MCF	Bbl/Day
10 # RVP 400 EP GASOLINE	11.113	0.7415	4020
GAS OIL	1.124	0.0750	407
FUEL OIL	1.367	0.0912	494
POLY TAR	0.273	0.0182	99
TOTAL	13.877	0.9259	5020
W. S. CHEM.	1.690	0.1128	612
TOTAL	15.567	1.0387	5632

OPERATING DATA					
Pressure, psig	410	Inlet Velocity, Ft/sec	1.09	Catalyst	CM&S
Temperature, °F	652	Bed Depth, Ft	14.42	Weight, #	1723
Recycle Ratio	1.14	Bed Density, #/C F	181	Volume, Cu ft	9.52

FRESH FEED CONVERSION — %				TOTAL FEED CONVERSION — %			SELECTIVITY
Contraction	CO	H_2	H_2+CO	CO	H_2	CO+H_2	C_3 + /C_4 +
56.42	82.21	64.21	71.03	56.10	33.15	40.41	78.24

	RECOVERED OIL	0.427**	59.85	3.993	9.320	0.622
	TOTAL OIL		94.82	6.327	16.607	1.108
	WATER SOLUBLE CHEMICALS	0.262**	13.89	0.927	1.690	0.113
	TOTAL LIQUID PRODUCTS C_4+		108.71	7.254	18.297	1.221
	NET WATER	5.719**	103.04	6.875	12.370	0.825
	GROSS WATER		116.93	7.802	14.060	0.938
	HYDROCARBON TOTAL—C_4+		138.93	9.271		

Form ML-11

**Included in Reactor Effluent Total

g/NCM = 16.91 X #/MCF *9488 MCFH H_2 + CO, Bbl/Day = 5421.6 X gal/MCF

OPERATING CONDITIONS			
PRESSURES PSIG		RATES S.C.F.H.	
Oxygen	435	Fresh Feed	15382
Natural Gas	432	Recycle	17543
Generator Outlet	418	Combined Feed	32925
Reactor Inlet	410	Wet Gas—Measured	6334
Condenser Inlet		Adjusted	6703
Product Accumulator	361	Loss	369
TEMPERATURES—°F.		Recycle/Fresh Feed	1.14
Oxygen	434	Inlet Velocity—ft./sec.	1.09
Natural Gas	760	Fresh Feed Rate—S.C.F.H. H_2+CO	14987
Generator		per Cu. Ft. Dense Bed	1576
Quench Accumulator	180	per Lb. Catalyst	8.70
Reactor Inlet	533	per sq. ft.	22708
Condenser Inlet			
Product Accumulator	70		

Catalyst No.	Height	
1	0'0"	635
2	0'9"	654
3	1'9"	656
4	4'5"	656
5	7'0"	655
6	12'3"	655
7	17'5"	644
8	20'0"	641
9	22'7"	655
10	25'2"	681
11	26'11"	674

652 Avg.

PRODUCT TESTS	OIL	WATER
°API	52.1	10.4
Neut. No.	38.8	40.3
Sap. No.	50.5	38.8
Hydrox. No.		
Bromine No.	91	
Pour °F.		
Chemicals, % by K_2CO_3		12.0

HEMPEL, DIST. %		°API
205 °F.		
400	73.0	56.4
400-550	13.2	38.6
550+	13.8	

A. S. T. M. DIST. ON		
Naphtha °F.		
IBP	108	
10%	140	
50%	230	
90%	344	
EP	386	
Rec.	96.5	

CATALYST DATA		
INVENTORY DATA		
In Reactor at Start of Period		
Fresh Catalyst Added		
Total		
Catalyst Recovered	184.5	
In Reactor at End of Period		
REACTOR d-p, Inches H_2O		
No. Height		
0 0-21 3/8	51	
1 21 3/8-52 3/4	85	
2 52 3/4-84	93	
3 84-115 3/8	93	
4 115 3/8-353 1/8	180	
Total	502	
CALCULATED FROM dp		
Density, Lbs./Cu.Ft.	181	
Inventory, Lbs.	1723	
Bed Depth, Ft.	14.42	
Volume, cu. ft.	9.52	
Carryover Catalyst Sieve Analysis On 325-mesh 64.9%		
Thru 325-mesh 35.1%		

PARTICLE SIZE					
	Screen Analysis			Sedimentation	
	Mesh	Microns	%	Microns	%
On 40	419+		35.3	80+	
100	150		35.5	40—80	
150	105		10.2	20—40	
200	74		7.8	10—20	
250	62		4.2	0—20	
325	44		5.4		
<325			1.6		

CATALYST	
Bulk Density, Lbs./Cu.Ft.	
Aerated	159
Settled	161
Compacted	197
Particle Density, gm./cc.	4.74
NH_3 Value, ml./gm.	
N_2 Surface, m^2/gm.	

CHEMICAL ANALYSIS	
Fe	
C	1.96
O	
H	
K_2O, W+, % basis Fe	
X-Ray Analysis—	
$Fe_{20}C_9$	
Fe_3O_4	
Fe	

GAS ANALYSES	1400	2200	0600	AVERAGE
HOUR				
FRESH FEED				
CO 28.010	37.14	37.08	36.59	36.74
H_2 2.016	61.08	60.65	59.74	60.49
CO_2 44.010	1.11	2.08	2.33	1.84
N_2 28.016	0.05	0.09	1.25	0.46
CH_4 16.042	0.62	0.10	0.09	0.27
			M. W.	12.548
			H_2O 18.016	
				1.5189
			BALANCE	
WET GAS				
CO 28.010	15.29	15.96	16.00	15.08
H_2 2.016	49.01	51.67	48.33	49.68
CO_2 44.010	23.11	19.51	22.88	21.84
N_2 28.016	0.64	0.57	0.48	0.56
CH_4 16.042	7.28	5.66	6.03	6.32
C_2H_4 28.052	1.53	1.54	1.98	1.68
C_2H_6 30.068	1.09	1.07	1.08	1.08
C_3H_6 42.078	1.86	1.85	0.99	1.57
C_3H_8 44.094	0.20	0.20	0.04	0.15
C_4H_8 56.104	1.03	1.03	0.97	1.01
C_4H_{10} 58.120	0.43	0.37	0.32	0.37
C_5H_{10} 70.130	0.39	0.43	0.78	0.53
C_5H_{12} 72.146	0.07	0.05	0.07	0.06
C_6H_{12} 84.156	0.07	0.09	0.05	0.07
			M. W.	18.786

GENERATOR BALANCE	M/HR	C	H	O
FRESH FEED				
CO	14.973	14.973		14.973
H_2	24.518		49.036	
CO_2	0.746	0.746		1.492
N_2	0.186			
CH_4	0.109	0.109	0.436	
			8.154	4.077
	40.532	15.828	57.626	20.542
		100.71	102.08	97.23

	Mol %	M/Hr	C	H	O
O_2 32.000	0.15	10.443 0.019			20.924
CO_2 44.010	0.79	0.102	0.102		0.204
N_2 28.016	1.52	0.197			
CH_4 16.042	83.66	10.817	10.817	43.268	
C_2H_6 30.068	6.87	0.888	1.776	5.328	
C_3H_8 44.094	5.12	0.662	1.986	5.296	
C_4H_{10} 58.120	1.46	0.189	0.756	1.890	
C_5H_{12} 72.146	0.43	0.056	0.280	0.672	
TOTAL MW = 19.724			15.717	56.454	21.128

WEIGHT BALANCE	#/hr Measured	At Wt. Balance
WET GAS	313.54	331.82
OIL	59.85	59.85
WATER	116.93	116.93
TOTAL	490.32	508.60
FRESH FEED	508.60	
WEIGHT BALANCE	96.4058	
WET GAS FACTOR	1.058301	
INDICATED LOSS—S C F H	369	

GAS FLOW RATES		PRESSURE	TEMP.	M. W.	S. C. F. H.	M/HR
		410	101			
FRESH FEED	6.433	20,615	0.9628	1.5189	15382	40.532
		2.0	64			
WET GAS	7.904	4.090	0.9962	1.2414	6334	16.690
		415	125			
RECYCLE	8.550	20.736	0.9428	1.2414	16457	43.365
			60			
BLEED	8.400	20.736	1.0000	1.2414	1086	2.862
		432	198			
NATURAL GAS	7.580	21.140	0.8890	1.2115	4907	12.930
		435	74			
OXYGEN	6.994	21.210	0.9868		3963	10.443
		39-10	260			
STEAM	5.450					

LIQUID PRODUCT RATES								
HOUR	GAGE	GAL.	°F	FACTOR	GAL. AT 60	API° #/GAL.	#	#/HR GAL/HR
OIL	7'-5½"	395.14	52	1.0039	396.68	50.9 6.459	2562.2	
	6'-11"	366.77	54	1.0030	367.87	"	2376.1	
	4'-9"	253.29	56	1.0020	253.80	52.1 6.416	1628.4	
	1'-2½"	61.74	50	1.0049	62.04	"	398.0	
					+3.12		+20.0	59.85
					223.69		1436.5	9.32
WATER	6'-9"	358.04	71	0.9988	357.61	10.1 8.322	2976.0	
	2'-4½"	126.59	60	1.0000	126.59	"	1053.5	
	2'-3"	119.67	57	1.0003	119.71	10.4 8.305	994.2	
	0'-3"	13.28	58	1.0002	13.28	"	110.3	
					337.45		2806.4	116.93
								14.06

THE TEXAS COMPANY — MONTEBELLO LABORATORY

YIELD CALCULATIONS

RUN NO. 58-C
HOURS 31-55
CATALYST AGE

	FRESH FEED %	FRESH FEED m/hr	FRESH FEED #/hr	WET GAS %	WET GAS At Wt. Balance m/hr	WET GAS At Wt. Balance #/hr	RECYCLE m/hr	COMBINED FEED m/hr	EFFLUENT m/hr	NET CHANGE m/hr	NET CHANGE #/hr
CO 28.010	37.413	15.096	422.85	16.103	2.777	77.78	6.861	21.957	9.638	-12.319	-345.07
H_2 2.016	60.160	24.275	48.94	47.354	8.167	16.46	20.172	44.447	28.339	-16.108	-32.48
CO_2 44.010	2.087	0.842	37.06	22.830	3.938	173.31	9.727	10.569	13.665	3.096	136.25
N_2 28.016	0.100	0.040	1.12	0.477	0.082	2.30	0.203	0.243	0.285		
CH_4 16.042	0.240	0.097	1.56	5.807	1.001	16.06	2.474	2.571	3.475	0.904	14.50
C_2H_4 28.052				1.667	0.287	8.05	0.710	0.710	0.997	0.287	8.05
C_3H_6 30.068				1.087	0.187	5.62	0.463	0.463	0.650	0.187	5.62
C_4+C_5											28.17
C_2H_6 48.078				2.153	0.371	15.61	0.917	0.917	1.288	0.371	15.61
C_3H_8 44.094				0.170	0.029	1.28	0.072	0.072	0.101	0.029	1.28
C_4H_8 56.104				1.290	0.222	12.46	0.550	0.550	0.772	0.222	12.46
C_4H_{10} 58.120				0.443	0.076	4.42	0.189	0.189	0.265	0.076	4.42
C_5H_{10} 70.130				0.483	0.083	5.82	0.206	0.206	0.289	0.083	5.82
C_5H_{12} 72.146				0.063	0.011	0.79	0.027	0.027	0.038	0.011	0.79
C_6H_{12} 84.156				0.083	0.014	1.18	0.035	0.035	0.049	0.014	1.18
C_5-C_6											41.56
TOTAL		40.350	511.53		17.245	341.14	42.606	82.956	66.172		
H_2+CO	97.573	39.371	14941	SCFH	10.944		27.033	66.404	37.977	-28.427	
H_2/CO		1.61	Factor.	.669299	2.94		2.94	2.02	2.94	1.31	

CONDENSATE #/MCF	CONDENSATE #/gal	CONDENSATE gal/hr	CONDENSATE gal/MCF
9.119			
1.885			
1.045	4.32	3.613	0.242
0.086	4.24	0.302	0.020
0.834	5.00	2.492	0.167
0.296	4.86	0.909	0.061
0.390	5.48	1.068	0.071
0.053	5.25	0.150	0.010
0.079	5.54	0.213	0.014
2.783		8.747	0.585

YIELD BASIS H_2+CO FED

YIELDS	BASIS BROWNSVILLE DESIGN FEED RATE*			
	CORRECTED HEMPEL, %	gal/hr	TREATING RECOVERY, %	gal/hr
400 EP	78.6	6.527	98.0	6.396
400-550	13.6	1.129	91.4	1.032
550 +	7.8	0.648	114.6	0.743

	RECOVERY %	#/hr	gal/hr	
PROPYLENE	32.9	5.14		
C_3 POLY GASO.	87.5	4.50	0.753	
C_3 POLY TAR	12.5	0.64	0.085	

	#/gal	#/hr	gal/hr	RVP
C_4H_8	5.00			68.0
C_4 POLY GASO.	5.98	10.90	1.823	1.5
C_4H_{10}	4.86	4.52	0.889	68.0
C_4-FREE GASO.			8.580	5.8
C_4 POLY TAR	7.53	1.56	0.207	

	gal/hr	gal/MCF	Bbl/Day
10 # RVP 400 EP GASOLINE	9.469	0.6338	3436
GAS OIL	1.032	0.0691	375
FUEL OIL	0.743	0.0497	269
POLY TAR	0.292	0.0195	106
TOTAL	11.536	0.7721	4186
W. S. CHEM.	1.875	0.1255	680
TOTAL	13.411	0.8976	4866

OPERATING DATA

Pressure, psig	406	Inlet Velocity, Ft/sec	0.78	Catalyst	CM&S
Temperature, °F	650	Bed Depth, Ft	14.42	Weight, #	1685
Recycle Ratio	1.06	Bed Density, #/CF	177	Volume, Cu ft	9.52

	RECOVERED OIL	0.380**	53.28	3.566		8.304	0.556
	TOTAL OIL		94.84	6.349		17.051	1.141
	WATER SOLUBLE CHEMICALS	0.288**	15.27	1.022		1.875	0.125
	TOTAL LIQUID PRODUCTS C_4+		110.11	7.371		18.926	1.266
	NET WATER	5.653**	101.84	6.816		12.226	0.818
	GROSS WATER		117.11	7.839		14.101	0.943
	HYDROCARBON TOTAL—C_1+		138.28	9.255			

FRESH FEED CONVERSION — %

Contraction	CO	H_2	H_2+CO
57.26	81.60	66.36	72.20

TOTAL FEED CONVERSION — %

H_2	$CO+H_2$	C_3+/C_1+
36.24	42.81	79.63

SELECTIVITY

Form ML-11

**Included in Reactor Effluent Total

g/NCM = 16.91 × #/MCF *9488 MCFH H_2+CO, Bbl/Day = 5421.6 × gal/MCF

OPERATING CONDITIONS

PRESSURES PSIG		RATES S.C.F.H.	
Oxygen	432	Fresh Feed	15315
Natural Gas	428	Recycle	16169
Generator Outlet	415	Combined Feed	31482
Reactor Inlet	406	Wet Gas—Measured	6033
Condenser Inlet		Adjusted	6544
Product Accumulator	362	Loss	511
TEMPERATURES—°F.		Recycle/Fresh Feed	1.06
Oxygen	457	Inlet Velocity—ft./sec.	0.78
Natural Gas	773	Fresh Feed Rate—S.C.F.H. per sq. ft.	14941
Generator		per Cu. Ft. Dense Bed	1569
Quench Accumulator		per Lb. Catalyst	8.87
Reactor Inlet	412	per sq. ft.	22638
Condenser Inlet			
Product Accumulator	66		

Catalyst No.	Height	
1	0'0"	615
2	0'9"	654
3	1'9"	660
4	4'5"	655
5	7'0"	660
6	12'3"	660
7	17'5"	646
8	20'0"	630
9	22'7"	635
10	25'2"	635
11	26'11"	603

650 Avg.

PRODUCT TESTS

	OIL	WATER
°API	52.1	10.4
Neut. No.	47.3	46.1
Sap. No.	50.6	39.9
Hydrox. No.		
Bromine No.	91	
Pour °F.		
Chemicals, % by K_2CO_3		13.3

HEMPEL DIST. %		°API
205 °F.		
400	77.6	58.6
400-550	13.6	38.4
550+	8.8	

A. S. T. M. DIST. ON		
Naphtha °F.		
IBP	102	
10%	132	
50%	228	
90%	352	
EP	396	
Rec.	96.0	

CATALYST DATA

INVENTORY DATA		
In Reactor at Start of Period		
Fresh Catalyst Added		
Total		
Catalyst Recovered	73.0	
In Reactor at End of Period		
REACTOR d-p, Inches H_2O		
No. Height		
0 0-21 3/8	51	
1 21 3/8-52 3/4	85	
2 52 3/4-84	90	
3 84-115 3/8	90	
4 115 3/8-353 1/8	175	
Total	491	
CALCULATED FROM dp		
Density, Lbs./Cu.Ft.	177	
Inventory, Lbs.	1685	
Bed Depth, Ft.	14.42	
Volume, cu. ft.	9.52	

PARTICLE SIZE

Screen Analysis Mesh	Microns	%	Sedimentation Microns	%
On 40	419+	28.7	80+	
100	150	42.9	40—80	
150	105	11.4	20—40	
200	74	8.8	10—20	
250	62	4.0	0—20	
325	44	3.2		
<325		1.0		

CATALYST

Bulk Density, Lbs./Cu.Ft.	
Aerated	159
Settled	161
Compacted	199
Particle Density, gm./cc.	4.8
NH_3 Value, ml./gm.	
N_2 Surface, m^2/gm.	

CHEMICAL ANALYSIS

Fe	
C	2.06
O	
H	
K_2O, W+, % basis Fe	
X-Ray Analysis—	
$Fe_{20}C_9$	
Fe_3O_4	
Fe	

GAS ANALYSES

HOUR	1400	2200	0600	AVERAGE
FRESH FEED				
CO 28.010	37.17	37.15	37.92	37.413
H_2 2.016	60.65	60.40	59.43	60.160
CO_2 44.010	1.70	2.12	2.44	2.087
N_2 28.016	0.07	0.09	0.14	0.100
CH_4 16.042	0.41	0.24	0.07	0.240
			M. W.	12.67721
			H_2O 18.016	
			BALANCE	

GENERATOR BALANCE

M/HR	C	H	O
15.096	15.096		15.096
24.275		48.550	
0.842	0.842		1.684
0.040			
0.097	0.097	0.388	
		8.198	4.099
40.350	16.035	57.136	20.879
	101.07	100.50	99.32

	Mol %	M/Hr	C	H	O
O_2 32.000	0.16	0.021			0.832
CO_2 44.010	0.74	0.095	0.095		0.190
N_2 28.016	0.85	0.109			
CH_4 16.042	84.18	10.843	10.843	43.372	
C_2H_6 30.068	6.77	0.872	1.744	5.232	
C_2H_4 28.052	5.04	0.649	1.947	5.192	
C_4H_{10} 58.120	1.70	0.219	0.876	2.190	
C_3H_6 72.146	0.56	0.072	0.360	0.864	
TOTAL MW=	19.76916		15.865	56.850	21.022

WEIGHT BALANCE

	#/hr Measured	At Wt. Balance
WET GAS	314.48	341.14
OIL	53.28	53.28
WATER	117.11	117.11
TOTAL	484.87	511.53
FRESH FEED	511.53	
WEIGHT BALANCE		
WET GAS FACTOR	1.084774	
INDICATED LOSS—S C F H	511	

WET GAS				
CO 28.010	15.62	16.06	16.63	16.103
H_2 2.016	48.64	46.30	47.12	47.354
CO_2 44.010	22.12	23.17	23.20	22.830
N_2 28.016	0.51	0.33	0.59	0.477
CH_4 16.042	6.50	5.78	5.14	5.807
C_2H_4 28.052	1.64	1.81	1.55	1.667
C_2H_6 30.068	1.04	1.12	1.10	1.087
C_2H_2 48.078	1.94	2.39	2.13	2.153
C_3H_8 44.094	0.21	0.21	0.09	0.170
C_4H_8 56.104	1.06	1.55	1.26	1.290
C_4H_{10} 58.120	0.28	0.44	0.58	0.433
C_5H_{10} 70.130	0.35	0.63	0.47	0.483
C_5H_{12} 72.146	0.05	0.09	0.05	0.063
C_6H_{12} 84.156	0.04	0.12	0.09	0.083
			M. W.	19.78256

GAS FLOW RATES

	√h	PRESSURE	TEMP.	M. W.	S. C. F. H.	M/HR
FRESH FEED		406.3	102.9	2283625		
	6.479	20.518	0.9611	1.5112	15313	40.350
WET GAS		2.03	65.5			
	7.863	4.090	0.9947	1.1903	6033	15.897
RECYCLE		410.6	126.7			
	8.317	20.623	0.9414	1.1903	15243	40.166
BLEED						
	7.979	20.623	0.9414	1.1903	926	2.440
NATURAL GAS		428.0	198.7	14644		
	7.600	21.040	0.8885	1.2101	4888	12.880
OXYGEN		432.0	74.4			
	6.992	21.135	0.9863		3945	10.395
STEAM		38.8				
	4.771	215.7				

LIQUID PRODUCT RATES

HOUR	GAGE	GAL.	°F	FACTOR	GAL. AT 60	API° #/GAL.	#	#/HR GAL HR
OIL	7'3"	384.23	70	0.9951	382.35	59.1 6.416	2453.16	
	4'9"	253.29	56	1.0020	253.80	"	1628.40	
	1'6"	78.16	53	1.0035	78.43	"	503.21	
	0'3"	13.28	58	1.0010	13.29	"	85.27	
					•5.61		•36.00	53.28
					199.30		1278.70	8.304
WATER	7'0"	371.14	68	0.99920	370.84	10.4	3079.83	
	2'3"	119.67	57	1.0003	119.71	8.305	994.20	
	1'11"	100.59	61	0.99992	100.58	"	835.32	
	0'3"	13.28	58	1.00018	13.28	"	110.29	117.11
					338.43		2810.66	14.101

THE TEXAS COMPANY — MONTEBELLO LABORATORY
YIELD CALCULATIONS

RUN NO. 58-D
HOURS 55-79
CATALYST AGE

	FRESH FEED %	FRESH FEED m/hr	FRESH FEED #/hr	WET GAS %	WET GAS At Wt. Balance m/hr	WET GAS At Wt. Balance #/hr	RECYCLE m/hr	COMBINED FEED m/hr	EFFLUENT m/hr	NET CHANGE m/hr	NET CHANGE #/hr	CONDENSATE #/MCF	CONDENSATE #/gal	CONDENSATE gal/hr	CONDENSATE gal/MCF
CO 28.010	36.867	14.817	415.01	17.063	3.278	91.82	7.656	22.473	10.934	-11.539	-323.19				
H_2 2.016	60.770	24.423	49.24	51.056	9.807	19.77	22.910	47.333	32.717	-14.616	-29.47				
CO_2 44.010	2.013	0.809	35.60	18.317	3.519	154.86	8.219	9.028	11.738	2.710	119.26	8.008			
N_2 28.016	0.117	0.047	1.32	0.910	0.175	4.90	0.408	0.455	0.583						
CH_4 16.042	0.233	0.094	1.51	5.887	1.131	18.14	2.641	2.735	3.772	1.037	16.63	1.117			
C_2H_4 28.052				1.537	0.295	8.28	0.690	0.690	0.985	0.295	8.28	0.556			
C_2H_6 30.068				0.957	0.184	5.53	0.429	0.429	0.613	0.184	5.53	0.371			
C_1+C_2											30.44	2.044			
C_3H_6 42.078				2.020	0.388	16.33	0.906	0.906	1.294	0.388	16.33	1.097	4.32	3.780	0.254
C_3H_8 44.094				0.377	0.072	3.17	0.169	0.169	0.241	0.072	3.17	0.213	4.24	0.748	0.050
C_4H_8 56.104				1.073	0.206	11.56	0.481	0.481	0.687	0.206	11.56	0.776	5.00	2.312	0.155
C_4H_{10} 58.120				0.280	0.054	3.14	0.126	0.126	0.180	0.054	3.14	0.211	4.86	0.646	0.043
C_5H_{10} 70.130				0.387	0.074	5.19	0.174	0.174	0.248	0.074	5.19	0.349	5.45	0.952	0.064
C_5H_{12} 72.146				0.063	0.012	0.87	0.028	0.028	0.040	0.012	0.87	0.058	5.25	0.166	0.011
C_6H_{12} 84.156				0.073	0.014	1.18	0.033	0.033	0.047	0.014	1.18	0.079	5.54	0.212	0.014
C_3-C_4											41.44	2.783		8.816	0.591
TOTAL		40.190	502.68		19.209	344.74	44.870	85.060	70.151						
H_2+CO	97.637	39.240	14892	SCFH	13.085		30.566	69.806	43.651	-26.155					
H_2/CO		1.65	Factor. 671501		2.99		2.99	2.11	2.99	1.27					

	NET CHANGE m/hr	NET CHANGE #/hr	#/MCF	#/gal	gal/hr	gal/MCF
RECOVERED OIL	0.322**	45.22	3.037		7.060	0.474
TOTAL OIL		86.66	5.820		15.876	1.065
WATER SOLUBLE CHEMICALS	0.261**	13.83	0.929		1.727	0.116
TOTAL LIQUID PRODUCTS C_3+		100.49	6.749		17.603	1.181
NET WATER	5.489**	98.89	6.640		11.871	0.797
GROSS WATER		112.72	7.569		13.598	0.913
HYDROCARBON TOTAL—C_1+		130.93	8.793			

OPERATING DATA

Pressure, psig	402	Inlet Velocity, Ft/sec	0.77	Catalyst	CM&S
Temperature, °F	644	Bed Depth, Ft	13.93	Weight, #	1627
Recycle Ratio	1.12	Bed Density, #/CF	177	Volume, Cu ft	9.19

FRESH FEED CONVERSION — %				TOTAL FEED CONVERSION — %			SELECTIVITY
Contraction	CO	H_2	H_2+CO	CO	H_2	CO+H_2	C_3+/C_1+
52.20	77.88	59.85	66.65	51.35	30.88	37.47	76.75

YIELD BASIS H_2+CO FED

YIELDS BASIS BROWNSVILLE DESIGN FEED RATE*	CORRECTED HEMPEL, %	gal/hr	TREATING RECOVERY, %	gal/hr
400 EP	78.6	5.549	98.0	5.438
400-550	15.0	1.059	91.4	0.968
550 +	6.4	0.452	114.6	0.518

	RECOVERY %	#/hr	gal/hr
PROPYLENE	29.9	4.88	
C_3 POLY GASO.	87.5	4.27	0.714
C_3 POLY TAR	12.5	0.61	0.081

	#/gal	#/hr	gal/hr	RVP
C_4H_8	5.00	0.65	0.130	68.0
C_4 POLY GASO	5.98	9.55	1.596	1.5
C_4H_{10}	4.86	3.14	0.646	68.0
C_4-FREE GASO.			7.482	5.8
C_4 POLY TAR	7.53	1.36	0.181	

	gal/hr	gal/MCF	Bbl/Day
10 # RVP 400 EP GASOLINE	9.854	0.6617	3587
GAS OIL	0.968	0.0650	352
FUEL OIL	0.518	0.0348	189
POLY TAR	0.262	0.0176	95
TOTAL	11.602	0.7791	4224
W. S. CHEM.	1.727	0.1160	629
TOTAL	13.329	0.8951	4853

Form ML-11

**Included in Reactor Effluent Total

g/NCM = 16.91×#/MCF

*9488 MCFH H_2 + CO, Bbl/Day = 5421.6 × gal/MCF

OPERATING CONDITIONS

PRESSURES PSIG		RATES S.C.F.H.	
Oxygen	429	Fresh Feed	15252
Natural Gas	425	Recycle	17028
Generator Outlet	411	Combined Feed	32280
Reactor Inlet	402	Wet Gas—Measured	6600
Condenser Inlet		Adjusted	7282
Product Accumulator	361	Loss	682
TEMPERATURES—°F.		Recycle/Fresh Feed	1.12
Oxygen	476	Inlet Velocity—ft./sec.	0.77
Natural Gas	763	Fresh Feed Rate—S.C.F.H. H_2+CO	14892
Generator		per Cu. Ft. Dense Bed	1620
Quench Accumulator		per Lb. Catalyst	9.15
Reactor Inlet	380	per sq. ft.	22564
Condenser Inlet			
Product Accumulator	66		
Catalyst No. Height			
1 0'0"	602		
2 0'9"	649		
3 1'9"	654		
4 4'5"	648		
5 7'0"	658		
6 12'3"	657		
7 17'5"	642	644 Avg.	
8 20'0"	626		
9 22'7"	630		
10 25'2"	637		
11 26'11"	605		

PRODUCT TESTS

	OIL	WATER
°API	52.7	10.6
Neut. No.	45.3	44.1
Sap. No.	54.6	43.8
Hydrox. No.		
Bromine No.	97	
Pour °F.		
Chemicals, % by K_2CO_3		12.7
HEMPEL. DIST. %		°API
205 °F.		
400	77.6	56.7
400-550	15.0	37.7
550+	8.4	
A. S. T. M. DIST. ON Naphtha °F.		
IBP	100	
10%	134	
50%	222	
90%	352	
EP	392	
Rec.	96	

CATALYST DATA

INVENTORY DATA	
In Reactor at Start of Period	
Fresh Catalyst Added	
Total	
Catalyst Recovered	46.0
In Reactor at End of Period	

REACTOR d-p, Inches H_2O

No.	Height	
0	0-21 3/8	52
1	21 3/8-52 3/4	87
2	52 3/4-84	90
3	84-115 3/8	90
4	115 3/8-353 1/8	155
Total		474

CALCULATED FROM dp	
Density, Lbs./Cu.Ft.	177
Inventory, Lbs.	1627
Bed Depth, Ft.	13.93
Volume, cu. ft.	9.19

PARTICLE SIZE

Screen Analysis Mesh	Microns	%	Sedimentation Microns	%
On 40	419+	48.0	80+	
100	150	42.0	40—80	
150	105	5.8	20—40	
200	74	2.4	10—20	
250	62	0.6	0—20	
325	44	0.6		
<325		0.6		

CATALYST	
Bulk Density, Lbs./Cu.Ft.	
Aerated	164
Settled	165
Compacted	194
Particle Density, gm./cc.	4.66
NH_3 Value, ml./gm.	
N_2 Surface, m^2/gm.	
CHEMICAL ANALYSIS	
Fe	
C	3.32
O	
H	
K_2O, W+, % basis Fe	
X-Ray Analysis—	
$Fe_{20}C_9$	
Fe_3O_4	
Fe	

GAS ANALYSES / GENERATOR BALANCE

HOUR	1400	2200	0600	AVERAGE	M/HR	C	H	O
FRESH FEED								
CO 28.010	36.74	36.81	37.05	36.867	14.817	14.817		14.817
H_2 2.016	60.95	60.71	60.65	60.770	24.423		48.846	
CO_2 44.010	1.71	2.24	2.09	2.013	0.809	0.809		1.618
N_2 28.016	0.15	0.08	0.12	0.117	0.047			
CH_4 16.042	0.45	0.16	0.09	0.233	0.094	0.094	0.376	
			M. W.	12.50765				
			H_2O 18.016				8.290	4.145
					40.190	15.720	57.512	20.580
			BALANCE			99.15	101.84	97.54

	Mol %	M/Hr	C	H	O
O_2 32.000	0.19	10.398 0.024			20.844
CO_2 44.010	1.00	0.128	0.128		0.256
N_2 28.016	1.15	0.147			
CH_4 16.042	83.03	10.635	10.635	42.540	
C_2H_6 30.068	7.05	0.903	1.806	5.418	
C_3H_8 44.094	5.27	0.675	2.025	5.400	
C_4H_{10} 58.120	1.71	0.219	0.876	2.190	
C_5H_{12} 72.146	0.60	0.077	0.385	0.924	
TOTAL MW=	20.01303		15.855	56.472	21.100

WEIGHT BALANCE

	#/hr Measured	At Wt. Balance
WET GAS	312.46	344.74
OIL	45.22	45.22
WATER	112.72	112.72
TOTAL	470.40	502.68
FRESH FEED	502.68	
WEIGHT BALANCE	93.5784	
WET GAS FACTOR	1103309	
INDICATED LOSS—S C F H	682	

WET GAS	1400	2200	0600	AVERAGE
CO 28.010	16.46	16.73	18.00	17.063
H_2 2.016	50.21	49.28	53.68	51.056
CO_2 44.010	19.27	21.08	14.60	18.317
N_2 28.016	0.75	0.72	1.26	0.910
CH_4 16.042	6.34	5.50	5.82	5.887
C_2H_4 28.052	1.55	1.39	1.67	1.537
C_2H_6 30.068	0.98	0.90	0.99	0.957
C_3H_6 42.078	1.98	1.93	2.15	2.020
C_3H_8 44.094	0.36	0.38	0.39	0.377
C_4H_8 56.104	1.16	1.10	0.96	1.073
C_4H_{10} 58.120	0.32	0.36	0.16	0.280
C_5H_{10} 70.130	0.48	0.45	0.23	0.387
C_5H_{12} 72.146	0.05	0.09	0.05	0.063
C_6H_{12} 84.156	0.09	0.09	0.04	0.073
			M. W.	17.94743

GAS FLOW RATES

		√R	PRESSURE	TEMP.	M. W.	S. C. F. H.	M/HR
FRESH FEED	79.31	6.433	402.0 / 20.413	101.3 / 0.9626	2314583 / 1.5214	15252	40.190
WET GAS	158.44	8.071	2.02 / 4.089	66.4 / 0.9938	1613044 / 1.2701	6600	17.410
RECYCLE	79.31	8.217	408.1 / 20.562	124.0 / 0.9436	1.2701	16060	42.319
BLEED	5.02	7.825	20.562	0.9436	1.2701	968	2.551
NATURAL GAS	28.43	7.592	425.4 / 20.979	192.7 / 0.8925	1446557 / 1.2027	4861	12.809
OXYGEN	27.07	7.012	429.4 / 21.074	74.4 / 0.9865		3946	10.398
STEAM	215.7	4.354	41.5				

LIQUID PRODUCT RATES

HOUR	GAGE	GAL.	°F	FACTOR	GAL. AT 60	API° #/GAL.	#	#/HR GAL HR
OIL	4'7 3/8"	246.20	64	0.9980	245.71	52.7 6.396	1571.56	
	1'6"	78.16	53	1.0035	78.43	52.1 6.416	503.21	
					+2.66		+17.00	
					169.44		1085.35	45.22
								7.060
WATER	7'1"	375.50	64	0.99963	375.36	10.6 8.293	3112.86	
	1'11"	100.59	61	0.99992	100.58	10.4 8.305	835.32	
	1'3"	65.01	79	0.99775	64.86	10.6 8.293	537.88	
	0'3"	13.28	58	1.00018	13.28	"	110.13	
					326.36		2705.29	112.72
								13.598

THE TEXAS COMPANY — MONTEBELLO LABORATORY

YIELD CALCULATIONS

RUN NO. 58-E
HOURS 79-93
CATALYST AGE

FRESH FEED	%	m/hr	#/hr
CO 28.010	37.505	14.896	417.23
H_2 2.016	60.105	23.872	48.13
CO_2 44.010	2.095	0.832	36.62
N_2 28.016	0.165	0.066	1.85
CH_4 16.042	0.130	0.052	0.83
C_2H_4 28.052			
C_2H_6 30.068			
C_3+C_4			
C_3H_6 42.078			
C_3H_8 44.094			
C_4H_8 56.104			
C_4H_{10} 58.120			
C_5H_{10} 70.130			
C_5H_{12} 72.146			
C_6H_{12} 84.156			
C_5-C_6			
TOTAL		39.718	504.66
H_2+CO	97.610	38.768	14713 SCFH
H_2/CO		1.60	Factor. 379671

WET GAS	%	At Wt. Balance m/hr	At Wt. Balance #/hr
CO 28.010	16.495	2.994	83.85
H_2 2.016	48.105	8.730	17.60
CO_2 44.010	21.070	3.823	168.20
N_2 28.016	2.140	0.388	10.87
CH_4 16.042	5.500	0.998	16.01
C_2H_4 28.052	1.545	0.280	7.85
C_2H_6 30.068	0.950	0.172	5.17
C_3H_6 42.078	1.870	0.339	14.26
C_3H_8 44.094	0.340	0.062	2.73
C_4H_8 56.104	1.050	0.191	10.72
C_4H_{10} 58.120	0.385	0.070	4.07
C_5H_{10} 70.130	0.400	0.073	5.12
C_5H_{12} 72.146	0.070	0.013	0.94
C_6H_{12} 84.156	0.080	0.015	1.26
C_5-C_6			
TOTAL		18.148	348.65
H_2+CO	SCFH	11.724	
H_2/CO	Factor.	2.92	

RECYCLE	COMBINED FEED	EFFLUENT	NET CHANGE	
	m/hr	m/hr	m/hr	#/hr
	7.151	22.047	10.145	-11.902	-333.38
	20.856	44.728	29.686	-15.142	-30.53
	9.135	9.967	12.958	2.991	131.58
	0.928	0.994	1.316		
	2.385	2.437	3.383	0.946	15.18
	0.670	0.670	0.950	0.280	7.58
	0.412	0.412	0.584	0.172	5.17
					28.20
	0.811	0.811	1.150	0.339	14.26
	0.147	0.147	0.209	0.062	2.73
	0.455	0.455	0.646	0.191	10.72
	0.167	0.167	0.237	0.070	4.07
	0.173	0.173	0.246	0.073	5.12
	0.030	0.030	0.043	0.013	0.94
	0.035	0.035	0.050	0.015	1.26
					39.10
	43.355	83.073	67.306		
	28.007	66.775	39.731	27.044	
	2.92	2.03	2.92	1.51	

YIELD BASIS H_2+CO FED					
CONDENSATE	#/MCF	#/gal	gal/hr	gal/MCF	
	1.032				
	0.534				
	0.351				
	1.917				
	0.969	4.32	3.301	0.224	
	0.186	4.24	0.644	0.044	
	0.729	5.00	2.144	0.146	
	0.277	4.86	0.837	0.057	
	0.348	5.48	0.939	0.064	
	0.064	5.25	0.179	0.012	
	0.086	5.54	0.227	0.015	
	2.659		8.271	0.562	

YIELDS	BASIS BROWNSVILLE DESIGN FEED RATES			
		CORRECTED MEMPEL, %	gal/hr	TREATING RECOVERY, %	gal/hr
400 EP		78.6	5.944	98.0	5.825
400-550		13.6	1.029	91.4	0.941
550 +		7.8	0.590	114.6	0.676
		RECOVERY %	#/hr	gal/hr	
PROPYLENE		30.9	4.41		
C_3 POLY GASO.		87.5	3.86	0.545	
C_3 POLY TAR		12.5	0.55	0.073	
		#/gal	#/hr	gal/hr	RVP
C_4H_8		5.00			68.0
C_4 POLY GASO.		5.98	9.38	1.569	1.5
C_4H_{10}		4.86	5.87	0.796	68.0
C_4-FREE GASO.				7.815	5.8
C_4 POLY TAR		7.53	1.34	0.178	
		gal/hr	gal/MCF	Bbl/Day	
10 # RVP 400 EP GASOLINE		10.180	0.6919	3751	
GAS OIL		0.941	0.0640	347	
FUEL OIL		0.676	0.0459	249	
POLY TAR		0.251	0.0171	93	
TOTAL		12.048	0.8189	4440	
W. S. CHEM.		1.724	0.1172	635	
TOTAL		13.772	0.9361	5075	

OPERATING DATA							
Pressure, psig	400	Inlet Velocity, Ft/sec	0.76	Catalyst	CM&S	RECOVERED OIL	0.346**	48.54	3.299		7.563	0.514
Temperature, °F	645	Bed Depth, Ft	13.73	Weight, #	1613	TOTAL OIL		87.64	5.958		15.834	1.076
Recycle Ratio	1.09	Bed Density, #/CF	178	Volume, Cu ft	9.06	WATER SOLUBLE CHEMICALS	0.262**	13.88	0.943		1.724	0.117
						TOTAL LIQUID PRODUCTS C_4+		101.52	6.901		17.558	1.193
FRESH FEED CONVERSION — %				TOTAL FEED CONVERSION — %			SELECTIVITY	NET WATER	5.195**	93.59	6.361		11.235	0.764
Contraction	CO	H_2	H_2+CO	CO	H_2	$CO+H_2$	C_3+/C_1+	GROSS WATER		107.47	7.304		12.959	0.881
84.31	79.90	63.43	69.76	53.98	33.85	40.50	78.26	HYDROCARBON TOTAL—C_1+		129.72	8.818			

Form ML-11

**Included in Reactor Effluent Total

g/NCM = 16.91 X f/MCF *9488 MCFH H_2+CO, Bbl/Day = 5421.6 X gal/MCF

OPERATING CONDITIONS			
PRESSURES PSIG		RATES S.C.F.H.	
Oxygen	429	Fresh Feed	15073
Natural Gas	426	Recycle	16453
Generator Outlet	411	Combined Feed	31526
Reactor Inlet	400	Wet Gas—Measured	6610
Condenser Inlet		Adjusted	6887
Product Accumulator	360	Loss	277
TEMPERATURES—°F.		Recycle/Fresh Feed	1.09
Oxygen	460	Inlet Velocity—ft./sec.	0.76
Natural Gas	750	Fresh Feed Rate—S.C.F.H. H_2+CO	14713
Generator		per Cu. Ft. Dense Bed	1624
Quench Accumulator		per Lb. Catalyst	9.12
Reactor Inlet	380	per sq. ft.	22292
Condenser Inlet			
Product Accumulator	69		
Catalyst No. Height			
1 0'0"	602		
2 0'9"	650		
3 1'9"	655		
4 4'5"	649		
5 7'0"	658		
6 12'3"	658		
7 17'5"	640 / 645 Avg.		
8 20'0"	624		
9 22'7"	632		
10 25'2"	640		
11 26'11"	610		

PRODUCT TESTS	OIL	WATER
°API	52.5	10.6
Neut. No.	43.0	47.0
Sap. No.	55.9	44.9
Hydrox. No.		
Bromine No.	99	
Pour °F.		
Chemicals, % by K_2CO_3		13.3
HEMPEL, DIST. %		°API
205 °F.		
400	77.6	57.2
400-550	13.6	38.7
550+	8.8	
A. S. T. M. DIST. ON		
Naphtha °F.		
IBP	96	
10%	130	
50%	220	
90%	340	
EP	388	
Rec.	97.5	

CATALYST DATA					
INVENTORY DATA		PARTICLE SIZE			
		Screen Analysis		Sedimentation	
In Reactor at Start of Period		Mesh	Microns	%	Microns	%
Fresh Catalyst Added		On 40	419+	49.9	80+	
Total		100	150	38.4	40—80	
Catalyst Recovered	38.0	150	105	6.8	20—40	
In Reactor at End of Period		200	74	3.3	10—20	
		250	62	0.7	0—20	
REACTOR d-p, Inches H_2O		325	44	0.7		
No. Height		<325				
0 0-21 3/8	52					
1 21 3/8-52 3/4	87	CATALYST				
2 52 3/4-84	91	Bulk Density, Lbs./Cu.Ft.				
3 84-115 3/8	90	Aerated			165	
4 115 3/8-353 1/8	150	Settled			167	
Total	470	Compacted			195	
		Particle Density, gm./cc.			4.76	
CALCULATED FROM dp		NH_3 Value, ml./gm.				
Density, Lbs./Cu.Ft.	178	N_2 Surface, m^2/gm.				
Inventory, Lbs.	1613					
Bed Depth, Ft.	13.73	CHEMICAL ANALYSIS				
Volume, cu. ft.	9.06	Fe				
		C			3.60	
		O				
		H				
		K_2O, W+, % basis Fe				
		X-Ray Analysis—				
		$Fe_{20}C_9$				
		Fe_3O_4				
		Fe				

	GAS ANALYSES				GENERATOR BALANCE									
HOUR	1000	1800		AVERAGE	M/HR	C	H	O		Mol %	M/Hr	C	H	O
FRESH FEED									O_2 32.000	0.21	0.027			20.686
CO 28.010	37.92	37.09		37.505	14.896	14.896		14.896	CO_2 44.010	1.36	0.173	0.173		0.346
H_2 2.016	59.74	60.47		60.105	23.872		47.744		N_2 28.014	2.45	0.313			
CO_2 44.010	2.06	2.13		2.095	0.832	0.832		1.664	CH_4 16.042	81.93	10.460	10.460	41.840	
N_2 28.016	0.19	0.14		0.165	0.066				C_2H_4 28.052	6.50	0.830	1.660	4.980	
CH_4 16.042	0.09	0.17		0.130	0.052	0.052	0.208		C_2H_6 44.094	5.50	0.702	2.106	5.616	
			M. W.	12.70596					C_4H_{10} 58.120	1.47	0.188	0.752	1.880	
			H_2O 18.016				8.098	4.049	C_3H_6 42.140	0.58	0.074	0.370	0.888	
					39.718	15.780	56.050	20.609						
			BALANCE			101.67	101.53	97.99	TOTAL MW=	20.14774		15.521	55.204	21.032

WEIGHT BALANCE	#/hr Measured	At Wt. Balance
WET GAS	334.63	348.65
OIL	48.54	48.54
WATER	107.47	107.47
TOTAL	490.64	504.66
FRESH FEED	504.66	
WEIGHT BALANCE	972218	
WET GAS FACTOR	1041897	
INDICATED LOSS—S C F H	277	

WET GAS				
CO 28.010	16.76	16.23		16.495
N_2 28.016	48.33	47.88		48.105
CO_2 44.010	21.56	20.58		21.070
N_2 28.016	0.52	3.76		2.140
CH_4 16.042	5.69	5.31		5.500
C_2H_4 28.052	1.57	1.52		1.545
C_2H_6 30.068	1.01	0.89		0.950
C_3H_6 42.078	1.99	1.75		1.870
C_3H_8 44.094	0.37	0.31		0.340
C_4H_8 56.104	1.16	0.94		1.050
C_4H_{10} 58.120	0.46	0.31		0.385
C_5H_{10} 70.130	0.44	0.36		0.400
C_5H_{12} 72.146	0.07	0.07		0.070
C_6H_{12} 84.156	0.07	0.09		0.080
			M. W.	19.2118

GAS FLOW RATES								
	$\sqrt{H}$	PRESSURE	TEMP.	M. W.	S. C. F. H.	M/HR
FRESH FEED		400.2	103.7	2278458		
	79.31	6.436	20.369	0.9604	1.5095	15073	39.718
		2.18	89.1	1506884		
WET GAS						
	158.44	8.343	4.109	0.9914	1.2276	6610	17.418
		408.3	124.0			
RECYCLE						
	79.31	8.207	20.567	0.9436	1.2276	15507	40.862
BLEED						
	5.02	7.914	20.567	0.9436	1.2276	946	2.493
		425.7	192.3	1436885		
NATURAL GAS						
	28.43	7.586	20.986	0.8930	1.1987	4845	12.767
OXYGEN						
	27.07	6.993	21.059	0.9820		3915	10.316
STEAM			40.3				
	215.7						

LIQUID PRODUCT RATES basis 12 hours							
HOUR	GAGE	GAL.	°F	FACTOR	GAL. AT 60	API° #/GAL.	#	#/HR GAL/HR
OIL	6'-4"	336.22	68	0.9961	334.91	52.5 6.402	2144.09	
	4'-7 3/4"	246.20	64	0.9980	245.71	52.7 6.396	1571.56	
					+1.56		+10.00	
					90.76		582.53	48.54
								7.563
WATER	4'-1 1/8"	220.55	68	0.99920	220.37	10.6 8.293	1827.53	
	1'-3"	65.01	79	0.99775	64.86	"	537.88	
					155.51		1289.65	107.47
								12.959

RUN NO. 59-0(A-D)
HOURS 0-86
CATALYST

THE TEXAS COMPANY — MONTEBELLO LABORATORY
YIELD CALCULATIONS

	FRESH FEED %	FRESH FEED m/hr	FRESH FEED #/hr	WET GAS %	WET GAS At Wt. Balance m/hr	WET GAS At Wt. Balance #/hr	RECYCLE m/hr	COMBINED FEED m/hr	EFFLUENT m/hr	NET CHANGE m/hr	NET CHANGE #/hr	CONDENSATE #/MCF	CONDENSATE #/gal	CONDENSATE gal/hr	CONDENSATE gal/MCF
CO 28.010		16.326						19.179		-15.364	-430.35				
H_2 2.016		27.017						40.649		-22.399	45.16				
CO_2 44.010										3.327	146.42	8.901			
N_2 28.016															
CH_4 16.042										1.229	19.72	1.199			
C_2H_4 28.052										0.292	8.19	0.498			
C_2H_6 30.068										0.144	4.33	0.263			
C_1+C_2											32.24	1.960			
C_3H_6 42.078										0.340	14.31	0.870	4.32	3.313	0.201
C_3H_8 44.094										0.040	1.76	0.107	4.24	0.415	0.025
C_4H_8 56.104										0.254	14.25	0.866	5.00	2.850	0.173
C_4H_{10} 58.120										0.089	5.17	0.314	4.86	1.064	0.065
C_5H_{10} 70.130										0.123	8.63	0.525	5.45	1.583	0.096
C_5H_{12} 72.146										0.032	2.31	0.140	5.25	0.440	0.027
C_6H_{12} 84.156										0.032	2.69	0.164	5.54	0.486	0.030
C_3-C_6											49.12	2.986		10.151	0.617
TOTAL															
H_2+CO		43.343	16449 SCFH					59.828		-37.763					
H_2/CO		1.66	Factor 607939												

YIELD BASIS H_2+CO FED — YIELDS BASIS BROWNSVILLE DESIGN FEED RATE*

YIELDS	CORRECTED HEMPEL, %	gal/hr	TREATING RECOVERY, %	gal/hr
400 EP	77.2	9.796	98.0	9.600
400-550	15.2	1.929	91.4	1.763
550 +	7.6	0.964	114.6	1.105

	RECOVERY %	#/hr	gal/hr
PROPYLENE	49.3	7.055	
C_3 POLY GASO.	87.5	6.173	1.032
C_3 POLY TAR	12.5	0.882	0.117

	#/gal	#/hr	gal/hr	RVP
C_4H_8	5.00	0.87	0.174	68.0
C_4 POLY GASO.	5.98	11.71	1.958	1.5
C_4H_{10}	4.86	5.17	1.064	68.0
C_4-FREE GASO.			13.141	5.8
C_4 POLY TAR	7.53	1.67	0.222	

	gal/hr	gal/MCF	Bbl/Day
10 # RVP 400 EP GASOLINE	16.337	0.9932	5385
GAS OIL	1.763	0.1072	581
FUEL OIL	1.105	0.0672	364
POLY TAR	0.339	0.0206	112
TOTAL	19.544	1.1882	6442
W. S. CHEM.	0.539 2.113	0.0328 0.1285	178 697
TOTAL	22.196	1.3494	7316

							m/hr	#/hr	#/MCF	#/gal	gal/hr	gal/MCF
Weight Recovery, %	99.41	Catalyst Age, hrs. Ave. 43	Space Velocity, vhv 1472			RECOVERED OIL		82.02	4.986		12.689	0.771
Pressure, psig	375	Inlet Velocity, Ft/sec 0.98	Catalyst Vol, CF 11.25			TOTAL OIL		131.14	7.973		22.840	1.389
Temperature, °F	668	Bed Depth, Ft 17.0	Weight, # 1746			WATER SOLUBLE CHEMICALS	Acids Alcohols	4.25 16.65	0.258 1.012		0.539 2.113	0.033 0.129
Recycle Ratio	0.86	Bed Density, #/CF .155	Effluent Shift Ratio $\frac{(H_2)(CO_2)}{(H_2O)(CO)}$ =			TOTAL LIQUID PRODUCTS C_3+		152.04	9.243		25.492	1.550
FRESH FEED CONVERSION — %			TOTAL FEED CONVERSION — %		SELECTIVITY	NET WATER		144.35	8.776		16.791	1.021
Contraction	CO	H_2	H_2+CO	CO	H_2	CO+H_2	C_3+/C_1+	GROSS WATER		165.25	10.046		19.443	1.182
70.88	94.11	82.91	87.13	80.11	55.10	63.12	82.50	HYDROCARBON TOTAL—C_1+		184.28	11.203			

Form ML—11 AI = (38.37)(0.8904)=34.16

g/NCM = 16.91×#/MCF *9488 MCFH H_2 + CO, Bbl/Day=5421.6×gal/MCF

RUN NO. 59-1(E-H)
HOURS 86-178
CATALYST Spent CM&S

THE TEXAS COMPANY — MONTEBELLO LABORATORY
YIELD CALCULATIONS

	FRESH FEED %	FRESH FEED m/hr	FRESH FEED #/hr	WET GAS %	WET GAS At Wt. Balance m/hr	WET GAS At Wt. Balance #/hr	RECYCLE m/hr	COMBINED FEED m/hr	EFFLUENT m/hr	NET CHANGE m/hr	NET CHANGE #/hr	CONDENSATE #/MCF	CONDENSATE #/gal	CONDENSATE gal/hr	CONDENSATE gal/MCF
CO 28.010		15.949						18.583		-14.991	-419.90				
H_2 2.016		28.244						44.073		-22.504	-45.37				
CO_2 44.010										3.458	152.19	9.074			
N_2 28.016															
CH_4 16.042										1.220	19.57	1.167			
C_2H_4 28.052										0.309	8.67	0.517			
C_2H_6 30.068										0.144	4.33	0.258			
C_1+C_2											32.57	1.942			
C_3H_6 42.078										0.364	15.32	0.913	4.32	3.546	0.211
C_3H_8 44.094										0.041	1.81	0.108	4.24	0.427	0.025
C_4H_8 56.104										0.280	15.71	0.937	5.00	3.142	0.187
C_4H_{10} 58.120										0.081	4.71	0.281	4.86	0.969	0.058
C_5H_{10} 70.130										0.139	9.75	0.581	5.45	1.789	0.107
C_5H_{12} 72.146										0.032	2.31	0.138	5.25	0.440	0.026
C_6H_{12} 84.156										0.037	3.11	0.185	5.54	0.561	0.033
C_3-C_6											52.72	3.143		10.874	0.648
TOTAL															
H_2+CO		44.193	16772 SCFH					62.656		-37.495					
H_2/CO		1.77	Factor 596231												

YIELD BASIS H_2+CO FED — YIELDS BASIS BROWNSVILLE DESIGN FEED RATE*

YIELDS	CORRECTED HEMPEL, %	gal/hr	TREATING RECOVERY, %	gal/hr
400 EP	78.8	8.853	98.0	8.676
400-550	13.5	1.517	91.4	1.387
550 +	7.7	0.865	114.6	0.991

	RECOVERY %	#/hr	gal/hr
PROPYLENE	45.5	6.971	
C_3 POLY GASO.	87.5	6.100	1.020
C_3 POLY TAR	12.5	0.871	0.116

	#/gal	#/hr	gal/hr	RVP
C_4H_8	5.00	1.22	0.244	68.0
C_4 POLY GASO.	5.98	12.68	2.120	1.5
C_4H_{10}	4.86	4.71	0.969	68.0
C_4-FREE GASO.			12.486	5.8
C_4 POLY TAR	7.53	1.81	0.240	

	gal/hr	gal/MCF	Bbl/Day
10 # RVP 400 EP GASOLINE	15.819	0.9432	5114
GAS OIL	1.387	0.0827	448
FUEL OIL	0.991	0.0591	320
POLY TAR	0.356	0.0212	115
TOTAL	18.553	1.1062	5997
W. S. CHEM.	0.555 1.962	0.0331 0.1170	179 634
TOTAL	21.070	1.2563	6811

							m/hr	#/hr	#/MCF	#/gal	gal/hr	gal/MCF
Weight Recovery, %	98.30	Catalyst Age, hrs. Ave. 132	Space Velocity, vhv 1657			RECOVERED OIL		72.61	4.329		11.235	0.670
Pressure, psig	372	Inlet Velocity, Ft/sec 1.02	Catalyst Vol., CF 10.15			TOTAL OIL		125.33	7.473		22.109	1.318
Temperature, °F	681	Bed Depth, Ft 15.4	Weight, # 1354			WATER SOLUBLE CHEMICALS	Acids Alcohols	4.38 15.47	0.261 0.922		0.555 1.962	0.033 0.117
Recycle Ratio	0.87	Bed Density, #/CF 133	Effluent Shift Ratio $\frac{(H_2)(CO_2)}{(H_2O)(CO)}$ =			TOTAL LIQUID PRODUCTS C_3+		145.18	8.656		24.626	1.468
FRESH FEED CONVERSION — %			TOTAL FEED CONVERSION — %		SELECTIVITY	NET WATER		131.99	7.870		15.815	0.943
Contraction	CO	H_2	H_2+CO	CO	H_2	CO+H_2	C_3+/C_1+	GROSS WATER		151.84	9.053		18.332	1.093
68.62	93.99	79.68	84.84	80.67	51.06	59.84	81.68	HYDROCARBON TOTAL—C_1+		177.75	10.598			

Form ML—11 AI = (40.71)(0.8193) = 33.35

g/NCM = 16.91×#/MCF *9488 MCFH H_2 + CO, Bbl/Day=5421.6×gal/MCF

THE TEXAS COMPANY — MONTEBELLO LABORATORY
YIELD CALCULATIONS

RUN NO. 59-2(I-M)
HOURS 178-291
CATALYST Spent CM&S

	FRESH FEED %	FRESH FEED m/hr	FRESH FEED #/hr	WET GAS %	WET GAS At Wt. Balance m/hr	WET GAS At Wt. Balance #/hr	RECYCLE m/hr	COMBINED FEED m/hr	EFFLUENT m/hr	NET CHANGE m/hr	NET CHANGE #/hr	YIELD BASIS H_2+CO FED #/MCF	CONDENSATE #/gal	CONDENSATE gal/hr	CONDENSATE gal/MCF
CO 28.010		15.411						18.944		-14.237	-398.78				
H_2 2.016		24.384						39.011		-19.449	-39.21				
CO_2 44.010										3.177	139.82	9.258			
N_2 28.016															
CH_4 16.042										1.224	19.64	1.300			
C_2H_4 28.052										0.354	9.93	0.658			
C_2H_6 30.068										0.157	4.72	0.313			
C_1+C_2											34.29	2.271			
C_3H_6 42.078										0.319	13.42	0.889	4.32	3.106	0.206
C_3H_8 44.094										0.035	1.54	0.102	4.24	0.363	0.024
C_4H_8 56.104										0.214	12.01	0.795	5.00	2.402	0.159
C_4H_{10} 58.120										0.085	4.94	0.327	4.86	1.016	0.067
C_5H_{10} 70.130										0.110	7.71	0.511	5.45	1.415	0.094
C_5H_{12} 72.146										0.029	2.09	0.138	5.25	0.398	0.026
C_6H_{12} 84.156										0.038	3.20	0.212	5.54	0.578	0.038
C_3-C_6											44.91	2.974		9.278	0.614
TOTAL															
H_2+CO		39.795	15102 SCFH					57.955		-33.686					
H_2/CO		1.58	Factor 662163												

YIELDS BASIS BROWNSVILLE DESIGN FEED RATE*	CORRECTED HEMPEL, %	gal/hr	TREATING RECOVERY, %	gal/hr
400 EP	72.9	8.006	98.0	7.846
400-550	13.8	1.516	91.4	1.386
550 +	13.3	1.461	114.6	1.674

	RECOVERY %	#/hr	gal/hr
PROPYLENE	43.6	5.851	
C_3 POLY GASO.	87.5	5.120	0.856
C_3 POLY TAR	12.5	0.731	0.097

	#/gal	#/hr	gal/hr	RVP
C_4H_8	5.00	0.20	0.040	68.0
C_4 POLY GASO.	5.98	10.33	1.728	1.5
C_4H_{10}	4.86	4.94	1.016	68.0
C_4-FREE GASO.			11.093	5.8
C_4 POLY TAR	7.53	1.48	0.197	

Weight Recovery, % 96.91	Catalyst Age, hrs. Ave. 166	Space Velocity, vhv 1813
Pressure, psig 375	Inlet Velocity, Ft/sec 0.99	Catalyst Vol., CF = 9.07
Temperature, °F 674	Bed Depth, Ft 12.0	Weight, # 1128
Recycle Ratio 1.00	Bed Density, #/CF 124	Effluent Shift Ratio $\frac{(H_2)(CO_2)}{(H_2O)(CO)}$ = 10.13

		#/hr	#/MCF	#/gal	gal/hr	gal/MCF
RECOVERED OIL		70.86	4.692		10.982	0.727
TOTAL OIL		115.77	7.666		20.260	1.342
WATER SOLUBLE CHEMICALS	Acids Alcohols	4.42 15.16	0.293 1.004		0.555 1.903	0.037 0.126
TOTAL LIQUID PRODUCTS C_3+		135.35	8.962		22.718	1.504
NET WATER		123.46	8.175		14.797	0.980
GROSS WATER		143.04	9.472		17.255	1.143
HYDROCARBON TOTAL—C_1+		169.64	11.233			

	gal/hr	gal/MCF	Bbl/Day
10 # RVP 400 EP GASOLINE	13.877	0.9189	4982
GAS OIL	1.386	0.0918	498
FUEL OIL	1.674	0.1108	601
POLY TAR	0.294	0.0195	106
TOTAL	17.231	1.1410	6186
W. S. CHEM.	0.555 1.903	0.0368 0.1260	200 683
TOTAL	19.689	1.3037	7068

FRESH FEED CONVERSION — % Contraction	CO	H_2	H_2+CO	TOTAL FEED CONVERSION — % CO	H_2	CO+H_2	SELECTIVITY C_3+/C_1+
67.24	92.38	79.76	84.65	75.15	49.86	58.12	79.78

Form ML—11 AI = (42.58)(0.8139) = 34.66

g/NCM = 16.91 × #/MCF *9488 MCFH H_2 + CO, Bbl/Day = 5421.6 × gal/MCF

THE TEXAS COMPANY — MONTEBELLO LABORATORY
YIELD CALCULATIONS

RUN NO. 59-3(N-T)
HOURS 291-445
CATALYST Spent CM&S

	FRESH FEED %	FRESH FEED m/hr	FRESH FEED #/hr	WET GAS %	WET GAS At Wt. Balance m/hr	WET GAS At Wt. Balance #/hr	RECYCLE m/hr	COMBINED FEED m/hr	EFFLUENT m/hr	NET CHANGE m/hr	NET CHANGE #/hr	YIELD BASIS H_2+CO FED #/MCF	CONDENSATE #/gal	CONDENSATE gal/hr	CONDENSATE gal/MCF
CO 28.010		13.047						17.186		-11.916	-333.77				
H_2 2.016		20.404						25.244		-16.354	32.97				
CO_2 44.010										2.823	124.24	9.787			
N_2 28.016															
CH_4 16.042										0.893	14.33	1.129			
C_2H_4 28.052										0.276	7.74	0.610			
C_2H_6 30.068										0.170	5.11	0.403			
C_1+C_2											27.18	2.141			
C_3H_6 42.078										0.294	12.37	0.974	4.32	2.863	0.226
C_3H_8 44.094										0.036	1.59	0.125	4.24	0.375	0.030
C_4H_8 56.104										0.194	10.88	0.857	5.00	2.176	0.171
C_4H_{10} 58.120										0.074	4.30	0.339	4.86	0.885	0.070
C_5H_{10} 70.130										0.098	6.87	0.541	5.45	1.261	0.099
C_5H_{12} 72.146										0.021	1.52	0.120	5.25	0.290	0.023
C_6H_{12} 84.156										0.032	2.69	0.212	5.54	0.486	0.038
C_3-C_6											40.22	3.168		8.336	0.657
TOTAL															
H_2+CO		33.451	12694 SCFH					52.430		-28.270					
H_2/CO		1.56	Factor 787773												

YIELDS BASIS BROWNSVILLE DESIGN FEED RATE*	CORRECTED HEMPEL, %	gal/hr	TREATING RECOVERY, %	gal/hr
400 EP	74.0	5.746	98.0	5.631
400-550	13.9	1.079	91.4	0.986
550 +	12.1	0.940	114.6	1.077

	RECOVERY %	#/hr	gal/hr
PROPYLENE	43.5	5.381	
C_3 POLY GASO.	87.5	4.708	0.787
C_3 POLY TAR	12.5	0.673	0.089

	#/gal	#/hr	gal/hr	RVP
C_4H_8	5.00	--	--	68.0
C_4 POLY GASO.	5.98	9.52	1.592	1.5
C_4H_{10}	4.86	(4.30) 4.11	(0.885) 0.845	68.0
C_4-FREE GASO.			8.855	5.8
C_4 POLY TAR	7.53	1.36	0.181	

Weight Recovery, % 96.30	Catalyst Age, hrs. Ave. 211	Space Velocity, vhv 1225
Pressure, psig 375	Inlet Velocity, Ft/sec 0.90	Catalyst Vol., CF 10.58
Temperature, °F 653	Bed Depth, Ft 15.7	Weight, # 1471
Recycle Ratio 1.22	Bed Density, #/CF 142	Effluent Shift Ratio $\frac{(H_2)(CO_2)}{(H_2O)(CO)}$ = 10.61

	#/hr	#/MCF	#/gal	gal/hr	gal/MCF
RECOVERED OIL	49.82	3.925		7.765	0.612
TOTAL OIL	90.04	7.093		16.101	1.268
WATER SOLUBLE CHEMICALS	4.23 14.83	0.333 1.168		0.533 1.867	0.042 0.147
TOTAL LIQUID PRODUCTS C_3+	109.10	8.595		18.501	1.457
NET WATER	103.12	8.124		12.353	0.973
GROSS WATER	122.18	9.625		14.753	1.162
HYDROCARBON TOTAL—C_1+	136.28	10.736			

	gal/hr	gal/MCF	Bbl/Day
10 # RVP 400 EP GASOLINE	10.892	0.8580	4652
GAS OIL	0.986	0.0777	421
FUEL OIL	1.077	0.0848	460
POLY TAR	0.270	0.0213	115
TOTAL	13.225	1.0418	5648
W. S. CHEM.	0.533 1.867	0.0420 0.1471	228 798
TOTAL	15.625	1.2309	6674

FRESH FEED CONVERSION — % Contraction	CO	H_2	H_2+CO	TOTAL FEED CONVERSION — % CO	H_2	CO+H_2	SELECTIVITY C_3+/C_1+
67.05	91.33	80.15	84.51	69.34	46.40	53.92	80.06

Form ML—11 AI = (35.00)(0.8100) = 28.35

g/NCM = 16.91 × #/MCF *9488 MCFH H_2 + CO, Bbl/Day = 5421.6 × gal/MCF

RUN NO. 59-4(U-X)
HOURS 445-541
CATALYST Spent CM&S

THE TEXAS COMPANY — MONTEBELLO LABORATORY
YIELD CALCULATIONS

	FRESH FEED %	FRESH FEED m/hr	FRESH FEED #/hr	WET GAS %	WET GAS At Wt. Balance m/hr	WET GAS At Wt. Balance #/hr	RECYCLE m/hr	COMBINED FEED m/hr	EFFLUENT m/hr	NET CHANGE m/hr	NET CHANGE #/hr	YIELD BASIS H_2+CO FED CONDENSATE #/MCF	CONDENSATE #/gal	CONDENSATE gal/hr	CONDENSATE gal/MCF
CO 28.010		14.627						18.476		-13.497	-378.05				
H_2 2.016		22.484						36.806		-18.284	-36.86				
CO_2 44.010										3.070	135.11	9.594			
N_2 28.016															
CH_4 16.042										0.970	15.56	1.105			
C_2H_2 26.052										0.317	8.89	0.631			
C_2H_4 30.068										0.180	5.41	0.384			
C_1+C_2											29.86	2.120			
C_3H_4 42.078										0.342	14.39	1.022	4.32	3.331	0.237
C_3H_8 44.094										0.036	1.59	0.113	4.24	0.375	0.027
C_4H_8 56.104										0.249	13.97	0.992	5.00	2.794	0.198
C_4H_{10} 58.120										0.089	5.17	0.367	4.86	1.064	0.076
C_5H_{10} 70.130										0.116	8.14	0.578	5.45	1.494	0.106
C_5H_{12} 72.146										0.018	1.30	0.092	5.25	0.248	0.018
C_6H_{12} 84.156										0.041	3.45	0.245	5.54	0.623	0.044
C_3-C_6											48.01	3.409		9.929	0.705
TOTAL															
H_2+CO		37.111	14083 SCFH					55.282		-31.781					
H_2/CO		1.54	Factor 710075												

Weight Recovery, %	97.83	Catalyst Age, hrs. Ave.:	228	Space Velocity, vhv	1057
Pressure, psig	372	Inlet Velocity, Ft/sec	0.93	Catalyst Vol, CF=	13.33
Temperature, °F	653	Bed Depth, Ft	20.2	Weight, #	1982
Recycle Ratio	1.08	Bed Density, #/CF	149	Effluent $(H_2)(CO_2)$ / Shift Ratio $(H_2O)(CO)$	= 11.66

FRESH FEED CONVERSION — %				TOTAL FEED CONVERSION — %			SELECTIVITY
Contraction	CO	H_2	H_2+CO	CO	H_2	$CO+H_2$	C_3+/C_1+
68.15	92.27	81.32	85.64	73.05	49.68	57.49	81.18

	RECOVERED OIL	TOTAL OIL	WATER SOLUBLE CHEMICALS	TOTAL LIQUID PRODUCTS C_3+	NET WATER	GROSS WATER	HYDROCARBON TOTAL—C_1+
		61.38	4.46 / 14.91	128.76	116.54	135.91	158.62
		109.39	7.767	19.531	1.387		
			0.317	0.568	0.040		
			1.059	1.900	0.135		
			9.143	21.999	1.562		
			8.275	13.956	0.991		
			9.651	16.424	1.166		
			11.263				

YIELDS BASIS BROWNSVILLE DESIGN FEED RATE*	CORRECTED HEMPEL, %	gal/hr	TREATING RECOVERY, %	gal/hr
400 EP	76.4	7.336	98.0	7.189
400-550	13.9	1.335	91.4	1.220
550 +	9.7	0.931	114.6	1.067

	RECOVERY %	#/hr	gal/hr
PROPYLENE	44.7	6.432	
C_3 POLY GASO.	87.5	5.628	0.941
C_3 POLY TAR	12.5	0.804	0.107

	#/gal	#/hr	gal/hr	RVP
C_4H_8	5.00	--	--	68.0
C_4 POLY GASO.	5.98	12.22	2.044	1.5
C_4H_{10}	4.86	(5.17) 5.15	(1.064) 1.059	68.0
C_4-FREE GASO.			10.495	5.8
C_4 POLY TAR	7.53	1.75	0.232	

	gal/hr	gal/MCF	Bbl/Day
10 # RVP 400 EP GASOLINE	13.598	0.9656	5235
GAS OIL	1.220	0.0866	470
FUEL OIL	1.067	0.0758	411
POLY TAR	0.339	0.0241	131
TOTAL	16.224	1.1520	6246
W.S. CHEM.	0.568 / 1.900	0.0403 / 0.1349	218 / 731
TOTAL	18.692	1.3272	7196

Form ML—11

AI = (32.51)(0.8429)= 27.40

g/NCM = 16.91 × #/MCF

*9488 MCFH H_2+CO, Bbl/Day = 5421.6 × gal/MCF

RUN NO. 59-5(X-CC)
HOURS 541-661
CATALYST Spent CM&S

THE TEXAS COMPANY — MONTEBELLO LABORATORY
YIELD CALCULATIONS

	FRESH FEED %	FRESH FEED m/hr	FRESH FEED #/hr	WET GAS %	WET GAS At Wt. Balance m/hr	WET GAS At Wt. Balance #/hr	RECYCLE m/hr	COMBINED FEED m/hr	EFFLUENT m/hr	NET CHANGE m/hr	NET CHANGE #/hr	YIELD BASIS H_2+CO FED CONDENSATE #/MCF	CONDENSATE #/gal	CONDENSATE gal/hr	CONDENSATE gal/MCF
CO 28.010		14.725						17.804		-13.706	-383.91				
H_2 2.016								35.556		-17.537	-35.35				
CO_2 44.010										3.250	143.03	10.257			
N_2 28.016															
CH_4 16.042										1.002	16.07	1.152			
C_2H_2 26.052										0.346	9.71	0.696			
C_2H_4 30.068										0.175	5.26	0.377			
C_1+C_2											31.04	2.226			
C_3H_4 42.078										0.357	15.02	1.077	4.32	3.477	0.249
C_3H_8 44.094										0.041	1.81	0.130	4.24	0.427	0.031
C_4H_8 56.104										0.234	13.13	0.942	5.00	2.626	0.188
C_4H_{10} 58.120										0.085	4.94	0.354	4.86	1.016	0.073
C_5H_{10} 70.130										0.123	8.63	0.619	5.45	1.583	0.114
C_5H_{12} 72.146										0.019	1.37	0.098	5.25	0.261	0.019
C_6H_{12} 84.156										0.043	3.62	0.260	5.54	0.653	0.047
C_3-C_6											48.52	3.479		10.043	0.720
TOTAL															
H_2+CO		36.745	13945 SCFH					53.360		-31.243					
H_2/CO		1.50	Factor 717102												

Weight Recovery, %	95.32	Catalyst Age, hrs. Ave.	303	Space Velocity, vhv	1072
Pressure, psig	365	Inlet Velocity, Ft/sec	1.00	Catalyst Vol CF=	13.01
Temperature, °F	653	Bed Depth, Ft	19.7	Weight, #	1942
Recycle Ratio		Bed Density, #/CF	149	Effluent $(H_2)(CO_2)$ / Shift Ratio $(H_2O)(CO)$	= 11.92

FRESH FEED CONVERSION — %				TOTAL FEED CONVERSION — %			SELECTIVITY
Contraction	CO	H_2	H_2+CO	CO	H_2	$CO+H_2$	C_3+/C_1+
66.86	93.08	79.64	85.03	76.98	49.32	58.55	80.38

	RECOVERED OIL	TOTAL OIL	WATER SOLUBLE CHEMICALS	TOTAL LIQUID PRODUCTS C_3+	NET WATER	GROSS WATER	HYDROCARBON TOTAL—C_1+
		57.51	5.50 / 15.63	127.16	113.79	134.92	158.20
		106.03	7.603	19.002	1.363		
			0.394	0.703	0.050		
			1.121	1.997	0.143		
			9.119	21.702	1.556		
			8.160	13.618	0.977		
			9.675	16.318	1.170		
			11.345				

YIELDS BASIS BROWNSVILLE DESIGN FEED RATE*	CORRECTED HEMPEL, %	gal/hr	TREATING RECOVERY, %	gal/hr
400 EP	75.5	6.764	98.0	6.629
400-550	14.9	1.335	91.4	1.220
550 +	9.6	0.860	114.6	0.986

	RECOVERY %	#/hr	gal/hr
PROPYLENE	42.5	6.384	
C_3 POLY GASO.	87.5	5.586	0.934
C_3 POLY TAR	12.5	0.798	0.106

	#/gal	#/hr	gal/hr	RVP
C_4H_8	5.00	--	--	68.0
C_4 POLY GASO.	5.98	11.49 (4.94)	1.921 (1.016)	1.5
C_4H_{10}	4.86	4.91	1.010	68.0
C_4-FREE GASO.			10.060	5.8
C_4 POLY TAR	7.53	1.64	0.218	

	gal/hr	gal/MCF	Bbl/Day
10 # RVP 400 EP GASOLINE	12.991	0.9316	5051
GAS OIL	1.220	0.0875	474
FUEL OIL	0.986	0.0707	383
POLY TAR	0.324	0.0232	126
TOTAL	15.521	1.1130	6034
W.S. CHEM.	0.703 / 1.997	0.0504 / 0.1432	273 / 776
TOTAL	18.221	1.3066	7084

Form ML—11

AI=(32.74)(0.8248)=27.00

g/NCM = 16.91 × #/MCF

*9488 MCFH H_2+CO, Bbl/Day = 5421.6 × gal/MCF

RUN NO. 59-6(DD-HH)
HOURS 661-781
CATALYST Spent CM&S

THE TEXAS COMPANY — MONTEBELLO LABORATORY
YIELD CALCULATIONS

FRESH FEED				WET GAS			RECYCLE	COMBINED FEED	EFFLUENT	NET CHANGE		YIELD BASIS H_2+CO FED								
					At Wt. Balance							CONDENSATE								
	%	m/hr	#/hr	%	m/hr	#/hr	m/hr	m/hr	m/hr	m/hr	#/hr	#/MCF	#/gal	gal/hr	gal/MCF	YIELDS BASIS BROWNSVILLE DESIGN FEED RATE*				
CO 28.010		14.770						17.191		-13.981	-391.61						CORRECTED HEMPEL, %	gal/hr	TREATING RECOVERY, %	gal/hr
H_2 2.016		22.560						35.724		-18.290	-36.87					400 EP	76.4	7.251	98.0	7.106
CO_2 44.010										3.219	141.67	10.000				400-550	14.1	1.338	91.4	1.223
N_2 28.016																550 +	9.5	0.902	114.6	1.034
CH_4 16.042										1.192	19.12	1.350								
C_2H_4 28.052										0.385	10.80	0.762					RECOVERY %	#/hr	gal/hr	
C_2H_6 30.068										0.184	5.53	0.390				PROPYLENE	44.6	6.886		
C_1+C_2											35.45	2.502				C_3 POLY GASO.	87.5	6.025	1.008	
C_3H_6 42.078										0.367	15.44	1.090	4.32	3.574	0.252	C_3 POLY TAR	12.5	0.861	0.114	
C_3H_8 44.094										0.040	1.76	0.124	4.24	0.415	0.029					
C_4H_8 56.104										0.232	13.02	0.919	5.00	2.604	0.184		#/gal	#/hr	gal/hr	RVP
C_4H_{10} 58.120										0.078	4.53	0.320	4.86	0.932	0.066	C_4H_8	5.00	0.54	0.108	68.0
C_5H_{10} 70.130										0.119	8.35	0.589	5.45	1.532	0.108	C_4 POLY GASO.	5.98	10.92	1.826	1.5
C_5H_{12} 72.146										0.026	1.88	0.133	5.25	0.358	0.025	C_4H_{10}	4.86	4.53	0.932	68.0
C_6H_{12} 84.156										0.043	3.62	0.256	5.54	0.653	0.046	C_4-FREE GASO.			10.657	5.8
C_3-C_6											48.62	3.432		10.068	0.711	C_4 POLY TAR	7.53	1.56	0.207	
TOTAL		37.330																		
H_2+CO		37.330	14167 SCFH					52.915		-32.271							gal/hr	gal/MCF	Bbl/Day	
H_2/CO		1.53	Factor 705865													10 # RVP 400 EP GASOLINE	13.523	0.9545	5175	
Weight Recovery, % 94.63		Catalyst Age, hrs. Ave. 376		Space Velocity, vhv 1095			RECOVERED OIL				61.22	4.321		9.491	0.670	GAS OIL	1.223	0.0863	468	
Pressure, psig 3361		Inlet Velocity, Ft/sec 0.92		Catalyst Vol., CF= 12.94			TOTAL OIL				109.82	7.752		19.559	1.381	FUEL OIL	1.034	0.0730	396	
Temperature, °F 678		Bed Depth, Ft 19.6		Weight, # 1842			WATER SOLUBLE CHEMICALS				5.38 15.04	0.380 1.062		0.683 1.909	0.048 0.135	POLY TAR	0.321	0.0227	123	
Recycle Ratio 0.98		Bed Density, #/CF 142		Effluent $(H_2)(CO_2)$ / Shift Ratio $(H_2O)(CO)$ =14.28			TOTAL LIQUID PRODUCTS C_3+				130.24	9.193		22.151	1.564	TOTAL	16.101	1.1365	6162	
FRESH FEED CONVERSION — %				TOTAL FEED CONVERSION — %			SELECTIVITY			NET WATER	117.22	8.274		14.034	0.991	W. S. CHEM.	0.683 1.909	0.0482 0.1347	261 730	
Contraction	CO	H_2	H_2+CO	CO	H_2	$CO+H_2$	C_3+/C_1+			GROSS WATER	137.64	9.716		16.626	1.174	TOTAL	18.693	1.3195	7154	
68.05	94.66	81.07	86.45	81.33	51.20	60.99	78.60			HYDROCARBON TOTAL—C_1+	165.69	11.695								

Form ML—11 AI = (33.09)(0.8681) = 28.73

g/NCM = 16.91 × #/MCF *9488 MCFH H_2+CO, Bbl/Day = 5421.6 × gal/MCF

RUN NO. 59-7(II-LL)
HOURS 781-843
CATALYST Spent CM&S

THE TEXAS COMPANY — MONTEBELLO LABORATORY
YIELD CALCULATIONS

FRESH FEED				WET GAS			RECYCLE	COMBINED FEED	EFFLUENT	NET CHANGE		YIELD BASIS H_2+CO FED								
					At Wt. Balance							CONDENSATE								
	%	m/hr	#/hr	%	m/hr	#/hr	m/hr	m/hr	m/hr	m/hr	#/hr	#/MCF	#/gal	gal/hr	gal/MCF	YIELDS BASIS BROWNSVILLE DESIGN FEED RATE*				
CO 28.010		14.458						16.757		-13.738	-384.80						CORRECTED HEMPEL, %	gal/hr	TREATING RECOVERY, %	gal/hr
H_2 2.016		22.395						35.932		-18.150	-36.59					400 EP	77.7	7.604	98.0	7.452
CO_2 44.010										2.974	130.89	9.359				400-550	14.3	1.399	91.4	1.279
N_2 28.016																550 +	8.0	0.783	114.6	0.897
CH_4 16.042										1.207	19.36	1,384								
C_2H_4 28.052										0.342	9.59	0.686					RECOVERY %	#/hr	gal/hr	
C_2H_6 30.068										0.188	5.65	0.404				PROPYLENE	45.09	6.583		
C_1+C_2											34.60	2.474				C_3 POLY GASO.	87.5	5.760	0.963	
C_3H_6 42.078										0.347	14.60	1.044	4.32	3.380	0.242	C_3 POLY TAR	12.5	0.823	0.109	
C_3H_8 44.094										0.040	1.76	0.126	4.24	0.415	0.030					
C_4H_8 56.104										0.244	13.69	0.979	5.00	2.738	0.196		#/gal	#/hr	gal/hr	RVP
C_4H_{10} 58.120										0.078	4.53	0.324	4.86	0.932	0.067	C_4H_8	5.00	0.63	0.126	68.0
C_5H_{10} 70.130										0.116	8.14	0.582	5.45	1.494	0.107	C_4 POLY GASO.	5.98	11.43	1.911	1.5
C_5H_{12} 72.146										0.021	1.52	0.109	5.25	0.290	0.021	C_4H_{10}	4.86	4.53	0.932	68.0
C_6H_{12} 84.156										0.035	2.95	0.211	5.54	0.532	0.038	C_4-FREE GASO.			10.731	5.8
C_3-C_6											47.19	3.374		9.781	0.699	C_4 POLY TAR	7.53	1.63	0.216	
TOTAL																				
H_2+CO		36.853	13985 SCFH					52.689		-31.888							gal/hr	gal/MCF	Bbl/Day	
H_2/CO		1.55	Factor 715051													10 # RVP 400 EP GASOLINE	13.700	0.9796	5311	
Weight Recovery, % 96.32		Catalyst Age, hrs. Ave. 432		Space Velocity, vhv 1114			RECOVERED OIL				63.44	4.536		9.786	0.700	GAS OIL	1.279	0.0915	496	
Pressure, psig 373		Inlet Velocity, Ft/sec 0.92		Catalyst Vol, CF= 12.61			TOTAL OIL				110.63	7.911		19.567	1.399	FUEL OIL	0.897	0.0641	348	
Temperature, °F 678		Bed Depth, Ft 19.1		Weight, # 1712			WATER SOLUBLE CHEMICALS				5.60 14.91	0.400 1.066		0.709 1.888	0.051 0.135	POLY TAR	0.325	0.0232	126	
Recycle Ratio 1.01		Bed Density, #/CF 136		Effluent $(H_2)(CO_2)$ / Shift Ratio $(H_2O)(CO)$ =14.14			TOTAL LIQUID PRODUCTS C_3+				131.14	9.377		22.164	1.585	TOTAL	16.201	1.1585	6281	
FRESH FEED CONVERSION — %				TOTAL FEED CONVERSION — %			SELECTIVITY			NET WATER	123.14	8.805		14.746	1.054	W. S. CHEM.	0.709 1.888	0.0507 0.1350	275 732	
Contraction	CO	H_2	H_2+CO	CO	H_2	$CO+H_2$	C_3+/C_1+			GROSS WATER	143.65	10.272		17.343	1.240	TOTAL	18.798	1.3442	7288	
68.32	95.02	81.04	86.53	81.98	50.51	60.52	79.12			HYDROCARBON TOTAL—C_1+	165.74	11.851								

Form ML—11 AI = (33.38)(0.8706) = 29.06

g/NCM = 16.91 × #/MCF *9488 MCFH H_2+CO, Bbl/Day = 5421.6 × gal/MCF

RUN NO. 59-A
HOURS 0-14
CATALYST AGE 14

THE TEXAS COMPANY — MONTEBELLO LABORATORY
YIELD CALCULATIONS

	FRESH FEED			WET GAS			RECYCLE	COMBINED FEED	EFFLUENT	NET CHANGE		YIELD BASIS H_2+CO FED				YIELDS BASIS BROWNSVILLE DESIGN FEED RATE*				
	%	m/hr	#/hr	%	At Wt. Balance m/hr	At Wt. Balance #/hr	m/hr	m/hr	m/hr	m/hr	#/hr	CONDENSATE #/MCF	CONDENSATE #/gal	CONDENSATE gal/hr	CONDENSATE gal/MCF		CORRECTED HEMPEL. %	gal/hr	TREATING RECOVERY.%	gal/hr
CO 28.010	36.623	16.267	455.62	8.107	1.024	28.68	3.166	19.433	4.190	-15.243	-426.94									
H_2 2.016	60.361	26.810	54.05	33.736	4.263	8.59	13.175	39.985	17.438	-22.547	-45.46					400 EP	73.9	10.549	98.0	10.338
CO_2 44.010	2.343	1.041	45.81	33.376	4.216	185.57	13.035	14.076	17.251	3.175	139.76	8.549				400-550	18.0	2.569	91.4	2.348
N_2 28.016	0.120	0.053	1.48	1.230	0.155	4.34	0.480	0.533	0.635							550 +	8.1	1.156	114.6	1.325
CH_4 16.042	0.553	0.246	3.95	13.377	1.690	27.11	5.224	5.470	6.914	1.444	23.16	1.417								
C_2H_4 28.052				2.380	0.301	8.44	0.929	0.929	1.230	0.301	8.44	0.516					RECOVERY %	#/hr	gal/hr	
C_2H_6 30.068				1.397	0.177	5.32	0.546	0.546	0.723	0.177	5.32	0.325				PROPYLENE	50.6	7.75		
C_1+C_2											36.92	2.258				C_3 POLY GASO.	87.5	6.78	1.134	
C_3H_6 42.078				2.877	0.364	15.32	1.123	1.123	1.487	0.364	15.32	0.937	4.32	3.546	0.217	C_3 POLY TAR	12.5	0.97	0.129	
C_3H_8 44.094				0.530	0.067	2.95	0.207	0.207	0.274	0.067	2.95	0.180	4.24	0.696	0.043					
C_4H_6 54.104				1.627	0.206	11.56	0.635	0.635	0.841	0.206	11.56	0.707	5.00	2.312	0.141		#/gal	#/hr	gal/hr	RVP
C_4H_{10} 58.120				0.590	0.075	4.36	0.230	0.230	0.305	0.075	4.36	0.267	4.86	0.897	0.055	C_4H_8	5.00	1.24	0.248	68.0
C_4H_{10} 70.130				0.580	0.073	5.12	0.226	0.226	0.299	0.073	5.12	0.313	5.45	0.939	0.057	C_4 POLY GASO.	5.98	9.03	1.510	1.5
C_5H_{12} 72.146				0.090	0.011	0.79	0.035	0.035	0.046	0.011	0.79	0.048	5.25	0.150	0.009	C_4H_{10}	4.86	4.36	0.897	68.0
C_6H_{12} 84.156				0.103	0.013	1.09	0.040	0.040	0.053	0.013	1.09	0.067	5.54	0.196	0.012	C_4-FREE GASO.			12.757	5.8
C_5-C_6											41.19	2.519		8.736	0.534	C_4 POLY TAR	7.53	1.29	0.171	
TOTAL		44.418	560.91		12.635	309.24	39.051	83.469	60.551											
H_2+CO	96.984	43.077	16348 SCFH		5.287		16.341	59.418	21.628	-37.790							gal/hr	gal/MCF	Bbl/Day	
H_2/CO		1.65	Factor. 611673		4.16		4.16	2.06	4.16	1.48						10 # RVP 400 EP GASOLINE	15.412	0.9427	5111	

OPERATING DATA						Space Vel. = 1383
Pressure, psig	417	Inlet Velocity, Ft/sec	0.99	Catalyst	Spent CM&S	
Temperature, °F	668	Bed Depth, Ft	17.91	Weight, #	1785	
Recycle Ratio	0.87	Bed Density, #/CF	151	Volume, Cu ft	11.82	

FRESH FEED CONVERSION — %				TOTAL FEED CONVERSION — %			SELECTIVITY
Contraction	CO	H_2	H_2+CO	CO	H_2	CO+H_2	C_3+/C_1+
71.55	93.71	84.10	87.73	78.44	56.39	63.60	80.32

RECOVERED OIL	0.664**	93.14	5.697	14.274 0.873
TOTAL OIL		134.33	8.216	23.010 1.407
WATER SOLUBLE CHEMICALS	0.308**	16.33	0.999	2.045 0.125
TOTAL LIQUID PRODUCTS C_3+		150.66	9.215	25.055 1.532
NET WATER	7.893**	142.20	8.698	17.071 1.044
GROSS WATER		158.53	9.697	19.116 1.169
HYDROCARBON TOTAL—C_1+		187.58	11.473	

Form ML-11 K_{shift} = 9.1

**Included in Reactor Effluent Total

g/NCM = 16.91 × #/MCF *9488 MCFH H_2 + CO, Bbl/Day = 5421.6 × gal/MCF

THE TEXAS COMPANY — MONTEBELLO LABORATORY
DATA SUMMARY

RUN NO. 59-A
HOURS 0-14

OPERATING CONDITIONS				PRODUCT TESTS			CATALYST DATA					
PRESSURES PSIG		RATES S.C.F.H.			OIL	WATER	INVENTORY DATA		PARTICLE SIZE			
Oxygen	441	Fresh Feed	16857	°API	49.4	10.6	In Reactor at Start of Period	2816	Screen Analysis			Sedimentation
Natural Gas	439	Recycle	14820	Neut. No.	21.8	19.6	Fresh Catalyst Added	842	Mesh	Microns	%	Microns %
Generator Outlet	423	Combined Feed	31677	Sap. No.	33.2	28.8	Total Inventory after feed was cut in	1660	On 40	419+	48.4	80+
Reactor Inlet	417	Wet Gas—Measured	4800	Hydrox. No.			Catalyst Recovered	12	100	150	39.8	40—80
Condenser Inlet		Adjusted	4795	Bromine No.	97		In Reactor at End of Period		150	105	7.1	20—40
Product Accumulator	375	Loss	-5	Pour °F.					200	74	3.1	10—20
				Chemicals, % by K_2CO_3		10.7	REACTOR d-p, Inches H_2O		250	62	0.4	0—20
							No. Height		325	44	0.6	
TEMPERATURES—°F.		Recycle/Fresh Feed	0.87				0 0-21 3/8	53	<325		0.6	
Oxygen	293	Inlet Velocity—ft./sec.	0.99				1 21 3/8-52 3/4	75	CATALYST			
Natural Gas	277	Fresh Feed Rate—S.C.F.H. H_2 + CO	16348	HEMPEL DIST. %		°API	2 52 3/4-84	80	Bulk Density, Lbs./Cu.Ft.			
Generator	2468	per Cu. Ft. Dense Bed	1383	205 °F.			3 84-115 3/8	72	Aerated			151
Quench Accumulator	201	per Lb. Catalyst	9.16	400	72.9	57.3	4 115 3/8-353 1/8	240	Settled			153
Reactor Inlet	140	per Sq. Ft.	24770	400-550	18.0	36.2	Total	520	Compacted			166
Condenser Inlet	566			550+	9.1				Particle Density, gm./cc.			4.85
Product Accumulator		Heat Transfer Calculations					CALCULATED FROM dp		NH_3 Value, ml./gm.			
Catalyst No. Height		Steam Rate = 350 #/hr		A. S. T. M. DIST. ON			Density, Lbs./Cu.Ft.	151	N_2 Surface, m^2/gm.			
1 0'0"	537	@696 psia & 513°F.=		Naphtha °F.			Inventory, Lbs.	1785				
2 0'9"	681	1200 Btu/#		IBP	104		Bed Depth, Ft.	17.91	CHEMICAL ANALYSIS			
3 1'9"	677	Water in @64°F = 32 Btu/#		10%	134		Vol., Cu. Ft.	11.82	Fe on carryover			82.6
4 4'5"	657	Net Btu/# steam = 1168 Btu		50%	228				C on reactor sample			4.77
5 7'0"	679	(1168)(350) = 408,800 Btu/hr.		90%	350				O			
6 12'3"	678	Ave. Bed Temp. = 668°F.		EP	396				H			
7 17'5"	660	dT = 668-513 = 155°F.		Rec.	96.5				K_2O, W+, % basis Fe			
8 20'0"	645	Tube Area = 32.5 sq. ft.							X-Ray Analysis—			
9 22'7"	640	$K = \frac{408,800}{(32.5)(155)}$ =							$Fe_{20}C_9$			
10 25'2"	637	81.2 Btu/°F/sq. ft.							Fe_3O_4			
11 26'11"	612								Fe			

RUN NO. 59-B
HOURS 14-38
CATALYST Spent CM&S

THE TEXAS COMPANY — MONTEBELLO LABORATORY
YIELD CALCULATIONS

	FRESH FEED %	FRESH FEED m/hr	FRESH FEED #/hr	WET GAS %	WET GAS At Wt. Balance m/hr	WET GAS At Wt. Balance #/hr	RECYCLE m/hr	COMBINED FEED m/hr	EFFLUENT m/hr	NET CHANGE m/hr	NET CHANGE #/hr	CONDENSATE #/MCF	CONDENSATE #/gal	CONDENSATE gal/hr	CONDENSATE gal/MCF
CO 28.010	36.607	16.394	459.20	9.170	1.190	33.33	3.606	20.000	4.796	-15.204	-425.87				
H_2 2.016	60.573	27.128	54.69	36.950	4.796	9.66	14.529	41.657	19.325	-22.332	-45.03				
CO_2 44.010	1.943	0.870	38.29	31.913	4.141	182.24	12.548	13.418	16.689	3.271	143.95	8.715			
N_2 28.016	0.080	0.036	1.01	1.020	0.132	3.70	0.401	0.437	0.533						
CH_4 16.042	0.797	0.357	5.73	11.510	1.494	23.97	4.526	4.883	6.020	1.137	18.24	1.104			
C_2H_4 28.052				2.063	0.268	7.52	0.811	0.811	1.079	0.268	7.52	0.455			
C_3H_6 30.068				0.947	0.123	3.70	0.372	0.372	0.495	0.123	3.70	0.224			
C_1+C_2											29.46	1.783			
C_2H_2 42.078				2.547	0.331	13.93	1.001	1.001	1.332	0.331	13.93	0.843	4.32	3.225	0.195
C_3H_8 44.094				0.263	0.034	1.50	0.103	0.103	0.137	0.034	1.50	0.091	4.24	0.354	0.021
C_3H_6 56.104				1.803	0.234	13.13	0.709	0.709	0.943	0.234	13.13	0.795	5.00	2.626	0.159
C_4H_{10} 58.120				0.537	0.070	4.07	0.211	0.211	0.281	0.070	4.07	0.246	4.86	0.837	0.051
C_5H_{10} 70.130				0.870	0.113	7.92	0.342	0.342	0.455	0.113	7.92	0.480	5.45	1.453	0.088
C_5H_{12} 72.146				0.187	0.024	1.73	0.074	0.074	0.098	0.024	1.73	0.105	5.25	0.330	0.020
C_4H_{12} 84.156				0.220	0.029	2.44	0.087	0.087	0.116	0.029	2.44	0.148	5.54	0.440	0.027
C_3-C_6											44.72	2.708		9.265	0.561
TOTAL		44.785	558.92		12.979	308.84	39.320	84.105	61.663						
H_2+CO	97.180	43.522	1651671 SCFH		5.985		18.135	61.657	24.121	-37.536					
H_2/CO		1.65	Factor 605447		4.03		4.03	2.08	4.03	1.47					

Weight Recovery, %	100.48	Catalyst Age, hrs.	26	Space Velocity, vhv	1463	RECOVERED OIL	0.574**	80.49
Pressure, psig	419	Inlet Velocity, Ft/sec	0.98	Catalyst	Vol., CF 11.29	TOTAL OIL		125.21
Temperature, °F	662	Bed Depth, Ft	17.10	Weight, #	1829	WATER SOLUBLE CHEMICALS	0.320**	17.00
Recycle Ratio	0.88	Bed Density, #/CF	162	Effluent $\frac{(H_2)(CO_2)}{(H_2O)(CO)}$ / Shift Ratio =	7.72	TOTAL LIQUID PRODUCTS C_3+		142.21
						NET WATER	8.470**	152.59
						GROSS WATER		169.59
						HYDROCARBON TOTAL—C_1+		171.67

FRESH FEED CONVERSION — %				TOTAL FEED CONVERSION — %			SELECTIVITY
Contraction	CO	H_2	H_2+CO	CO	H_2	CO+H_2	C_3+ /C_1+
71.02	92.74	82.32	86.25	76.02	53.61	60.88	82.84

Form ML—11

**Included in Reactor Effluent Total

YIELD BASIS H_2+CO FED — YIELDS BASIS BROWNSVILLE DESIGN FEED RATE*	CORRECTED HEMPEL, %	gal/hr	TREATING RECOVERY, %	gal/hr
400 EP	76.3	9.547	98.0	9.356
400-550	16.0	2.002	91.4	1.830
550 +	7.7	0.964	114.6	1.105

	RECOVERY %	#/hr	gal/hr
PROPYLENE	49.5	6.90	
C_3 POLY GASO.	87.5	6.04	1.010
C_3 POLY TAR	12.5	0.86	0.114

	#/gal	#/hr	gal/hr	RVP
C_4H_8	5.00	1.61	0.322	68.0
C_4 POLY GASO.	5.98	10.08	1.686	1.5
C_4H_{10}	4.86	4.07	0.837	68.0
C_4-FREE GASO.			12.589	5.8
C_4 POLY TAR	7.53	1.44	0.191	

	gal/hr	gal/MCF	Bbl/Day
10 # RVP 400 EP GASOLINE	15.434	0.9344	5066
GAS OIL	1.830	0.1108	601
FUEL OIL	1.105	0.0669	363
POLY TAR	0.305	0.0185	100
TOTAL	18.674	1.1306	6130
W. S. CHEM.	2.195	0.1329	721
TOTAL	20.869	1.2635	6851

g/NCM = 16.91 × #/MCF *9488 MCFH H_2 + CO, Bbl/Day = 5421.6 × gal/MCF

THE TEXAS COMPANY — MONTEBELLO LABORATORY
DATA SUMMARY

RUN NO. 59-B
HOURS 14-38

OPERATING CONDITIONS			
PRESSURES PSIG		RATES S.C.F.H.	
Oxygen	445	Fresh Feed	16996
Natural Gas	444	Recycle	14922
Generator Outlet	426	Combined Feed	31918
Reactor Inlet	419	Wet Gas—Measured	4965
Condenser Inlet		Adjusted	4925
Product Accumulator	375	Loss	-40
TEMPERATURES—°F.		Recycle/Fresh Feed	0.88
Oxygen	297	Inlet Velocity—ft./sec.	0.98
Natural Gas	297	Fresh Feed Rate, S.C.F.H. H_2 + CO	16517
Generator		per Cu. Ft. Dense Bed	1463
Quench Accumulator	197	per Lb. Catalyst	9.03
Reactor Inlet	146	per Sq. Ft.	25026
Condenser Inlet	562		
Product Accumulator	92	Heat Transfer Calculations	
Catalyst No. Height		Steam Rate = 365 #/hr.	
1 See Period A	511	@694 psia & 514°F. =	
2	662	1199 Btu/#	
3	667	Water in @65.8°F. = 32 Btu/#	
4	647	Net Btu/# steam = 1167 Btu	
5	667	(1167)(365) = 425,955 Btu/hr.	
6	670	Ave. Bed Temp. = 662°F.	
7	658	dT = 662-514 = 148°F.	
8	639	Tube Area = 31.1 sq. ft.	
9	637	K = $\frac{425,955}{(31.1)(148)}$ =	
10	636	92.5 Btu/°F/sq.ft.	
11	610		

PRODUCT TESTS	OIL	WATER
° API	50.8	10.7
Neut. No.	25.0	22.6
Sap. No.	42.4	31.1
Hydrox. No.		
Bromine No.	97	
Pour °F.		
Chemicals, % by K_2CO_3		10.7
HEMPEL. DIST. %		°API
205 °F.		
400	75.3	57.0
400-550	16.0	36.1
550+	8.7	
A. S. T. M. DIST. ON		
Naphtha °F.		
IBP	103	
10%	132	
50%	226	
90%	354	
EP	394	
Rec.	96	

CATALYST DATA — INVENTORY DATA		PARTICLE SIZE				
		Screen Analysis			Sedimentation	
		Mesh	Microns	%	Microns	%
In Reactor at Start of Period		On 40	419+	74.5	80+	
Fresh Catalyst Added		100	150	23.9	40—80	
Total		150	105	0.8	20—40	
Catalyst Recovered	35⅛	200	74	0.2	10—20	
In Reactor at End of Period		250	62	0.2	0—20	
		325	44	0.2		
REACTOR d-p, Inches H_2O		<325		0.2		
No. Height						
0 See Period A	58					
1	86					
2	84					
3	75					
4	230					
Total	533					
CALCULATED FROM dp						
Density, Lbs./Cu.Ft.	162					
Inventory, Lbs.	1829					
Bed Depth, Ft.	17.10					
Vol., Cu. Ft.	11.29					

CATALYST	
Bulk Density, Lbs./Cu.Ft.	
Aerated	153
Settled	154
Compacted	169
Particle Density, gm./cc.	4.64
NH_3 Value, ml./gm.	
N_2 Surface, m^2/gm.	
CHEMICAL ANALYSIS	
Fe	73.4
C	5.47
O	
H	
K_2O, W+, % basis Fe	
X-Ray Analysis—	
$Fe_{20}C_9$	
Fe_3O_4	
Fe	

RUN NO. 59-C
HOURS 38-62
CATALYST Spent CMeS

THE TEXAS COMPANY — MONTEBELLO LABORATORY
YIELD CALCULATIONS

	FRESH FEED %	FRESH FEED m/hr	FRESH FEED #/hr	WET GAS %	WET GAS At Wt. Balance m/hr	WET GAS At Wt. Balance #/hr	RECYCLE m/hr	COMBINED FEED m/hr	EFFLUENT m/hr	NET CHANGE m/hr	NET CHANGE #/hr	YIELD BASIS H_2+CO FED CONDENSATE #/MCF	CONDENSATE #/gal	CONDENSATE gal/hr	CONDENSATE gal/MCF
CO 28.010	36.387	16.293	456.38	6.536	0.891	24.96	2.500	18.793	3.391	-15.402	-431.42				
H_2 2.016	60.450	27.070	54.58	35.930	4.900	9.88	13.745	40.815	18.645	-22.170	-44.70				
CO_2 44.010	2.313	1.036	45.59	33.900	4.623	203.45	12.968	14.004	17.591	3.587	157.86	9.593			
N_2 28.016	0.123	0.055	1.54	1.793	0.244	6.84	0.686	0.741	0.930						
CH_4 16.042	0.727	0.326	5.23	11.620	1.584	25.41	4.445	4.771	6.029	1.258	20.18	1.226			
C_2H_4 28.052				2.167	0.295	8.28	0.829	0.829	1.124	0.295	8.28	0.503			
C_2H_6 30.068				1.067	0.145	4.36	0.408	0.408	0.553	0.145	4.36	0.265			
C_1+C_2											32.82	1.994			
C_3H_6 42.078				2.367	0.323	13.59	0.905	0.905	1.228	0.323	13.59	0.826	4.32	3.146	0.191
C_3H_8 44.094				0.227	0.031	1.37	0.087	0.087	0.118	0.031	1.37	0.083	4.24	0.323	0.020
C_4H_8 56.104				1.977	0.270	15.15	0.756	0.756	1.026	0.270	15.15	0.921	5.00	3.030	0.184
C_4H_{10} 58.120				0.800	0.109	6.34	0.306	0.306	0.415	0.109	6.34	0.385	4.86	1.305	0.079
C_5H_{10} 70.130				1.023	0.139	9.75	0.391	0.391	0.530	0.139	9.75	0.592	5.45	1.789	0.109
C_5H_{12} 72.146				0.320	0.044	3.17	0.122	0.122	0.166	0.044	3.17	0.193	5.25	0.604	0.037
C_6H_{12} 84.156				0.273	0.037	3.11	0.105	0.105	0.142	0.037	3.11	0.189	5.54	0.561	0.034
C_3-C_6											52.48	3.189		10.758	0.654
TOTAL		44.780	563.32		13.635	335.66	38.253	83.033	60.279						
H_2+CO	96.837	43.363	1645648 SCFH		5.791		16.245	59.608	22.036	-37.572					
H_2/CO		1.66	Factor 607663		5.50		5.50	2.17	5.50	1.44					

Weight Recovery, %	97.17	Catalyst Age, hrs.	50	Space Velocity, vhv	1517	RECOVERED OIL 0.542** 76.05
Pressure, psig	420	Inlet Velocity, Ft/sec	0.97	Catalyst Vol., CF	10.85	TOTAL OIL 128.53
Temperature, °F	667	Bed Depth, Ft	16.44	Weight, #	1736	WATER SOLUBLE CHEMICALS 0.291** 15.44
Recycle Ratio	0.85	Bed Density, #/CF	160	Effluent $\frac{(H_2)(CO_2)}{(H_2O)(CO)}$ / Shift Ratio	12.80	TOTAL LIQUID PRODUCTS C_3+ 143.97

FRESH FEED CONVERSION — %				TOTAL FEED CONVERSION — %			SELECTIVITY	
Contraction	CO	H_2	H_2+CO	CO	H_2	$CO+H_2$	C_3+/C_1+	
69.55	94.53	81.90	86.65	81.96	54.32	63.03	81.44	

NET WATER	7.558**	136.17	8.275	16.347	0.993
GROSS WATER		151.61	9.213	18.306	1.112
HYDROCARBON TOTAL—C_1+		176.79	10.742		

YIELDS BASIS BROWNSVILLE DESIGN FEED RATE*

	CORRECTED HEMPEL, %	gal/hr	TREATING RECOVERY, %	gal/hr
400 EP	77.0	9.047	98.0	8.866
400-550	14.0	1.645	91.4	1.504
550 +	9.0	1.058	114.6	0.212

	RECOVERY %	#/hr	gal/hr
PROPYLENE	46.8	6.36	
C_3 POLY GASO.	87.5	5.57	0.931
C_3 POLY TAR	12.5	0.79	0.105

	#/gal	#/hr	gal/hr	RVP
C_4H_8	5.00	-	-	68.0
C_4 POLY GASO.	5.98	13.26	2.217	1.5
C_4H_{10}	4.86	(6.34) 6.07	(1.305) 1.248	68.0
C_4-FREE GASO.			12.751	5.8
C_4 POLY TAR	7.53	1.89	0.251	

	gal/hr	gal/MCF	Bbl/Day
10 # RVP 400 EP GASOLINE	16.216	0.9854	5342
GAS OIL	1.504	0.0914	496
FUEL OIL	1.212	0.0736	399
POLY TAR	0.356	0.0216	117
TOTAL	19.288	1.1720	6354
W.S. CHEM.	1.959	0.1190	645
TOTAL	21.247	1.2910	6999

Form ML—11

**Included In Reactor Effluent Total

g/NCM = 16.91 × #/MCF *9488 MCFH H_2 + CO, Bbl/Day = 5421.6 × gal/MCF

RUN NO. 59-C
HOURS 38-62

THE TEXAS COMPANY — MONTEBELLO LABORATORY
DATA SUMMARY

OPERATING CONDITIONS			
PRESSURES PSIG		RATES S.C.F.H.	
Oxygen	447.3	Fresh Feed	16994
Natural Gas	445.0	Recycle	14517
Generator Outlet	427.5	Combined Feed	31511
Reactor Inlet	420.0	Wet Gas—Measured	4929
Condenser Inlet		Adjusted	5174
Product Accumulator	375.5	Loss	245
TEMPERATURES—°F.		Recycle/Fresh Feed	0.85
Oxygen	326	Inlet Velocity—ft./sec.	0.97
Natural Gas	281	Fresh Feed Rate—S.C.F.H. H_2+CO	16456
Generator		per Cu. Ft. Dense Bed	1517
Quench Accumulator	200	per Lb. Catalyst	9.48
Reactor Inlet	153	per Sq. Ft.	24933
Condenser Inlet	568		
Product Accumulator	93	Heat Transfer Calculations	
Catalyst No. Height		Steam Rate = 364 #/hr.	
1 See Period A	505	@694 psia & 514°F. =	
2	665	1199 Btu/#	
3	672	Water in @69.9°F. = 37.9 Btu/#	
4	650	Net Btu/# steam = 1161 Btu	
5	678	(1161)(364) = 422,604 Btu/hr.	
6	674	Ave. Bed Temp. = 667°F	
7	661	dT = 667-514 = 153°F.	
8	640	Tube Area = 30.0 sq.ft.	
9	639	$K = \frac{422,604}{(30.0)(153)} = 92.1$ Btu/°F/sq.ft.	
10	637		
11	614		

PRODUCT TESTS	OIL	WATER
°API	50.6	10.8
Neut. No.	28.2	23.8
Sap. No.	45.7	31.6
Hydrox. No.		
Bromine No.	99	
Pour °F.		
Chemicals, % by K_2CO_3		10.7
HEMPEL, DIST. %		°API
205 °F.		
400	76.0	55.6
400-550	14.0	36.8
550+	10.0	
A. S. T. M. DIST. ON		
Naphtha °F.		
IBP	103	
10%	138	
50%	228	
90%	356	
EP	400	
Rec.	96.5	

CATALYST DATA		
INVENTORY DATA		
In Reactor at Start of Period		
Fresh Catalyst Added		
Total		
Catalyst Recovered	61⅛	
In Reactor at End of Period		
REACTOR d-p, Inches H_2O		
No. Height		
0 See Period A	56	
1	85	
2	80	
3	75	
4	210	
Total	506	
CALCULATED FROM dp		
Density, Lbs./Cu.Ft.	160	
Inventory, Lbs.	1736	
Bed Depth, Ft.	16.44	
Vol., Cu. Ft.	10.85	

PARTICLE SIZE					
	Screen Analysis			Sedimentation	
	Mesh	Microns	%	Microns	%
	On 40	419+		80+	
	100	150		40—80	
	150	105		20—40	
	200	74		10—20	
	250	62		0—20	
	325	44			
	<325				

CATALYST
Bulk Density, Lbs./Cu.Ft.
Aerated
Settled
Compacted
Particle Density, gm./cc.
NH_3 Value, ml./gm.
N_2 Surface, m^2/gm.
CHEMICAL ANALYSIS
Fe
C
O
H
K_2O, W+, % basis Fe
X-Ray Analysis—
$Fe_{20}C_9$
Fe_3O_4
Fe

RUN NO. 59-D
HOURS 62-86
CATALYST Spent CM&S

THE TEXAS COMPANY — MONTEBELLO LABORATORY
YIELD CALCULATIONS

	FRESH FEED %	FRESH FEED m/hr	FRESH FEED #/hr	WET GAS %	WET GAS At Wt. Balance m/hr	WET GAS At Wt. Balance #/hr	RECYCLE m/hr	COMBINED FEED m/hr	EFFLUENT m/hr	NET CHANGE m/hr	NET CHANGE #/hr	CONDENSATE #/MCF	CONDENSATE #/gal	CONDENSATE gal/hr	CONDENSATE gal/MCF
CO 28.010	36.450	16.327	457.30	6.060	0.769	21.54	2.268	18.595	3.037	-15.558	-435.76				
H_2 2.016	60.223	26.975	54.38	34.423	4.367	8.80	12.886	39.861	17.253	-22.608	-45.58				
CO_2 44.010	2.507	1.123	49.42	34.586	4.387	193.08	12.947	14.070	17.334	3.264	143.66	8.742			
N_2 28.016	0.057	0.026	0.73	1.570	0.199	5.58	0.588	0.614	0.767						
CH_4 16.042	0.763	0.342	5.49	11.907	1.510	24.22	4.458	4.800	5.968	1.168	18.73	1.140			
C_2H_4 28.052				2.410	0.306	8.58	0.902	0.902	1.208	0.306	8.58	0.522			
C_2H_6 30.068				1.137	0.144	4.33	0.426	0.426	0.570	0.144	4.33	0.263			
C_1+C_2											31.64	1.925			
C_3H_6 42.078				2.780	0.353	14.85	1.041	1.041	1.394	0.353	14.85	0.904	4.32	3.438	0.209
C_3H_8 44.094				0.327	0.041	1.81	0.122	0.122	0.163	0.041	1.81	0.110	4.24	0.427	0.026
C_4H_8 56.104				2.257	0.286	16.05	0.845	0.845	1.131	0.286	16.05	0.977	5.00	3.210	0.195
C_4H_{10} 58.120				0.750	0.095	5.52	0.281	0.281	0.376	0.095	5.52	0.336	4.86	1.136	0.069
C_5H_{10} 70.130				1.140	0.145	10.17	0.427	0.427	0.572	0.145	10.17	0.619	5.48	1.866	0.114
C_5H_{12} 72.146				0.333	0.042	3.03	0.125	0.125	0.167	0.042	3.03	0.184	5.25	0.577	0.035
C_6H_{12} 84.156				0.320	0.041	3.45	0.120	0.120	0.161	0.041	3.45	0.210	5.54	0.623	0.038
C_3-C_6											54.88	3.340		11.277	0.686
TOTAL		44.793	567.32		12.685	321.01	37.436	82.229	59.126						
H_2+CO	96.673	43.302	1643344 SCFH		5.136		15.154	58.456	20.290	-38.166					
H_2/CO		1.65	Factor 608515		5.68		5.68	2.14	5.68	1.45					

Weight Recovery, %	99.92	Catalyst Age, hrs.	74	Space Velocity, vhv	1488
Pressure, psig	421	Inlet Velocity, Ft/sec	0.96	Catalyst Vol., CF	11.04
Temperature, °F	673	Bed Depth, Ft	16.73	Weight, #	1634
Recycle Ratio	0.84	Bed Density, #/CF	148	Effluent $\frac{(H_2)(CO_2)}{(H_2O)(CO)}$ Shift Ratio	= 12.19

FRESH FEED CONVERSION — %				TOTAL FEED CONVERSION — %			SELECTIVITY
Contraction	CO	H_2	H_2+CO	CO	H_2	CO+H_2	C_3+/C_1+
71.68	95.29	83.81	88.14	83.67	56.72	65.29	83.10

	RECOVERED OIL	TOTAL OIL	WATER SOLUBLE CHEMICALS	TOTAL LIQUID PRODUCTS C_3+	NET WATER	GROSS WATER	HYDROCARBON TOTAL—C_1+
	0.592**	83.04	5.053	12.878	0.784		
		137.92	8.393	24.155	1.470		
	0.334**	17.71	1.078	2.226	0.135		
		155.63	9,471	26.381	1.605		
	8.079**	145.56	8.858	17.474	1.063		
		163.27	9.936	19.700	1.198		
		187.27	11.396				

YIELDS BASIS BROWNSVILLE DESIGN FEED RATE*	CORRECTED HEMPEL, %	gal/hr	TREATING RECOVERY, %	gal/hr
400 EP	80.3	10.341	98.0	10.134
400-550	14.0	1.803	91.4	1.648
550 +	5.7	0.734	114.6	0.841

	RECOVERY %	#/hr	gal/hr
PROPYLENE	51.0	7.57	
C_3 POLY GASO.	87.5	6.62	1.107
C_3 POLY TAR	12.5	0.95	0.126

	#/gal	#/hr	gal/hr	RVP
C_4H_8	5.00	1.99	0.398	68.0
C_4 POLY GASO.	5.98	12.30	2.057	1.5
C_4H_{10}	4.86	5.52	1.136	68.0
C_4-FREE GASO.			14.307	5.8
C_4 POLY TAR	7.53	1.76	0.234	

	gal/hr	gal/MCF	Bbl/Day
10 # RVP 400 EP GASOLINE	17.898	1.0891	5905
GAS OIL	1.648	0.1003	544
FUEL OIL	0.841	0.0512	278
POLY TAR	0.360	0.0219	119
TOTAL	20.747	1.2625	6845
W. S. CHEM.	2.226	0.1355	735
TOTAL	22.973	1.3980	7579

Form ML—11

**Included in Reactor Effluent Total

g/NCM = 16.91 × #/MCF *9488 MCFH H_2 + CO, Bbl/Day = 5421.6 × gal/MCF

RUN NO. 59-D
HOURS 58-82

THE TEXAS COMPANY — MONTEBELLO LABORATORY
DATA SUMMARY

OPERATING CONDITIONS				PRODUCT TESTS	OIL	WATER
PRESSURES PSIG		RATES S.C.F.H.				
Oxygen	449	Fresh Feed	16999	° API	51.1	10.7
Natural Gas	445	Recycle	14207	Neut. No.	26.0	23.0
Generater Outlet	428	Combined Feed	31206	Sap. No.	39.8	30.8
Reactor Inlet	421	Wet Gas—Measured	4807	Hydrox. No.		
Condenser Inlet		Adjusted	4814	Bromine No.	97	
Product Accumulator	375	Loss	7	Pour °F.		
				Chemicals, % by K_2CO_3		11.3
TEMPERATURES—°F.		Recycle/Fresh Feed	0.84			
Oxygen	318	Inlet Velocity—ft./sec.	0.96			
Natural Gas	305	Fresh Feed Rate $\frac{S.C.F.H.}{H_2 + CO}$	16433	HEMPEL, DIST. %		°API
Generator		per Cu. Ft. Dense Bed	1488	205 °F.		
Quench Accumulator	198	per Lb. Catalyst	10.06	400	79.3	56.7
Reactor Inlet	155	per Sq. Ft.	24898	400-550	14.0	36.9
Condenser Inlet	572			550+	6.7	
Product Accumulator	94	Heat Transfer Calculations				
Catalyst No. Height		Steam Rate = 369 #/hr.		A. S. T. M. DIST. ON		
1 See Period A	488	@694 psia & 514°F. =		Naphtha °F.		
2	675	1199 Btu/#		IBP	100	
3	681	Water in @70.3°F. = 38.3 Btu/#		10%	130	
4	658	Net Btu/# steam = 1161 Btu		50%	216	
5	683	(1161)(369) = 428,409		90%	340	
6	679	Ave. Bed Temp. = 673°F.		EP	398	
7	664	dT = 673-514 = 159°F.		Rec.	97.5	
8	642	Tube Area = 30.4 sq. ft.				
9	641	K = $\frac{428,409}{(30.4)(159)}$ =				
10	638	88.6 Btu/°F./sq. ft.				
11	617					

CATALYST DATA					
INVENTORY DATA		PARTICLE SIZE			
In Reactor at Start of Period		Screen Analysis			Sedimentation
Fresh Catalyst Added		Mesh	Microns	%	Microns %
Total		On 40	419+	70.5	80+
Catalyst Recovered	86⅓	100	150	27.5	40—80
In Reactor at End of Period		150	105	1.2	20—40
		200	74	0.2	10—20
REACTOR d-p, Inches H_2O		250	62	0.2	0—20
No. Height		325	44	0.2	
0 See Period A	52	<325		0.2	
1	79	CATALYST			
2	74	Bulk Density, Lbs./Cu.Ft.			
3	71	Aerated			143
4	200	Settled			144
Total	476	Compacted			175
		Particle Density, gm./cc.			4.39
CALCULATED FROM dp		NH_3 Value, ml./gm.			
Density, Lbs./Cu.Ft.	148	N_2 Surface, m^2/gm.			
Inventory, Lbs.	1634				
Bed Depth, Ft.	16.73	CHEMICAL ANALYSIS			
Vol., Cu. Ft.	11.04	Fe			
		C			6.78
		O			
		H			
		K_2O, W+, % basis Fe			
		X-Ray Analysis—			
		$Fe_{20}C_9$			
		Fe_3O_4			
		Fe			

RUN NO. 59-E
HOURS 86-110
CATALYST Spent CM&S

THE TEXAS COMPANY — MONTEBELLO LABORATORY
YIELD CALCULATIONS

	FRESH FEED %	FRESH FEED m/hr	FRESH FEED #/hr	WET GAS %	WET GAS At Wt. Balance m/hr	WET GAS At Wt. Balance #/hr	RECYCLE m/hr	COMBINED FEED m/hr	EFFLUENT m/hr	NET CHANGE m/hr	NET CHANGE #/hr
CO 28.010	35.637	16.125	451.65	5.393	0.713	19.97	2.080	18.205	2.793	-15.412	-431.68
H_2 2.016	61.323	27.748	55.94	36.967	4.889	9.86	14.252	42.000	19.141	-22.859	-46.08
CO_2 44.010	2.370	1.072	47.18	34.596	4.576	201.39	13.341	14.413	17.917	3.504	154.21
N_2 28.016	0.147	0.067	1.88	1.237	0.164	4.59	0.477	0.544	0.641		
CH_4 16.042	0.523	0.237	3.80	11.087	1.466	23.52	4.275	4.512	5.741	1.229	19.72
C_2H_4 28.052				2.357	0.312	8.75	0.909	0.909	1.221	0.312	8.75
C_2H_6 30.068				1.070	0.142	4.27	0.413	0.413	0.555	0.142	4.27
C_1+C_2											32.74
C_3H_6 42.078				2.797	0.370	15.57	1.079	1.079	1.449	0.370	15.57
C_3H_8 44.094				0.313	0.041	1.81	0.121	0.121	0.162	0.041	1.81
C_4H_8 56.104				2.070	0.274	15.37	0.798	0.798	1.072	0.274	15.37
C_4H_{10} 58.120				0.593	0.078	4.53	0.229	0.229	0.307	0.078	4.53
C_5H_{10} 70.130				1.023	0.135	9.47	0.394	0.394	0.529	0.135	9.47
C_5H_{12} 72.146				0.227	0.030	2.16	0.089	0.089	0.119	0.030	2.16
C_6H_{12} 84.156				0.270	0.036	3.03	0.104	0.104	0.140	0.036	3.03
C_5-C_6											51.94
TOTAL		45.249	560.45		13.276	324.29	38.561	83.810	60.580		
H_2+CO	96.960	43.873	16650 SCFH		5.602		16.332	60.205	21.934	-38.271	
H_2/CO		1.72	Factor 6006006		6.85		6.85	2.31	6.85	1.48	

YIELD BASIS H_2+CO FED — CONDENSATE	#/MCF	#/gal	gal/hr	gal/MCF
	1.184			
	0.526			
	0.256			
	1.966			
	0.935	4.32	3.604	0.216
	0.109	4.24	0.427	0.026
	0.923	5.00	3.074	0.185
	0.272	4.86	0.932	0.056
	0.569	5.45	1.738	0.104
	0.130	5.25	0.411	0.025
	0.182	5.54	0.547	0.033
	3.120		10.733	0.645

YIELDS BASIS BROWNSVILLE DESIGN FEED RATE*	CORRECTED HEMPEL, %	gal/hr	TREATING RECOVERY, %	gal/hr
400 EP	79.4	9.455	98.0	9.266
400-550	16.0	1.905	91.4	1.741
550 +	4.6	0.548	114.6	0.628

	RECOVERY %	#/hr	gal/hr
PROPYLENE	49.0	7.63	
C_3 POLY GASO.	87.5	6.68	1.117
C_3 POLY TAR	12.5	0.95	0.126

	#/gal	#/hr	gal/hr	RVP
C_4H_8	5.00	1.55	0.310	68.0
C_4 POLY GASO.	5.98	12.09	2.022	1.5
C_4H_{10}	4.86	4.53	0.932	68.0
C_4-FREE GASO.			13.079	5.8
C_4 POLY TAR	7.53	1.73	0.230	

	gal/hr	gal/MCF	Bbl/Day
10 # RVP 400 EP GASOLINE	16.343	0.9816	5322
GAS OIL	1.741	0.1046	567
FUEL OIL	0.628	0.0377	204
POLY TAR	0.356	0.0214	116
TOTAL	19.068	1.1453	6209
W. S. CHEM.	2.058	0.1236	670
TOTAL	21.126	1.2689	6879

RECOVERED OIL	0.548**	76.92	4.620		11.908	0.715		
TOTAL OIL		128.86	7.740		22.641	1.360		
WATER SOLUBLE CHEMICALS	0.305**	16.19	0.972		2.058	0.124		
TOTAL LIQUID PRODUCTS C_5+		145.05	8.712		24.699	1.484		
NET WATER	7.940**	143.05	8.592		17.173	1.031		
GROSS WATER		159.24	9.564		19.231	1.155		
HYDROCARBON TOTAL—C_1+		177.99	10.678					

Weight Recovery, %	97.73	Catalyst Age, hrs.	98	Space Velocity, vhv	1565
Pressure, psig	417	Inlet Velocity, Ft/sec	1.00	Catalyst Vol., CF	10.64
Temperature, °F	682	Bed Depth, Ft	16.12	Weight, #	1500
Recycle Ratio	0.852	Bed Density, #/CF	141	Effluent $(H_2)(CO_2)$ / Shift Ratio $(H_2O)(CO)$	= 15.46

FRESH FEED CONVERSION — %				TOTAL FEED CONVERSION — %			SELECTIVITY
Contraction	CO	H_2	H_2+CO	CO	H_2	CO+H_2	C_3+ / C_1+
70.77	95.58	82.38	87.23	84.66	54.43	63.57	81.59

Form ML—11

**Included in Reactor Effluent Total

g/NCM = 16.91 × #/MCF *9488 MCFH H_2 + CO, Bbl/Day = 5421.6 × gal/MCF

THE TEXAS COMPANY — MONTEBELLO LABORATORY
DATA SUMMARY

RUN NO. 59-E
HOURS 82-106

OPERATING CONDITIONS — PRESSURES PSIG	
Oxygen	446
Natural Gas	442
Generator Outlet	425
Reactor Inlet	417
Condenser Inlet	
Product Accumulator	372
TEMPERATURES—°F.	
Oxygen	319
Natural Gas	304
Generator	-
Quench Accumulator	204
Reactor Inlet	155
Condenser Inlet	577
Product Accumulator	94
Catalyst No. Height	
1 See Period A	463
2	684
3	688
4	663
5	690
6	684
7	667
8	646
9	645
10	642
11	620

OPERATING CONDITIONS — RATES S.C.F.H.	
Fresh Feed	17172
Recycle	14634
Combined Feed	31806
Wet Gas—Measured	4822
Adjusted	5019
Loss	197
Recycle/Fresh Feed	0.852
Inlet Velocity—ft./sec.	1.000
Fresh Feed Rate—S.C.F.H. H_2 + CO	16650
per Cu.Ft. Dense Bed	1565
per Lb. Catalyst	11.1
per Sq. Ft.	25227
Heat Transfer Calculations	
Steam Rate = 389 #/hr.	
@693 psia & 514°F. =	
1199 Btu/#	
Water in @69.4°F. = 37.4 Btu/#	
Net Btu/# steam = 1162 Btu	
(1162)(389) = 452,018 Btu/hr.	
Ave. Bed Temp. = 682°F.	
dT = 682-514 = 168°F.	
Tube Area = 29.2 sq.ft.	
$K = \frac{452,018}{(29.2)(168)} =$	
92.14 Btu/°F/sq. ft.	

PRODUCT TESTS	OIL	WATER
°API	51.0	10.8
Neut. No.	26.3	22.8
Sap. No.	44.3	30.9
Hydrox. No.		
Bromine No.	97	
Pour °F.		
Chemicals, % by K_2CO_3		10.7
HEMPEL, DIST. %		°API
205 °F.		
400	78.4	56.3
400-550	16.0	35.5
550+	5.6	
A. S. T. M. DIST. ON		
Naphtha °F.		
IBP	102	
10%	136	
50%	224	
90%	352	
EP	398	
Rec.		

CATALYST DATA — INVENTORY DATA	
In Reactor at Start of Period	
Fresh Catalyst Added	
Total	
Catalyst Recovered	102
In Reactor at End of Period	
REACTOR d-p, Inches H_2O	
No. Height	
0 See Period A	49
1	75
2	70
3	68
4	175
Total	437
CALCULATED FROM dp	
Density, Lbs./Cu.Ft.	141
Inventory, Lbs.	1500
Bed Depth, Ft.	16.12
Vol., Cu. Ft.	10.64

PARTICLE SIZE — Screen Analysis			Sedimentation	
Mesh	Microns	%	Microns	%
On 40	419+	57.3	80+	
100	150	35.3	40—80	
150	105	4.4	20—40	
200	74	2.0	10—20	
250	62	0.2	0—20	
325	44	0.4		
<325		0.4		

CATALYST	
Bulk Density, Lbs./Cu.Ft.	
Aerated	137
Settled	138
Compacted	171
Particle Density, gm./cc.	4.47
NH_3 Value, ml./gm.	
N_2 Surface, m^2/gm.	
CHEMICAL ANALYSIS	
Fe	
C	7.26
O	
H	
K_2O, W+, % basis Fe	
X-Ray Analysis—	
$Fe_{20}C_9$	
Fe_3O_4	
Fe	

THE TEXAS COMPANY — MONTEBELLO LABORATORY
DATA SUMMARY

RUN NO. 59-F
HOURS 106-130

OPERATING CONDITIONS				PRODUCT TESTS			CATALYST DATA					
PRESSURES PSIG		RATES S.C.F.H.			OIL	WATER	INVENTORY DATA		PARTICLE SIZE			
Oxygen	444	Fresh Feed	17316	°API	52.1	10.8	In Reactor at Start of Period		Screen Analysis			Sedimentation
Natural Gas	439	Recycle	15099	Neut. No.	26.0	23.7	Fresh Catalyst Added		Mesh	Microns	%	Microns %
Generator Outlet	424	Combined Feed	32415	Sap. No.	38.4	30.6	Total		On 40	419+	64.9	80+
Reactor Inlet	416	Wet Gas—Measured	5122	Hydrox. No.			Catalyst Recovered	96½	100	150	29.6	40—80
Condenser Inlet		Adjusted	5233	Bromine No.	101		In Reactor at End of Period		150	105	3.1	20—40
Product Accumulator	372	Loss	111	Pour °F.	below -40				200	74	1.4	10—20
				Chemicals, % by K_2CO_3		10.7	REACTOR d-p, Inches H_2O		250	62	0.2	0—20
							No. Height		325	44	0.4	
TEMPERATURES—°F.		Recycle/Fresh Feed	0.87									
Oxygen	314	Inlet Velocity—ft./sec.	1.02				0 See Period A	46	<325		0.4	
Natural Gas	312	Fresh Feed Rate H_2+CO S.C.F.H.	16843	HEMPEL. DIST. %		°API	1	65	CATALYST			
Generator	-	per Cu. Ft. Dense Bed	1596	205 °F.			2	69	Bulk Density, Lbs./Cu.Ft.			
Quench Accumulator	206	per Lb. Catalyst	12.09	400	77.6	56.4	3	66	Aerated			140
Reactor Inlet	152	per Sq. Ft.	25520	400-550	12.4	35.7	4	160	Settled			141
Condenser Inlet	575			550+	10.0		Total	406	Compacted			187
Product Accumulator	90	Heat Transfer Calculations							Particle Density, gm./cc.			4.52
Catalyst No. Height		Steam Rate = 343 #/hr.		A. S. T. M. DIST. ON			CALCULATED FROM dp		NH_3 Value, ml./gm.			
1 See Period A	457	@694 psia & 514°F =		Naphtha °F.			Density, Lbs./Cu.Ft.	132	N_2 Surface, m^2/gm.			
2	672	1199 Btu/#		IBP	104		Inventory, Lbs.	1393				
3	684	Water in @64.7°F= 33 Btu/#		10%	132		Bed Depth, Ft.	15.99	CHEMICAL ANALYSIS			
4	657	Net Btu/# steam = 1166 Btu		50%	218		Vol., Cu. Ft.	10.55	Fe			
5	690	(1166)(343) = 399,938 Btu/hr.		90%	356				C			6.74
6	686	Ave. Bed Temp. = 678°F		EP	394				O			
7	665	dT = 678-514 = 164°F.		Rec.	95.5				H			
8	647	Tube Area = 29.0 sq. ft.							K_2O, W+, % basis Fe			
9	648	K = 399,938 / (29.0)(164) =							X-Ray Analysis—			
10	643	84.09 Btu/°F./sq. ft.							$Fe_{20}C_9$			
11	623								Fe_3O_4			
									Fe			

THE TEXAS COMPANY — MONTEBELLO LABORATORY
YIELD CALCULATIONS

RUN NO. 59-F
HOURS 110-134
CATALYST Spent CM&S

	FRESH FEED			WET GAS			RECYCLE	COMBINED FEED	EFFLUENT	NET CHANGE		YIELD BASIS H_2+CO FED				
					At Wt. Balance							CONDENSATE				
	%	m/hr	#/hr	%	m/hr	#/hr	m/hr	m/hr	m/hr	m/hr	#/hr	#/MCF	#/gal	gal/hr	gal/MCF	
CO 28.010	35.057	15.996	448.06	6.303	0.869	24.34	2.508	18.504	3.377	-15.127	-423.72					
H_2 2.016	62.210	28.385	57.22	40.167	5.540	11.17	15.981	44.366	21.431	-22.845	-46.05					
CO_2 44.010	2.173	0.991	43.61	31.430	4.334	190.74	12.505	13.496	16.839	3.343	147.13	8.735				
N_2 28.016	0.087	0.040	1.12	1.210	0.167	4.68	0.481	0.521	0.648							
CH_4 16.042	0.473	0.216	3.47	10.343	1.426	22.88	4.115	4.331	5.541	1.210	19.41	1.152				
C_2H_4 28.052				2.330	0.321	9.00	0.927	0.927	1.248	0.321	9.00	0.534				
C_2H_6 30.068				1.040	0.143	4.30	0.414	0.414	0.557	0.143	4.30	0.255				
C_1+C_2											32.71	1.941				
C_3H_6 42.078				2.773	0.382	16.07	1.103	1.103	1.485	0.382	16.07	0.954	4.32	3.720	0.221	
C_3H_8 44.094				0.290	0.040	1.76	0.115	0.115	0.155	0.040	1.76	0.104	4.24	0.415	0.025	
C_4H_8 56.104				2.027	0.280	15.71	0.806	0.806	1.086	0.280	15.71	0.933	5.00	3.142	0.187	
C_4H_{10} 58.120				0.580	0.080	4.65	0.231	0.231	0.311	0.080	4.65	0.276	4.86	0.957	0.057	
C_5H_{10} 70.130				1.000	0.138	9.68	0.398	0.398	0.536	0.138	9.68	0.575	5.45	1.776	0.105	
C_5H_{12} 72.146				0.220	0.030	2.16	0.088	0.088	0.118	0.030	2.16	0.128	5.25	0.411	0.024	
C_6H_{12} 84.156				0.287	0.040	3.37	0.114	0.114	0.154	0.040	3.37	0.200	5.54	0.608	0.036	
C_5-C_6											53.40	3.170		11.029	0.655	
TOTAL		45.628	553.48		13.790	320.51	39.786	85.414	62.259		-					
H_2+CO	97.267	44.381	16843	SCFH	6.409		18.489	62.870	24.808	-37.972						
H_2/CO		1.77	Factor 593718		6.38		6.38	2.40	6.38	1.51						

Weight Recovery, %	98.77	Catalyst Age, hrs.	134	Space Velocity, vhv	1596	RECOVERED OIL	0.540**	75.69	4.494	11.868	0.705
Pressure, psig	416	Inlet Velocity, Ft/sec	1.02	Catalyst Vol., CF	10.55	TOTAL OIL		129.09	7.664	22.897	1.359
Temperature, °F	678	Bed Depth, Ft	15.99	Weight, #	1393	WATER SOLUBLE CHEMICALS	0.302**	16.01	0.951	2.032	0.121
Recycle Ratio	0.87	Bed Density, #/CF	132	Effluent $(H_2)(CO_2)$ / Shift Ratio $(H_2O)(CO)$	13.63	TOTAL LIQUID PRODUCTS C_3+		145.10	8.615	24.929	1.480
						NET WATER	7.841**	141.27	8.387	16.959	1.007
						GROSS WATER		157.28	9.338	18.991	1.128
						HYDROCARBON TOTAL—C_1+		177.81	10.557		

FRESH FEED CONVERSION — %				TOTAL FEED CONVERSION — %			SELECTIVITY
Contraction	CO	H_2	H_2+CO	CO	H_2	$CO+H_2$	C_3+/C_1+
69.78	94.57	80.48	85.56	81.75	51.49	60.40	81.60

YIELDS BASIS BROWNSVILLE DESIGN FEED RATE*				
	CORRECTED HEMPEL. %	gal/hr	TREATING RECOVERY.%	gal/hr
400 EP	78.6	9.328	98.0	9.141
400-550	12.4	1.472	91.4	1.345
550 +	9.0	1.068	114.6	1.224
	RECOVERY %	#/hr	gal/hr	
PROPYLENE	47.0	7.55		
C_3 POLY GASO.	87.5	6.61	1.105	
C_3 POLY TAR	12.5	0.94	0.125	
	#/gal	#/hr	gal/hr	RVP
C_4H_8	5.00	1.46	0.292	68.0
C_4 POLY GASO.	5.98	14.25	2.085	1.5
C_4H_{10}	4.86	4.65	0.957	68.0
C_4 FREE GASO.			13.041	5.8
C_4 POLY TAR	7.53	1.78	0.237	
	gal/hr	gal/MCF	Bbl/Day	
10 # RVP 400 EP GASOLINE	16.375	0.972	5270	
GAS OIL	1.345	0.080	434	
FUEL OIL	1.224	0.073	396	
POLY TAR	0.362	0.021	114	
TOTAL	19.306	1.146	6214	
W. S. CHEM.	2.032	0.121	656	
TOTAL	21.338	1.267	6870	

Form ML—11

**Included in Reactor Effluent Total

g/NCM = 16.91 × #/MCF *9488 MCFH H_2+CO, Bbl/Day = 5421.6 × gal/MCF

THE TEXAS COMPANY — MONTEBELLO LABORATORY
DATA SUMMARY

RUN NO. 59-G
HOURS 130-154

OPERATING CONDITIONS				PRODUCT TESTS			CATALYST DATA					
PRESSURES PSIG		RATES S.C.F.H.			OIL	WATER	INVENTORY DATA		PARTICLE SIZE			
Oxygen	444	Fresh Feed	17351	°API	50.2	10.7	In Reactor at Start of Period		Screen Analysis			Sedimentation
Natural Gas	440	Recycle	15156	Neut. No.	29.9	25.9	Fresh Catalyst Added		Mesh	Microns	%	Microns %
Generator Outlet	424	Combined Feed	32507	Sap. No.	45.9	33.8	Total		On 40	419+	45.9	80+
Reactor Inlet	416	Wet Gas—Measured	5440	Hydrox. No.			Catalyst Recovered	78.5	100	150	38.3	40—80
Condenser Inlet		Adjusted	5611	Bromine No.	95		In Reactor at End of Period		150	105	7.9	20—40
Product Accumulator	372	Loss	171	Pour °F.	below -40				200	74	5.1	10—20
				Chemicals, % by K_2CO_3		10.7	REACTOR d-p, Inches H_2O		250	62	0.8	0—20
							No. Height		325	44	0.8	
TEMPERATURES—°F.		Recycle/Fresh Feed	0.87				0 See Period A	46	<325		1.2	
Oxygen	322	Inlet Velocity—ft./sec.	1.02				1	68	CATALYST			
Natural Gas	305	Fresh Feed Rate—S.C.F.H. $H_2 + CO$	16843	HEMPEL, DIST. %		°API	2	68	Bulk Density, Lbs./Cu.Ft.			
Generator	-	per Cu.Ft. Dense Bed	1705	205 °F.			3	66	Aerated			140
Quench Accumulator	196	per Lb. Catalyst	12.82	400	77.6	55.0	4	135	Settled			141
Reactor Inlet	152	per Sq. Ft.	25520	400-550	12.4	34.4	Total	383	Compacted			172
Condenser Inlet	572			550+	10.0				Particle Density, gm./cc.			4.44
Product Accumulator	91	Heat Transfer Calculations					CALCULATED FROM dp		NH_3 Value, ml./gm.			
Catalyst No. Height		Steam Rate = 328 #/hr.		A. S. T. M. DIST. ON			Density, Lbs./Cu.Ft.	133	N_2 Surface, m^2/gm.			
1 See Period A	435	@694 psia & 514°F =		Naphtha °F.			Inventory, Lbs.	1314				
2	670	1199 Btu/#		IBP	104		Bed Depth, Ft.	14.97	CHEMICAL ANALYSIS			
3	686	Water in @66.9°F.= 34.9 Btu/#		10%	134		Vol., Cu. Ft.	9.88	Fe			
4	661	Net Btu/# steam = 1164 Btu		50%	226				C			7.74
5	693	(1164)(328) = 381,792 Btu/hr.		90%	350				O			
6	690	Ave. Bed Temp. = 680°F.		EP	396				H			
7	663	dT = 680-514 = 166°F.		Rec.	97.0				K_2O, W+, % basis Fe			
8	649	Tube Area = 27.2 sq. ft.							X-Ray Analysis—			
9	651	$K = \frac{381,792}{(27.2)(166)}$ =							$Fe_{20}C_9$			
10	647	84.6 Btu/°F./sq. ft.							Fe_3O_4			
11	629								Fe			

THE TEXAS COMPANY — MONTEBELLO LABORATORY
YIELD CALCULATIONS

RUN NO. 59-G
HOURS 134-158
CATALYST Spent CM&S

	FRESH FEED			WET GAS			RECYCLE	COMBINED FEED	EFFLUENT	NET CHANGE		YIELD BASIS H_2+CO FED				
	%	m/hr	#/hr	%	At Wt. Balance m/hr	#/hr	m/hr	m/hr	m/hr	m/hr	#/hr	CONDENSATE #/MCF	#/gal	gal/hr	gal/MCF	
CO 28.010	34.993	15.999	448.14	7.373	1.090	30.53	2.945	18.944	4.035	-14.909	-417.61					
H_2 2.016	62.080	28.384	57.22	41.084	6.075	12.25	16.407	44.791	22.482	-22.309	-44.97					
CO_2 44.010	2.353	1.076	47.36	31.370	4.638	204.10	12.528	13.604	17.166	3.562	156.74	9.306				
N_2 28.016	0.077	0.035	0.98	1.270	0.188	5.27	0.507	0.542	0.695							
CH_4 16.042	0.497	0.227	4.64	9.660	1.428	22.91	3.858	4.085	5.286	1.201	18.27	1.085				
C_2H_4 28.052				2.013	0.298	8.36	0.804	0.804	1.102	0.298	8.36	0.496				
C_2H_6 30.068				0.970	0.143	4.30	0.387	0.387	0.530	0.143	4.30	0.255				
C_1+C_2											30.93	1.836				
C_3H_6 42.078				2.533	0.375	15.78	1.012	1.012	1.387	0.375	15.78	0.937	4.32	3.653	0.217	
C_3H_8 44.094				0.267	0.039	1.72	0.107	0.107	0.146	0.039	1.72	0.102	4.24	0.406	0.024	
C_4H_8 56.104				1.790	0.265	14.88	0.715	0.715	0.980	0.265	14.88	0.883	5.00	2.976	0.177	
C_4H_{10} 58.120				0.447	0.066	3.84	0.179	0.179	0.245	0.066	3.84	0.228	4.86	0.790	0.047	
C_5H_{10} 70.130				0.860	0.127	8.91	0.343	0.343	0.470	0.127	8.91	0.529	5.45	1.635	0.097	
C_5H_{12} 72.146				0.160	0.024	1.73	0.064	0.064	0.088	0.024	1.73	0.103	5.25	0.330	0.020	
C_6H_{12} 84.156				0.203	0.030	2.52	0.081	0.081	0.111	0.030	2.52	0.150	5.54	0.455	0.027	
C_5-C_6											49.38	2.932		10.245	0.609	
TOTAL		45.721	557.34		14.786	337.10	39.937	85.658	63.002							
H_2+CO	97.073	44.383	16843136 SCFH		7.165		19.352	63.735	26.517	-37.218						
H_2/CO		1.77	Factor 5937136		5.57		5.57	2.36	5.57	1.50						

Weight Recovery, %	98.15	Catalyst Age, hrs. 158	Space Velocity, vh 1705	RECOVERED OIL	0.498**	69.90	4.150	10.693	0.635
Pressure, psig	416	Inlet Velocity, Ft/sec 1.02	Catalyst Vol., CF 9.88	TOTAL OIL		119.28	7.082	20.938	1.244
Temperature, °F	680	Bed Depth, Ft 14.97	Weight, # 1314	WATER SOLUBLE CHEMICALS	0.290**	15.39	0.914	1.941	0.115
Recycle Ratio	0.87	Bed Density, #/CF 133	Effluent $(H_2)(CO_2)$ / Shift Ratio $(H_2O)(CO)$ = 12.77	TOTAL LIQUID PRODUCTS C_5+		134.67	7.996	22.879	1.359
				NET WATER	7.491**	134.95	8.012	16.200	0.962
				GROSS WATER		150.34	8.926	18.141	1.077
				HYDROCARBON TOTAL—C_1+		165.60	9.832		

FRESH FEED CONVERSION — %				TOTAL FEED CONVERSION — %			SELECTIVITY
Contraction	CO	H_2	H_2+CO	CO	H_2	$CO+H_2$	C_3+/C_1+
67.66	93.19	78.60	83.86	78.70	49.81	58.39	81.32

YIELDS BASIS BROWNSVILLE DESIGN FEED RATE*				
	CORRECTED HEMPEL, %	gal/hr	TREATING RECOVERY, %	gal/hr
400 EP	78.6	8.405	98.0	8.237
400-550	12.4	1.326	91.4	1.212
550 +	9.0	0.962	114.6	1.102
	RECOVERY %	#/hr	gal/hr	
PROPYLENE	43.9	6.93		
C_3 POLY GASO.	87.5	6.06	1.013	
C_3 POLY TAR	12.5	0.87	0.116	
	#/gal	#/hr	gal/hr	RVP
C_4H_8	5.00	1.69	0.338	68.0
C_4 POLY GASO.	5.98	11.51	1.930	1.5
C_4H_{10}	4.86	3.84	0.790	68.0
C_4-FREE GASO.			11.670	5.8
C_4 POLY TAR	7.53	1.65	0.219	
	gal/hr	gal/MCF	Bbl/Day	
10 # RVP 400 EP GASOLINE	14.728	0.8744	4741	
GAS OIL	1.212	0.0720	390	
FUEL OIL	1.102	0.0654	355	
POLY TAR	0.335	0.0199	108	
TOTAL	17.377	1.0317	5594	
W. S. CHEM.	1.941	0.1152	625	
TOTAL	19.318	1.1469	6219	

Form ML—11

**Included in Reactor Effluent Total

g/NCM = 16.91 × #/MCF *9488 MCFH H_2 + CO, Bbl/Day = 5421.6 × gal/MCF

RUN NO. 59-H
HOURS 158-178
CATALYST Spent CM-8

THE TEXAS COMPANY — MONTEBELLO LABORATORY
YIELD CALCULATIONS

	FRESH FEED			WET GAS			RECYCLE	COMBINED FEED	EFFLUENT	NET CHANGE		YIELD BASIS H_2+CO FED *			
	%	m/hr	#/hr	%	At Wt. Balance m/hr	#/hr	m/hr	m/hr	m/hr	m/hr	#/hr	CONDENSATE #/MCF	#/gal	gal/hr	gal/MCF
CO 28.010	34.303	15.677	439.11	7.540	1.162	32.55	3.003	18.680	4.165	-14.515	-406.56				
H_2 2.016	62.271	28.459	57.37	41.880	6.457	13.02	16.677	45.136	23.134	-22.002	-44.35				
CO_2 44.010	2.643	1.208	53.16	30.035	4.631	203.82	11.961	13.169	16.592	3.423	150.66	8.995			
N_2 28.016	0.150	0.069	1.93	1.125	0.173	4.85	0.448	0.517	0.621						
CH_4 16.042	0.633	0.289	4.64	9.905	1.527	24.50	3.945	4.234	5.472	1.238	19.86	1.186			
C_2H_4 28.052				1.975	0.304	8.53	0.787	0.787	1.091	0.304	8.53	0.509			
C_2H_6 30.068				0.945	0.146	4.39	0.376	0.376	0.522	0.146	4.39	0.262			
C_1+C_2											32.78	1.957	-		
C_3H_6 42.078				2.140	0.330	13.89	0.852	0.852	1.182	0.330	13.89	0.829	4.32	3.215	0.192
C_3H_8 44.094				0.280	0.043	1.90	0.112	0.112	0.155	0.043	1.90	0.113	4.24	0.448	0.027
C_4H_8 56.104				1.955	0.301	16.89	0.779	0.779	1.080	0.301	16.89	1.008	5.00	3.378	0.202
C_4H_{10} 58.120				0.650	0.100	5.81	0.259	0.259	0.359	0.100	5.81	0.347	4.86	1.195	0.071
C_5H_{10} 70.130				1.015	0.156	10.94	0.404	0.404	0.560	0.156	10.94	0.653	5.45	2.007	0.120
C_5H_{12} 72.146				0.285	0.044	3.17	0.113	0.113	0.157	0.044	3.17	0.189	5.25	0.604	0.036
C_4H_{12} 84.156				0.270	0.042	3.53	0.108	0.108	0.150	0.042	3.53	0.211	5.54	0.637	0.038
C_3-C_4											56.13	3.350		11.484	0.686
TOTAL		45.702	556.21		15.416	347.79	39.824	85.526	62.998						
H_2+CO	96.574	44.136	167498 SCFH		7.619		19.680	63.816	27.299	-36.517					
H_2/CO		1.82	Factor 597022		5.56		5.56	2.42	5.56	1.52					

Weight Recovery, %	98.53	Catalyst Age, hrs.	178	Space Velocity, vhv	1761	RECOVERED OIL	0.484**	67.94
Pressure, psig	416	Inlet Velocity, Ft/sec	1.02	Catalyst Vol., CF	9.51	TOTAL OIL		124.07
Temperature, °F	683	Bed Depth, Ft	14.41	Weight, #	1208	WATER SOLUBLE CHEMICALS	0.269**	14.28
Recycle Ratio	0.87	Bed Density, #/CF	127	Effluent Shift Ratio $\frac{(H_2)(CO_2)}{(H_2O)(CO)}$	13.16	TOTAL LIQUID PRODUCTS C_4+		138.35
						NET WATER	7.005**	126.20
						GROSS WATER		140.48
						HYDROCARBON TOTAL—C_1+		171.13

FRESH FEED CONVERSION — %				TOTAL FEED CONVERSION — %			SELECTIVITY
Contraction	CO	H_2	H_2+CO	CO	H_2	$CO+H_2$	C_3+/C_1+
66.27	92.59	77.31	82.74	77.70	48.75	80.90	80.84

YIELDS BASIS BROWNSVILLE DESIGN FEED RATE*				
	CORRECTED HEMPEL, %	gal/hr	TREATING RECOVERY, %	gal/hr
400 EP	78.6	8.229	98.0	8.064
400-550	13.2	1.382	91.4	1.263
550 +	8.2	0.859	114.6	0.984
	RECOVERY %	#/hr	gal/hr	
PROPYLENE	42.0	5.83		
C_3 POLY GASO.	87.5	5.10	0.853	
C_3 POLY TAR	12.5	0.73	0.097	
	#/gal	#/hr	gal/hr	RVP
C_4H_8	5.00	0.22	0.044	68.0
C_4 POLY GASO.	5.98	14.59	2.439	1.5
C_4H_{10}	4.86	5.81	1.195	68.0
C_4 FREE GASO.			12.165	5.8
C_4 POLY TAR	7.53	2.08	0.276	
	gal/hr	gal/MCF	Bbl/Day	
10 # RVP 400 EP GASOLINE	15.843	0.9459	5128	
GAS OIL	1.263	0.0754	409	
FUEL OIL	0.984	0.0587	318	
POLY TAR	0.373	0.0223	121	
TOTAL	18.463	1.1023	5976	
W. S. CHEM.	1.815	0.1084	588	
TOTAL	20.278	1.2107	6564	

Form ML—11

**Included in Reactor Effluent Total

g/NCM = 16.91 × #/MCF *9488 MCFH H_2+CO, Bbl/Day = 5421.6 × gal/MCF

THE TEXAS COMPANY — MONTEBELLO LABORATORY
DATA SUMMARY

RUN NO. 59-H
HOURS 154-174

OPERATING CONDITIONS			
PRESSURES PSIG		RATES S.C.F.H.	
Oxygen	443	Fresh Feed	17344
Natural Gas	439	Recycle	15113
Generator Outlet	423	Combined Feed	32457
Reactor Inlet	416	Wet Gas—Measured	5713
Condenser Inlet		Adjusted	5850
Product Accumulator	372	Loss	137
TEMPERATURES—°F.		Recycle/Fresh Feed	0.87
Oxygen	312	Inlet Velocity—ft./sec.	1.02
Natural Gas	310	Fresh Feed Rate—S.C.F.H. H_2+CO	16750
Generator	-	per Cu. Ft. Dense Bed	1761
Quench Accumulator	199	per Lb. Catalyst	13.87
Reactor Inlet	156	per Sq. Ft.	25379
Condenser Inlet	576		
Product Accumulator	90	Heat Transfer Calculations	
Catalyst No. Height		Steam Rate = 318 #/hr.	
1 See Period A	463	@694 psia & 514°F =	
2	675	1199 Btu/#	
3	689	Water in @73.8°F.= 41.8 Btu/#	
4	665	Net Btu/# steam = 1157 Btu	
5	695	(1157)(318) = 367,926	
6	693	Ave. Bed Temp.= 683°F.	
7	661	dT = 683-514 = 169°F.	
8	650	Tube Area = 26.0 sq. ft.	
9	654	$K = \frac{367,926}{(26.0)(169)} =$	
10	650	83.73 Btu/°F./sq. ft.	
11	633		

PRODUCT TESTS		
	OIL	WATER
°API	50.1	10.8
Neut. No.	29.4	26.5
Sap. No.	46.5	35.3
Hydrox. No.		
Bromine No.	91	
Pour °F.	below -40	
Chemicals, % by K_2CO_3		10.7
HEMPEL, DIST. %		°API
205 °F.		
400	77.6	55.3
400-550	13.2	36.1
550+	9.2	
A. S. T. M. DIST. ON		
Naphtha °F.		
IBP	102	
10%	132	
50%	222	
90%	346	
EP	388	
Rec.	96.0	

CATALYST DATA						
INVENTORY DATA		PARTICLE SIZE				
		Screen Analysis			Sedimentation	
In Reactor at Start of Period		Mesh	Microns	%	Microns	%
Fresh Catalyst Added		On 40	419+	57.1	80+	
Total		100	150	30.9	40—80	
Catalyst Recovered	60	150	105	7.5	20—40	
In Reactor at End of Period	1048#	200	74	3.9	10—20	
Unloaded at end of Period		250	62	0.2	0—20	
REACTOR d-p, Inches H_2O		325	44	0.2		
No. Height		<325		0.2		
0 See Period A	44	CATALYST				
1	63	Bulk Density, Lbs./Cu.Ft.				
2	66	Aerated			133	
3	64	Settled			134	
4	115	Compacted			157	
Total	352	Particle Density, gm./cc.			4.47	
		NH_3 Value, ml./gm.				
CALCULATED FROM dp		N_2 Surface, m^2/gm.				
Density, Lbs./Cu.Ft.	127					
Inventory, Lbs.	1208					
Bed Depth, Ft.	14.41	CHEMICAL ANALYSIS				
Vol., Cu. Ft.	9.51	Fe			68.5	
		C			7.89	
		O				
		H				
		K_2O, W+, % basis Fe				
		X-Ray Analysis—				
		$Fe_{20}C_9$				
		Fe_3O_4				
		Fe				

RUN NO. 59-I
HOURS 178-206
CATALYST 206

THE TEXAS COMPANY — MONTEBELLO LABORATORY
YIELD CALCULATIONS

	FRESH FEED %	FRESH FEED m/hr	FRESH FEED #/hr	WET GAS %	WET GAS At Wt. Balance m/hr	WET GAS At Wt. Balance #/hr	RECYCLE m/hr	COMBINED FEED m/hr	EFFLUENT m/hr	NET CHANGE m/hr	NET CHANGE #/hr
CO 28.010	37.150	16.376	458.70	8.587	1.279	35.82	3.352	19.728	4.631	-15.097	-422.88
H_2 2.016	58.907	25.968	52.35	36.852	5.489	11.06	14.386	40.354	19.875	-20.479	-41.29
CO_2 44.010	2.473	1.090	47.97	29.532	4.397	193.51	11.528	12.618	15.925	3.307	145.54
N_2 28.016	0.077	0.034	0.96	1.680	0.250	7.00	0.656	0.690	0.906		
CH_4 16.042	1.393	0.614	9.85	14.593	2.173	34.85	5.696	6.310	7.869	1.559	25.00
C_2H_4 28.052				2.465	0.367	10.30	0.962	0.962	1.329	0.367	10.30
C_2H_6 30.068				1.113	0.166	4.99	0.434	0.434	0.600	0.166	4.99
C_1+C_2											40.29
C_3H_6 42.078				1.908	0.284	11.95	0.745	0.745	1.029	0.284	11.95
C_3H_8 44.094				0.230	0.034	1.50	0.090	0.090	0.124	0.034	1.50
C_4H_8 56.104				1.147	0.171	9.59	0.448	0.448	0.619	0.171	9.59
C_4H_{10} 58.120				0.625	0.093	5.41	0.244	0.244	0.337	0.093	5.41
C_5H_{10} 70.130				0.695	0.104	7.29	0.271	0.271	0.375	0.104	7.29
C_5H_{12} 72.146				0.178	0.027	1.95	0.069	0.069	0.096	0.027	1.95
C_6H_{12} 84.156				0.395	0.059	4.97	0.154	0.154	0.213	0.059	4.97
C_3-C_6											42.66
TOTAL		44.082	569.83		14.893	340.19	39.035	83.117	62.395		
H_2+CO	96.057	42.344	1606938 SCFH		6.768		17.738	60.082	24.506	-35.576	
H_2/CO		1.59	Factor 622301		4.29		4.29	2.05	4.29	1.36	

Weight Recovery, %	95.99	Catalyst Age, hrs.	206	Space Velocity, vhv	2063	RECOVERED OIL
Pressure, psig	404	Inlet Velocity, Ft/sec	1.03	Catalyst Vol., CF	7.79	TOTAL OIL
Temperature, °F	693	Bed Depth, Ft	11.80	Weight, #	872	WATER SOLUBLE CHEMICALS
Recycle Ratio	0.89	Bed Density, #/CF	112	Effluent Shift Ratio $\frac{(H_2)(CO_2)}{(H_2O)(CO)}$	= 8.93	TOTAL LIQUID PRODUCTS C_3+

FRESH FEED CONVERSION — %				TOTAL FEED CONVERSION — %			SELECTIVITY		EFFLUENT	NET CHANGE	
Contraction	CO	H_2	H_2+CO	CO	H_2	CO+H_2	C_3+ /C_1+	NET WATER	7.651**	137.84	8.578
66.22	92.19	78.86	84.02	76.53	50.75	59.21	76.94	GROSS WATER		151.58	9.433
								HYDROCARBON TOTAL—C_1+		174.75	10.876

	0.557**	78.06	4.858		11.962	0.744
		120.72	7.513		20.719	1.288
	0.259**	13.74	0.855		1.717	0.107
		134.46	8.368		22.436	1.395

YIELD BASIS H_2 + CO FED — CONDENSATE	#/MCF	#/gal	gal/hr	gal/MCF
	0.744	4.32	2.766	0.172
	0.093	4.24	0.354	0.022
	0.597	5.00	1.918	0.119
	0.337	4.86	1.113	0.069
	0.454	5.45	1.338	0.083
	0.121	5.25	0.371	0.023
	0.309	5.54	0.897	0.056
	2.655		8.757	0.544
	9.057			
	0.641			
	0.311			
	2.508			
	1.556			

YIELDS BASIS BROWNSVILLE DESIGN FEED RATE*	CORRECTED HEMPEL, %	gal/hr	TREATING RECOVERY, %	gal/hr
400 EP	73.5	8.792	98.0	8.616
400-550	12.8	1.531	91.4	1.399
550 +	13.7	1.639	114.6	1.878

	RECOVERY %	#/hr	gal/hr	
PROPYLENE	42.0	5.02		
C_3 POLY GASO.	87.5	4.39	0.734	
C_3 POLY TAR	12.5	0.63	0.084	

	#/gal	#/hr	gal/hr	RVP
C_4H_8	5.00	"	"	68.0
C_4 POLY GASO.	5.98	8.39	1.403	1.5
C_4H_{10}	4.86	(5.81) 5.21	(1.113) 1.072	68.0
C_4 FREE GASO.			11.956	5.8
C_4 POLY TAR	7.53	1.20	0.159	

	gal/hr	gal/MCF	Bbl/Day
10 # RVP 400 EP GASOLINE	14.431	0.8980	4869
GAS OIL	1.399	0.0871	472
FUEL OIL	1.878	0.1169	634
POLY TAR	0.243	0.0151	82
TOTAL	17.951	1.1171	6056
W. S. CHEM.	1.717	0.1068	579
TOTAL	19.668	1.2239	6635

Form ML—11

**Included in Reactor Effluent Total

g/NCM = 16.91 × #/MCF *9488 MCFH H_2 + CO, Bbl/Day = 5421.6 × gal/MCF

RUN NO. 59-I
HOURS 178-206

THE TEXAS COMPANY — MONTEBELLO LABORATORY
DATA SUMMARY

OPERATING CONDITIONS			
PRESSURES PSIG		RATES S.C.F.H.	
Oxygen	432	Fresh Feed	16729
Natural Gas	429	Recycle	14814
Generator Outlet	412	Combined Feed	31543
Reactor Inlet	404	Wet Gas—Measured	5272
Condenser Inlet		Adjusted	5652
Product Accumulator	375	Loss	380
TEMPERATURES—°F.		Recycle/Fresh Feed	0.89
Oxygen	303	Inlet Velocity—ft./sec.	1.03
Natural Gas	327	Fresh Feed Rate—S.C.F.H. H_2+CO	16069
Generator		per Cu. Ft. Dense Bed	2063
Quench Accumulator	148	per Lb. Catalyst	18.4
Reactor Inlet	123	per Sq. Ft.	24347
Condenser Inlet	571		
Product Accumulator	93	Heat Transfer Calculations	
Catalyst No. Height		Steam Rate = 346 #/hr @	
1 See Period A	631	728 psia & 489°F =	
2	690	1203 BTU/#	
3	699	Water in @ 71.3 = 39.3 BTU/#	
4	673	Net BTU/# Steam = 1164	
5	706	1164 x 346 = 402,744	
6*	696	Ave. Bed Temp = 693°F	
7	668	dT = 693-489 = 204°F	
8	656	Tube Area = 21.4 sq. ft.	
9	659		
10	651	K = $\frac{402,744}{(21.4)(204)}$ = 92.3 BTU/°F/sq ft	
11	627		

PRODUCT TESTS	OIL	WATER
°API	49.0	10.5
Neut. No.	27.8	22.9
Sap. No.	43.6	30.5
Hydrox. No.		
Bromine No.	89	
Pour °F.	Below -40	
Chemicals, % by K_2CO_3		9.4
HEMPEL, DIST. %	°API	
205 °F.		
400	72.5	54.4
400-550	12.8	36.3
550+	14.7	
A. S. T. M. DIST. ON		
Naphtha °F.		
IBP	108	
10%	140	
50%	216	
90%	348	
EP	390	
Rec.	97.0	

CATALYST DATA — INVENTORY DATA	
Loaded	988
H_2O	138
In Reactor at Start of Period	33
Rec.	
Fresh Catalyst Added	817
Total +0.66	
Catalyst Recovered	102
In Reactor at End of Period	
REACTOR d-p, Inches H_2O	
No. Height	
0 See Period A	39
1	58
2	56
3	55
4	46
Total	254
CALCULATED FROM dp	
Density, Lbs./Cu.Ft.	112
Inventory, Lbs.	872
Bed Depth, Ft.	11.80
Vol., Cu. Ft.	7.79

PARTICLE SIZE — Screen Analysis			Sedimentation	
Mesh	Microns	%	Microns	%
On 40	419+	36.1	80+	
100	150	43.5	40—80	
150	105	8.0	20—40	
200	74	6.2	10—20	
250	62	1.8	0—20	
325	44	3.2		
<325		1.2		

CATALYST	
Bulk Density, Lbs./Cu.Ft.	
Aerated	131
Settled	132
Compacted	168
Particle Density, gm./cc.	4.18
NH_3 Value, ml./gm.	
N_2 Surface, m^2/gm.	
CHEMICAL ANALYSIS	
Fe	67.0
C	9.16
O	
H	
K_2O, W+, % basis Fe	
X-Ray Analysis—	
$Fe_{20}C_9$	
Fe_3O_4	
Fe	

THE TEXAS COMPANY — MONTEBELLO LABORATORY
YIELD CALCULATIONS

RUN NO. 59-J
HOURS 206-230
CATALYST Spent CM&S

	FRESH FEED			WET GAS			RECYCLE	COMBINED FEED	EFFLUENT	NET CHANGE		YIELD BASIS H_2+CO FED — CONDENSATE			
	%	m/hr	#/hr	%	At Wt. Balance m/hr	At Wt. Balance #/hr	m/hr	m/hr	m/hr	m/hr	#/hr	#/MCF	#/gal	gal/hr	gal/MCF
CO 28.010	37.477	16.399	459.33	6.420	0.965	27.03	2.504	18.903	3.469	-15.434	-432.30				
H_2 2.016	58.500	25.598	51.60	37.350	5.616	11.32	14.565	40.163	20.181	-19.982	-40.28				
CO_2 44.010	2.433	1.065	46.87	31.255	4.697	206.72	12.188	13.253	16.885	3.632	159.85	10.030			
N_2 28.016	0.150	0.066	1.85	2.280	0.343	9.61	0.889	0.955	1.232						
CH_4 16.042	1.440	0.630	10.10	13.360	2.008	32.21	5.210	5.840	7.218	1.378	22.11	1.387			
C_2H_4 28.052				2.590	0.389	10.91	1.010	1.010	1.399	0.389	10.91	0.685			
C_2H_6 30.068				0.875	0.132	3.97	0.341	0.341	0.473	0.132	3.97	0.249			
C_1+C_2											36.99	2.321			
C_3H_6 42.078				2.180	0.328	13.80	0.850	0.850	1.178	0.328	13.80	0.866	4.32	3.194	0.200
C_3H_8 44.094				0.200	0.030	1.32	0.078	0.078	0.108	0.030	1.32	0.083	4.24	0.311	0.020
C_4H_8 56.104				1.555	0.234	13.13	0.606	0.606	0.840	0.234	13.13	0.824	5.00	2.626	0.165
C_4H_{10} 58.120				0.630	0.095	5.52	0.246	0.246	0.341	0.095	5.52	0.346	4.86	1.136	0.071
C_5H_{10} 70.130				0.795	0.120	8.42	0.310	0.310	0.430	0.120	8.42	0.528	5.45	1.545	0.097
C_5H_{12} 72.146				0.225	0.034	2.45	0.088	0.088	0.122	0.034	2.45	0.154	5.25	0.467	0.029
C_6H_{12} 84.156				0.285	0.043	3.62	0.111	0.111	0.154	0.043	3.62	0.227	5.54	0.653	0.041
C_3-C_6											48.26	3.028		9.932	0.623
TOTAL		43.758	569.75		15.034	350.03	38.996	82.754	62.046						
H_2+CO	95.977	41.997	1593794	SCFH	6.581		17.069	59.066	23.650	-35.416					
H_2/CO		1.56	Factor 627433		5.82		5.82	2.12	5.82	1.29					

							m/hr	#/hr	#/MCF	#/gal	gal/hr	gal/MCF
Weight Recovery, %	96.97	Catalyst Age, hrs.	230	Space Velocity, vhv	2404	RECOVERED OIL	0.530**	74.33	4.664		11.423	0.717
Pressure, psig	402	Inlet Velocity, Ft/sec	1.03	Catalyst Vol., CF	7.21	TOTAL OIL		122.59	7.692		21.355	1.340
Temperature, °F	700	Bed Depth, Ft	10.93	Weight, #	765	WATER SOLUBLE CHEMICALS	0.301**	15.95	1.001		1.980	0.124
Recycle Ratio	0.89	Bed Density, #/CF	116	Effluent Shift Ratio $\frac{(H_2)(CO_2)}{(H_2O)(CO)}$	= 13.67	TOTAL LIQUID PRODUCTS C_3+		138.54	8.693		23.335	1.464

FRESH FEED CONVERSION — %				TOTAL FEED CONVERSION — %			SELECTIVITY		m/hr	#/hr	#/MCF	#/gal	gal/hr	gal/MCF
Contraction	CO	H_2	H_2+CO	CO	H_2	CO+H_2	C_3 + /C_1 +	NET WATER	7.185**	129.44	8.121		15.539	0.975
								GROSS WATER		145.39	9.122		17.519	1.099
65.64	94.12	78.06	84.33	81.65	49.75	59.96	78.93	HYDROCARBON TOTAL—C_1 +		175.53	11.014			

YIELDS BASIS BROWNSVILLE DESIGN FEED RATE*

	CORRECTED HEMPEL, %	gal/hr	TREATING RECOVERY, %	gal/hr
400 EP	73.0	8.339	98.0	8.172
400-550	14.0	1.599	91.4	1.461
550 +	13.0	1.485	114.6	1.702
	RECOVERY %	#/hr	gal/hr	
PROPYLENE	41.2	5.69		
C_3 POLY GASO.	87.5	4.98	0.833	
C_3 POLY TAR	12.5	0.71	0.094	
	#/gal	#/hr	gal/hr	RVP
C_4H_8	5.00	-	-	68.0
C_4 POLY GASO.	5.98	11.49	1.921	1.5
C_4H_{10}	4.86	(5.52) 5.48	(1.136) 1.127	68.0
C_4-FREE GASO.			11.670	5.8
C_4 POLY TAR	7.53	1.64	0.218	
	gal/hr	gal / MCF	Bbl/Day	
10 # RVP 400 EP GASOLINE	14.718	0.9235	5007	
GAS OIL	1.461	0.0917	497	
FUEL OIL	1.702	0.1068	579	
POLY TAR	0.312	0.0196	106	
TOTAL	18.193	1.1416	6189	
W. S. CHEM.	1.980	0.1242	673	
TOTAL	20.173	1.2658	6862	

Form ML—11

**Included in Reactor Effluent Total

g/NCM = 16.91×#/MCF

*9488 MCFH H_2 + CO, Bbl/Day = 5421.6 × gal/MCF

THE TEXAS COMPANY — MONTEBELLO LABORATORY
DATA SUMMARY

RUN NO. 59-J
HOURS 206-230

OPERATING CONDITIONS

PRESSURES PSIG		RATES S.C.F.H.	
Oxygen	429	Fresh Feed	16606
Natural Gas	427	Recycle	14799
Generator Outlet	410	Combined Feed	31405
Reactor Inlet	402	Wet Gas—Measured	5424
Condenser Inlet		Adjusted	5706
Product Accumulator	374	Loss	282
TEMPERATURES—°F.		Recycle/Fresh Feed	0.89
Oxygen	331	Inlet Velocity—ft./sec.	1.03
Natural Gas	322	Fresh Feed Rate—S.C.F.H.	15938
Generator	--	per Cu. Ft. Dense Bed	2404
Quench Accumulator	148	per Lb. Catalyst	20.73
Reactor Inlet	120	per Sq. Ft.	24148
Condenser Inlet	580		
Product Accumulator	92	Heat Transfer Calculations	
Catalyst No. Height		Steam Rate = 316#/hr	
1 See Period A	621	@ 728 psia & 489°F	
2	701	1203 BTU/#	
3	708	Water in @ 70.6°F = 39°F	
4	680	Net BTU/# steam = 1164	
5	714	1164 x 316 = 367824	
6	698	Ave. Bed Temp = 700°F	
7	676	dT = 700-489=211°F	
8	665	Tube Area = 19.7 sq ft	
9	667		
10	660	$K = \frac{367824}{(19.7)(211)}$ = 88.5 BTU/°F/sq ft	
11	637		

PRODUCT TESTS

	OIL	WATER
° API	49.3	10.5
Neut. No.	28.1	28.2
Sap. No.	45.2	37.7
Hydrox. No.		
Bromine No.	89	
Pour °F.	below -35°	
Chemicals, % by K_2CO_3		11.3
HEMPEL, DIST. %		°API
205 °F.		
400	72.0	53.8
400-550	14.0	35.9
550+	14.0	
A. S. T. M. DIST. ON Naphtha °F.		
IBP	106	
10%	146	
50%	236	
90%	356	
EP	392	
Rec.	97.0	

CATALYST DATA

INVENTORY DATA	
In Reactor at Start of Period	
Fresh Catalyst Added	
Total	
Catalyst Recovered	100
In Reactor at End of Period	
REACTOR d-p, Inches H_2O	
No. Height	
0 See Period A	39
1	56
2	55
3	50
4	24
Total	224
CALCULATED FROM dp	
Density, Lbs./Cu.Ft.	116
Inventory, Lbs.	769
Bed Depth, Ft.	10.04
Vol., Cu. Ft.	6.63

PARTICLE SIZE

Screen Analysis Mesh	Microns	%	Sedimentation Microns	%
On 40	419+	37.5	80+	
100	150	41.5	40—80	
150	105	8.3	20—40	
200	74	5.9	10—20	
250	62	3.2	0—20	
325	44	2.8		
<325		0.8		

CATALYST	
Bulk Density, Lbs./Cu.Ft.	
Aerated	130
Settled	131
Compacted	157
Particle Density, gm./cc.	3.96
NH_3 Value, ml./gm.	
N_2 Surface, m^2/gm.	
CHEMICAL ANALYSIS	
Fe	
C	11.8
O	
H	
K_2O, W+, % basis Fe	
X-Ray Analysis—	
$Fe_{20}C_9$	
Fe_3O_4	
Fe	

RUN NO. 59-K
HOURS 230-254
CATALYST Spent CM&S

THE TEXAS COMPANY — MONTEBELLO LABORATORY
YIELD CALCULATIONS

	FRESH FEED			WET GAS			RECYCLE	COMBINED FEED	EFFLUENT	NET CHANGE		YIELD BASIS H_2+CO FED: CONDENSATE			
	%	m/hr	#/hr	%	At Wt. Balance m/hr	At Wt. Balance #/hr	m/hr	m/hr	m/hr	m/hr	#/hr	#/MCF	#/gal	gal/hr	gal/MCF
CO 28.010	37.627	14.947	418.67	11.430	1.598	44.76	4.856	19.803	6.454	-13.349	-373.91				
H_2 2.016	58.843	28.373	47.12	39.523	5.527	11.14	16.791	40.164	22.318	-17.846	-35.98				
CO_2 44.010	2.240	0.890	39.17	28.393	3.970	174.73	12.063	12.953	16.033	3.080	135.56	9.321			
N_2 28.016	0.243	0.097	2.72	1.307	0.183	5.13	0.555	0.652	0.738						
CH_4 16.042	1.047	0.416	6.67	10.103	1.413	22.67	4.292	4.708	5.705	0.997	16.00	1.100			
C_2H_4 28.052				2.627	0.367	10.30	1.116	1.116	1.483	0.367	10.30	0.708			
C_2H_6 30.068				1.013	0.142	4.27	0.430	0.430	0.572	0.142	4.27	0.294			
C_1+C_2											30.57	2.102			
C_3H_6 42.078				2.173	0.304	12.79	0.923	0.923	1.227	0.304	12.79	0.879	4.32	2.961	0.204
C_3H_8 44.094				0.197	0.028	1.23	0.084	0.084	0.112	0.028	1.23	0.085	4.24	0.290	0.020
C_4H_8 56.104				1.497	0.209	11.73	0.636	0.636	0.845	0.209	11.73	0.807	5.00	2.346	0.161
C_4H_{10} 58.120				0.523	0.073	4.24	0.222	0.222	0.295	0.073	4.24	0.292	4.86	0.872	0.060
C_5H_{10} 70.130				0.770	0.108	7.57	0.327	0.327	0.435	0.108	7.57	0.521	5.45	1.389	0.096
C_5H_{12} 72.146				0.237	0.033	2.38	0.101	0.101	0.134	0.033	2.38	0.164	5.25	0.453	0.031
C_6H_{12} 84.156				0.207	0.029	2.44	0.088	0.088	0.117	0.029	2.44	0.168	5.54	0.440	0.030
C_3-C_6											42.38	2.916		8.751	0.602
TOTAL		39.723	514.31		13.984	315.38	42.485	82.208	63.778						
H_2+CO	96.470	38.320	145428525 SCFH		7.125		21.647	59.987	28.772	-31.195					
H_2/CO		1.56	Factor 6876230		3.46		3.46	2.03	3.46	1.34					
RECOVERED OIL										0.473**	66.34	4.562		10.410	0.716
TOTAL OIL											108.72	7.478		19.161	1.318
WATER SOLUBLE CHEMICALS										0.269**	14.27	0.981		1.809	0.124
TOTAL LIQUID PRODUCTS C_3+											122.99	8.459		20.970	1.442
NET WATER										6.567**	118.32	8.136		14.204	0.977
GROSS WATER											132.59	9.117		16.013	1.101
HYDROCARBON TOTAL—C_1+											153.56	10.559			

Weight Recovery, %	95.65	Catalyst Age, hrs.		Space Velocity, vhv	1791
Pressure, psig	413	Inlet Velocity, Ft/sec	0.98	Catalyst Vol., CF	8.12
Temperature, °F	672	Bed Depth, Ft	12.3	Weight, #	982
Recycle Ratio	1.07	Bed Density, #/CF	121	Effluent Shift Ratio $\frac{(H_2)(CO_2)}{(H_2O)(CO)}$ =	8.44

FRESH FEED CONVERSION — %				TOTAL FEED CONVERSION — %			SELECTIVITY
Contraction	CO	H_2	H_2+CO	CO	H_2	CO+H_2	C_3+/C_1+
64.80	89.31	76.35	81.41	67.41	44.43	52.02	80.09

YIELDS BASIS BROWNSVILLE DESIGN FEED RATE*

	CORRECTED HEMPEL, %	gal/hr	TREATING RECOVERY, %	gal/hr
400 EP	73.5	7.651	98.0	7.498
400-550	14.8	1.541	91.4	1.408
550 +	11.7	1.218	114.6	1.396

	RECOVERY %	#/hr	gal/hr
PROPYLENE	40.1	5.13	
C_3 POLY GASO.	87.5	4.49	0.751
C_3 POLY TAR	12.5	0.64	0.085

	#/gal	#/hr	gal/hr	RVP
C_4H_8	5.00	0.64	0.128	68.0
C_4 POLY GASO.	5.98	9.70	1.623	1.5
C_4H_{10}	4.86	4.24	0.872	68.0
C_4-FREE GASO.			10.531	5.8
C_4 POLY TAR	7.53	1.39	0.185	

	gal/hr	gal/MCF	Bbl/Day
10 # RVP 400 EP GASOLINE	13.154	0.9045	4904
GAS OIL	1.408	0.0968	525
FUEL OIL	1.396	0.0960	520
POLY TAR	0.270	0.0186	101
TOTAL	16.228	1.1159	6050
W. S. CHEM.	1.809	0.1244	674
TOTAL	18.037	1.2403	6724

Form ML—11

**Included in Reactor Effluent Total

g/NCM = 16.91 × #/MCF

*9488 MCFH H_2 + CO, Bbl/Day = 5421.6 × gal/MCF

RUN NO. 59-K
HOURS 230-254

THE TEXAS COMPANY — MONTEBELLO LABORATORY
DATA SUMMARY

OPERATING CONDITIONS				PRODUCT TESTS		
PRESSURES PSIG		RATES S.C.F.H.			OIL	WATER
Oxygen	431	Fresh Feed	15075	° API	51.8	10.7
Natural Gas	430	Recycle	16123	Neut. No.	30.9	28.7
Generator Outlet		Combined Feed	31198	Sap. No.	49.6	38.6
Reactor Inlet	413	Wet Gas—Measured	4931	Hydrox. No.		
Condenser Inlet		Adjusted	5307	Bromine No.	91	
Product Accumulator	377	Loss	376	Pour °F.	below -40	
				Chemicals, % by K_2CO_3		11.3
TEMPERATURES—°F.		Recycle/Fresh Feed	1.07			
Oxygen	342	Inlet Velocity—ft./sec.	0.98			
Natural Gas	334	Fresh Feed Rate—S.C.F.H.	14543	HEMPEL, DIST. %		°API
Generator	--	per Cu.Ft. Dense Bed	1791	205 °F.		
Quench Accumulator	152	per Lb. Catalyst	14.81	400	72.5	55.2
Reactor Inlet	143	per Sq. Ft.	22035	400-550	14.8	37.4
Condenser Inlet	56.5	Heat Transfer Calculations		550+	12.7	
Product Accumulator	89	Steam Rate=276#/hr				
Catalyst No. Height		@721 psia & 495°F=		A. S. T. M. DIST. ON		
1 See Period A	611	1202 BTU/#		Naphtha °F.		
2	669	Water in @ 71.4°F=39°F		IBP	110	
3	678	Net BTU/# Steam=1163		10%	140	
4	653	1163x276=320988		50%	226	
5	686	Ave. Bed Temp=672°F		90%	346	
6	673	dT=672-495=177°F		EP	388	
7	652	Tube Area=22.2 sq ft		Rec.	97.0	
8	642					
9	643	$K = \frac{320988}{(22.2)(177)} = 81.7$ BTU/°F/sq ft				
10	637					
11	614					

CATALYST DATA						
INVENTORY DATA		PARTICLE SIZE				
In Reactor at Start of Period		Screen Analysis			Sedimentation	
Fresh Catalyst Added	219	Mesh	Microns	%	Microns	%
Total		On 40	419+	34.6	80+	
Catalyst Recovered	98	100	150	43.8	40—80	
In Reactor at End of Period		150	105	8.9	20—40	
		200	74	6.9	10—20	
REACTOR d-p, Inches H_2O		250	62	2.8	0—20	
No. Height		325	44	1.4		
0 See Period A	42	<325		1.6		
1	63	CATALYST				
2	61	Bulk Density, Lbs./Cu.Ft.				
3	60	Aerated				135
4	60	Settled				136
Total	286	Compacted				160
		Particle Density, gm./cc.				4.10
CALCULATED FROM dp		NH_3 Value, ml./gm.				
Density, Lbs./Cu.Ft.	121	N_2 Surface, m^2/gm.				
Inventory, Lbs.	982					
Bed Depth, Ft.	12.30	CHEMICAL ANALYSIS				
Vol., Cu. Ft.	8.12	Fe				66.5
		C				9.65
		O				
		H				
		K_2O, W+, % basis Fe				
		X-Ray Analysis—				
		$Fe_{20}C_9$				
		Fe_3O_4				
		Fe				1.44

RUN NO. 59-L
HOURS 254-267
CATALYST

THE TEXAS COMPANY — MONTEBELLO LABORATORY
YIELD CALCULATIONS

FRESH FEED				WET GAS			RECYCLE	COMBINED FEED	EFFLUENT	NET CHANGE		YIELD BASIS H_2+CO FED								
					At Wt. Balance							CONDENSATE				YIELDS BASIS BROWNSVILLE DESIGN FEED RATE*				
	%	m/hr	#/hr	%	m/hr	#/hr	m/hr	m/hr	m/hr	m/hr	#/hr	#/MCF	#/gal	gal/hr	gal/MCF		CORRECTED HEMPEL, %	gal/hr	TREATING RECOVERY, %	gal/hr
CO 28.010	36.437	14.514	406.54	9.360	1.110	31.08	3.945	18.459	5.055	-13.404	-375.46									
H_2 2.016	60.180	23.972	48.33	34.040	4.036	8.13	14.348	38.320	18.384	-19.936	-40.20					400 EP	71.9	7.889	98.0	7.731
CO_2 44.010	2.463	0.981	43.17	32.826	3.891	171.23	13.836	14.817	17.727	2.910	128.06	8.768				400-550	12.8	1.404	91.4	1.283
N_2 28.016	0.107	0.043	1.20	1.457	0.173	4.85	0.614	0.657	0.787							550 +	15.3	1.679	114.6	1.924
CH_4 16.042	0.813	0.324	5.20	11.660	1.382	22.17	4.914	5.238	6.296	1.058	16.97	1.162								
C_2H_6 28.052				2.557	0.303	8.50	1.078	1.078	1.381	0.303	8.50	0.582					RECOVERY %	#/hr	gal/hr	
C_2H_6 30.068				1.427	0.169	5.08	0.601	0.601	0.770	0.169	5.08	0.348				PROPYLENE	48.0	6.24		
C_1+C_2											30.55	2.092				C_3 POLY GASO.	87.5	5.46	0.913	
C_3H_6 42.078				2.610	0.309	13.00	1.100	1.100	1.409	0.309	13.00	0.890	4.32	3.009	0.206	C_3 POLY TAR	12.5	0.78	0.104	
C_3H_8 44.094				0.313	0.037	1.63	0.132	0.132	0.169	0.037	1.63	0.112	4.24	0.384	0.026					
C_4H_8 56.104				1.753	0.208	11.67	0.739	0.739	0.947	0.208	11.67	0.799	5.00	2.334	0.160		#/gal	#/hr	gal/hr	RVP
C_4H_{10} 58.120				0.733	0.087	5.05	0.309	0.309	0.396	0.087	5.05	0.346	4.86	1.039	0.071	C_4H_8	5.00	-	-	68.0
C_5H_{10} 70.130				0.340	0.100	7.01	0.354	0.354	0.454	0.100	7.01	0.480	5.45	1.286	0.088	C_4 POLY GASO.	5.98	10.21	1.708	1.5
C_5H_{12} 72.146				0.207	0.025	1.80	0.087	0.087	0.112	0.025	1.80	0.123	5.25	0.343	0.023	C_4H_{10}	4.86	(5.05) 4.97	(1.039) 1.023	68.0
C_6H_{12} 84.156				0.217	0.026	2.19	0.091	0.091	0.117	0.026	2.19	0.150	5.54	0.395	0.027	C_4-FREE GASO.			10.668	5.8
C_5-C_6											42.35	2.900		8.790	0.601	C_4 POLY TAR	7.53	1.46	0.194	
TOTAL		39.834	504.44		11.856	293.39	42.148	81.982	61.717											
H_2+CO	96.617	38.486	1460559 SCFH		5.146		18.293	56.779	23.439	-33.340							gal/hr	gal/MCF	Bbl/Day	
H_2/CO		1.65	Factor 684669		3.64		3.64	2.08	3.64	1.49						10 # RVP 400 EP GASOLINE	13.399	0.9174	4974	
Weight Recovery, %		97.98	Catalyst Age, hrs.			Space Velocity, vhv		1586	RECOVERED OIL	0.502**	70.47	4.825		10.972	0.751	GAS OIL	1.283	0.0878	476	
Pressure, psig		410	Inlet Velocity, Ft/sec		0.97	Catalyst, Vol., CF		9.21	TOTAL OIL		112.82	7.725		19.762	1.352	FUEL OIL	1.924	0.1317	714	
Temperature, °F		657	Bed Depth, Ft		13.95	Weight, #		1225	WATER SOLUBLE CHEMICALS	0.304**	16.15	1.106		2.037	0.139	POLY TAR	0.298	0.0204	111	
Recycle Ratio		1.06	Bed Density, #/CF		133	Effluent $(H_2)(CO_2)$ / Shift Ratio $(H_2O)(CO)$		= 9.33	TOTAL LIQUID PRODUCTS C_3+		128.97	8.831		21.799	1.491	TOTAL	16.904	1.1573	6275	
FRESH FEED CONVERSION — %				TOTAL FEED CONVERSION — %			SELECTIVITY		NET WATER	6.907**	124.43	8.519		14.937	1.023	W. S. CHEM.	2.037	0.1395	756	
Contraction	CO	H_2	H_2+CO	CO	H_2	CO+H_2	C_3+ / C_1+		GROSS WATER		140.58	9.625		16.974	1.162	TOTAL	18.941	1.2968	7031	
70.24	92.35	83.16	86.63	72.61	52.03	58.72	80.85		HYDROCARBON TOTAL—C_1+		159.52	10.923								

Form ML—11

**Included in Reactor Effluent Total

g/NCM = 16.91 × #/MCF *9488 MCFH H_2 + CO, Bbl/Day = 5421.6 × gal/MCF

THE TEXAS COMPANY — MONTEBELLO LABORATORY
DATA SUMMARY

RUN NO. 59-L
HOURS 254-267

OPERATING CONDITIONS				PRODUCT TESTS			CATALYST DATA					
PRESSURES PSIG		RATES S.C.F.H.			OIL	WATER	INVENTORY DATA		PARTICLE SIZE			
Oxygen	435	Fresh Feed	15117				In Reactor at Start of Period		Screen Analysis			Sedimentation
Natural Gas	435	Recycle	15995	°API	10.8	51.9	Fresh Catalyst Added	307	Mesh	Microns	%	Microns %
Generator Outlet	417	Combined Feed	31112	Neut. No.	29.2	25.8	Total		On 40	419+	36.1	80+
Reactor Inlet	410	Wet Gas—Measured	4343	Sap. No.	47.8	35.0	Catalyst Recovered	52	100	150	41.7	40—80
Condenser Inlet		Adjusted	4499	Hydrox. No.			In Reactor at End of Period		150	105	8.3	20—40
Product Accumulator	375	Loss	156	Bromine No.	89				200	74	6.5	10—20
				Pour °F.	below -40				250	62	2.0	0—20
				Chemicals, % by K_2CO_3		12.0	REACTOR d-p, Inches H_2O		325	44	3.6	
							No. Height		<325		1.8	
TEMPERATURES—°F.		Recycle/Fresh Feed	1.06				0 See Period A	46				
Oxygen	300	Inlet Velocity—ft./sec.	0.97				1	66	CATALYST			
Natural Gas	334	Fresh Feed Rate—S.C.F.H.	14606	HEMPEL, DIST. %			2	68	Bulk Density, Lbs./Cu.Ft.			
Generator		per Cu. Ft. Dense Bed	1586	205 °F.		°API	3	67	Aerated			143
Quench Accumulator	138	per Lb. Catalyst	11.92	400	70.9	54.6	4	156	Settled			145
Reactor Inlet	208	per Sq. Ft.	22130	400-550	12.8	36.8	Total	357	Compacted			169
Condenser Inlet	549			550+	16.3				Particle Density, gm./cc.			4.20
Product Accumulator	87	Heat Transfer Calculations					CALCULATED FROM dp		NH_3 Value, ml./gm.			
Catalyst No. Height		Steam Rate = 359#/hr		A. S. T. M. DIST. ON			Density, Lbs./Cu.Ft.	133	N_2 Surface, m^2/gm.			
1 See Period A	617	@ 707 psia & 505°F =		Naphtha °F.			Inventory, Lbs.	1225				
2	654	1201 BTU/#		IBP	104		Bed Depth, Ft.	13.95	CHEMICAL ANALYSIS			
3	660	Water in @ 59.1=27.1		10%	140		Vol., Cu. Ft.	9.21	Fe			
4	642	Net BTU/# steam=1174		50%	224				C			9.85
5	666	1174x359=421466		90%	348				O			
6	667	Ave. Bed Temp.=657°F		EP	392				H			
7	653	dT=657-505=152°F		Rec.	97.5				K_2O, W+, % basis Fe			
8	633	Tube Area=25.4 sq ft							X-Ray Analysis—			
9	629								$Fe_{2n}C_9$			
10	626	$K = \frac{421466}{(25.4)(152)} = 110.7$ BTU/°F/sq ft							Fe_3O_4			
11	599								Fe			

RUN NO. 59-M
HOURS 267-291
CATALYST

THE TEXAS COMPANY — MONTEBELLO LABORATORY
YIELD CALCULATIONS

	FRESH FEED			WET GAS			RECYCLE	COMBINED FEED	EFFLUENT	NET CHANGE		YIELD BASIS H_2+CO FED			
	%	m/hr	#/hr	%	At Wt. Balance m/hr	At Wt. Balance #/hr	m/hr	m/hr	m/hr	m/hr	#/hr	CONDENSATE #/MCF	#/gal	gal/hr	gal/MCF
CO 28.010	37.333	14.247	399.07	7.840	0.872	24.42	3.226	17.473	4.098	-13.375	-374.65				
H_2 2.016	59.107	22.556	45.47	31.484	3.503	7.06	12.957	35.513	16.460	-19.053	-38.41				
CO_2 44.010	2.627	1.002	44.10	34.267	3.812	167.78	14.101	15.103	17.913	2.810	123.68	8.856			
N_2 28.016	0.063	0.024	0.67	1.863	0.207	5.80	0.767	0.791	0.974						
CH_4 16.042	0.870	0.332	5.33	11.953	1.330	21.34	4.919	5.251	6.249	0.998	16.01	1.146			
C_2H_4 28.052				2.850	0.317	8.89	1.173	1.173	1.490	0.317	8.89	0.637			
C_2H_6 30.068				1.610	0.179	5.38	0.663	0.663	0.842	0.179	5.38	0.385			
C_1+C_2											30.28	2.168			
C_3H_6 42.078				3.353	0.373	15.70	1.380	1.380	1.753	0.373	15.70	1.124	4.32	3.634	0.260
C_3H_8 44.094				0.400	0.045	1.98	0.165	0.165	0.210	0.045	1.98	0.142	4.24	0.467	0.033
C_4H_8 56.104				2.257	0.251	14.08	0.929	0.929	1.180	0.251	14.08	1.008	5.00	2.816	0.202
C_4H_{10} 58.120				0.687	0.076	4.42	0.283	0.283	0.359	0.076	4.42	0.316	4.86	0.909	0.065
C_5H_{10} 70.130				1.013	0.113	7.92	0.417	0.417	0.530	0.113	7.92	0.567	5.45	1.453	0.104
C_6H_{12} 72.146				0.210	0.023	1.66	0.086	0.086	0.109	0.023	1.66	0.119	5.25	0.316	0.023
C_7H_{12} 84.156				0.213	0.024	2.02	0.088	0.088	0.112	0.024	2.02	0.145	5.54	0.365	0.026
C_3-C_6											47.78	3.421		9.960	0.713
TOTAL		38.166	494.64		11.125	288.45	41.154	79.320	60.042						
H_2+CO	96.440	36.803	1396644 SCFH	4.375			16.183	52.986	20.558	-32.428					
H_2/CO		1.58	Factor 716002	4.02			4.02	2.03	4.02	1.42					

Weight Recovery, %	97.95	Catalyst Age, hrs.		Space Velocity, vhv	1073	RECOVERED OIL	0.454**
Pressure, psig	417	Inlet Velocity, Ft/sec	0.92	Catalyst Vol., CF	13.01	TOTAL OIL	
Temperature, °F	650	Bed Depth, Ft	19.71	Weight, #	1795	WATER SOLUBLE CHEMICALS	0.309**
Recycle Ratio	1.08	Bed Density, #/CF	138	Effluent $\frac{(H_2)(CO_2)}{(H_2O)(CO)}$ Shift Ratio	=10.28	TOTAL LIQUID PRODUCTS C_3+	

FRESH FEED CONVERSION — %				TOTAL FEED CONVERSION — %			SELECTIVITY
Contraction	CO	H_2	H_2+CO	CO	H_2	$CO+H_2$	C_3+/C_1+
70.85	93.88	84.47	88.11	76.55	53.65	61.20	80.85

NET WATER	7.000**	126.12	9.030		15.140	1.084
GROSS WATER		142.49	10.202		17.205	1.232
HYDROCARBON TOTAL—C_1+		158.13	11.322			

YIELDS BASIS BROWNSVILLE DESIGN FEED RATE*	CORRECTED HEMPEL, %	gal/hr	TREATING RECOVERY, %	gal/hr
400 EP	72.0	7.182	98.0	7.038
400-550	14.4	1.436	91.4	1.313
550 +	13.6	1.357	114.6	1.555

	RECOVERY %	#/hr	gal/hr
PROPYLENE	49.2	7.72	
C_3 POLY GASO.	87.5	6.75	1.129
C_3 POLY TAR	12.5	0.97	0.129

	#/gal	#/hr	gal/hr	RVP
C_4H_8	5.00	0.63	0.126	68.0
C_4 POLY GASO.	5.98	11.77	1.968	1.5
C_4H_{10}	4.86	4.42	0.909	68.0
C_4-FREE GASO.			10.301	5.8
C_4 POLY TAR	7.53	1.68	0.223	

	gal/hr	gal/MCF	Bbl/Day
10 # RVP 400 EP GASOLINE	13.304	0.9526	5165
GAS OIL	1.313	0.0940	510
FUEL OIL	1.555	0.1113	603
POLY TAR	0.352	0.0252	137
TOTAL	16.524	1.1831	6415
W. S. CHEM.	2.065	0.1479	802
TOTAL	18.589	1.3310	7217

Form ML—11

**Included in Reactor Effluent Total

g/NCM = 16.91 × #/MCF *9488 MCFH H_2 + CO, Bbl/Day = 5421.6 × gal/MCF

RUN NO. 59-M
HOURS 267-291

THE TEXAS COMPANY — MONTEBELLO LABORATORY
DATA SUMMARY

OPERATING CONDITIONS			
PRESSURES PSIG		RATES S.C.F.H.	
Oxygen	440	Fresh Feed	14482
Natural Gas	440	Recycle	15618
Generator Outlet	423	Combined Feed	30100
Reactor Inlet	417	Wet Gas—Measured	4073
Condenser Inlet		Adjusted	4222
Product Accumulator	373	Loss	149
TEMPERATURES—°F.		Recycle/Fresh Feed	1.08
Oxygen	303	Inlet Velocity—ft./sec.	0.92
Natural Gas	331	Fresh Feed Rate—S.C.F.H.	13966
Generator		per Cu. Ft. Dense Bed	1073
Quench Accumulator	157	per Lb. Catalyst	7.78
Reactor Inlet	296	per Sq. Ft.	21161
Condenser Inlet	544	Heat Transfer Calculations	
Product Accumulator	90	Steam Rate=389#/hr	
Catalyst No. Height		@ 705 psia & 506°F=	
1 See Period A	629	1201 BTU/#	
2	652	Water in @ 61.3=29.3	
3	659	Net BTU/# steam=1172	
4	621	1172x389=455908	
5	664	Ave. Bed Temp=650	
6	663	dT=650-506=144°F	
7	652	Tube Area=35.7 sq ft	
8	642		
9	633	$K=\frac{455908}{(35.7)(144)}=88.7$ BTU/°F/sqft	
10	627		
11	604		

PRODUCT TESTS			
	OIL	WATER	
°API	52.5	10.8	
Neut. No.	30.2	26.8	
Sap. No.	49.1	35.8	
Hydrox. No.			
Bromine No.	89		
Pour °F.	below -40		
Chemicals, % by K_2CO_3		12.0	
HEMPEL. DIST. %		°API	
205 °F.			
400	71.0	54.5	
400-550	14.4	37.1	
550+	14.6		
A. S. T. M. DIST. ON			
Naphtha °F.			
IBP	108		
10%	144		
50%	228		
90%	350		
EP	390		
Rec.	97.0		

CATALYST DATA								
INVENTORY DATA		PARTICLE SIZE						
		Screen Analysis			Sedimentation	
In Reactor at Start of Period		Mesh	Microns	%	Microns	%
Fresh Catalyst Added	288	On 40	419+	45.8	80+	
Total		100	150	39.2	40—80	
Catalyst Recovered	64.3	150	105	7.3	20—40	
In Reactor at End of Period		200	74	4.9	10—20	
		250	62	1.0	0—20	
REACTOR d-p, Inches H_2O		325	44	1.4		
No. Height		<325		0.4		
0 See Period A	48					
1	68	CATALYST				
2	72	Bulk Density, Lbs./Cu.Ft.				
3	70	Aerated			145	
4	265	Settled			146	
Total	523	Compacted			167	
		Particle Density, gm./cc.			4.55	
CALCULATED FROM dp		NH_3 Value, ml./gm.				
Density, Lbs./Cu.Ft.	138	N_2 Surface, m^2/gm.				
Inventory, Lbs.	1795					
Bed Depth, Ft.	19.71	CHEMICAL ANALYSIS				
Vol., Cu. Ft.	13.01	Fe				
		C			7.18	
		O				
		H				
		K_2O, W+. % basis Fe				
		X-Ray Analysis—				
		$Fe_{20}C_9$				
		Fe_3O_4				
		Fe				

RUN NO. 59-N
HOURS 291-315
CATALYST Spent CM&S

THE TEXAS COMPANY — MONTEBELLO LABORATORY
YIELD CALCULATIONS

	FRESH FEED			WET GAS	At Wt. Balance		RECYCLE	COMBINED FEED	EFFLUENT	NET CHANGE		YIELD BASIS H_2+CO FED			
												CONDENSATE			
	%	m/hr	#/hr	%	m/hr	#/hr	m/hr	m/hr	m/hr	m/hr	#/hr	#/MCF	#/gal	gal/hr	gal/MCF
CO 28.010	38.420	14.040	393.25	7.670	0.844	23.64	3.160	17.200	4.004	-13.196	-369.61				
H_2 2.016	57.880	21.150	42.63	31.302	3.444	6.95	12.898	34.048	16.342	-17.706	-35.68				
CO_2 44.010	2.676	0.978	43.04	36.600	4.029	177.32	15.080	16.058	19.109	3.051	134.28	10.055			
N_2 28.016	0.177	0.065	1.82	1.617	0.178	4.99	0.666	0.731	0.844						
CH_4 16.042	0.847	0.310	4.97	11.413	1.256	20.15	4.703	5.013	5.959	0.946	15.18	1.137			
C_2H_4 28.052				2.747	0.302	8.47	1.132	1.132	1.434	0.302	8.47	0.634			
C_2H_6 30.068				1.623	0.179	5.38	0.669	0.669	0.848	0.179	5.38	0.403			
C_1+C_2											29.03	2.174			
C_3H_6 42.078				2.767	0.305	12.83	1.140	1.140	1.445	0.305	12.83	0.961	4.32	2.970	0.222
C_3H_8 44.094				0.317	0.035	1.54	0.131	0.131	0.166	0.035	1.54	0.115	4.24	0.363	0.027
C_4H_8 56.104				1.867	0.205	11.50	0.769	0.769	0.974	0.205	11.50	0.861	5.00	2.300	0.172
C_4H_{10} 58.120				0.640	0.070	4.07	0.264	0.264	0.334	0.070	4.07	0.305	4.86	0.837	0.063
C_5H_{10} 70.130				0.973	0.107	7.50	0.401	0.401	0.508	0.107	7.50	0.562	5.45	1.376	0.103
C_5H_{12} 72.146				0.197	0.022	1.59	0.081	0.081	0.103	0.022	1.59	0.119	5.25	0.303	0.023
C_6H_{12} 84.156				0.267	0.029	2.44	0.110	0.110	0.139	0.029	2.44	0.183	5.54	0.440	0.033
C_3-C_6											41.47	3.106		8.589	0.643
TOTAL		36.543	485.71		11.005	288.37	41.204	77.747	59.849						
H_2+CO	96.300	35.190	13354884 SCFH		4.288		16.058	51.248	20.346	-30.902					
H_2/CO		1.51	Factor 748789		4.08		4.08	1.98	4.08	1.34					
									RECOVERED OIL	0.400**	56.14	4.204		8.839	0.662
									TOTAL OIL		97.61	7.310		17.428	1.305
									WATER SOLUBLE CHEMICALS	0.308**	16.32	1.222		2.044	0.153
									TOTAL LIQUID PRODUCTS C_3+		113.93	8.532		19.472	1.458
									NET WATER	6.932**	124.88	9.351		14.991	1.123
									GROSS WATER		141.20	10.573		17.035	1.276
									HYDROCARBON TOTAL—C_1+		142.96	10.706			

Weight Recovery, %	95.71	Catalyst Age, hrs.		Space Velocity, vhv	1102
Pressure, psig	420	Inlet Velocity, Ft/sec	0.90	Catalyst Vol., CF	12.12
Temperature, °F	653	Bed Depth, Ft	18.36	Weight, #	1709
Recycle Ratio	1.13	Bed Density, #/C.F	141	Effluent $(H_2)(CO_2)$ / Shift Ratio $(H_2O)(CO)$	11.25

FRESH FEED CONVERSION — %				TOTAL FEED CONVERSION — %			SELECTIVITY
Contraction	CO	H_2	H_2+CO	CO	H_2	$CO+H_2$	C_3+/C_1+
69.88	93.99	83.72	87.81	76.72	52.00	60.30	79.69

YIELDS BASIS BROWNSVILLE DESIGN FEED RATE*	CORRECTED HEMPEL, %	gal/hr	TREATING RECOVERY, %	gal/hr
400 EP	74.7	6.603	98.0	6.471
400-550	11.6	1.025	91.4	0.937
550 +	13.7	1.211	114.6	1.388

	RECOVERY %	#/hr	gal/hr
PROPYLENE	47.5	6.09	
C_3 POLY GASO.	87.5	5.33	0.891
C_3 POLY TAR	12.5	0.76	0.101

	#/gal	#/hr	gal/hr	RVP
C_4H_8	5.00	0.44	0.088	68.0
C_4 POLY GASO.	5.98	9.68	1.618	1.5
C_4H_{10}	4.86	4.07	0.837	68.0
C_4-FREE GASO.			9.481	5.8
C_4 POLY TAR	7.53	1.38	0.183	

	gal/hr	gal/MCF	Bbl/Day
10 # RVP 400 EP GASOLINE	12.024	0.9003	4881
GAS OIL	0.937	0.0702	381
FUEL OIL	1.388	0.1039	563
POLY TAR	0.284	0.0213	115
TOTAL	14.633	1.0957	5940
W. S. CHEM.	2.044	0.1531	830
TOTAL	16.677	1.2488	6770

Form ML—11

**Included in Reactor Effluent Total

g/NCM = 16.91 × #/MCF *9488 MCFH H_2 + CO, Bbl/Day = 5421.6 × gal/MCF

RUN NO. 59-N
HOURS 291-315

THE TEXAS COMPANY — MONTEBELLO LABORATORY
DATA SUMMARY

OPERATING CONDITIONS				PRODUCT TESTS			CATALYST DATA				
PRESSURES PSIG		RATES S.C.F.H.			OIL	WATER	INVENTORY DATA		PARTICLE SIZE		
Oxygen	442	Fresh Feed	13868	°API	53.5	10.7	In Reactor at Start of Period		Screen Analysis		Sedimentation
Natural Gas	441	Recycle	15637	Neut. No.	31.1	26.0	Fresh Catalyst Added		Mesh / Microns / %		Microns / %
Generator Outlet	425	Combined Feed	29505	Sap. No.	51.2	34.4	Total		On 40	419+	40.6	80+	
Reactor Inlet	420	Wet Gas—Measured	3875	Hydrox. No.			Catalyst Recovered	47	100	150	39.8	40—80	
Condenser Inlet		Adjusted	4177	Bromine No.	91		In Reactor at End of Period		150	105	8.0	20—40	
Product Accumulator	375	Loss	302	Pour °F.	below -40				200	74	6.0	10—20	
				Chemicals, % by K_2CO_3		12.0	REACTOR d-p, Inches H_2O		250	62	3.2	0—20	
							No. Height		325	44	2.0		
TEMPERATURES—°F.		Recycle/Fresh Feed	1.13				0 See period A	49	<325		0.4		
Oxygen	345	Inlet Velocity—ft./sec.	0.90				1	70	CATALYST				
Natural Gas	307	Fresh Feed Rate—S.C.F.H. H_2*CO	13355	HEMPEL. DIST. %		°API	2	73	Bulk Density, Lbs./Cu.Ft.				
Generator	--	per Cu.Ft. Dense Bed	1102	205 °F.			3	71	Aerated			145	
Quench Accumulator	156	per Lb. Catalyst	7.81	400	73.7	54.6	4	235	Settled			146	
Reactor Inlet	316	per Sq. Ft.	20235	400-550	11.6	36.2	Total	498	Compacted			169	
Condenser Inlet	545	Heat Transfer Calculations		550+	14.7				Particle Density, gm./cc.			4.42	
Product Accumulator	88	Steam Rate=382#/hr					CALCULATED FROM dp		NH_3 Value, ml./gm.				
Catalyst No. Height		@ 705 psis & 506°F		A. S. T. M. DIST. ON			Density, Lbs./Cu.Ft.	141	N_2 Surface, m^2/gm.				
1 See Period A	631	1201 BTU/#		Naphtha °F.			Inventory, Lbs.	1702					
2	650	Water in @ 64.1=32°F		IBP	114		Bed Depth, Ft.	18.36	CHEMICAL ANALYSIS				
3	656	Net BTU/# steam=1169		10%	142		Vol., Cu. Ft.	12.12	Fe			69.7	
4	642	1169x382=446558		50%	224				C			7.61	
5	661	Ave. Bed Temp=653°F		90%	356				O			.16	
6	660	dT=653-506=147°F		EP	386				H				
7	650	Tube Area=33.4 sq ft		Rec.	96.5				K_2O, W+, % basis Fe			•	
8	637	$K=\frac{446558}{(33.4)(147)}=90.95$ BTU/°F/sq ft							X-Ray Analysis—				
9	628								$Fe_{20}C_9$				
10	626								Fe_3O_4				
11	603								Fe				

RUN NO. 59-0
HOURS 315-339
CATALYST Spent CM&S

THE TEXAS COMPANY — MONTEBELLO LABORATORY
YIELD CALCULATIONS

	FRESH FEED %	FRESH FEED m/hr	FRESH FEED #/hr	WET GAS %	WET GAS At Wt. Balance m/hr	WET GAS At Wt. Balance #/hr	RECYCLE m/hr	COMBINED FEED m/hr	EFFLUENT m/hr	NET CHANGE m/hr	NET CHANGE #/hr	CONDENSATE #/MCF	CONDENSATE #/gal	CONDENSATE gal/hr	CONDENSATE gal/MCF
CO 28.010	38.015	13.313	372.89	8.523	0.966	27.06	3.537	16.850	4.503	-12.347	-345.83				
H_2 2.016	58.030	20.323	40.97	32.010	3.630	7.32	13.284	33.607	16.914	-16.693	-33.65				
CO_2 44.010	2.773	0.971	42.73	35.900	4.071	179.13	14.897	15.868	18.968	3.100	136.40	10.685			
N_2 28.016	0.237	0.083	2.33	1.317	0.149	4.17	0.547	0.630	0.696						
CH_4 16.042	0.947	0.332	5.33	11.427	1.296	20.79	4.742	5.074	6.038	0.964	15.46	1.211			
C_2H_4 28.052				2.583	0.293	8.22	1.072	1.072	1.365	0.293	8.22	0.644			
C_2H_6 30.068				1.583	0.179	5.38	0.657	0.657	0.836	0.179	5.38	0.421			
C_1+C_2											29.06	2.276			
C_3H_6 42.078				2.803	0.318	13.38	1.163	1.163	1.481	0.318	13.38	1.048	4.32	3.097	0.243
C_3H_8 44.094				0.313	0.035	1.54	0.130	0.130	0.165	0.035	1.54	0.121	4.24	0.363	0.028
C_4H_8 56.104				1.710	0.194	10.88	0.710	0.710	0.904	0.194	10.88	0.852	5.00	2.176	0.170
C_4H_{10} 58.120				0.577	0.065	3.78	0.239	0.239	0.304	0.065	3.78	0.296	4.86	0.778	0.061
C_5H_{10} 70.130				0.797	0.090	6.31	0.331	0.331	0.421	0.090	6.31	0.494	5.45	1.158	0.091
C_6H_{12} 72.146				0.210	0.024	1.73	0.087	0.087	0.111	0.024	1.73	0.136	5.25	0.330	0.026
C_6H_{12} 84.156				0.247	0.028	2.36	0.103	0.103	0.131	0.028	2.36	0.185	5.54	0.426	0.033
C_5-C_6											39.98	3.132		8.328	0.652
TOTAL		35.022	464.25		11.339	292.15	41.499	76.521	59.513						
H_2+CO	96.043	33.636	12765075 SCFH	4.596			16.821	50.457	21.417	-29.040					
H_2/CO		1.53	Factor 783387	3.76			3.76	1.99	3.76	1.35					

Weight Recovery, %	94.07	Catalyst Age, hrs.		Space Velocity, vhv	1120	RECOVERED OIL	0.343**	48.06
Pressure, psig	419	Inlet Velocity, Ft/sec	0.89	Catalyst Vol., CF	11.40	TOTAL OIL		88.04
Temperature, °F	657	Bed Depth, Ft	17.27	Weight, #	1630	WATER SOLUBLE CHEMICALS	0.284**	15.08
Recycle Ratio	1.18	Bed Density, #/CF	143	Effluent $(H_2)(CO_2)$ / Shift Ratio $(H_2O)(CO)$	= 11.78	TOTAL LIQUID PRODUCTS C_5+		103.12

FRESH FEED CONVERSION — %				TOTAL FEED CONVERSION — %			SELECTIVITY		
Contraction	CO	H_2	H_2+CO	CO	H_2	CO+H_2	C_3 + /C_1 +	NET WATER	6.048**	108.96
67.62	92.74	82.14	86.34	73.28	49.67	57.55	78.01	GROSS WATER		124.04
								HYDROCARBON TOTAL—C_1+		132.18

**Included in Reactor Effluent Total

YIELD BASIS H_2+CO FED — YIELDS BASIS BROWNSVILLE DESIGN FEED RATE*	CORRECTED HEMPEL, %	gal/hr	TREATING RECOVERY, %	gal/hr
400 EP	73.0	5.489	98.0	5.379
400-550	14.0	1.053	91.4	0.962
550 +	13.0	0.978	114.6	1.121

	RECOVERY %	#/hr	gal/hr
PROPYLENE	44.0	5.89	
C_3 POLY GASO.	87.5	5.15	0.861
C_3 POLY TAR	12.5	0.74	0.098

	#/gal	#/hr	gal/hr	RVP
C_4H_8	5.00	0.21	0.042	68.0
C_4 POLY GASO.	5.98	9.34	1.561	1.5
C_4H_{10}	4.86	3.78	0.778	68.0
C_4-FREE GASO.			8.154	5.8
C_4 POLY TAR	7.53	1.33	0.177	

	gal/hr	gal/MCF	Bbl/Day
10 # RVP 400 EP GASOLINE	10.535	0.8253	4474
GAS OIL	0.962	0.0754	409
FUEL OIL	1.121	0.0878	476
POLY TAR	0.275	0.0215	117
TOTAL	12.893	1.0100	5476
W. S. CHEM.	1.903	0.1491	808
TOTAL	14.796	1.1591	6284

Form ML—11

g/NCM = 16.91 × #/MCF

*9488 MCFH H_2 + CO, Bbl/Day = 5421.6 × gal/MCF

THE TEXAS COMPANY — MONTEBELLO LABORATORY
DATA SUMMARY

RUN NO. 59-0
HOURS 315-339

OPERATING CONDITIONS — PRESSURES PSIG		RATES S.C.F.H.	
Oxygen	442	Fresh Feed	13291
Natural Gas	441	Recycle	15749
Generator Outlet	425	Combined Feed	29040
Reactor Inlet	419	Wet Gas—Measured	3898
Condenser Inlet		Adjusted	4303
Product Accumulator	375	Loss	405
TEMPERATURES—°F.		Recycle/Fresh Feed	1.18
Oxygen	308	Inlet Velocity—ft./sec.	0.89
Natural Gas	351	Fresh Feed Rate—S.C.F.H. H_2+CO	12765
Generator	--	per Cu. Ft. Dense Bed	1120
Quench Accumulator	145	per Lb. Catalyst	7.83
Reactor Inlet	336	per Sq. Ft.	19341
Condenser Inlet	548		
Product Accumulator	90	Heat Transfer Calculations	
Catalyst No. Height		Steam Rate=374#/hr	
1 See Period A	639	@705 psia & 506°F=	
2	655	1201 BTU/#	
3	657	Water in @ 76.3=44.3°F	
4	650	Net BTU/# steam=1157	
5	663	1157x374=432718	
6	661	Ave. Bed Temp=657°F	
7	652	dT=657-506=151°F	
8	633	Tube Area=31.4 sq ft	
9	630	$K = \frac{432718}{(31.4)(151)} = 91.3$ BTU/°F/sq ft	
10	630		
11	605		

PRODUCT TESTS	OIL	WATER
°API	52.5	11.0
Neut. No.	32.4	27.9
Sap. No.	51.7	37.3
Hydrox. No.		
Bromine No.	93	
Pour °F.		
Chemicals, % by K_2CO_3		12.7
HEMPEL, DIST. %		°API
205 °F.		
400	72.0	54.6
400-550	14.0	36.2
550+	14.0	
A. S. T. M. DIST. ON		
Naphtha °F.		
IBP	118	
10%	144	
50%	224	
90%	340	
EP	380	
Rec.	98.0	

CATALYST DATA — INVENTORY DATA		PARTICLE SIZE
In Reactor at Start of Period		Screen Analysis / Sedimentation
Fresh Catalyst Added		Mesh / Microns / % / Microns / %
Total		On 40 / 419+ / 56.9 / 80+
Catalyst Recovered	81	100 / 150 / 35.7 / 40—80
In Reactor at End of Period		150 / 105 / 4.4 / 20—40
		200 / 74 / 1.6 / 10—20
REACTOR d-p, Inches H_2O		250 / 62 / 0.6 / 0—20
No. Height		325 / 44 / 0.4
0 See Period A	49	<325 / / 0.4 / /
1	71	CATALYST
2	73	Bulk Density, Lbs./Cu.Ft.
3	72	Aerated 145
4	210	Settled 146
Total	475	Compacted 167
		Particle Density, gm./cc. 4.55
CALCULATED FROM dp		NH_3 Value, ml./gm.
Density, Lbs./Cu.Ft.	143	N_2 Surface, m^2/gm.
Inventory, Lbs.	1630	
Bed Depth, Ft.	17.27	CHEMICAL ANALYSIS
Vol., Cu. Ft.	11.40	Fe
		C 8.52
		O
		H
		K_2O, W+, % basis Fe
		X-Ray Analysis—
		$Fe_{20}C_9$
		Fe_3O_4
		Fe

THE TEXAS COMPANY — MONTEBELLO LABORATORY
YIELD CALCULATIONS

RUN NO. 59-P
HOURS 339-363
CATALYST

	FRESH FEED %	FRESH FEED m/hr	FRESH FEED #/hr	WET GAS %	WET GAS At Wt. Balance m/hr	WET GAS At Wt. Balance #/hr	RECYCLE m/hr	COMBINED FEED m/hr	EFFLUENT m/hr	NET CHANGE m/hr	NET CHANGE #/hr	YIELD BASIS H_2+CO FED CONDENSATE #/MCF	CONDENSATE #/gal	CONDENSATE gal/hr	CONDENSATE gal/MCF
CO 28.010	37.087	12.356	346.09	9.570	0.971	27.20	3.980	16.336	4.951	-11.385	-318.89				
H_2 2.016	59.113	19.693	39.70	33.763	3.427	6.91	14.042	33.735	17.469	-16.266	-32.79				
CO_2 44.010	2.620	0.873	38.42	35.580	3.611	158.95	14.796	15.669	18.407	2.738	120.53	9.910			
N_2 28.016	0.180	0.060	1.68	1.600	0.162	4.54	0.665	0.725	0.827						
CH_4 16.042	1.000	0.333	5.34	9.413	0.955	15.32	3.914	4.247	4.869	0.622	9.98	0.821			
C_2H_4 28.052				2.170	0.220	6.17	0.902	0.902	1.122	0.220	6.17	0.507			
C_2H_6 30.068				1.373	0.139	4.18	0.517	0.517	0.710	0.139	4.18	0.344			
C_1+C_2											20.33	1.672			
C_3H_6 42.078				2.470	0.251	10.56	1.027	1.027	1.278	0.251	10.56	0.868	4.32	2.444	0.201
C_3H_8 44.094				0.287	0.029	1.28	0.119	0.119	0.148	0.029	1.28	0.105	4.24	0.302	0.025
C_4H_8 56.104				1.707	0.173	9.71	0.710	0.710	0.883	0.173	9.71	0.798	5.00	1.942	0.160
C_4H_{10} 58.120				0.690	0.070	4.07	0.287	0.287	0.357	0.070	4.07	0.335	4.86	0.837	0.069
C_5H_{10} 70.130				0.877	0.089	6.24	0.365	0.365	0.454	0.089	6.24	0.513	5.45	1.145	0.094
C_5H_{12} 72.146				0.180	0.018	1.30	0.075	0.075	0.093	0.018	1.30	0.107	5.25	0.248	0.020
C_6H_{12} 84.156				0.320	0.032	2.69	0.133	0.133	0.165	0.032	2.69	0.221	5.54	0.486	0.040
C_3-C_6											35.85	2.947		7.404	0.609
TOTAL		33.315	431.22		10.147	259.12	41.586	74.901	58.408						
H_2+CO	96.200	32.049	12162566 SCFH		4.398		18,022	50.071	22.420	-27.651					
H_2/CO		1.59	Factor 822194		3.53		3.53	2.07	3.52	1.43					

YIELDS BASIS BROWNSVILLE DESIGN FEED RATE*	CORRECTED HEMPEL, %	gal/hr	TREATING RECOVERY,%	gal/hr
400 EP	75.0	5.640	98.0	5.527
400-550	14.4	1.083	91.4	0.990
550 +	10.6	0.797	114.6	0.913

	RECOVERY %	#/hr	gal/hr	
PROPYLENE	46.8	4.94		
C_3 POLY GASO.	87.5	4.32	0.722	
C_3 POLY TAR	12.5	0.62	0.082	

	#/gal	#/hr	gal/hr	RVP
C_4H_8	5.00	-	-	68.0
C_4 POLY GASO.	5.98	8.50	1.421	1.5
C_4H_{10}	4.86	(4.07) 3.87	(0.837) 0.797	68.0
C_4 FREE GASO.			8.128	5.8
C_4 POLY TAR	7.53	1.21	0.161	

	gal/hr	gal/MCF	Bbl/Day
10 # RVP 400 EP GASOLINE	10.346	0.8506	4612
GAS OIL	0.990	0.0814	441
FUEL OIL	0.913	0.0751	407
POLY TAR	0.243	0.0200	108
TOTAL	12.492	1.0271	5568
W. S. CHEM.	1.903	0.1565	849
TOTAL	14.395	1.1836	6417

Weight Recovery, %	99.00	Catalyst Age, hrs.		Space Velocity, vhv	1128	RECOVERED OIL	0.343** 48.06
Pressure, psig	419	Inlet Velocity, Ft/sec	0.87	Catalyst Vol., CF	10.78	TOTAL OIL	83.91
Temperature, °F	654	Bed Depth, Ft	16.33	Weight, #	1520	WATER SOLUBLE CHEMICALS	0.284** 15.08
Recycle Ratio	1.25	Bed Density, #/CF	141	Effluent $(H_2)(CO_2)$ / Shift Ratio $(H_2O)(CO)$	10.74	TOTAL LIQUID PRODUCTS C_3+	98.99

FRESH FEED CONVERSION — %				TOTAL FEED CONVERSION — %			SELECTIVITY		
Contraction	CO	H_2	H_2+CO	CO	H_2	$CO+H_2$	C_3+/C_1+	NET WATER	6.048** 108.96
69.54	92.14	82.60	86.28	69.69	48.22	55.82	82.96	GROSS WATER	124.04
								HYDROCARBON TOTAL—C_1+	119.32

10.199	14.983	1.231	TOTAL
9.810			

Form ML—11

**Included in Reactor Effluent Total

g/NCM = 16.91 × #/MCF *9488 MCFH H_2+CO, Bbl/Day = 5421.6 × gal/MCF

THE TEXAS COMPANY — MONTEBELLO LABORATORY
DATA SUMMARY

RUN NO. 59-P
HOURS 339-363

OPERATING CONDITIONS			
PRESSURES PSIG		RATES S.C.F.H.	
Oxygen	442	Fresh Feed	12643
Natural Gas	441	Recycle	15782
Generator Outlet	424	Combined Feed	28425
Reactor Inlet	419	Wet Gas—Measured	3787
Condenser Inlet		Adjusted	3851
Product Accumulator	375	Loss	64
TEMPERATURES—°F.		Recycle/Fresh Feed	1.25
Oxygen	319	Inlet Velocity—ft./sec.	0.87
Natural Gas	327	Fresh Feed Rate—S.C.F.H.	12163
Generator		per Cu. Ft. Dense Bed	1128
Quench Accumulator	147	per Lb. Catalyst	8.00
Reactor Inlet	336	per Sq. Ft.	18429
Condenser Inlet	544		
Product Accumulator	91	Heat Transfer Calculations	
Catalyst No. Height		Steam Rate=350#/hr	
1 See Per. A	631	@ 705 psia & 506°F=	
2	652	1201 BTU/#	
3	657	Water in @ 76.7=45°F	
4	645	Net BTU/# steam=1156	
5	660	1156x350=404600	
6	658	Ave. Bed Temp=654°F	
7	647	dT=654-506=148°F	
8	627	Tube Area=29.6 sq ft	
9	629	$K=\frac{404600}{(29.6)(148)}=92.4$ BTU/°F/sq ft	
10	626		
11	600		

PRODUCT TESTS	OIL	WATER
°API	52.4	11.0
Neut. No.	33.2	29.4
Sap. No.	52.4	39.0
Hydrox. No.		
Bromine No.	91	
Pour °F.		
Chemicals, % by K_2CO_3		12.7
HEMPEL. DIST. %		°API
205 °F.		
400	74.0	53.1
400-550	14.4	37.4
550+	11.6	
A. S. T. M. DIST. ON		
Naphtha °F.		
IBP	114	
10%	140	
50%	224	
90%	352	
EP	388	
Rec.	97.0	

CATALYST DATA						
INVENTORY DATA		PARTICLE SIZE				
In Reactor at Start of Period		Screen Analysis			Sedimentation	
Fresh Catalyst Added		Mesh	Microns	%	Microns	%
Total		On 40	419+	39.1	80+	
Catalyst Recovered	76	100	150	40.7	40—80	
In Reactor at End of Period		150	105	8.4	20—40	
		200	74	7.2	10—20	
REACTOR d-p, Inches H_2O		250	62	1.6	0—20	
No. Height		325	44	2.0		
0 See Period A	49	<325		1.0		
1	71	CATALYST				
2	72	Bulk Density, Lbs./Cu.Ft.				
3	71	Aerated			146	
4	180	Settled			149	
Total	443	Compacted			177	
		Particle Density, gm./cc.			4.71	
CALCULATED FROM dp		NH_3 Value, ml./gm.				
Density, Lbs./Cu.Ft.	141	N_2 Surface, m^2/gm.				
Inventory, Lbs.	1520					
Bed Depth, Ft.	16.33	CHEMICAL ANALYSIS				
Vol., Cu. Ft.	10.78	Fe				
		C			8.40	
		O				
		H				
		K_2O, W+, % basis Fe				
		X-Ray Analysis—				
		$Fe_{20}C_9$				
		Fe_3O_4				
		Fe				

RUN NO. 59-Q
HOURS 363-387
CATALYST Spent CM&S

THE TEXAS COMPANY — MONTEBELLO LABORATORY
YIELD CALCULATIONS

	FRESH FEED			WET GAS			RECYCLE	COMBINED FEED	EFFLUENT	NET CHANGE		YIELD BASIS H_2+CO FED — CONDENSATE			
	%	m/hr	#/hr	%	At Wt. Balance m/hr	At Wt. Balance #/hr	m/hr	m/hr	m/hr	m/hr	#/hr	#/MCF	#/gal	gal/hr	gal/MCF
CO 28.010	35.853	11.801	330.55	10.183	1.034	28.96	4.437	16.238	5.471	-10.767	-301.59				
H_2 2.016	60.767	20.001	40.32	36.556	3.712	7.48	15.930	35.931	19.642	-16.289	-32.84				
CO_2 44.010	2.300	0.757	33.32	29.537	2.997	131.89	12.872	13.629	15.869	2.240	98.57	8.167			
N_2 28.016	0.107	0.035	0.98	1.853	0.188	5.27	0.807	0.842	0.995						
CH_4 16.042	0.973	0.320	5.13	11.577	1.175	18.85	5.045	5.365	6.220	0.855	13.72	1.137			
C_2H_4 28.052				2.290	0.233	6.54	0.998	0.998	1.231	0.233	6.54	0.542			
C_2H_6 30.068				1.623	0.165	4.96	0.707	0.707	0.872	0.165	4.96	0.411			
C_1+C_2											25.22	2.090			
C_3H_6 42.078				2.497	0.254	10.69	1.088	1.088	1.342	0.254	10.69	0.886	4.32	2.475	0.205
C_3H_8 44.094				0.327	0.033	1.46	0.142	0.142	0.175	0.033	1.46	0.121	4.24	0.344	0.029
C_4H_8 56.104				1.603	0.163	9.14	0.699	0.699	0.862	0.163	9.14	0.757	5.00	1.828	0.151
C_4H_{10} 58.120				0.667	0.068	3.95	0.291	0.291	0.359	0.068	3.95	0.327	4.86	0.813	0.067
C_5H_{10} 70.130				0.797	0.081	5.68	0.347	0.347	0.428	0.081	5.68	0.471	5.45	1.042	0.086
C_5H_{12} 72.146				0.187	0.019	1.37	0.081	0.081	0.100	0.019	1.37	0.114	5.25	0.261	0.022
C_6H_{12} 84.156				0.303	0.031	2.61	0.132	0.132	0.163	0.031	2.61	0.216	5.54	0.471	0.039
C_3-C_6											34.90	2.892		7.234	0.599
TOTAL		32.914	410.30		10.153	238.85	43.576	76.490	60.318						
H_2+CO	96.620	31.802	12068.80	SCFH	4.746		20.367	52.169	25.113	-27.056					
H_2/CO		1.69	Factor 828582		3.59		3.59	2.21	3.59	1.51					

							m/hr	#/hr	#/MCF	#/gal	gal/hr	gal/MCF
Weight Recovery, %	100.62	Catalyst Age, hrs.		Space Velocity, vhv	1179	RECOVERED OIL	0.347**	48.74	4.039		7.620	0.631
Pressure, psig	415	Inlet Velocity, Ft/sec	0.89	Catalyst Vol., CF	10.24	TOTAL OIL		83.64	6.931		14.854	1.230
Temperature, °F	652	Bed Depth, Ft	15.52	Weight, #	1455	WATER SOLUBLE CHEMICALS	0.293**	15.54	1.288		1.973	0.163
Recycle Ratio	1.32	Bed Density, #/CF	142	Effluent Shift Ratio $\frac{(H_2)(CO_2)}{(H_2O)(CO)}$ =	9.58	TOTAL LIQUID PRODUCTS C_3+		99.18	8.219		16.827	1.393

FRESH FEED CONVERSION — %				TOTAL FEED CONVERSION — %			SELECTIVITY		m/hr	#/hr	#/MCF	#/gal	gal/hr	gal/MCF
								NET WATER	5.949**	107.17	8.880		12.865	1.066
Contraction	CO	H_2	H_2+CO	CO	H_2	$CO+H_2$	C_3+/C_1+	GROSS WATER		122.71	10.168		14.838	1.229
69.15	91.24	81.44	85.08	66.31	45.33	51.86	79.73	HYDROCARBON TOTAL—C_1+		124.40	10.309			

YIELDS BASIS BROWNSVILLE DESIGN FEED RATE*

	CORRECTED HEMPEL, %	gal/hr	TREATING RECOVERY, %	gal/hr
400 EP	77.0	5.867	98.0	5.750
400-550	11.6	0.884	91.4	0.808
550 +	11.4	0.869	114.6	0.996
		7.620		

	RECOVERY %	#/hr	gal/hr
PROPYLENE	46.2	4.94	
C_3 POLY GASO.	87.5	4.32	0.722
C_3 POLY TAR	12.5	0.62	0.082

	#/gal	#/hr	gal/hr	RVP
C_4H_8	5.00	--	--	68.0
C_4 POLY GASO.	5.98	8.00	1.337	1.5
C_4H_{10}	4.86	(3.95) 3.85	(0.813) 0.793	68.0
C_4-FREE GASO.			8.246	5.8
C_4 POLY TAR	7.53	1.14	0.151	

	gal/hr	gal/MCF	Bbl/Day
10 # RVP 400 EP GASOLINE	10.376	0.8597	4661
GAS OIL	0.808	0.0669	363
FUEL OIL	0.996	0.0825	447
POLY TAR	0.233	0.0193	105
TOTAL	12.413	1.0284	5576
W. S. CHEM.	1.973	0.1635	886
TOTAL	14.386	1.1919	6462

Form ML—11

**Included in Reactor Effluent Total

g/NCM = 16.91×#/MCF

*9488 MCFH H_2+CO, Bbl/Day = 5421.6× gal/MCF

RUN NO. 59-Q
HOURS 363-387

THE TEXAS COMPANY — MONTEBELLO LABORATORY
DATA SUMMARY

OPERATING CONDITIONS

PRESSURES PSIG		RATES S.C.F.H.	
Oxygen	438	Fresh Feed	12491
Natural Gas	437	Recycle	16537
Generator Outlet	421	Combined Feed	29028
Reactor Inlet	415	Wet Gas—Measured	3894
Condenser Inlet		Adjusted	3853
Product Accumulator	375	Loss	-41
TEMPERATURES—°F.		Recycle/Fresh Feed	1.32
Oxygen	330	Inlet Velocity—ft./sec.	0.89
Natural Gas	322	Fresh Feed Rate H_2+CO—S.C.F.H.	12069
Generator	--	per Cu. Ft. Dense Bed	1179
Quench Accumulator	139	per Lb. Catalyst	8.29
Reactor Inlet	340	per Sq. Ft.	18286
Condenser Inlet	542		
Product Accumulator	89	Heat Transfer Calculations	
Catalyst No. Height		Steam Rate=330#/hr	
1 See Per. A	620	@ 705 psia & 506°F=	
2	649	1201 BTU/#	
3	655	Water in @=69.9=38°F	
4	644	Net BTU/# steam=1163	
5	656	1163x330=383790	
6	655	Ave. Bed Temp=652	
7	640	dT=652-506=146°F	
8	623	Tube Area=29.2 sq ft	
9	624	$K=\frac{383790}{(29.2)(146)}$ = 90.0 BTU/°F/sq ft	
10	623		
11	596		

PRODUCT TESTS

	OIL	WATER
°API	52.7	11.0
Neut. No.	33.2	30.0
Sap. No.	52.4	39.6
Hydrox. No.		
Bromine No.	93	
Pour °F.		
Chemicals, % by K_2CO_3		13.3
HEMPEL, DIST. %		°API
205 °F.		
400	76.0	54.4
400-550	11.6	37.0
550+	12.4	
A. S. T. M. DIST. ON		
Naphtha °F.		
IBP	108	
10%	136	
50%	220	
90%	348	
EP	384	
Rec.	96.5	

CATALYST DATA

INVENTORY DATA	
In Reactor at Start of Period	
Fresh Catalyst Added	
Total	
Catalyst Recovered	70
In Reactor at End of Period	
REACTOR d-p, Inches H_2O	
No. Height	
0 See Period A	49
1	71
2	73
3	71
4	160
Total	424
CALCULATED FROM dp	
Density, Lbs./Cu.Ft.	142
Inventory, Lbs.	1455
Bed Depth, Ft.	15.52
Vol., Cu. Ft.	10.24

PARTICLE SIZE

Screen Analysis Mesh	Microns	%	Sedimentation Microns	%
On 40	419+	36.3	80+	
100	150	43.3	40—80	
150	105	8.2	20—40	
200	74	5.5	10—20	
250	62	2.0	0—20	
325	44	3.0		
<325		1.7		

CATALYST	
Bulk Density, Lbs./Cu.Ft.	
Aerated	148
Settled	149
Compacted	169
Particle Density, gm./cc.	4.46
NH_3 Value, ml./gm.	
N_2 Surface, m^2/gm.	
CHEMICAL ANALYSIS	
Fe	68.4
C	8.17
O	.27
H	
K_2O, W+, % basis Fe	
X-Ray Analysis—	
$Fe_{20}C_9$	
Fe_3O_4	
Fe	

RUN NO. 59-R
HOURS 387-411
CATALYST Spent CM&S

THE TEXAS COMPANY — MONTEBELLO LABORATORY
YIELD CALCULATIONS

	FRESH FEED %	FRESH FEED m/hr	FRESH FEED #/hr	WET GAS %	WET GAS At Wt. Balance m/hr	WET GAS At Wt. Balance #/hr	RECYCLE m/hr	COMBINED FEED m/hr	EFFLUENT m/hr	NET CHANGE m/hr	NET CHANGE #/hr	YIELD BASIS H_2+CO FED CONDENSATE #/MCF	#/gal	gal/hr	gal/MCF
CO 28.010	37.374	11.602	324.99	10.133	1.053	29.49	4.247	15.849	5.300	-10.549	-295.50				
H_2 2.016	58.430	18.139	36.58	33.307	3.463	6.98	13.961	32.100	17.424	-14.676	-29.60				
CO_2 44.010	2.733	0.848	37.32	31.887	3.311	145.70	13.365	14.213	16.676	2.463	108.38	9.602			
N_2 28.016	0.310	0.096	2.69	1.697	0.176	4.93	0.711	0.807	0.887						
CH_4 16.042	1.153	0.358	5.74	10.833	1.126	18.06	4.541	4.899	5.667	0.768	12.32	1.092			
C_2H_4 28.052				2.540	0.264	7.41	1.065	1.065	1.329	0.264	7.41	0.657			
C_3H_6 30.068				1.670	0.174	5.23	0.700	0.700	0.874	0.174	5.23	0.463			
C_1+C_2											24.96	2.212			
C_3H_8 42.078				3.037	0.316	13.30	1.273	1.273	1.589	0.316	13.30	1.178	4.32	3.079	0.273
C_3H_8 44.094				0.343	0.036	1.59	0.144	0.144	0.180	0.036	1.59	0.141	4.24	0.375	0.033
C_4H_8 56.104				2.153	0.224	12.57	0.902	0.902	1.126	0.224	12.57	1.114	5.00	2.514	0.223
C_4H_{10} 58.120				0.800	0.083	4.82	0.335	0.335	0.418	0.083	4.82	0.427	4.86	0.992	0.088
C_5H_{10} 70.130				1.050	0.109	7.64	0.440	0.440	0.549	0.109	7.64	0.677	5.48	1.402	0.124
C_5H_{12} 72.146				...0.207	0.022	1.59	0.087	0.087	0.109	0.022	1.59	0.141	5.25	0.303	0.027
C_6H_{12} 84.156				0.343	0.036	3.03	0.144	0.144	0.180	0.036	3.03	0.268	5.54	0.547	0.048
C_5-C_6											44.54	3.946		9.212	0.816
TOTAL		31.043	407.32		10.391	262.34	41.915	72.958	57.782						
H_2+CO	95.804	29.741	11286669 SCFH		4.516		18.208	47.949	22.724	-25.225					
H_2/CO		1.56	Factor 8860009		3.29		3.29	2.03	3.29	1.39					

Weight Recovery, %	95.31	Catalyst Age, hrs.		Space Velocity, vhv	1167	RECOVERED OIL	0.308**	43.23	3.830		6.673	0.591
Pressure, psig	414	Inlet Velocity, Ft/sec	0.85	Catalyst Vol., CF	9.67	TOTAL OIL		87.77	7.776		15.885	1.407
Temperature, °F	645	Bed Depth, Ft	14.65	Weight, #	1363	WATER SOLUBLE CHEMICALS	0.247**	13.10	1.161		1.633	0.145
Recycle Ratio	1.35	Bed Density, #/CF	141	Effluent $(H_2)(CO_2)$ / Shift Ratio $(H_2O)(CO)$	11.14	TOTAL LIQUID PRODUCTS C_3+		100.87	8.937		17.518	1.552

FRESH FEED CONVERSION — %				TOTAL FEED CONVERSION — %			SELECTIVITY	NET WATER	4.921**	88.65	7.854		10.642	0.943
Contraction	CO	H_2	H_2+CO	CO	H_2	$CO+H_2$	C_3+/C_1+	GROSS WATER		101.75	9.015		12.275	1.088
66.53	90.92	80.91	84.82	66.56	45.72	52.61	80.16	HYDROCARBON TOTAL—C_1+		125.83	11.149			

YIELDS BASIS BROWNSVILLE DESIGN FEED RATE@	CORRECTED HEMPEL, %	gal/hr	TREATING RECOVERY, %	gal/hr
400 EP	73.9	4.931	98.0	4.832
400-550	13.6	0.908	91.4	0.830
550 +	12.5	0.834	114.6	0.956

	RECOVERY %	#/hr	gal/hr
PROPYLENE	42.4	5.64	
C_3 POLY GASO.	87.5	4.93	0.824
C_3 POLY TAR	12.5	0.71	0.094

	#/gal	#/hr	gal/hr	RVP
C_4H_8	5.00	-	-	68.0
C_4 POLY GASO.	5.98	11.00	1.839	1.5
C_4H_{10}	4.86	[4.82) 4.09	(0.992) 0.842	68.0
C_4-FREE GASO.			7.908	5.8
C_4 POLY TAR	7.53	1.57	0.208	

	gal/hr	gal/MCF	Bbl/Day
10 # RVP 400 EP GASOLINE	10.589	0.9382	5087
GAS OIL	0.830	0.0735	398
FUEL OIL	0.956	0.0847	459
POLY TAR	0.302	0.0268	145
TOTAL	12.677	1.1232	6089
W. S. CHEM.	1.633	0.1447	785
TOTAL	14.310	1.2679	6874

Form ML—11

**Included in Reactor Effluent Total

g/NCM = 16.91 × #/MCF

@9488 MCFH H_2 + CO, Bbl/Day = 5421.6 × gal/MCF

THE TEXAS COMPANY — MONTEBELLO LABORATORY
DATA SUMMARY

RUN NO. 59-R
HOURS 387-411

OPERATING CONDITIONS			
PRESSURES PSIG		RATES S.C.F.H.	
Oxygen	436	Fresh Feed	11781
Natural Gas	435	Recycle	15907
Generator Outlet	418	Combined Feed	27688
Reactor Inlet	414	Wet Gas—Measured	3656
Condenser Inlet		Adjusted	3943
Product Accumulator	375	Loss	287
TEMPERATURES—°F.		Recycle/Fresh Feed	1.35
Oxygen	312	Inlet Velocity—ft./sec.	0.85
Natural Gas	315	Fresh Feed Rate—S.C.F.H. H_2+CO	11287
Generator		per Cu. Ft. Dense Bed	1167
Quench Accumulator	161	per Lb. Catalyst	8.28
Reactor Inlet	350	per Sq. Ft.	17102
Condenser Inlet	533	Heat Transfer Calculations	
Product Accumulator	93	Steam Rate=301#/hr	
Catalyst No. Height		@ 705 psia & 506°F=	
1 See Per. A	612	1201 BTU/#	
2	639	Water in @ 66.8°F=35	
3	652	Net BTU/# steam=1166	
4	641	1166x301=350966	
5	647	Ave. Bed Temp=645°F	
6	646	dT=645-506=139°F	
7	625	Tube Area=26.6 sq ft	
8	614	$U=\frac{350966}{(26.6)(139)}=94.9$ BTU/°F/sq ft	
9	615		
10	613		
11	587		

PRODUCT TESTS	OIL	WATER
°API	51.6	10.8
Neut. No.	36.5	31.8
Sap. No.	54.1	41.0
Hydrox. No.		
Bromine No.	93	
Pour °F.		
Chemicals, % by K_2CO_3		13.3
HEMPEL, DIST. %		°API
205 °F.		
400	72.9	53.0
400-550	13.6	36.8
550+	13.5	
A. S. T. M. DIST. ON		
Naphtha °F.		
IBP	108	
10%	142	
50%	224	
90%	342	
EP	392	
Rec.	97.5	

CATALYST DATA						
INVENTORY DATA		PARTICLE SIZE				
In Reactor at Start of Period		Screen Analysis			Sedimentation	
Fresh Catalyst Added		Mesh	Microns	%	Microns	%
Total		On 40	419+	36.7	80+	
Catalyst Recovered	67	100	150	39.5	40—80	
In Reactor at End of Period		150	105	9.0	20—40	
		200	74	7.4	10—20	
REACTOR d-p, Inches H_2O		250	62	1.8	0—20	
No. Height		325	44	2.8		
0 See Period A	48	<325		2.8		
1	70	CATALYST				
2	72	Bulk Density, Lbs./Cu.Ft.				
3	72	Aerated			146	
4	135	Settled			147	
Total	397	Compacted			175	
		Particle Density, gm./cc.			4.44	
CALCULATED FROM dp		NH_3 Value, ml./gm.				
Density, Lbs./Cu.Ft.	141	N_2 Surface, m^2/gm.				
Inventory, Lbs.	1363					
Bed Depth, Ft.	14.65	CHEMICAL ANALYSIS				
Vol., Cu. Ft.	9.67	Fe				
		C			8.58	
		O				
		H				
		K_2O, W+, % basis Fe				
		X-Ray Analysis—				
		$Fe_{2.2}C_9$				
		Fe_3O_4				
		Fe				

THE TEXAS COMPANY — MONTEBELLO LABORATORY
YIELD CALCULATIONS

RUN NO. 59-S
HOURS 411-421
CATALYST Spent CM&S

	FRESH FEED %	FRESH FEED m/hr	FRESH FEED #/hr	WET GAS %	WET GAS At Wt. Balance m/hr	WET GAS At Wt. Balance #/hr	RECYCLE m/hr	COMBINED FEED m/hr	EFFLUENT m/hr	NET CHANGE m/hr	NET CHANGE #/hr	YIELD BASIS H_2+CO FED — CONDENSATE #/MCF	#/gal	gal/hr	gal/MCF
CO 28.010	37.947	14.576	408.28	11.490	1.710	47.90	5.169	19.745	6.879	-12.866	-360.38				
H_2 2.016	58.850	22.605	45.58	41.824	6.225	12.55	18.818	41.423	25.043	-16.380	-33.03				
CO_2 44.010	2.560	0.983	43.26	25.623	3.816	167.94	11.528	12.511	15.344	2.833	124.68	8.836			
N_2 28.016	0.350	0.134	3.76	1.737	0.259	7.26	0.781	0.915	1.040						
CH_4 16.042	0.293	0.113	1.81	10.213	1.520	24.38	4.595	4.708	6.115	1.407	22.57	1.600			
C_2H_4 28.052				2.303	0.343	9.62	1.036	1.036	1.379	0.343	9.62	0.682			
C_2H_6 30.068				1.313	0.195	5.86	0.591	0.591	0.786	0.195	5.86	0.415			
C_1+C_2											38.05	2.697			
C_3H_6 42.078				2.003	0.298	12.54	0.901	0.901	1.199	0.298	12.54	0.889	4.32	2.903	0.206
C_3H_8 44.094				0.403	0.060	2.65	0.181	0.181	0.241	0.060	2.65	0.188	4.24	0.625	0.044
C_4H_8 56.104				1.317	0.196	11.00	0.593	0.593	0.789	0.196	11.00	0.780	5.00	2.200	0.156
C_4H_{10} 58.120				0.687	0.102	5.93	0.309	0.309	0.411	0.102	5.93	0.420	4,86	1.220	0.086
C_5H_{10} 70.130				0.707	0.105	7.36	0.318	0.318	0.423	0.105	7.36	0.522	5.45	1.350	0.096
C_5H_{12} 72.146				0.177	0.026	1.88	0.080	0.080	0.106	0.026	1.88	0.133	5.25	0.358	0.025
C_6H_{12} 84.156				0.203	0.030	2.52	0.091	0.091	0.121	0.030	2.52	0.179	5.54	0.455	0.032
C_3-C_6											43.88	3.111		9.111	0.645
TOTAL		38.411	502.69		14.885	319.39	44.991	83.402	66.594						
H_2+CO	96.797	37.181	14110099 SCFH		7.935		23.987	61.168	31.922	-29.246					
H_2/CO		1.55	Factor 708712		3.64		3.64	2.10	3.64	1.27					

Weight Recovery, %	93.85	Catalyst Age, hrs.		Space Velocity, vhv	1512
Pressure, psig	416	Inlet Velocity, Ft/sec	0.98	Catalyst Vol., CF	9.33
Temperature, °F	656	Bed Depth, Ft	14.13	Weight, #	1352
Recycle Ratio	1.17	Bed Density, #/CF	145	Effluent Shift Ratio $\frac{(H_2)(CO_2)}{(H_2O)(CO)}$	= 9.26

	NET CHANGE m/hr	NET CHANGE #/hr	#/MCF	#/gal	gal/hr	gal/MCF
RECOVERED OIL	0.438**	61.48	4.357		9.474	0.671
TOTAL OIL		105.36	7.468		18.585	1.316
WATER SOLUBLE CHEMICALS	0.248**	13.14	0.931		1.662	0.118
TOTAL LIQUID PRODUCTS C_3+		118.50	8.399		20.257	1.434
NET WATER	6.032**	108.68	7.702		13.047	0.925
GROSS WATER		121.82	8.635		14.709	1.043
HYDROCARBON TOTAL—C_1+		156.55	11.096			

FRESH FEED CONVERSION — %				TOTAL FEED CONVERSION — %			SELECTIVITY
Contraction	CO	H_2	H_2+CO	CO	H_2	$CO+H_2$	C_3+/C_1+
61.25	88.27	72.46	78.66	65.16	39.54	47.81	75.69

YIELDS BASIS BROWNSVILLE DESIGN FEED RATE*

	CORRECTED HEMPEL, %	gal/hr	TREATING RECOVERY, %	gal/hr
400 EP	73.0	6.916	98.0	6.778
400-550	16.0	1.516	91.4	1.386
550 +	11.0	1.042	114.6	1.194

	RECOVERY %	#/hr	gal/hr	
PROPYLENE	36.3	4.55		
C_3 POLY GASO.	87.5	3.98	0.666	
C_3 POLY TAR	12.5	0.57	0.076	

	#/gal	#/hr	gal/hr	RVP
C_4H_8	5.00	-	-	68.0
C_4 POLY GASO.	5.98	9.63	1.610	1.5
C_4H_{10}	4.86	(5.93) 4.52	(1.220) 0.931	68.0
C_4-FREE GASO.			9.607	5.8
C_4 POLY TAR	7.53	1.37	0.182	

	gal/hr	gal/MCF	Bbl/Day
10 # RVP 400 EP GASOLINE	12.148	0.8609	4667
GAS OIL	1.386	0.0982	532
FUEL OIL	1.194	0.0846	459
POLY TAR	0.258	0.0183	99
TOTAL	14.986	1.0620	5757
W. S. CHEM.	1.662	0.1178	639
TOTAL	16.648	1.1798	6396

Form ML—11

**Included in Reactor Effluent Total

g/NCM = 16.91 × #/MCF

*9488 MCFH H_2+CO, Bbl/Day = 5421.6 × gal/MCF

THE TEXAS COMPANY — MONTEBELLO LABORATORY
DATA SUMMARY

RUN NO. 59-S
HOURS 411-421

OPERATING CONDITIONS

PRESSURES PSIG		RATES S.C.F.H.	
Oxygen	437	Fresh Feed	14577
Natural Gas	436	Recycle	17074
Generator Outlet	422	Combined Feed	31651
Reactor Inlet	416	Wet Gas—Measured	5102
Condenser Inlet		Adjusted	5649
Product Accumulator	375	Loss	547
TEMPERATURES—°F.		Recycle/Fresh Feed	1.17
Oxygen	316	Inlet Velocity—ft./sec.	0.98
Natural Gas	301	Fresh Feed Rate—S.C.F.H. H_2+CO	14110
Generator		per Cu. Ft. Dense Bed	1512
Quench Accumulator	130	per Lb. Catalyst	10.44
Reactor Inlet	243	per Sq. Ft.	21379
Condenser Inlet	544		
Product Accumulator	97.2	Heat Transfer Calculations	
Catalyst No. Height		Steam Rate=272#/hr	
1 See Per. A	611	@ 705 psia & 506°F=	
2	650	1201 BTU/#	
3	658	Water in @ 67°F=35°F	
4	642	Net BTU/# steam=1166	
5	664	1166x272=317152	
6	665	Ave. Bed Temp=656°F	
7	639	dT=656-506=150°F	
8	625	Tube Area=25.6	
9	626	$K=\frac{317152}{(25.6)(150)}=82.6$ BTU/°F/sq ft	
10	622		
11	593		

PRODUCT TESTS

	OIL	WATER
° API	50.0	10.8
Neut. No.	32.3	29.3
Sap. No.	49.9	38.4
Hydrox. No.		
Bromine No.	91	
Pour °F.		
Chemicals, % by K_2CO_3		11.3
HEMPEL, DIST. %		°API
205 °F.		
400	72.0	53.0
400-550	16.0	36.7
550+	12.0	
A. S. T. M. DIST. ON		
Naphtha °F.		
IBP	118	
10%	144	
50%	236	
90%	350	
EP	380	
Rec.	97.0	

CATALYST DATA

INVENTORY DATA	
In Reactor at Start of Period	
Fresh Catalyst Added	
Total	
Catalyst Recovered	30½
In Reactor at End of Period	
REACTOR d-p, Inches H_2O	
No. Height	
0 See Period A	50
1	72
2	74
3	73
4	125
Total	394
CALCULATED FROM dp	
Density, Lbs./Cu.Ft.	145
Inventory, Lbs.	1352
Bed Depth, Ft.	14.13
Vol., Cu. Ft.	9.33

PARTICLE SIZE

Screen Analysis Mesh	Microns	%	Sedimentation Microns	%
On 40	419+	32.5	80+	
100	150	41.8	40—80	
150	105	10.8	20—40	
200	74	8.7	10—20	
250	62	3.2	0—20	
325	44	1.6		
<325		1.4		

CATALYST	
Bulk Density, Lbs./Cu.Ft.	
Aerated	146
Settled	148
Compacted	172
Particle Density, gm./cc.	4.46
NH_3 Value, ml./gm.	
N_2 Surface, m^2/gm.	
CHEMICAL ANALYSIS	
Fe	
C	9.38
O	
H	
K_2O, W+, % basis Fe	
X-Ray Analysis—	
$Fe_{20}C_9$	
Fe_3O_4	
Fe	

RUN NO. 59-T
HOURS 421-445
CATALYST Spent CM&S

THE TEXAS COMPANY — MONTEBELLO LABORATORY
YIELD CALCULATIONS

	FRESH FEED			WET GAS			RECYCLE	COMBINED FEED	EFFLUENT	NET CHANGE		CONDENSATE				YIELD BASIS H_2+CO FED				
	%	m/hr	#/hr	%	At Wt. Balance m/hr	At Wt. Balance #/hr	m/hr	m/hr	m/hr	m/hr	#/hr	#/MCF	#/gal	gal/hr	gal/MCF	YIELDS BASIS BROWNSVILLE DESIGN FEED RATE*				
CO 28.010	38.173	14.530	406.98	11.550	1.672	46.83	5.049	19.579	6.721	-12.858	-360.15						CORRECTED HEMPEL, %	gal/hr	TREATING RECOVERY,%	gal/hr
H_2 2.016	58.327	22.201	44.76	39.490	5.717	11.53	17.265	39.466	22.982	-16.484	-33.23					400 EP	71.5	5.511	98.0	5.401
CO_2 44.010	2.903	1.105	48.63	30.730	4.448	195.78	13.435	14.540	17.883	3.343	147.15	10.556				400-550	16.0	1.233	91.4	1.127
N_2	0.297	0.113	3.17	1.650	0.239	6.70	0.721	0.834	0.960							550 +	12.5	0.964	114.6	1.105
CH_4 16.042	0.300	0.114	1.83	7.617	1.103	17.69	3.330	3.444	4.433	0.989	15.86	1.138								
C_2H_4 28.052				2.207	0.319	8.95	0.965	0.965	1.284	0.319	8.95	0.642					RECOVERY %	#/hr	gal/hr	
C_2H_6 30.068				1.183	0.171	5.14	0.517	0.517	0.688	0.171	5.14	0.369				PROPYLENE	37.0	4.92		
C_1+C_2											29.95	2.149				C_3 POLY GASO.	87.5	4.30	0.719	
C_3H_4 42.078				2.183	0.316	13.30	0.954	0.954	1.270	0.316	13.30	0.954	4.32	3.079	0.221	C_3 POLY TAR	12.5	0.62	0.082	
C_3H_8 44.094				0.283	0.041	1.81	0.124	0.124	0.165	0.041	1.81	0.130	4.24	0.427	0.031					
C_4H_8 56.104				1.417	0.205	11.50	0.619	0.619	0.824	0.205	11.50	0.825	5.00	2.300	0.165		#/gal	#/hr	gal/hr	RVP
C_4H_{10} 58.120				0.537	0.078	4.53	0.235	0.235	0.313	0.078	4.53	0.325	4.86	0.932	0.067	C_4H_8	5.00	--	--	68.0
C_5H_{10} 70.130				0.750	0.109	7.64	0.328	0.328	0.437	0.109	7.64	0.548	5.45	1.402	0.101	C_4 POLY GASO.	5.98	10.06	1.683	1.5
C_5H_{12} 72.146				0.133	0.019	1.37	0.058	0.058	0.077	0.019	1.37	0.098	5.25	0.261	0.019	C_4H_{10}	4.86	(4.53) 4.15	(0.932) 0.853	68.0
C_6H_{12} 84.156				0.270	0.039	3.28	0.118	0.118	0.157	0.039	3.28	0.235	5.54	0.592	0.042	C_4 FREE GASO.			8.375	5.8
C_3-C_6											43.43	3.115		8.993	0.646	C_4 POLY TAR	7.53	1.44	0.191	
TOTAL		38.063	505.37		14.476	336.05	43.718	81.781	64.646											
H_2+CO	95.500	36.731	13939425 SCFH		7.389		22.314	59.045	29.703	-29.342							gal/hr	gal/MCF	Bbl/Day	
H_2/CO		1.53	Factor 717389		3.42		3.42	2.02	3.42	1.28						10 # RVP 400 EP GASOLINE	10.911	0.7827	4243	
Weight Recovery, %	95.51	Catalyst Age, hrs.		Space Velocity, vhv	1537	RECOVERED OIL		0.355**	49.86	3.577		7.708	0.553	GAS OIL	1.127	0.0808	438	
Pressure, psig	419	Inlet Velocity, Ft/sec	0.95	Catalyst, Vol. CF	9.07	TOTAL OIL			93.29	6.692		16.701	1.199	FUEL OIL	1.105	0.0793	430	
Temperature, °F	657	Bed Depth, Ft	13.74	Weight, #	1270	WATER SOLUBLE CHEMICALS		0.275**	14.57	1.045		1.832	0.131	POLY TAR	0.273	0.0196	106	
Recycle Ratio	1.15	Bed Density, #/CF	140	Effluent $(H_2)(CO_2)$ / Shift Ratio $(H_2O)(CO)$	= 10.50	TOTAL LIQUID PRODUCTS C_3+			107.86	7.737		18.533	1.330	TOTAL	13.416	0.9624	5217	
FRESH FEED CONVERSION — %				TOTAL FEED CONVERSION — %			SELECTIVITY		NET WATER	5.822**	104.89	7.525		12.592	0.903	W. S. CHEM.	1.832	0.1314	712	
Contraction	CO	H_2	H_2+CO	CO	H_2	$CO+H_2$	C_3+/C_1+		GROSS WATER		119.46	8.570		14.424	1.034	TOTAL	15.248	1.0938	5929	
61.97	88.49	74.25	79.88	65.67	41.77	49.69	78.27		HYDROCARBON TOTAL—C_1+		137.81	9.886								

Form ML—11

**Included in Reactor Effluent Total

g/NCM = 16.91 × #/MCF *9488 MCFH H_2+CO, Bbl/Day = 5421.6 × gal/MCF

THE TEXAS COMPANY — MONTEBELLO LABORATORY
DATA SUMMARY

RUN NO. 59-T
HOURS 421-445

OPERATING CONDITIONS				PRODUCT TESTS			CATALYST DATA					
PRESSURES PSIG		RATES S.C.F.H.			OIL	WATER	INVENTORY DATA		PARTICLE SIZE			
Oxygen	441	Fresh Feed	14445	°API	50.4	10.8	In Reactor at Start of Period		Screen Analysis			Sedimentation
Natural Gas	439	Recycle	16591	Neut. No.	34.6	32.3	Fresh Catalyst Added		Mesh	Microns	%	Microns %
Generator Outlet	425	Combined Feed	31036	Sap. No.	54.3	41.6	Total		On 40	419+	36.3	80+
Reactor Inlet	419	Wet Gas—Measured	5123	Hydrox. No.			Catalyst Recovered	48	100	150	42.7	40—80
Condenser Inlet		Adjusted	5494	Bromine No.	93		In Reactor at End of Period		150	105	9.2	20—40
Product Accumulator	375	Loss	371	Pour °F.					200	74	7.0	10—20
				Chemicals, % by K_2CO_3		12.7	REACTOR d-p, Inches H_2O		250	62	1.8	0—20
							No. Height		325	44	1.2	
TEMPERATURES—°F.		Recycle/Fresh Feed	1.15				0 See Period A	48	<325		1.8	
Oxygen	313	Inlet Velocity—ft./sec.	0.95				1	70	CATALYST			
Natural Gas	313	Fresh Feed Rate—S.C.F.H. H_2+CO	13939	HEMPEL, DIST. %		°API	2	70	Bulk Density, Lbs./Cu.Ft.			
Generator		per Cu.Ft. Dense Bed	1537	205 °F.			3	72	Aerated			146
Quench Accumulator	136	per Lb. Catalyst	10.98	400	70.5	52.8	4	110	Settled			148
Reactor Inlet	270	per Sq. Ft.	21120	400-550	16.0	36.8	Total	370	Compacted			1.74
Condenser Inlet	558			550+	13.5				Particle Density, gm./cc.			4.30
Product Accumulator	96.5	Heat Transfer Calculations					CALCULATED FROM dp		NH_3 Value, ml./gm.			
Catalyst No. Height		Steam Rate=280#/hr		A. S. T. M. DIST. ON			Density, Lbs./Cu.Ft.	140	N_2 Surface, m^2/gm.			
1 See Per. A	618	@ 705 psia & 506°F		Naphtha °F.			Inventory, Lbs.	1270				
2	652	1201 BTU/#		IBP	120		Bed Depth, Ft.	13.74	CHEMICAL ANALYSIS			
3	659	Water in @ 67°F=35°F		10%	144		Vol., Cu. Ft.	9.07	Fe			
4	644	Net BTU/# steam=1166		50%	234				C			9.71
5	665	1166x280=326480		90%	350				O			
6	665	Ave. Bed Temp=657°F		EP	380				H			
7	639	dT=657-506=151°F		Rec.	96.5				K_2O, W+, % basis Fe			
8	634	Tube Area=24.8 sq ft							X-Ray Analysis—			
9	638	$K=\frac{326480}{(24.8)(151)}=87.2$ BTU/°F/sq ft							$Fe_{2.2}C_9$			
10	636								Fe_3O_4			
11	608								Fe			

THE TEXAS COMPANY — MONTEBELLO LABORATORY
YIELD CALCULATIONS

RUN NO. 59-U
HOURS 445-469
CATALYST

	FRESH FEED %	FRESH FEED m/hr	FRESH FEED #/hr	WET GAS %	WET GAS At Wt. Balance m/hr	WET GAS At Wt. Balance #/hr	RECYCLE m/hr	COMBINED FEED m/hr	EFFLUENT m/hr	NET CHANGE m/hr	NET CHANGE #/hr	CONDENSATE #/MCF	CONDENSATE #/gal	CONDENSATE gal/hr	CONDENSATE gal/MCF
CO 28.010	38.220	14.623	409.59	7.430	0.906	25.38	3.083	17.706	3.989	-13.717	-384.21				
H_2 2.016	58.197	22.267	44.89	33.936	4.137	8.34	14.082	36.349	18.219	-18.130	-36.55				
CO_2 44.010	2.883	1.103	48.54	34.890	4.253	187.17	14.478	15.581	18.731	- 3.150	138.63	9.902			
N_2 28.016	0.467	0.179	5.01	2.987	0.364	10.20	1.240	1.419	1.604						
CH_4 16.042	0.233	0.089	1.43	9.167	1.117	17.92	3.804	3.893	4.921	1.028	16.49	1.178			
C_2H_4 28.052				2.227	0.271	7.60	0.924	0.924	1.195	0.271	7.60	0.543			
C_2H_6 30.068				1.493	0.182	5.47	0.620	0.620	0.802	0.182	5.47	0.391			
C_1+C_2											29.56	2.112			
C_3H_6 42.078				2.760	0.363	14.14	1.145	1.145	1.481	0.336	14.14	1.010	4.32	3.273	0.234
C_3H_8 44.094				0.270	0.033	1.46	0.112	0.112	0.145	0.033	1.46	0.104	4.24	0.344	0.025
C_4H_8 56.104				2.730	0.333	18.68	1.133	1.133	1.466	0.333	18.68	1.334	5.00	3.736	0.267
C_4H_{10} 58.120				0.677	0.083	4.82	0.281	0.281	0.364	0.083	4.82	0.344	4,86	0.992	0.071
C_5H_{10} 70.130				0.937	0.114	7.99	0.389	0.389	0.503	0.114	7.99	0.571	5.45	1.466	0.105
C_5H_{12} 72.146				0.163	0.020	1.44	0.068	0.068	0.088	0.020	1.44	0.103	5.25	0.274	0.020
C_6H_{12} 84.156				0.333	0.041	3.45	0.138	0.138	0.179	0.041	3.45	0.246	5.54	0.623	0.045
C_3-C_6											51.98	3.712		10.708	0.767
TOTAL		38.261	509.47		12.190	314.04	41.497	79.758	61.022						
H_2+CO	96.417	38.890	139997484 SCFH		5.043		17.165	54.055	22.208	-31.847					
H_2/CO		1.52	Factor 714298		4.57		4.57	2.05	4.57	1.32					

					NET CHANGE m/hr	NET CHANGE #/hr	#/MCF	#/gal	gal/hr	gal/MCF
Weight Recovery, %		Catalyst Age, hrs.	Space Velocity, vhv 1039	RECOVERED OIL	0.440**	61.68	4.406		9.708	0.693
Pressure, psig	422	Inlet Velocity, Ft/sec 0.91	Catalyst, Vol. CF 13.47	TOTAL OIL		113.66	8.118		20.416	1.460
Temperature, °F	646	Bed Depth, Ft 20.41	Weight, # 1980	WATER SOLUBLE CHEMICALS	0.272**	14.43	1.031		1.825	0.130
Recycle Ratio	1.08	Bed Density, #/CF 147	Effluent Shift Ratio $\frac{(H_2)(CO_2)}{(H_2O)(CO)}$ = 13.47	TOTAL LIQUID PRODUCTS C_3+		128.09	9.149		22.241	1.590
				NET WATER	6.623**	119.32	8.523		14.324	1.023
				GROSS WATER		133.75	9.554		16.149	1.154
				HYDROCARBON TOTAL—C_1+		157.65	11.261			

FRESH FEED CONVERSION — % Contraction	CO	H_2	H_2+CO	TOTAL FEED CONVERSION — % CO	H_2	$CO+H_2$	SELECTIVITY C_3+/C_1+
68.14	93.80	81.42	86.33	77.47	49.88	58.92	81.25

YIELDS BASIS BROWNSVILLE DESIGN FEED RATE*

	CORRECTED HEMPEL, %	gal/hr	TREATING RECOVERY, %	gal/hr
400 EP	75.9	7.368	98.0	7.221
400-550	14.8	1.437	91.4	1.313
550 +	9.3	0.903	114.6	1.035

	RECOVERY %	#/hr	gal/hr
PROPYLENE	44.6	6.31	
C_3 POLY GASO.	87.5	5.52	0.923
C_3 POLY TAR	12.5	0.79	0.105

	#/gal	#/hr	gal/hr	RVP
C_4H_8	5.00	0.77	0.154	68.0
C_4 POLY GASO.	5.98	15.67	2.621	. 1.5
C_4H_{10}	4.86	4.82	0.992	68.0
C_4-FREE GASO.			10.507	5.8
C_4 POLY TAR	7.53	2.24	0.297	

	gal/hr	gal/MCF	Bbl/Day
10 # RVP 400 EP GASOLINE	14.274	1.0196	5528
GAS OIL	1.313	0.0938	509
FUEL OIL	1.035	0.0739	401
POLY TAR	0.402	0.0287	156
TOTAL	17.024	1.2160	6594
W. S. CHEM.	1.825	0.1304	707
TOTAL	18.849	1.3464	7301

Form ML—11

**Included in Reactor Effluent Total

g/NCM = 16.91 × #/MCF

*9488 MCFH H_2 + CO, Bbl/Day = 5421.6 × gal/MCF

THE TEXAS COMPANY — MONTEBELLO LABORATORY
DATA SUMMARY

RUN NO. 59-U
HOURS 445-469

OPERATING CONDITIONS

PRESSURES PSIG		RATES S.C.F.H.	
Oxygen	445	Fresh Feed	14520
Natural Gas	444	Recycle	15748
Generator Outlet	428	Combined Feed	30268
Reactor Inlet	422	Wet Gas—Measured	4224
Condenser Inlet		Adjusted	4626
Product Accumulator	375	Loss	402
TEMPERATURES—°F.		Recycle/Fresh Feed	1.08
Oxygen	313	Inlet Velocity—ft./sec.	0.91
Natural Gas	313	Fresh Feed Rate—S.C.F.H. H_2+CO	14000
Generator		per Cu.Ft. Dense Bed	1039
Quench Accumulator	144	per Lb. Catalyst	7.07
Reactor Inlet	292	per Sq. Ft.	21212
Condenser Inlet	549		
Product Accumulator	99	Heat Transfer Calculations	
Catalyst No. Height		Steam Rate=341#/hr	
1 See Per. A	616	@ 705 psia & 506°F=	
2	641	1201 BTU/#	
3	648	Water in @ 68.5=37 BTU/#	
4	634	Net BTU/# steam=1164	
5	654	1164x341=396924	
6	654	Ave. Bed Temp=646	
7	645	dT=646-506=140°F	
8	638	Tube Area=36.7 sq ft	
9	629	$K=\frac{396924}{(36.7)(140)}$ = 77.3 BTU/°F/sq ft	
10	624		
11	599		

PRODUCT TESTS

	OIL	WATER
°API	52.0	10.8
Neut. No.	31.0	27.7
Sap. No.	49.6	37.6
Hydrox. No.		
Bromine No.	93	
Pour °F.		
Chemicals, % by K_2CO_3		11.3
HEMPEL, DIST. %		°API
205 °F.		
400	74.9	55.5
400-550	14.8	38.3
550+	10.3	
A. S. T. M. DIST. ON		
Naphtha °F.		
IBP	108	
10%	136	
50%	224	
90%	350	
EP	392	
Rec.	96.0	

CATALYST DATA

INVENTORY DATA	
In Reactor at Start of Period	
Fresh Catalyst Added	468
Total	
Catalyst Recovered	137.7
In Reactor at End of Period	
REACTOR d-p, Inches H_2O	
No. Height	
0 See Period A	50
1	73
2	75
3	74
4	305
Total	577
CALCULATED FROM dp	
Density, Lbs./Cu.Ft.	147
Inventory, Lbs.	1980
Bed Depth, Ft.	20.41
Vol., Cu. Ft.	13.47

PARTICLE SIZE

Screen Analysis Mesh	Microns	%	Sedimentation Microns	%
On 40	419+	34.0	80+	
100	150	40.0	40—80	
150	105	10.6	20—40	
200	74	8.4	10—20	
250	62	0.6	0—20	
325	44	4.8		
<325		1.6		

CATALYST	
Bulk Density, Lbs./Cu.Ft.	
Aerated	150
Settled	151
Compacted	173
Particle Density, gm./cc.	4.45
NH_3 Value, ml./gm.	
N_2 Surface, m^2/gm.	
CHEMICAL ANALYSIS	
Fe	
C	8.66
O	
H	
K_2O, W+, % basis Fe	
X-Ray Analysis—	
$Fe_{20}C_9$	
Fe_3O_4	
Fe	

THE TEXAS COMPANY — MONTEBELLO LABORATORY
YIELD CALCULATIONS

RUN NO. 59-V
HOURS 469-493
CATALYST Spent CM&S

	FRESH FEED			WET GAS			RECYCLE	COMBINED FEED	EFFLUENT	NET CHANGE		YIELD BASIS H_2+CO FED — CONDENSATE			
	%	m/hr	#/hr	%	At Wt. Balance m/hr	At Wt. Balance #/hr	m/hr	m/hr	m/hr	m/hr	#/hr	#/MCF	#/gal	gal/hr	gal/MCF
CO 28.010	38.960	14.876	416.69	10.483	1.293	36.22	4.376	19.252	5.669	-13.583	-380.47				
H_2 2.016	57.675	22.023	44.40	33.957	4.187	8.44	14.174	36.197	18.361	-17.836	-35.96				
CO_2 44.010	2.690	1.027	45.20	33.263	4.103	180.51	13.885	14.912	17.988	3.076	135.31	9.663			
N_2 28.016	0.115	0.044	1.23	1.677	0.207	5.80	0.700	0.744	0.907						
CH_4 16.042	0.560	0.214	3.43	9.310	1.148	18.42	3.886	4.100	5.034	0.934	14.99	1.070			
C_2H_4 28.052				2.653	0.327	9.17	1.107	1.107	1.434	0.327	9.17	0.655			
C_2H_6 30.068				1.480	0.183	5.50	0.618	0.618	0.801	0.183	5.50	0.393			
C_1+C_2											29.66	2.118			
C_3H_6 42.078				2.900	0.358	15.06	1.211	1.211	1.569	0.358	15.06	1.075	4.32	3.486	0.249
C_3H_8 44.094				0.317	0.039	1.72	0.132	0.132	0.171	0.039	1.72	0.123	4.24	0.406	0.029
C_4H_8 56.104				1.783	0.220	12.34	0.744	0.744	0.964	0.220	12.34	0.881	5.00	2.468	0.176
C_4H_{10} 58.120				0.850	0.105	6.10	0.355	0.355	0.460	0.105	6.10	0.436	4.86	1.255	0.090
C_5H_{10} 70.130				C0.900	0.111	7.78	0.376	0.376	0.487	0.111	7.78	0.556	5.45	1.428	0.102
C_5H_{12} 72.146				0.130	0.016	1.15	0.054	0.054	0.070	0.016	1.15	0.082	5.25	0.219	0.016
C_6H_{12} 84.156				0.297	0.037	3.11	0.124	0.124	0.161	0.037	3.11	0.222	5.54	0.561	0.040
C_3-C_6											47.26	3.375		9.823	0.702
TOTAL		38.184	510.95		12.334	311.32	41.742	79.926	61.590						
H_2+CO	96.635	36.899	14003378 SCFH		5.480		18.550	55.449	24.030	-31.419					
H_2/CO		1.48	Factor 714113		3.24		3.24	1.88	3.24	1.31					

							m/hr	#/hr	#/MCF	#/gal	gal/hr	gal/MCF
Weight Recovery, %		Catalyst Age, hrs.		Space Velocity, vhv	1054	RECOVERED OIL	0.441**	61.85	4.417		9.688	0.692
Pressure, psig	422	Inlet Velocity, Ft/sec	0.96	Catalyst, Vol. CF	13.29	TOTAL OIL		109.11	7.792		19.511	1.394
Temperature, °F	652	Bed Depth, Ft	20.13	Weight, #	1980	WATER SOLUBLE CHEMICALS	0.295**	15.67	1.119		1.999	0.143
Recycle Ratio	1.09	Bed Density, #/CF	149	Effluent Shift Ratio $\frac{(H_2)(CO_2)}{(H_2O)(CO)}$ =	13.29	TOTAL LIQUID PRODUCTS C_3+		124.78	8.911		21.510	1.537
						NET WATER	6.778**	122.11	8.720		14.659	1.407
						GROSS WATER		137.78	9.839		16.658	1.190
						HYDROCARBON TOTAL—C_1+		154.44	11.029			

FRESH FEED CONVERSION — %				TOTAL FEED CONVERSION — %			SELECTIVITY
Contraction	CO	H_2	H_2+CO	CO	H_2	$CO+H_2$	C_3+/C_1+
67.70	91.31	80.99	85.17	70.55	49.27	56.66	80.80

YIELDS BASIS BROWNSVILLE DESIGN FEED RATE*

	CORRECTED HEMPEL, %	gal/hr	TREATING RECOVERY, %	gal/hr
400 EP	76.2	7.382	98.0	7.234
400-550	14.2	1.376	91.4	1.258
550 +	9.6	0.930	114.6	1.066

	RECOVERY %	#/hr	gal/hr	
PROPYLENE	44.0	6.62		
C_3 POLY GASO.	87.5	5.79	0.968	
C_3 POLY TAR	12.5	0.83	0.110	

	#/gal	#/hr	gal/hr	RVP
C_4H_8	5.00	--	--	68.0
C_4 POLY GASO.	5.98	10.80	1.806	1.5
C_4H_{10}	4.86	(6.10) 4.95	(1.255) 1.019	68.0
C_4-FREE GASO.			10.410	5.8
C_4 POLY TAR	7.53	1.54	0.205	

	gal/hr	gal/MCF	Bbl/Day
10 # RVP 400 EP GASOLINE	13.236	0.9452	5124
GAS OIL	1.258	0.0898	487
FUEL OIL	1.066	0.0761	413
POLY TAR	0.315	0.0225	122
TOTAL	15.875	1.1336	6146
W. S. CHEM.	1.999	0.1428	774
TOTAL	17.874	1.2764	6920

Form ML—11

**Included in Reactor Effluent Total

g/NCM = 16.91×#/MCF

*9488 MCFH H_2+CO, Bbl/Day = 5421.6 × gal/MCF

THE TEXAS COMPANY — MONTEBELLO LABORATORY
DATA SUMMARY

RUN NO. 59-V
HOURS 469-493

OPERATING CONDITIONS				PRODUCT TESTS			CATALYST DATA						
PRESSURES PSIG		RATES S.C.F.H.			OIL	WATER	INVENTORY DATA		PARTICLE SIZE				
Oxygen	445	Fresh Feed	14491	°API	52.6	10.9	In Reactor at Start of Period		Screen Analysis			Sedimentation	
Natural Gas	443	Recycle	15841	Neut. No.	30.6	28.4	Fresh Catalyst Added	35	Mesh	Microns	%	Microns	%
Generator Outlet	427	Combined Feed	30332	Sap. No.	50.6	37.5	Total		On 40	419+	36.9	80+	
Reactor Inlet	422	Wet Gas—Measured	4298	Hydrox. No.			Catalyst Recovered	70.3	100	150	41.2	40—80	
Condenser Inlet		Adjusted	4681	Bromine No.	93		In Reactor at End of Period		150	105	9.0	20—40	
Product Accumulator	373	Loss	383	Pour °F.					200	74	7.5	10—20	
				Chemicals, % by K_2CO_3		12.0	REACTOR d-p, Inches H_2O		250	62	0.8	0—20	
							No. Height		325	44	3.0		
TEMPERATURES—°F.		Recycle/Fresh Feed	1.09				0 See Period A	51	<325		1.6		
Oxygen	322	Inlet Velocity—ft./sec.	0.96				1	.75	CATALYST				
Natural Gas	308	Fresh Feed Rate—S.C.F.H. H_2+CO	14003	HEMPEL. DIST. %		°API	2	76	Bulk Density, Lbs./Cu.Ft.				
Generator		per Cu.Ft. Dense Bed	1054	205 °F.			3	75	Aerated				151
Quench Accumulator	145	per Lb. Catalyst	7.07	400	75.2	55.6	4	300	Settled				154
Reactor Inlet	319	per Sq. Ft.	21217	400-550	14.2	37.3	Total	577	Compacted				177
Condenser Inlet	542			550+	10.6				Particle Density, gm./cc.				4.54
Product Accumulator	94	Heat Transfer Calculations					CALCULATED FROM dp		NH_3 Value, ml./gm.				
Catalyst No. Height		Steam Rate=368#/hr		A. S. T. M. DIST. ON			Density, Lbs./Cu.Ft.	149	N_2 Surface, m²/gm.				
1 See Per.A	624	@ 705 psia & 506°F=		Naphtha °F.			Inventory, Lbs.	1980					
2	648	1201 BTU/#		IBP	106		Bed Depth, Ft.	20.13	CHEMICAL ANALYSIS				
3	656	Water in @ 70°F=38°F		10%	138		Vol., Cu. Ft.	13.29	Fe				69.0
4	644	Net BTU/# steam=1163		50%	224				C				7.18
5	659	1163x368=427984		90%	348				O				.38
6	656	Ave. Bed Temp=652°F		EP	392				H				
7	647	dT=652-506=146°F		Rec.	97.0				K_2O, Wt. % basis Fe				
8	639	Tube Area=36.3 sq ft							X-Ray Analysis—				
9	629	$K=\frac{427984}{(146)(36.3)}=80.8$ BTU/°F/sq ft							$Fe_{20}C_9$				
10	624								Fe_3O_4				
11	600								Fe				

THE TEXAS COMPANY — MONTEBELLO LABORATORY
YIELD CALCULATIONS

RUN NO. 59-W
HOURS 493-517
CATALYST Spent CM&S

	FRESH FEED			WET GAS			RECYCLE	COMBINED FEED	EFFLUENT	NET CHANGE		YIELD BASIS H_2+CO FED — CONDENSATE			
	%	m/hr	#/hr	%	At Wt. Balance m/hr	At Wt. Balance #/hr	m/hr	m/hr	m/hr	m/hr	#/hr	#/MCF	#/gal	gal/hr	gal/MCF
CO 28.010	37.133	14.369	402.48	9.130	1.113	31.18	3.823	18.192	4.936	-13.256	-371.30				
H_2 2.016	59.624	23.072	46.51	34.917	4.254	8.58	14.621	37.693	18.875	-18.818	-37.93				
CO_2 44.010	2.693	1.042	45.86	33.700	4.107	180.70	14.112	15.154	18.219	3.065	134.84	9.490			
N_2 28.016	0.140	0.054	1.51	1.903	0.232	6.50	0.797	0.851	1.029						
CH_4 16.042	0.410	0.159	2.55	8.900	1.085	17.41	3.727	3.886	4.812	0.926	14.86	1.046			
C_2H_4 28.052				2.753	0.335	9.40	1.153	1.153	1.488	0.335	9.40	0.662			
C_2H_6 30.068				1.457	0.178	5.35	0.610	0.610	0.788	0.178	5.35	0.377			
C_1+C_2											29.61	2.085			
C_3H_6 42.078				2.917	0.355	14.94	1.222	1.222	1.577	0.355	14.94	1.051	4.32	3.458	0.234
C_3H_8 44.094				0.300	0.037	1.63	0.126	0.126	0.163	0.037	1.63	0.115	4.24	0.384	0.027
C_4H_8 56.104				1.883	0.229	12.85	0.789	0.789	1.018	0.229	12.85	0.904	5.00	2.570	0.181
C_4H_{10} 58.120				0.680	0.083	4.82	0.285	0.285	0.368	0.083	4.82	0.339	4.86	0.992	0.070
C_5H_{10} 70.130				0.980	0.119	8.35	0.410	0.410	0.529	0.119	8.35	0.588	5.45	1.532	0.108
C_5H_{12} 72.146				0.153	0.019	1.37	0.064	0.064	0.083	0.019	1.37	0.096	5.25	0.261	0.018
C_6H_{12} 84.156				0.327	0.040	3.37	0.137	0.137	0.177	0.040	3.37	0.237	5.54	0.608	0.043
C_3-C_6											47.33	3.330		9.805	0.690
TOTAL		38.696	498.91		12.186	306.45	41.876	80.572	61.140						
H_2+CO	96.757	37.441	14208765	SCFH	5.367		18.444	55.885	23.811	-32.074					
H_2/CO		1.61	Factor 703790		3.82		3.82	2.07	3.82	1.42					

YIELDS BASIS BROWNSVILLE DESIGN FEED RATE*				
	CORRECTED HEMPEL. %	gal/hr	TREATING RECOVERY, %	gal/hr
400 EP	76.2	7.534	98.0	7.383
400-550	12.4	1.226	91.4	1.121
550 +	11.4	1.127	114.6	1.292
	RECOVERY %	#/hr	gal/hr	
PROPYLENE	45.2	6.75		
C_3 POLY GASO.	87.5	5.91	0.988	
C_3 POLY TAR	12.5	0.84	0.112	
	#/gal	#/hr	gal/hr	RVP
C_4H_8	5.00	0.29	0.058	68.0
C_4 POLY GASO.	5.98	10.99	1.838	1.5
C_4H_{10}	4.86	4.82	0.992	68.0
C_4-FREE GASO.			10.772	5.8
C_4 POLY TAR	7.53	1.57	0.208	
	gal/hr	gal/MCF	Bbl/Day	
10 # RVP 400 EP GASOLINE	13.660	0.9614	5212	
GAS OIL	1.121	0.0789	428	
FUEL OIL	1.292	0.0909	493	
POLY TAR	0.320	0.0225	122	
TOTAL	16.393	1.1537	6255	
W. S. CHEM.	1.872	0.1317	714	
TOTAL	18.265	1.2854	6969	

Weight Recovery, %		Catalyst Age, hrs.		Space Velocity, vhv	1071
Pressure, psig	421	Inlet Velocity, Ft/sec	0.93	Catalyst , Vol. CF	13.27
Temperature, °F	654	Bed Depth, Ft	20.11	Weight, #	1991
Recycle Ratio	1.08	Bed Density, #/CF	150	Effluent Shift Ratio $\frac{(H_2)(CO_2)}{(H_2O)(CO)}$ =	10.97

	Net change m/hr	#/hr	#/MCF	#/gal	gal/hr	gal/MCF
RECOVERED OIL	0.452**	63.34	4.458		9.887	0.696
TOTAL OIL		110.67	7.788		19.692	1.386
WATER SOLUBLE CHEMICALS	0.278**	14.75	1.038		1.872	0.132
TOTAL LIQUID PRODUCTS C_3+		125.42	8.826		21.564	1.518
NET WATER	6.348**	114.37	8.049		13.730	0.966
GROSS WATER		129.12	9.087		15.602	1.098
HYDROCARBON TOTAL—C_1+		155.03	10.911			

FRESH FEED CONVERSION — %				TOTAL FEED CONVERSION — %			SELECTIVITY
Contraction	CO	H_2	H_2+CO	CO	H_2	$CO+H_2$	C_3+/C_1+
68.51	92.25	81.56	85.67	72.87	49.92	57.39	80.90

Form ML—11

**Included in Reactor Effluent Total

g/NCM = 16.91 × #/MCF

*9488 MCFH H_2+CO, Bbl/Day = 5421.6 × gal/MCF

THE TEXAS COMPANY — MONTEBELLO LABORATORY
DATA SUMMARY

RUN NO. 59-W
HOURS 493-517

OPERATING CONDITIONS

PRESSURES PSIG		RATES S.C.F.H.	
Oxygen	445	Fresh Feed	14685
Natural Gas	442	Recycle	15892
Generator Outlet	427	Combined Feed	30577
Reactor Inlet	421	Wet Gas—Measured	4212
Condenser Inlet		Adjusted	4624
Product Accumulator	372	Loss	412
TEMPERATURES—°F.		Recycle/Fresh Feed	1.08
Oxygen	323	Inlet Velocity—ft./sec.	0.93
Natural Gas	304	Fresh Feed Rate—S.C.F.H. H_2+CO	14209
Generator	--	per Cu. Ft. Dense Bed	1071
Quench Accumulator	145	per Lb. Catalyst	7.14
Reactor Inlet	330	per Sq. Ft.	21529
Condenser Inlet	540		
Product Accumulator	96	Heat Transfer Calculations	
Catalyst No. Height		Steam Rate=366#/hr	
1 See Per. A	624	@ 705 psia & 506°F=	
2	652	1201 BTU	
3	659	Water in @ 75°F=43°F	
4	647	Net BTU/# Steam=1158	
5	660	1158x366=423828	
6	659	Ave. Bed Temp=654°F	
7	649	dT=654-506=148	
8	639	Tube Area=36.2 sq ft	
9	628	$K=\frac{423828}{(36.2)(148)}$=79.1 BTU/°F/sq ft	
10	625		
11	602		

PRODUCT TESTS

	OIL	WATER
° API	52.4	10.9
Neut. No.	30.7	27.7
Sap. No.	50.4	36.9
Hydrox. No.		
Bromine No.	93	
Pour °F.		
Chemicals, % by K_2CO_3		12.0
HEMPEL, DIST. %		°API
205 °F.		
400	75.2	55.1
400-550	12.4	37.3
550+	12.4	
A. S. T. M. DIST. ON Naphtha °F.		
IBP	110	
10%	142	
50%	224	
90%	350	
EP	388	
Rec.	97.5	

CATALYST DATA

INVENTORY DATA	
In Reactor at Start of Period	
Fresh Catalyst Added	35
Total	
Catalyst Recovered	68.5
In Reactor at End of Period	
REACTOR d-p, Inches H_2O	
No. Height	
0 See Period A	52
1	75
2	78
3	75
4	300
Total	580
CALCULATED FROM dp	
Density, Lbs./Cu.Ft.	150
Inventory, Lbs.	1991
Bed Depth, Ft.	20.11
Vol., Cu. Ft.	13.27

PARTICLE SIZE — Screen Analysis			Sedimentation	
Mesh	Microns	%	Microns	%
On 40	419+	42.5	80+	
100	150	40.8	40—80	
150	105	7.7	20—40	
200	74	4.8	10—20	
250	62	0.8	0—20	
325	44	2.2		
<325		1.2		

CATALYST	
Bulk Density, Lbs./Cu.Ft.	
Aerated	151
Settled	154
Compacted	178
Particle Density, gm./cc.	4.50
NH_3 Value, ml./gm.	
N_2 Surface, m^2/gm.	
CHEMICAL ANALYSIS	
Fe	
C	7.38
O	
H	
K_2O, W+, % basis Fe	
X-Ray Analysis—	
$Fe_{20}C_9$	
Fe_3O_4	
Fe	

RUN NO. 59-X
HOURS 517-541
CATALYST Spent CMAs

THE TEXAS COMPANY — MONTEBELLO LABORATORY
YIELD CALCULATIONS

	FRESH FEED %	FRESH FEED m/hr	FRESH FEED #/hr	WET GAS %	WET GAS At Wt. Balance m/hr	WET GAS At Wt. Balance #/hr	RECYCLE m/hr	COMBINED FEED m/hr	EFFLUENT m/hr	NET CHANGE m/hr	NET CHANGE #/hr
CO 28.010	37.977	14.638	410.03	9.843	1.205	33.76	4.114	18.752	5.319	-13.433	-376.27
H_2 2.016	58.560	22.573	45.51	34.486	4.222	8.51	14.413	36.986	18.635	-18.351	-37.00
CO_2 44.010	2.870	1.106	48.68	33.423	4.093	180.14	13.969	15.075	18.062	2.987	131.46
N_2 28.016	0.133	0.051	1.43	1.683	0.206	5.77	0.703	0.754	0.909		
CH_4 16.042	0.460	0.177	2.84	9.560	1.170	18.78	3.996	4.173	5.166	0.993	15.94
C_2H_4 28.052				2.740	0.335	9.40	1.145	1.145	1.480	0.335	9.40
C_2H_6 30.068				1.457	0.178	5.35	0.609	0.609	0.787	0.178	5.35
C_1+C_2											30.69
C_3H_6 42.078				2.610	0.319	13.42	1.091	1.091	1.410	0.319	13.42
C_3H_8 44.094				0.287	0.035	1.54	0.120	0.120	0.155	0.035	1.54
C_4H_8 56.104				1.737	0.213	11.95	0.726	0.726	0.939	0.213	11.95
C_4H_{10} 58.120				0.697	0.085	4.94	0.291	0.291	0.376	0.085	4.94
C_5H_{10} 70.130				0.967	0.118	8.28	0.404	0.404	0.522	0.118	8.28
C_5H_{12} 72.146				0.140	0.017	1.23	0.059	0.059	0.076	0.017	1.23
C_6H_{12} 84.156				0.370	0.045	3.79	0.155	0.155	0.200	0.045	3.79
C_3-C_6											45.15
TOTAL		38.545	508.49		12.241	306.86	41.795	80.340	61.847		
H_2+CO	96.537	37.211	14121432 SCFH		5.427		18.527	55.738	23.954	-31.784	
H_2/CO		1.54	Factor 708143		3.50		3.50	1.97	3.50	1.37	

Weight Recovery, %		Catalyst Age, hrs.	Space Velocity, vhv 1064	RECOVERED OIL	0.418** 58.66
Pressure, psig	421	Inlet Velocity, Ft/sec 0.93	Catalyst, Vol. CF 13.27	TOTAL OIL	103.81
Temperature, °F	658	Bed Depth, Ft 20.10	Weight, # 1977	WATER SOLUBLE CHEMICALS	0.279** 14.80
Recycle Ratio	1.08	Bed Density, #/CF 149	Effluent Shift Ratio $\frac{(H_2)(CO_2)}{(H_2O)(CO)}$ = 8.90	TOTAL LIQUID PRODUCTS C_5+	118.61

FRESH FEED CONVERSION — %				TOTAL FEED CONVERSION — %			SELECTIVITY		
Contraction	CO	H_2	H_2+CO	CO	H_2	CO+H_2	C_3 + /C_1 +	NET WATER	7.114** 128.17
68.24	91.77	81.30	85.42	71.64	49.62	57.02	79.44	GROSS WATER	142.97
								HYDROCARBON TOTAL—C_1+	149.30

YIELD BASIS H_2 + CO FED

CONDENSATE #/MCF	CONDENSATE #/gal	CONDENSATE gal/hr	CONDENSATE gal/MCF
10.124		17.288	1.225
10.572			

YIELDS BASIS BROWNSVILLE DESIGN FEED RATE*

	CORRECTED HEMPEL, %	gal/hr	TREATING RECOVERY, %	gal/hr
400 EP	77.4	7.063	98.0	6.922
400-550	14.0	1.278	91.4	1.168
550 +	8.6	0.785	114.6	0.900

	RECOVERY %	#/hr	gal/hr	
PROPYLENE	45.0	6.04		
C_3 POLY GASO.	87.5	5.28	0.883	
C_3 POLY TAR	12.5	0.76	0.101	

	#/gal	#/hr	gal/hr	RVP
C_4H_8	5.00	--	--	68.0
C_4 POLY GASO.	5.98	10.46 (4.34)	1.749 (1.016)	1.5
C_4H_{10}	4.86	4.85	0.998	68.0
C_4-FREE GASO.			10.242	5.8
C_4 POLY TAR	7.53	1.49	0.198	

	gal/hr	gal/MCF	Bbl/Day
10 # RVP 400 EP GASOLINE	12.989	0.9198	4987
GAS OIL	1.168	0.0827	448
FUEL OIL	0.900	0.0637	345
POLY TAR	0.299	0.0212	115
TOTAL	15.356	1.0874	5895
W. S. CHEM.	1.902	0.1347	730
TOTAL	17.258	1.2221	6625

Form ML—11

**Included in Reactor Effluent Total

g/NCM = 16.91 × #/MCF

*9488 MCFH H_2 + CO, Bbl/Day = 5421.6 × gal/MCF

RUN NO. 59-X
HOURS 517-541

THE TEXAS COMPANY — MONTEBELLO LABORATORY
DATA SUMMARY

OPERATING CONDITIONS		RATES S.C.F.H.	
PRESSURES PSIG			
Oxygen	445	Fresh Feed	14628
Natural Gas	442	Recycle	15861
Generator Outlet	426	Combined Feed	30489
Reactor Inlet	421	Wet Gas—Measured	4272
Condenser Inlet		Adjusted	4645
Product Accumulator	371	Loss	373
TEMPERATURES—°F.		Recycle/Fresh Feed	1.08
Oxygen	330	Inlet Velocity—ft./sec.	0.93
Natural Gas	313	Fresh Feed Rate—S.C.F.H.	14121
Generator		per Cu. Ft. Dense Bed (H_2+CO)	1064
Quench Accumulator	146	per Lb. Catalyst	7.14
Reactor Inlet	331	per Sq. Ft.	21395
Condenser Inlet	541		
Product Accumulator	99	Heat Transfer Calculations	
Catalyst No. Height		Steam Rate=373#/hr	
1 See Per. A	619	@ 705 psia & 506°Fs	
2	654	1201 BTU/# steam	
3	662	Water in @ 80°F=48°F	
4	652	Net BTU/# steam=1153	
5	664	1153x373=430069	
6	662	Ave. Bed Temp=658°F	
7	652	dT=658-506=152°F	
8	641	Tube Area=36.3	
9	630	K=$\frac{430069}{(36.3)(152)}$=77.9 BTU/°F/sq ft	
10	628		
11	604		

PRODUCT TESTS	OIL	WATER
°API	52.1	11.0
Neut. No.	31.2	28.5
Sap. No.	50.9	37.9
Hydrox. No.		
Bromine No.	95	
Pour °F.	below -35	
Chemicals, % by K_2CO_3		11.0
HEMPEL, DIST. %		°API
205 °F.		
400	76.4	55.2
400-550	14.0	37.7
550+	9.6	
A. S. T. M. DIST. ON		
Naphtha °F.		
IBP	110	
10%	136	
50%	222	
90%	342	
EP	386	
Rec.	97.0	

CATALYST DATA							
INVENTORY DATA		PARTICLE SIZE					
In Reactor at Start of Period		Screen Analysis			Sedimentation		
Fresh Catalyst Added	36	Mesh	Microns	%	Microns	%	
Total		On 40	419+	41.4	80+		
Catalyst Recovered	75.5	100	150	41.4	40—80		
In Reactor at End of Period		150	105	8.1	20—40		
		200	74	5.1	10—20		
REACTOR d-p, Inches H_2O		250	62	1.0	0—20		
No. Height		325	44	1.8			
0 See Period A	51	<325		1.2			
1	74	CATALYST					
2	76	Bulk Density, Lbs./Cu.Ft.					
3	75	Aerated				150	
4	300	Settled				151	
Total	576	Compacted				175	
		Particle Density, gm./cc.				4.43	
CALCULATED FROM dp		NH_3 Value, ml./gm.					
Density, Lbs./Cu.Ft.	149	N_2 Surface, m^2/gm.					
Inventory, Lbs.	1977						
Bed Depth, Ft.	20.10	CHEMICAL ANALYSIS					
Vol., Cu. Ft.	13.27	Fe					
		C				8.01	
		O					
		H					
		K_2O, W+, % basis Fe					
		X-Ray Analysis—					
		$Fe_{20}C_9$					
		Fe_3O_4					
		Fe					

RUN NO. 59-Y
HOURS 541-565
CATALYST Spent CM&S

THE TEXAS COMPANY — MONTEBELLO LABORATORY
YIELD CALCULATIONS

	FRESH FEED			WET GAS	At Wt. Balance		RECYCLE	COMBINED FEED	EFFLUENT	NET CHANGE		CONDENSATE				YIELD BASIS H_2+CO FED				
	%	m/hr	#/hr	%	m/hr	#/hr	m/hr	m/hr	m/hr	m/hr	#/hr	#/MCF	#/gal	gal/hr	gal/MCF	YIELDS BASIS BROWNSVILLE DESIGN FEED RATE*				
CO 28.010	38.547	14.711	412.05	9.737	1.222	34.23	3.798	18.509	5.020	-13.489	-377.82						CORRECTED HEMPEL, %	gal/hr	TREATING RECOVERY,%	gal/hr
H_2 2.016	58.076	22.163	44.67	34.966	4.389	8.85	13.639	35.802	18.028	-17.774	-35.82					400 EP	77.0	6.951	98.0	6.812
CO_2 44.010	2.460	0.939	41.33	32.937	4.134	181.95	12.848	13.787	16.982	3.195	140.62	10.049				400-550	14.0	1.264	91.4	1.155
N_2 28.016	0.310	0.118	3.31	1.803	0.226	6.33	0.703	0.821	0.929							550 +	9.0	0.812	114.6	0.931
CH_4 16.042	0.607	0.232	3.72	10.137	1.272	20.41	3.954	4.186	5.226	1.040	16.69	1.193								
C_2H_4 28.052				2.603	0.327	9.17	1.015	1.015	1.342	0.327	9.17	0.655					RECOVERY %	#/hr	gal/hr	
C_2H_6 30.068				1.317	0.165	4.96	0.514	0.514	0.679	0.165	4.96	0.354				PROPYLENE	43.2	6.23		
C_1+C_2											30.82	2.202				C_3 POLY GASO.	87.5	5.45	0.911	
C_2H_2 42.078				2.730	0.343	14.43	1.065	1.065	1.408	0.343	14.43	1.031	4.32	3.340	0.239	C_3 POLY TAR	12.5	0.78	0.104	
C_3H_8 44.094				0.320	0.040	1.76	0.125	0.125	0.165	0.040	1.76	0.126	4.24	0.415	0.030					
C_4H_8 56.104				1.627	0.204	11.45	0.635	0.635	0.839	0.204	11.45	0.818	5.00	2.290	0.164		#/gal	#/hr	gal/hr	RVP
C_4H_{10} 58.120				0.547	0.069	4.01	0.213	0.213	0.282	0.069	4.01	0.287	4.86	0.825	0.059	C_4H_8	5.00	0.62	0.124	68.0
C_5H_{10} 70.130				0.813	0.102	7.15	0.317	0.317	0.419	0.102	7.15	0.511	5.48	1.312	0.094	C_4 POLY GASO.	5.98	9.48	1.585	1.5
C_6H_{12} 72.146				0.150	0.019	1.37	0.059	0.059	0.078	0.019	1.37	0.098	5.25	0.261	0.019	C_4H_{10}	4.86	4.01	0.825	68.0
C_8H_{12} 84.156				0.313	0.039	3.28	0.122	0.122	0.161	0.039	3.28	0.234	5.84	0.592	0.042	C_4 FREE GASO.			9.888	5.8
C_3-C_6											43.45	3.105		9.035	0.647	C_4 POLY TAR	7.53	1.35	0.179	
TOTAL		38.163	505.08		12.551	309.35	39.007	77.170	59056											
H_2+CO	96.623	36.874	13993909 SCFH		5.611		17.437	54.311	23.048	-31.263							gal/hr	gal/MCF	Bbl/Day	
H_2/CO		1.51	Factor 714596		3.59		3.59	1.93	3.59	1.32						10 # RVP 400 EP GASOLINE	12.422	0.8877	4813	
Weight Recovery, % 95.06		Catalyst Age, hrs.		Space Velocity, vhv 1064			RECOVERED OIL	**	0.413	57.97	4.143		9.027	0.645	GAS OIL	1.155	0.0825	447	
Pressure, psig 416		Inlet Velocity, Ft/sec 0.90		Catalyst, Vol. CF 13.15			TOTAL OIL			101.42	7.248		18.062	1.292	FUEL OIL	0.931	0.0665	361	
Temperature, °F 657		Bed Depth, Ft 19.93		Weight, # 1960			WATER SOLUBLE CHEMICALS	**	0.289	15.32	1.095		2.004	0.143	POLY TAR	0.283	0.0202	110	
Recycle Ratio 1.02		Bed Density, #/C.F 149		Effluent $\frac{(H_2)(CO_2)}{(H_2O)(CO)}$ Shift Ratio = 8.97			TOTAL LIQUID PRODUCTS C_3+			116.74	8.343		20.066	1.435	TOTAL	14.791	1.0569	5731	
FRESH FEED CONVERSION — %				TOTAL FEED CONVERSION — %			SELECTIVITY									W. S. CHEM.	2.004	0.1432	776	
Contraction	CO	H_2	H_2+CO	CO	H_2	$CO+H_2$	C_3+/C_1+	NET WATER	**	6.796	122.44	8.750		14.699	1.050					
								GROSS WATER			137.76	9.845		16.703	1.193	TOTAL	16.795	1.2001	6507	
67.11	91.69	80.20	84.78	72.88	49.65	57.56	79.11	HYDROCARBON TOTAL—C_1+			147.56	10.545								

Form ML—11

** Included in Reactor Effluent Total

g/NCM = 16.91 × #/MCF *9488 MCFH H_2+CO, Bbl/Day = 5421.6 × gal/MCF

THE TEXAS COMPANY — MONTEBELLO LABORATORY
DATA SUMMARY

RUN NO. 59-Y
HOURS 541-565

OPERATING CONDITIONS				PRODUCT TESTS			CATALYST DATA				
PRESSURES PSIG		RATES S.C.F.H.			OIL	WATER	INVENTORY DATA		PARTICLE SIZE		
Oxygen	441	Fresh Feed	14483	°API	52.0	11.0	In Reactor at Start of Period		Screen Analysis		Sedimentation
Natural Gas	438	Recycle	14803	Neut. No.	35.8	33.2	Fresh Catalyst Added	35	Mesh / Microns / %		Microns / %
Generator Outlet	422	Combined Feed	29286	Sap. No.	49.0	37.8	Total		On 40	54.8	80+
Reactor Inlet	416	Wet Gas—Measured	4379	Hydrox. No.			Catalyst Recovered	69½	100 / 150	33.9	40—80
Condenser Inlet		Adjusted	4763	Bromine No.	93		In Reactor at End of Period		150 / 105	4.5	20—40
Product Accumulator	369	Loss	384	Pour °F.	below -35				200 / 74	3.6	10—20
				Chemicals, % by K_2CO_3		12.0	REACTOR d-p, Inches H_2O		250 / 62	0.8	0—20
							No. Height		325 / 44	1.2	
TEMPERATURES—°F.		Recycle/Fresh Feed	1.02				0 See Period A	51	<325	1.2	
Oxygen	324	Inlet Velocity—ft./sec.	0.90				1	75	CATALYST		
Natural Gas	313	Fresh Feed Rate—S.C.F.H.	13994	HEMPEL, DIST. %		°API	2	76	Bulk Density, Lbs./Cu.Ft.		
Generator		H_2+CO per Cu.Ft. Dense Bed	1064	205 °F.			3	74	Aerated		152
Quench Accumulator	153	per Lb. Catalyst	7.14	400	76.0	54.7	4	295	Settled		154
Reactor Inlet	306	per Sq. Ft.	21203	400-550	14.0	37.7	Total	571	Compacted		180
Condenser Inlet	538			550+	10.0				Particle Density, gm./cc.		4.58
Product Accumulator	98	Heat Transfer Calculations					CALCULATED FROM dp		NH_3 Value, ml./gm.		
Catalyst No. Height		Steam Rate=356#/hr		A. S. T. M. DIST. ON			Density, Lbs./Cu.Ft.	149	N_2 Surface, m^2/gm.		
1 See Per. A	611	@ 705 psia & 506°F		Naphtha °F.			Inventory, Lbs.	1960			
2	651	1201 BTU/#		IBP	110		Bed Depth, Ft.	19.93	CHEMICAL ANALYSIS		
3	668	Water in @ 82.7=41 BTU/#		10%	140		Vol., Cu. Ft.	13.15	Fe		
4	652	Net BTU/# Steam=1160		50%	224				C		8.24
5	662	1160x356=412960		90%	348				O		
6	660	Ave. Bed Temp=657		EP	392				H		
7	650	dT=657-506=151°F		Rec.	97.0				K_2O, W+, % basis Fe		
8	639	Tube Area=36.0 sq ft							X-Ray Analysis—		
9	627	$K=\frac{412960}{(36.0)(151)}=76.0$ BTU/°F/sq ft							$Fe_{20}C_9$		
10	624								Fe_3O_4		
11	601								Fe		

RUN NO. 59-Z
HOURS 565-589
CATALYST Spent CM&S

THE TEXAS COMPANY — MONTEBELLO LABORATORY
YIELD CALCULATIONS

	FRESH FEED %	FRESH FEED m/hr	FRESH FEED #/hr	WET GAS %	WET GAS At Wt. Balance m/hr	WET GAS At Wt. Balance #/hr	RECYCLE m/hr	COMBINED FEED m/hr	EFFLUENT m/hr	NET CHANGE m/hr	NET CHANGE #/hr
CO 28.010	40.040	15.074	422.22	8.313	1.076	30.14	3.200	18.274	4.276	-13.998	-392.08
H_2 2.016	56.717	21.352	43.05	36.407	4.710	9.50	14.013	35.365	18.723	-16.642	-33.55
CO_2 44.010	2.463	0.927	40.80	32.360	4.188	184.31	12.455	13.382	16.643	3.261	143.51
N_2 28.016	0.213	0.080	2.24	1.807	0.234	6.56	0.696	0.776	0.930		
CH_4 16.042	0.567	0.214	3.43	9.630	1.246	19.99	3.707	3.921	4.953	1.032	16.56
C_2H_4 28.052				2.653	0.343	9.62	1.021	1.021	1.346	0.343	9.62
C_2H_6 30.068				1.377	0.178	5.35	0.530	0.530	0.708	0.178	5.35
C_1+C_2											31.53
C_3H_6 42.078				2.867	0.371	15.61	1.104	1.104	1.475	0.371	15.61
C_3H_8 44.094				0.343	0.044	1.94	0.132	0.132	0.176	0.044	1.94
C_4H_8 56.104				1.903	0.246	13.80	0.732	0.732	0.978	0.246	13.80
C_4H_{10} 58.120				0.897	0.116	6.74	0.345	0.345	0.461	0.116	6.74
C_5H_{10} 70.130				0.983	0.127	8.91	0.378	0.378	0.505	0.127	8.91
C_5H_{12} 72.146				0.133	0.017	1.23	0.051	0.051	0.068	0.017	1.23
C_6H_{12} 84.156				0.327	0.042	3.53	0.126	0.126	0.168	0.042	3.53
C_3-C_6											51.76
TOTAL		37.647	511.74		12.938	317.24	38.490	76.137	58.791		
H_2+CO	96.757	36.426	13824 SCFH	5.786			17.213	53.639	22.999	-30.640	
H_2/CO		1.42	Factor 723396	4.38			4.38	1.94	4.38	1.19	

Weight Recovery, %	95.21	Catalyst Age, hrs.	Space Velocity, vhv	1050	RECOVERED OIL **
Pressure, psig	413	Inlet Velocity, Ft/sec 0.88	Catalyst, Vol. CF 13.17		TOTAL OIL
Temperature, °F	648	Bed Depth, Ft 19.96	Weight, #	1963	WATER SOLUBLE CHEMICALS **
Recycle Ratio	1.02	Bed Density, #/CF 149	Effluent $\frac{(H_2)(CO_2)}{(H_2O)(CO)}$ Shift Ratio	= 10.98	TOTAL LIQUID PRODUCTS C_3+

FRESH FEED CONVERSION — %				TOTAL FEED CONVERSION — %			SELECTIVITY	
Contraction	CO	H_2	H_2+CO	CO	H_2	CO+H_2	C_3 + /C_1 +	
65.63	92.86	77.94	84.12	76.60	47.06	57.12	80.07	

	NET CHANGE #/hr
RECOVERED OIL **	58.67
TOTAL OIL	110.43
WATER SOLUBLE CHEMICALS **	16.25
TOTAL LIQUID PRODUCTS C_3+	126.68
NET WATER **	119.58
GROSS WATER	135.83
HYDROCARBON TOTAL—C_1+	158.21

YIELD BASIS H_2+CO FED — CONDENSATE #/MCF	#/gal	gal/hr	gal/MCF
10.381			
1.198			
0.696			
0.387			
2.281			
1.129	4.32	3.613	0.261
0.140	4.24	0.458	0.033
0.998	5.00	2.760	0.200
0.488	4.86	1.387	0.100
0.645	5.45	1.635	0.118
0.089	5.25	0.234	0.017
0.255	5.54	0.637	0.046
3.744		10.724	0.776
8.650		14.355	1.038
9.826		16.424	1.188
11.445			

YIELDS BASIS BROWNSVILLE DESIGN FEED RATE*	CORRECTED HEMPEL, %	gal/hr	TREATING RECOVERY, %	gal/hr
400 EP	74.4	6.826	98.0	6.689
400-550	14.8	1.358	91.4	1.241
550 +	10.8	0.991	114.6	1.136
	RECOVERY %	#/hr	gal/hr	
PROPYLENE	40.9	6.38		
C_3 POLY GASO.	87.5	5.58	0.933	
C_3 POLY TAR	12.5	0.80	0.106	
	#/gal	#/hr	gal/hr	RVP
C_4H_8	5.00			68.0
C_4 POLY GASO.	5.98	12.08	2.019	1.5
C_4H_{10}	4.86	(6.74) 5.00	(1.387) 1.029	68.0
C_4-FREE GASO.			10.128	5.8
C_4 POLY TAR	7.53	1.73	0.230	
	gal/hr	gal/MCF	Bbl/Day	
10 # RVP 400 EP GASOLINE	13.176	0.9531	5167	
GAS OIL	1.241	0.0898	487	
FUEL OIL	1.136	0.0822	446	
POLY TAR	0.336	0.0243	132	
TOTAL	15.889	1.494	6232	
W. S. CHEM.	2.069	0.1497	812	
TOTAL	17.958	1.2991	7043	

Form ML—11

** Included in Reactor Effluent Total

g/NCM = 16.91 × #/MCF *9488 MCFH H_2 + CO, Bbl/Day = 5421.6 × gal/MCF

RUN NO. 59-Z
HOURS 565-589

THE TEXAS COMPANY — MONTEBELLO LABORATORY
DATA SUMMARY

OPERATING CONDITIONS				PRODUCT TESTS	OIL	WATER
PRESSURES PSIG		RATES S.C.F.H.				
Oxygen	436	Fresh Feed	14287	° API	52.3	11.1
Natural Gas	433	Recycle	14607	Neut. No.	35.4	34.0
Generator Outlet	418	Combined Feed	28894	Sap. No.	49.7	37.5
Reactor Inlet	413	Wet Gas—Measured	4531	Hydrox. No.		
Condenser Inlet		Adjusted	4910	Bromine No.	93	
Product Accumulator	368	Loss	379	Pour °F.	-30	
				Chemicals, % by K_2CO_3		12.6
TEMPERATURES—°F.		Recycle/Fresh Feed	1.02			
Oxygen	339	Inlet Velocity—ft./sec.	0.88			
Natural Gas	323	Fresh Feed Rate—S.C.F.H. CO+H_2	13824	HEMPEL, DIST. %		°API
Generator		per Cu. Ft. Dense Bed	1050	205 °F.		
Quench Accumulator	148	per Lb. Catalyst	7.04	400	73.4	54.9
Reactor Inlet	255	per Sq. Ft.	20945	400-550	14.8	38.6
Condenser Inlet	528			550+	11.8	--
Product Accumulator	98	Heat Transfer Calculations				
Catalyst No. Height		Steam Rate=321#/hr		A. S. T. M. DIST. ON		
1 See Per. A	590	@ 705 psia & 507°F		Naphtha °F.		
2	635	1201 BTU		IBP	110	
3	664	Water in @ 85°F=53°F		10%	144	
4	649	Net BTU/# Steam=1148		50%	228	
5	649	1148x321=368508		90%	350	
6	650	Ave. Bed Temp=648		EP	394	
7	641	dT=648-507=141°F		Rec.	97.0	
8	631	Tube Area=36.0 sq ft				
9	621	$K = \frac{368508}{(36.0)(141)} = 72.6$ BTU/°F/sq ft				
10	616					
11	593					

CATALYST DATA — INVENTORY DATA		PARTICLE SIZE				
		Screen Analysis			Sedimentation	
In Reactor at Start of Period		Mesh	Microns	%	Microns	%
Fresh Catalyst Added	34	On 40	419+	40.4	80+	
Total		100	150	37.4	40—80	
Catalyst Recovered	65	150	105	8.9	20—40	
In Reactor at End of Period		200	74	7.3	10—20	
		250	62	1.2	0—20	
REACTOR d-p, Inches H_2O		325	44	3.4		
No. Height		<325		1.4		
0 See Period A	51					
1	75	CATALYST				
2	76	Bulk Density, Lbs./Cu.Ft.				
3	75	Aerated			150	
4	295	Settled			152	
Total	572	Compacted			171	
		Particle Density, gm./cc.			4.52	
CALCULATED FROM dp		NH_3 Value, ml./gm.				
Density, Lbs./Cu.Ft.	149	N_2 Surface, m^2/gm.				
Inventory, Lbs.	1963					
Bed Depth, Ft.	19.96	CHEMICAL ANALYSIS				
Vol., Cu. Ft.	13.17	Fe				
		C			6.86	
		O				
		H				
		K_2O, W+, % basis Fe				
		X-Ray Analysis—				
		$Fe_{20}C_9$				
		Fe_3O_4				
		Fe				

RUN NO. 59-AA
HOURS 589-613
CATALYST Spent CM&S

THE TEXAS COMPANY — MONTEBELLO LABORATORY
YIELD CALCULATIONS

	FRESH FEED			WET GAS			RECYCLE	COMBINED FEED	EFFLUENT	NET CHANGE		YIELD BASIS H_2+CO FED								
	%	m/hr	#/hr	%	At Wt. Balance m/hr	At Wt. Balance #/hr	m/hr	m/hr	m/hr	m/hr	#/hr	CONDENSATE #/MCF	#/gal	gal/hr	gal/MCF	YIELDS BASIS BROWNSVILLE DESIGN FEED RATE*	CORRECTED HEMPEL, %	gal/hr	TREATING RECOVERY, %	gal/hr
CO 28.010	39.446	14.825	415.26	7.653	0.977	27.37	2.889	17.714	3.866	-13.848	387.89									
H_2 2.016	56.783	21.342	43.03	35.384	4.518	9.11	13.357	34.699	17.875	-16.824	33.92					400 EP	74.0	6.566	98.0	6.435
CO_2 44.010	2.797	1.051	46.26	34.987	4.468	196.63	13.208	14.259	17.676	3.417	150.37	10.956				400-550	14.8	1.313	91.4	1.200
N_2 28.016	0.237	0.089	2.49	1.947	0.249	6.98	0.735	0.824	0.984							550 +	11.2	0.994	114.6	1.139
CH_4 16.042	0.737	0.277	4.45	9.287	1.186	19.03	3.506	3.783	4.692	0.909	14.58	1.062								
C_2H_4 28.052				2.623	0.335	9.40	0.990	0.990	1.325	0.335	9.40	0.685					RECOVERY %	#/hr	gal/hr	
C_2H_6 30.068				1.327	0.169	5.08	0.501	0.501	0.670	0.169	5.08	0.370				PROPYLENE	40.4	5.676		
C_1+C_2											29.06	2.117				C_3 POLY GASO.	87.5	4.967	0.831	
C_3H_6 42.078				2.613	0.334	14.05	0.986	0.986	1.320	0.334	14.05	1.024	4.32	3.252	0.237	C_3 POLY TAR	12.5	0.710	0.094	
C_3H_8 44.094				0.323	0.041	1.81	0.122	0.122	0.163	0.041	1.81	0.132	4.24	0.426	0.031					
C_4H_8 56.104				1.780	0.227	12.74	0.672	0.672	0.899	0.227	12.74	0.928	5.00	2.548	0.186		#/gal	#/hr	gal/hr	RVP
C_4H_{10} 58.120				0.607	0.078	4.53	0.229	0.229	0.307	0.078	4.53	0.330	4.86	0.932	0.068	C_4H_8	5.00	0.230	0.046	68.0
C_5H_{10} 70.130				0.973	0.124	8.70	0.367	0.367	0.491	0.124	8.70	0.634	5.45	1.596	0.116	C_4 POLY GASO.	5.98	10.946	1.830	1.5
C_5H_{12} 72.146				0.143	0.018	1.30	0.054	0.054	0.072	0.018	1.30	0.095	5.25	0.248	0.018	C_4H_{10}	4.86	4.530	0.932	68.0
C_6H_{12} 84.156				0.353	0.045	3.79	0.133	0.133	0.178	0.045	3.79	0.276	5.54	0.684	0.050	C_4-FREE GASO.			9.794	5.8
C_3-C_4											46.92	3.419		9.686	0.706	C_4 POLY TAR	7.53	1.564	0.207	
TOTAL		37.584	511.49		12.769	320.52	37.750	75.334	57.770											
H_2+CO	96.229	36.167	13725 SCFH		5.495		16.246	52.413	21.741	-30.672							gal/hr	gal/MCF	Bbl/Day	
H_2/CO		1.44	Factor 728597		4.62		4.62	1.96	4.62	1.21						10 # RVP 400 EP GASOLINE	12.602	0.9182	4978	
									RECOVERED OIL	** 0.407	57.09	4.160		8.873	0.646	GAS OIL	1.200	0.0874	474	
									TOTAL OIL		104.01	7.579		18.559	1.352	FUEL OIL	1.139	0.0830	450	
									WATER SOLUBLE CHEMICALS	** 0.302	16.02	1.167		2.040	0.149	POLY TAR	0.301	0.0219	119	
									TOTAL LIQUID PRODUCTS C_5+		120.03	8.746		20.599	1.501	TOTAL	15.242	1.1105	6021	
									NET WATER	** 6.542	117.86	8.587		14.149	1.031	W. S. CHEM.	2.040	0.1486	806	
									GROSS WATER		133.88	9.754		16.189	1.180	TOTAL	17.282	1.2592	6827	
									HYDROCARBON TOTAL—C_1+		149.09	10.863							

Weight Recovery, % 94.23 | Catalyst Age, hrs. | Space Velocity, vhv 1051
Pressure, psig 413 | Inlet Velocity, Ft/sec 0.88 | Catalyst, Vol CF 13.06
Temperature, °F 650 | Bed Depth, Ft 19.79 | Weight, # 1946
Recycle Ratio 1.00 | Bed Density, #/CF 149 | Effluent $(H_2)(CO_2)$ / Shift Ratio $(H_2O)(CO)$ = 12.49

FRESH FEED CONVERSION — %: Contraction 66.27; CO 93.41; H_2 78.83; H_2+CO 84.81
TOTAL FEED CONVERSION — %: CO 78.18; H_2 48.49; CO+H_2 58.52
SELECTIVITY: C_3 + /C_1 + 80.51

Form ML—11

** Included in Reactor Effluent Total

g/NCM = 16.91 × #/MCF *9488 MCFH H_2 + CO, Bbl/Day = 5421.6 × gal/MCF

RUN NO. 59-AA
HOURS 589-613

THE TEXAS COMPANY — MONTEBELLO LABORATORY
DATA SUMMARY

OPERATING CONDITIONS				PRODUCT TESTS			CATALYST DATA				
PRESSURES PSIG		RATES S.C.F.H.			OIL	WATER	INVENTORY DATA		PARTICLE SIZE		
Oxygen	437	Fresh Feed	14263	°API	51.6	11.0	In Reactor at Start of Period		Screen Analysis		Sedimentation
Natural Gas	434	Recycle	14326	Neut. No.	38.7	35.8	Fresh Catalyst Added (Red.)	36	Mesh / Microns / %		Microns / %
Generator Outlet	417	Combined Feed	28589	Sap. No.	47.9	37.5	Total		On 40 / 419+ / 40.8		80+
Reactor Inlet	413	Wet Gas—Measured	4400	Hydrox. No.			Catalyst Recovered	56½	100 / 150 / 39.8		40—80
Condenser Inlet		Adjusted	4846	Bromine No.	93		In Reactor at End of Period		150 / 105 / 7.5		20—40
Product Accumulator	366	Loss	446	Pour °F.	-30				200 / 74 / 6.1		10—20
				Chemicals, % by K_2CO_3		12.6	REACTOR d-p, Inches H_2O		250 / 62 / 1.6		0—20
							No. Height		325 / 44 / 2.0		
TEMPERATURES—°F.		Recycle/Fresh Feed	1.00				0 See Period A	51	<325 / / 2.2		
Oxygen	294	Inlet Velocity—ft./sec.	0.88				1	75	CATALYST		
Natural Gas	320	Fresh Feed Rate—S.C.F.H. $CO+H_2$	13725	HEMPEL, DIST. %		°API	2	76	Bulk Density, Lbs./Cu.Ft.		
Generator	--	per Cu.Ft. Dense Bed	1051	205 °F.			3	75	Aerated		151
Quench Accumulator	147	per Lb. Catalyst	7.05	400	73.0	54.0	4	290	Settled		152
Reactor Inlet	272	per Sq. Ft.	20795	400-550	14.8	37.8	Total	567	Compacted		176
Condenser Inlet	535			550+	12.2				Particle Density, gm./cc.		4.37
Product Accumulator	100	Heat Transfer Calculations					CALCULATED FROM dp		NH_3 Value, ml./gm.		
Catalyst No. Height		Steam Rate = 336 #/hr		A. S. T. M. DIST. ON			Density, Lbs./Cu.Ft.	149	N_2 Surface, m^2/gm.		
1 See Per. A	601	@ 705 psia & 506°F =		Naphtha °F.			Inventory, Lbs.	1946			
2	641	1201 BTU		IBP	114		Bed Depth, Ft.	19.79	CHEMICAL ANALYSIS		
3	662	Water in @ 84°F = 52°F		10%	144		Vol., Cu. Ft.	13.06	Fe		68.6
4	647	Net BTU/# Steam = 1149		50%	230				C		6.94
5	653	1149 x 336 = 386064		90%	354				O		.47
6	653	Ave. Bed Temp = 650		EP	390				H		
7	645	dT = 650-506 = 144°F		Rec.	96.5				K_2O, W+, % basis Fe		
8	634	Tube Area = 35.8 sq ft							X-Ray Analysis—		
9	623	$K = \frac{386064}{(35.8)(144)} = 74.9$ BTU/°F/sq ft							$Fe_{20}C_9$		
10	617								Fe_3O_4		
11	569								Fe		1.78

RUN NO. 59-BB
HOURS 613-637
CATALYST Spent CM&S

THE TEXAS COMPANY — MONTEBELLO LABORATORY
YIELD CALCULATIONS

	FRESH FEED %	FRESH FEED m/hr	FRESH FEED #/hr	WET GAS %	WET GAS At Wt. Balance m/hr	WET GAS At Wt. Balance #/hr	RECYCLE m/hr	COMBINED FEED m/hr	EFFLUENT m/hr	NET CHANGE m/hr	NET CHANGE #/hr
CO 28.010	37.563	14.583	408.45	9.613	1.199	33.58	5.646	18.229	4.845	-13.384	-374.87
H_2 2.016	59.720	23.184	46.74	36.096	4.503	9.08	13.689	36.873	18.192	-18.681	-37.66
CO_2 44.010	1.967	0.764	33.62	32.383	4.040	177.79	12.281	13.045	16.321	3.276	144.17
N_2 28.016	0.147	0.057	1.60	1.840	0.230	6.44	0.698	0.755	0.928		
CH_4 16.042	0.603	0.234	3.75	9.227	1.151	18.46	3.499	3.733	4.650	0.917	14.71
C_2H_4 28.052				2.710	0.338	9.48	1.028	1.028	1.366	0.338	9.48
C_2H_6 30.068				1.273	0.159	4.78	0.483	0.483	0.642	0.159	4.78
C_1+C_2											28.97
C_3H_6 42.078				2.667	0.333	14.01	1.011	1.011	1.344	0.333	14.01
C_3H_8 44.094				0.290	0.036	1.59	0.110	0.110	0.146	0.036	1.59
C_4H_8 56.104				1.817	0.227	12.74	0.689	0.689	0.916	0.227	12.74
C_4H_{10} 58.120				0.637	0.079	4.59	0.242	0.242	0.321	0.079	4.59
C_5H_{10} 70.130				0.983	0.123	8.63	0.373	0.373	0.496	0.123	8.63
C_5H_{12} 72.146				0.137	0.017	1.23	0.052	0.052	0.069	0.017	1.23
C_6H_{12} 84.156				0.327	0.041	3.45	0.124	0.124	0.165	0.041	3.45
C_3-C_6											46.24
TOTAL		38.822	494.16		12.476	305.85	37.924	76.746	57.571		
H_2+CO	97.283	37.767	1433270 SCFH	5.702			17.335	55.102	33.037	-32.065	
H_2/CO		1.59	Factor 697705	3.76			3.75	2.02	3.75	1.40	

Weight Recovery, % 9585	Catalyst Age, hrs.	Space Velocity, vhv 1113	RECOVERED OIL	** 0.403	56.48
Pressure, psig 411	Inlet Velocity, Ft/sec 0.91	Catalyst, Vol. CF 12.88	TOTAL OIL		102.72
Temperature, °F 654	Bed Depth, Ft 19.51	Weight, # 1932	WATER SOLUBLE CHEMICALS	** 0.282	14.98
Recycle Ratio 0.98	Bed Density, #/CF 150	Effluent $(H_2)(CO_2)$ / Shift Ratio $(H_2O)(CO)$ = 9.45	TOTAL LIQUID PRODUCTS C_3+		117.70

FRESH FEED CONVERSION — %				TOTAL FEED CONVERSION — %			SELECTIVITY		
Contraction	CO	H_2	H_2+CO	CO	H_2	CO+H_2	C_3+ /C_1+	NET WATER	** 6.486	116.85
67.86	91.78	80.58	84.90	73.42	50.66	58.19	80.25	GROSS WATER		131.83
								HYDROCARBON TOTAL—C_1+		146.67

YIELD BASIS H_2+CO FED

CONDENSATE #/MCF	CONDENSATE #/gal	CONDENSATE gal/hr	CONDENSATE gal/MCF
8.153		14.028	0.979
9.198		15.941	1.112
10.233			

YIELDS BASIS BROWNSVILLE DESIGN FEED RATE*	CORRECTED HEMPEL, %	gal/hr	TREATING RECOVERY, %	gal/hr
400 EP	76.3	6.706	98.0	6.572
400-550	15.6	1.371	91.4	1.253
550 +	8.1	0.712	114.6	0.816

	RECOVERY %	#/hr	gal/hr
PROPYLENE	44.2	6.19	
C_3 POLY GASO.	87.5	5.42	0.906
C_3 POLY TAR	12.5	0.77	0.102

	#/gal	#/hr	gal/hr	RVP
C_4H_8	5.00	0.21	0.042	68.0
C_4 POLY GASO.	5.98	10.96	1.833	1.5
C_4H_{10}	4.86	4.59	0.944	68.0
C_4-FREE GASO.			9.918	5.8
C_4 POLY TAR	7.53	1.57	0.208	

	gal/hr	gal/MCF	Bbl/Day
10 # RVP 400 EP GASOLINE	12.737	0.8887	4818
GAS OIL	1.253	0.0874	474
FUEL OIL	0.816	0.0569	308
POLY TAR	0.310	0.0216	117
TOTAL	15.116	1.0546	5717
W. S. CHEM.	1.913	0.1335	724
TOTAL	17.029	1.1881	6441

Form ML—11

** Included in Reactor Effluent Total

g/NCM = 16.91 × #/MCF *9488 MCFH H_2 + CO, Bbl/Day = 5421.6 × gal/MCF

RUN NO. 59-BB
HOURS 613-637

THE TEXAS COMPANY — MONTEBELLO LABORATORY
DATA SUMMARY

OPERATING CONDITIONS		RATES S.C.F.H.	
PRESSURES PSIG			
Oxygen	434	Fresh Feed	14733
Natural Gas	432	Recycle	14392
Generator Outlet	416	Combined Feed	29125
Reactor Inlet	411	Wet Gas—Measured	4417
Condenser Inlet		Adjusted	4735
Product Accumulator	364	Loss	318
TEMPERATURES—°F.		Recycle/Fresh Feed	0.98
Oxygen	285	Inlet Velocity—ft./sec.	0.91
Natural Gas	332	Fresh Feed Rate—S.C.F.H.	14333
Generator		per Cu. Ft. Dense Bed	1113
Quench Accumulator	151	per Lb. Catalyst	7.42
Reactor Inlet	304	per Sq. Ft.	21717
Condenser Inlet	540		
Product Accumulator	100	**Heat Transfer Calculations**	
Catalyst No. Height		**SteamRate=364#/hr**	
1	616	**@ 704 psia & 507°F**	
2	652	**1201 BTU/#**	
3	657	**Water in @ 84°F=52 BTU/#**	
4	646	**Net BTU/# steam=1149**	
5	660	**1149x364=418236**	
6	659	**Ave. BedTemp=654°F**	
7	650	**dT=654-507=147°F**	
8	638	**Tube Area=35.4 sq ft**	
9	627	**K= 418236 / (147)(35.4) =80.4 BTU/°F/sq ft**	
10	622		
11	599		

PRODUCT TESTS	OIL	WATER
° API	51.8	11.0
Neut. No.	38.1	35.3
Sap. No.	50.3	37.9
Hydrox. No.		
Bromine No.	93	
Pour °F.		
Chemicals, % by K_2CO_3		12.0
HEMPEL, DIST. %		°API
205 °F.		
400	75.3	55.5
400-550	15.6	37.5
550+	9.1	
A. S. T. M. DIST. ON		
Naphtha °F.		
IBP	110	
10%	138	
50%	228	
90%	364	
EP	390	
Rec.	96.0	

CATALYST DATA		PARTICLE SIZE				
INVENTORY DATA		Screen Analysis			Sedimentation	
In Reactor at Start of Period		Mesh	Microns	%	Microns	%
Fresh Catalyst Added	35	On 40	419+	39.2	80+	
Total		100	150	42.7	40—80	
Catalyst Recovered	65.5	150	105	8.0	20—40	
In Reactor at End of Period		200	74	6.1	10—20	
		250	62	1.0	0—20	
REACTOR d-p, Inches H_2O		325	44	2.0		
No. Height		<325		1.0		
0 See Period A	51					
1	75	CATALYST				
2	76	Bulk Density, Lbs./Cu.Ft.				
3	76	Aerated				148
4	285	Settled				149
Total	563	Compacted				167
		Particle Density, gm./cc.				4.44
CALCULATED FROM dp		NH_3 Value, ml./gm.				
Density, Lbs./Cu.Ft.	150	N_2 Surface, m^2/gm.				
Inventory, Lbs.	1932	•				
Bed Depth, Ft.	19.51	CHEMICAL ANALYSIS				
Vol., Cu. Ft.	12.88	Fe				
		C				5.86
		O				
		H				
		K_2O, W+, % basis Fe				
		X-Ray Analysis—				
		$Fe_{20}C_9$				
		Fe_3O_4				
		Fe				

RUN NO. 59-CC
HOURS 637-661
CATALYST Spent GMAS

THE TEXAS COMPANY — MONTEBELLO LABORATORY
YIELD CALCULATIONS

	FRESH FEED			WET GAS			RECYCLE	COMBINED FEED	EFFLUENT	NET CHANGE		YIELD BASIS H_2+CO FED								
	%	m/hr	#/hr	%	At Wt. Balance m/hr	#/hr	m/hr	m/hr	m/hr	m/hr	#/hr	CONDENSATE #/MCF	#/gal	gal/hr	gal/MCF	YIELDS BASIS BROWNSVILLE DESIGN FEED RATE*				
CO 28.010	37.990	14.430	404.19	4.983	0.617	17.28	1.864	16.294	2.481	-13.813	-386.91						CORRECTED HEMPEL, %	gal/hr	TREATING RECOVERY,%	gal/hr
H_2 2.016	58.077	22.060	44.47	34.687	4.294	8.66	12.979	35.039	17.273	-17.766	-35.81					400 EP	75.8	6.770	98.0	6.635
CO_2 44.010	2.883	1.095	48.19	33.924	4.198	184.77	12.694	13.789	16.892	3.103	136.58	9.863				400-550	15.2	1.358	91.4	1.241
N_2 28.016	0.317	0.120	3.36	2.273	0.281	7.87	0.850	0.970	1.131							550 +	9.0	0.804	114.6	0.921
CH_4 16.042	0.733	0.279	4.48	11.220	1.389	22.28	4.198	4.477	5.587	1.110	17.80	1.285								
C_2H_4 28.052				3.127	0.387	10.86	1.170	1.170	1.557	0.387	10.86	0.784					RECOVERY %	#/hr	gal/hr	
C_3H_6 30.068				1.657	0.205	6.16	0.620	0.620	0.825	01205	6.16	0.445				PROPYLENE	43.6	7.39		
C_1+C_2											34.82	2.514				C_3 POLY GASO.	87.5	6.47	1.082	
C_3H_8 42.078				3.253	0.403	16.96	1.217	1.217	1.620	0.403	16.96	1.225	4.32	3.926	0.284	C_3 POLY TAR	12.5	0.92	0.122	
C_3H_8 44.094				0.363	0.045	1.98	0.136	0.136	0.181	0.045	1.98	0.143	4.24	0.467	0.034					
C_4H_8 56.104				2.143	0.265	14.87	0.802	0.802	1.067	0.265	14.87	1.074	5.00	2.974	0.215		#/gal	#/hr	gal/hr	RVP
C_4H_{10} 58.120				0.667	0.083	4.82	0.250	0.250	0.333	0.083	4.82	0.348	4.86	0.992	0.072	C_4H_8	5.00	0.42	0.084	68.0
C_5H_{10} 70.130				1.117	0.138	9.68	0.418	0.418	0.556	0.138	9.68	0.699	5.48	1.776	0.128	C_4 POLY GASO.	5.98	12.64	2.114	1.5
C_5H_{12} 72.146				0.193	0.024	1.73	0.072	0.072	0.096	0.024	1.73	0.125	5.28	0.330	0.024	C_4H_{10}	4.86	4.82	0.992	68.0
C_6H_{12} 84.156				0.393	0.049	4.12	0.147	0.147	0.196	0.049	4.12	0.298	5.54	0.744	0.054	C_4 FREE GASO.			1 0.567	5.8
C_3-C_6											54.16	3.912		11.209	0.811	C_4 POLY TAR	7.53	1.81	0.240	
TOTAL		37.984	504.69		12.378	312.04	37.417	75.401	57.144											
H_2+CO	96.067	36.490	13848058 SCFH		4.911		14.843	51.333	19.754	-31.579							gal/hr	gal/MCF	Bbl/Day	
H_2/CO		1.53	Factor 722122		6.96		6.96	2.15	6.96	1.29						10 # RVP 400 EP GASOLINE	13.757	0.9934	5386	
									**	0.409	57.33	4.140		8.932	0.645	GAS OIL	1.241	0.0896	486	
											111.49	8.052		20.141	1.456	FUEL OIL	0.921	0.0665	361	
									**	0.294	15.59	1.126		1.960	0.142	POLY TAR	0.362	0.0261	142	
									**		127.08	9.178		22.101	1.598	TOTAL	16.281	1.1756	6375	
										6.646	119.73	8.646		14.373	1.038	W. S. CHEM.	1.960	0.1415	767	
											135.32	9.772		16.333	1.180	TOTAL	18.241	1.3171	7142	
											161.90	11.692								

Weight Recovery, % 96.24 | Catalyst Age, hrs. | Space Velocity, vhv 1082 | RECOVERED OIL
Pressure, psig 408 | Inlet Velocity, Ft/sec 0.90 | Catalyst, Vol, CF 12.80 | TOTAL OIL
Temperature, °F 657 | Bed Depth, Ft 19.50 | Weight, # 1908 | WATER SOLUBLE CHEMICALS
Recycle Ratio 0.99 | Bed Density, #/CF 149 | Effluent $\frac{(H_2)(CO_2)}{(H_2O)(CO)}$ = 17.70 Shift Ratio | TOTAL LIQUID PRODUCTS C_3+

FRESH FEED CONVERSION — %: Contraction 67.41 | CO 95.72 | H_2 80.53 | H_2+CO 86.54
TOTAL FEED CONVERSION — %: CO 84.77 | H_2 50.70 | CO+H_2 61.52
SELECTIVITY: C_3+/C_1+ 78.49
NET WATER | GROSS WATER | HYDROCARBON TOTAL—C_1+

Form ML—11

**Included in Reactor Effluent Total

g/NCM = 16.91 × #/MCF *9488 MCFH H_2 + CO, Bbl/Day = 5421.6 × gal/MCF

RUN NO. 59-CC
HOURS 637-661

THE TEXAS COMPANY — MONTEBELLO LABORATORY
DATA SUMMARY

OPERATING CONDITIONS				PRODUCT TESTS			CATALYST DATA					
PRESSURES PSIG		RATES S.C.F.H.			OIL	WATER	INVENTORY DATA		PARTICLE SIZE			
Oxygen	432	Fresh Feed	14415	°API	51.9	10.8	In Reactor at Start of Period		Screen Analysis			Sedimentation
Natural Gas	429	Recycle	14200	Neut. No.	37.9	36.0	Fresh Catalyst Added	39	Mesh	Microns	%	Microns %
Generator Outlet	414	Combined Feed	28615	Sap. No.	49.0	36.5	Total		On 40	419+	56.6	80+
Reactor Inlet	408	Wet Gas—Measured	4412	Hydrox. No.			Catalyst Recovered	61.5	100	150	31.8	40—80
Condenser Inlet		Adjusted	4697	Bromine No.	93		In Reactor at End of Period		150	105	4.4	20—40
Product Accumulator	360	Loss	285	Pour °F.	-30				200	74	3.4	10—20
				Chemicals, % by K_2CO_3		12.0	REACTOR d-p, Inches H_2O		250	62	0.6	0—20
							No. Height		325	44	2.0	
TEMPERATURES—°F.		Recycle/Fresh Feed	0.99				0 See Period A	51	<325		1.2	
Oxygen	284	Inlet Velocity—ft./sec.	0.90				1	74	CATALYST			
Natural Gas	324	Fresh Feed Rate—S.C.F.H. H_2+CO	13848	HEMPEL. DIST. %		°API	2	76	Bulk Density, Lbs./Cu.Ft.			
Generator		per Cu. Ft. Dense Bed	1082	205 °F.			3	75	Aerated			152
Quench Accumulator	153	per Lb. Catalyst	7.26	400	74.8	54.6	4	280	Settled			153
Reactor Inlet	315	per Sq. Ft.	20982	400-550	15.2	37.2	Total	556	Compacted			173
Condenser Inlet	541			550+	10.0				Particle Density, gm./cc.			4.46
Product Accumulator	98	Heat Transfer Calculations					CALCULATED FROM dp		NH_3 Value, ml./gm.			
Catalyst No. Height		Steam Rate=364#/hr		A. S. T. M. DIST. ON			Density, Lbs./Cu.Ft.	149	N_2 Surface, m^2/gm.			
1	623	@ 705 psia & 507°F=		Naphtha °F.			Inventory, Lbs.	1908				
2	657	1201 BTU		IBP	110		Bed Depth, Ft.	19.40	CHEMICAL ANALYSIS			
3	659	Water in @ 82°F=500°F		10%	136		Vol., Cu. Ft.	12.80	Fe			
4	648	Net BTU/# Steam=1151		50%	224				C			6.61
5	663	1151x364=418964		90%	350				O			
6	661	Ave. BedTemp=657		EP	390				H			
7	652	dT=657-507=150°F		Rec.	96.0				K_2O, W+, % basis Fe			
8	641	Tube Area=35.2 sq ft							X-Ray Analysis—			
9	630	$K = \frac{418964}{(35.2)(150)} = 79.3$ BTU/°F/sq ft							$Fe_{20}C_9$			
10	625								Fe_3O_4			
11	601								Fe			

RUN NO. 59-DD
HOURS 661-685
CATALYST Spent CH&S

THE TEXAS COMPANY — MONTEBELLO LABORATORY
YIELD CALCULATIONS

	FRESH FEED			WET GAS	At Wt. Balance		RECYCLE	COMBINED FEED	EFFLUENT	NET CHANGE		CONDENSATE				YIELD BASIS H_2+CO FED				
	%	m/hr	#/hr	%	m/hr	#/hr	m/hr	m/hr	m/hr	m/hr	#/hr	#/MCF	#/gal	gal/hr	gal/MCF	YIELDS BASIS BROWNSVILLE DESIGN FEED RATE*				
																	CORRECTED HEMPEL, %	gal/hr	TREATING RECOVERY,%	gal/hr
CO 28.010	39.347	14.996	420.64	8.673	1.120	31.37	3.275	18.271	4.395	-13.876	-388.67									
H_2 2.016	57.053	21.745	43.84	34.010	4.393	8.86	12.840	34.585	17.233	-17.352	-34.96					400 EP	76.2	7.026	98.0	6.885
CO_2 44.010	2.597	0.990	43.57	33.140	4.281	188.39	12.513	13.503	16.794	3.291	144.82	10.386				400-550	14.4	1.328	91.4	1.214
N_2 28.016	0.350	0.133	3.73	1.426	0.184	5.15	0.538	0.671	0.722							550 +	9.4	0.867	114.6	0.994
CH_4 16.042	0.653	0.249	3.99	11.893	1.536	24.64	4.490	4.739	6.026	1.287	20.65	1.481								
C_2H_4 28.052				2.757	0.356	9.99	1.041	1.041	1.397	0.356	9.99	0.716					RECOVERY %	#/hr	gal/hr	
C_2H_6 30.068				1.347	0.174	5.23	0.509	0.509	0.683	0.174	5.23	0.375				PROPYLENE	42.0	6.45		
C_1+C_2											35.87	2.572				C_3 POLY GASO.	87.5	5.64	0.943	
C_3H_6 42.078				2.823	0.365	15.36	1.066	1.066	1.431	0.365	15.36	1.102	4.32	3.556	0.255	C_3 POLY TAR	12.5	0.81	0.108	
C_3H_8 44.094				0.320	0.041	1.81	0.121	0.121	0.162	0.041	1.81	0.130	4.24	0.427	0.031					
C_4H_8 56.104				1.797	0.232	13.02	0.678	0.678	0.910	0.232	13.02	0.934	5.00	2.604	0.187		#/gal	#/hr	gal/hr	RVP
C_4H_{10} 58.120				0.520	0.067	3.89	0.196	0.196	0.263	0.067	3.89	0.279	4.86	0.800	0.057	C_4H_8	5.00	0.95	0.190	68.0
C_5H_{10} 70.130				0.887	0.115	8.06	0.335	0.335	0.450	0.115	8.06	0.578	5.45	1.479	0.106	C_4 POLY GASO.	5.98	10.56	1.766	1.5
C_6H_{12} 72.146				0.120	0.016	1.15	0.045	0.045	0.061	0.016	1.15	0.082	5.25	0.219	0.016	C_4H_{10}	4.86	3.89	0.800	68.0
C_6H_{12} 84.156				0.287	0.037	3.11	0.108	0.108	0.145	0.037	3.11	0.223	5.84	0.561	0.040	C_4-FREE GASO.			10.087	5.8
C_5-C_6											46.40	3.328		9.646	0.692	C_4 POLY TAR	7.53	1.51	0.201	
TOTAL		38.113	515.17		12.917	320.03	37.755	75.868	58.102											
H_2+CO	96.400	36.741	13943296 SCFH		5.513		16.115	52.856	21.628	-31.228							gal/hr	gal/MCF	Bbl/Day	
H_2/CO		1.45	Factor 717190		3.92		3.92	1.89	3.92	1.25						10 # RVP 400 EP GASOLINE	12.843	0.9211	4994	
GAS OIL																	1.214	0.0871	472	
FUEL OIL																	0.994	0.0713	387	
POLY TAR																	0.309	0.0222	120	
TOTAL																	15.360	1.1017	5973	
W. S. CHEM.																	1.801	0.1292	700	
TOTAL																	17.161	1.2309	6673	

Weight Recovery, % 93.36	Catalyst Age, hrs.	Space Velocity, vhv 1096	RECOVERED OIL	** 0.425	59.55	4.271		9.221	0.661
Pressure, psig 410	Inlet Velocity, Ft/sec 0.92	Catalyst, VOL, CF 12.72	TOTAL OIL		105.95	7.599		18.867	1.353
Temperature, °F 676	Bed Depth, Ft 19.27	Weight, # 1870	WATER SOLUBLE CHEMICALS	** 0.268	14.21	1.019		1.801	0.129
Recycle Ratio 0.99	Bed Density, #/C.F 147	Effluent $\frac{(H_2)(CO_2)}{(H_2O)(CO)}$ = 9.77	TOTAL LIQUID PRODUCTS C_3+		120.16	8.618		20.668	1.482
			NET WATER	** 6.737	121.38	8.705		14.571	1.045
			GROSS WATER		135.59	9.724		16.372	1.174
			HYDROCARBON TOTAL—C_1+		156.03	11.190			

FRESH FEED CONVERSION — %				TOTAL FEED CONVERSION — %			SELECTIVITY
Contraction	CO	H_2	H_2+CO	CO	H_2	CO+H_2	C_3 + /C_1 +
66.11	92.53	79.80	84.99	75.95	50.17	59.08	77.01

Form ML—11

**Included in Reactor Effluent Total

g/NCM = 16.91 × #/MCF *9488 MCFH H_2 + CO, Bbl/Day = 5421.6 × gal/MCF

RUN NO. 59-DD
HOURS 661-685

THE TEXAS COMPANY — MONTEBELLO LABORATORY
DATA SUMMARY

OPERATING CONDITIONS				PRODUCT TESTS			CATALYST DATA					
PRESSURES PSIG		RATES S.C.F.H.			OIL	WATER	INVENTORY DATA		PARTICLE SIZE			
Oxygen	435	Fresh Feed	14464						Screen Analysis			Sedimentation
Natural Gas	431	Recycle	14328	°API	51.2	10.8	In Reactor at Start of Period		Mesh	Microns	%	Microns %
Generator Outlet	415	Combined Feed	28792	Neut. No.	37.8	34.5	Fresh Catalyst Added	35	On 40	419+	41.5	80+
Reactor Inlet	410	Wet Gas—Measured	4378	Sap. No.	46.9	35.8	Total		100	150	38.9	40—80
Condenser Inlet		Adjusted	4902	Hydrox. No.			Catalyst Recovered	72	150	105	7.5	20—40
Product Accumulator	359	Loss	524	Bromine No.	93		In Reactor at End of Period		200	74	7.3	10—20
				Pour °F.	below -40				250	62	1.0	0—20
				Chemicals, % by K_2CO_3		11.0	REACTOR d-p, Inches H_2O		No.	Height		
									325	44	2.0	
TEMPERATURES—°F.		Recycle/Fresh Feed	0.99				0 See Period A	50	<325		1.8	
Oxygen	284	Inlet Velocity—ft./sec.	0.92				1	73	CATALYST			
Natural Gas	321	Fresh Feed Rate—S.C.F.H. H_2+CO	13943	HEMPEL, DIST. %		°API	2	75	Bulk Density, Lbs./Cu.Ft.			
Generator		per Cu.Ft. Dense Bed	1096	205 °F.			3	75	Aerated			149
Quench Accumulator	157	per Lb. Catalyst	7.46	400	75.2	53.7	4	272	Settled			150
Reactor Inlet	386	per Sq. Ft.	21126	400-550	14.4	36.0	Total	545	Compacted			175
Condenser Inlet	552			550+	10.4				Particle Density, gm./cc.			4.47
Product Accumulator	97	Heat Transfer Calculations					CALCULATED FROM dp		NH_3 Value, ml./gm.			
Catalyst No. Height		Steam Rate=404#/hr		A. S. T. M. DIST. ON			Density, Lbs./Cu.Ft.	147	N_2 Surface, m^2/gm.			
1	655	@ 705 psia & 507°F=		Naphtha °F.			Inventory, Lbs.	1870				
2	679	1201 BTU		IBP	110		Bed Depth, Ft.	19.27	CHEMICAL ANALYSIS			
3	679	Water in at 75°=43		10%	136		Vol., Cu. Ft.	12.72	Fe			
4	670	Net BTU/# steam=1158		50%	222				C			7.63
5	684	1158x404=467832		90%	360				O			
6	679	Ave. Bed Temp=676°F		EP	392				H			
7	667	dT=676-507=169°F		Rec.	96.0				K_2O, W+, % basis Fe			
8	654	Tube Area=35.0 sq ft							X-Ray Analysis—			
9	642	K= $\frac{467832}{(35.0)(169)}$ = 79.1 BTU/°F/sq ft							$Fe_{20}C_9$			
10	637								Fe_3O_4			
11	614								Fe			

RUN NO. 59-EE
HOURS 685-709
CATALYST Spent CM&S

THE TEXAS COMPANY — MONTEBELLO LABORATORY
YIELD CALCULATIONS

	FRESH FEED			WET GAS			RECYCLE	COMBINED FEED	EFFLUENT	NET CHANGE		YIELD BASIS H_2+CO FED								
					At Wt. Balance							CONDENSATE								
	%	m/hr	#/hr	%	m/hr	#/hr	m/hr	m/hr	m/hr	m/hr	#/hr	#/MCF	#/gal	gal/hr	gal/MCF	YIELDS BASIS BROWNSVILLE DESIGN FEED RATE*				
																	CORRECTED HEMPEL. %	gal/hr	TREATING RECOVERY.%	gal/hr
CO 28.010	38.330	14.622	409.56	6.420	0.777	21.77	2.407	17.029	3.184	-13.845	-387.79									
H_2 2.016	52.094	22.162	44.68	34.076	4.122	8.31	12.777	34.939	16.899	-18.040	-36.37					400 EP	73.0	7.192	98.0	7.048
CO_2 44.010	2.880	1.099	48.37	33.793	4.091	180.05	12.670	13.769	16.761	2.992	131.68	9.433				400-550	14.8	1.458	91.4	1.333
N_2 28.016	0.153	0.058	1.62	2.110	0.255	7.14	0.791	0.949	1.046							550 +	12.2	1.202	114.6	1.377
CH_4 16.042	0.543	0.207	3.32	11.287	1.366	21.91	4.232	4.439	5.598	1.159	18.59	1.332								
C_2H_6 28.052				3.287	0.398	11.16	1.232	1.232	1.630	0.398	11.16	0.799					RECOVERY %	#/hr	gal/hr	
C_2H_4 30.068				1.507	0.182	5.47	0.565	0.565	0.747	0.182	5.47	0.392				PROPYLENE	45.0	7.02		
C_1+C_2											35.22	2.523				C_3 POLY GASO.	87.5	6.14	1.027	
C_3H_6 42.078				3.063	0.371	15.61	1.148	1.148	1.519	0.371	15.61	1.118	4.32	3.613	0.259	C_3 POLY TAR	12.5	0.88	0.117	
C_3H_8 44.094				0.347	0.042	1.85	0.130	0.130	0.172	0.042	1.85	0.133	4.24	0.436	0.031					
C_4H_8 56.104				1.977	0.227	12.74	0.704	0.704	0.931	0.227	12.74	0.913	5.00	2.548	0.183		#/gal	#/hr	gal/hr	RVP
C_4H_{10} 58.120				0.663	0.080	4.65	0.249	0.249	0.329	0.080	4.65	0.333	4.86	0.957	0.069	C_4H_8	5.00	0.39	0.078	68.0
C_5H_{10} 70.130				0.953	0.115	8.06	0.357	0.357	0.472	0.115	8.06	0.577	5.45	1.479	0.106	C_4 POLY GASO.	5.98	10.81	1.807	1.5
C_5H_{12} 72.146				0.250	0.030	2.16	0.094	0.094	0.124	0.030	2.16	0.155	5.25	0.411	0.029	C_4H_{10}	4.86	4.65	0.957	68.0
C_6H_{12} 84.156				0.367	0.044	3.70	0.138	0.138	0.182	0.044	3.70	0.265	5.54	0.668	0.048	C_4 FREE GASO.			10.633	5.8
C_5-C_6											48.77	3.494		10.112	0.725	C_4 POLY TAR	7.53	1.54	0.205	
TOTAL		38.148	507.55		12.100	304.58	37.494	75.642	57.267											
H_2+CO	96.424	36.784	1395930 SCFH		4.899		15.184	51.968	20.083	-31.885							gal/hr	gal/MCF	Bbl/Day	
H_2 CO		1.52	Factor 716368		5.31		5.31	2.05	5.31	1.30						10 # RVP 400 EP GASOLINE	13.475	0.9653	5233	
Weight Recovery, % 94.98			Catalyst Age, hrs.			Space Velocity, vhv 1084			RECOVERED OIL	** 0.451	63.28	4.533		9.852	0.706	GAS OIL	1.333	0.0955	518	
Pressure, psig 410			Inlet Velocity, Ft/sec 0.91			Catalyst, VOL., CF 12.88			TOTAL OIL		112.05	8.027		19.964	1.431	FUEL OIL	1.377	0.0986	535	
Temperature, °F 677			Bed Depth, Ft 19.51			Weight, # 1867			WATER SOLUBLE CHEMICALS	** 0.274	14.52	1.040		1.957	0.133	POLY TAR	0.322	0.0231	125	
Recycle Ratio 0.98			Bed Density, # C.F 145			Effluent $\frac{(H_2)(CO_2)}{(H_2O)(CO)}$ = 12.90 Shift Ratio			TOTAL LIQUID PRODUCTS C_4+		126.57	9.067		21.821	1.564	TOTAL	16.507	1.1825	6411	
FRESH FEED CONVERSION — %				TOTAL FEED CONVERSION — %			SELECTIVITY		NET WATER	** 6.948	125.17	8.967		15.027	1.077	W. S. CHEM.	1.957	0.1330	721	
Contraction	CO	H_2	H_2+CO	CO	H_2	CO+H_2	C_3 + C_4 +		GROSS WATER		139.59	10.007		16.884	1.210	TOTAL	18.364	1.3155	7132	
63.28	94.69	81.40	86.68	81.30	51.63	61.36	78.23		HYDROCARBON TOTAL—C_4+		161.79	11.590								

Form ML—11

**Included in Reactor Effluent Total

g/NCM = 16.91 × #/MCF

*9488 MCFH H_2 + CO, Bbl/Day = 5421.6 × gal/MCF

THE TEXAS COMPANY — MONTEBELLO LABORATORY
DATA SUMMARY

RUN NO. 59-EE
HOURS 685-709

OPERATING CONDITIONS				PRODUCT TESTS			CATALYST DATA				
PRESSURES PSIG		RATES S.C.F.H.			OIL	WATER	INVENTORY DATA		PARTICLE SIZE		
Oxygen	434	Fresh Feed	14477	°API	51.5	10.9	In Reactor at Start of Period		Screen Analysis		Sedimentation
Natural Gas	431	Recycle	14229	Neut. No.	38.0	33.6	Fresh Catalyst Added	36	Mesh	Microns %	Microns %
Generator Outlet	415	Combined Feed	28706	Sap. No.	47.0	35.2	Total		On 40	419+ 46.8	80+
Reactor Inlet	410	Wet Gas—Measured	4200	Hydrox. No.			Catalyst Recovered	79.5	100	150 36.4	40—80
Condenser Inlet		Adjusted	4592	Bromine No.	93		In Reactor at End of Period		150	105 6.5	20—40
Product Accumulator	358	Loss	392	Pour °F.					200	74 5.7	10—20
				Chemicals, % by K_2CO_3		11.0	REACTOR d-p, Inches H_2O		250	62 1.0	0—20
							No. Height		325	44 2.0	
TEMPERATURES—°F.		Recycle/Fresh Feed	0.98				0 See Period A	50	<325	1.6	
Oxygen	303	Inlet Velocity—ft./sec.	0.91				1	71	CATALYST		
Natural Gas	323	Fresh Feed Rate—S.C.F.H.	13959	HEMPEL. DIST. %		°API	2	75	Bulk Density, Lbs./Cu.Ft.		
Generator	--	per Cu.Ft. Dense Bed	1084	205 °F.			3	73	Aerated		148
Quench Accumulator	153	per Lb. Catalyst	7.48	400	72.0	54.6	4	275	Settled		149
Reactor Inlet	385	per Sq. Ft.	21150	400-550	14.8	36.5	Total	544	Compacted		170
Condenser Inlet	553	Heat Transfer Calculations		550+	13.2				Particle Density, gm./cc.		4.32
Product Accumulator	95	Steam Rate=404#/hr					CALCULATED FROM dp		NH_3 Value, ml./gm.		
Catalyst No. Height		@ 705 psia & 507°F=		A. S. T. M. DIST. ON			Density, Lbs./Cu.Ft.	145	N_2 Surface, m^2/gm.		
1 See Per. A	656	1201 BTU		Naphtha °F.			Inventory, Lbs.	1867			
2	680	Water in @ 73°F=41°F		IBP	110		Bed Depth, Ft.	19.51	CHEMICAL ANALYSIS		
3	681	Net BTU/# Steam=1160		10%	136		Vol., Cu. Ft.	12.88	Fe		
4	672	1160x404=468640		50%	226				C		7.91
5	685	Ave. Bed Temp=677		90%	352				O		
6	680	dT=677-507=170°F		EP	394				H		
7	666	Tube Area=35.3 sq ft		Rec.	96.5				K_2O, W+, % basis Fe		
8	655	$K = \frac{468640}{(35.3)(170)} = 78.1$ BTU/°F/sq ft							X-Ray Analysis—		
9	643								$Fe_{20}C_9$		
10	638								Fe_3O_4		
11	613								Fe		

RUN NO. 59-FF
HOURS 709-733
CATALYST Spent CM&S

THE TEXAS COMPANY — MONTEBELLO LABORATORY
YIELD CALCULATIONS

	FRESH FEED			WET GAS			RECYCLE	COMBINED FEED	EFFLUENT	NET CHANGE		YIELD BASIS H_2+CO FED								
					At Wt. Balance							CONDENSATE								
	%	m/hr	#/hr	%	m/hr	#/hr	m/hr	m/hr	m/hr	m/hr	#/hr	#/MCF	#/gal	gal/hr	gal/MCF	YIELDS BASIS BROWNSVILLE DESIGN FEED RATE#				
CO 28.010	37.966	14.552	407.61	6.160	0.740	20.73	2.319	16.871	3.059	-13.812	-386.88						CORRECTED HEMPEL, %	gal/hr	TREATING RECOVERY,%	gal/hr
H_2 2.016	58.970	22.603	45.57	34.934	4.183	8.43	13.114	35.717	17.297	-18.420	-37.14					400 EP	77.8	7.176	98.0	7.032
CO_2 44.010	2.380	0.912	40.14	33.440	4.016	176.75	12.589	13.501	16.605	3.104	136.61	9.688				400-550	14.4	1.328	91.4	1.214
N_2 28.016	0.117	0.045	1.26	1.880	0.226	6.33	0.708	0.753	0.934							550 +	7.8	0.719	114.6	0.824
CH_4 16.042	0.567	0.217	3.48	10.920	1.300	20.85	4.073	1.517	4.373	1.083	17.37	1.232								
C_2H_4 28.052				3.333	0.400	11.22	1.255	0.400	1.655	0.400	11.22	0.796					RECOVERY %	#/hr	gal/hr	
C_2H_6 30.068				1.553	0.187	5.62	0.585	0.187	0.772	0.187	5.62	0.399				PROPYLENE	45.4	6.93		
C_1+C_2											34.21	2.427				C_3 POLY GASO.	87.5	6.06	1.013	
C_3H_6 42.078				3.023	0.363	15.27	1.138	0.363	1.501	0.363	15.27	1.083	4.32	3.535	0.251	C_3 POLY TAR	12.5	0.87	0.116	
C_3H_8 44.094				0.290	0.035	1.54	0.109	0.035	0.144	0.035	1.54	0.109	4.24	0.363	0.026					
C_4H_8 56.104				2.047	0.246	13.80	0.771	0.246	1.017	0.246	13.80	0.979	5.00	2.760	0.196		#/gal	#/hr	gal/hr	RVP
C_4H_{10} 58.120				0.930	0.100	5.81	0.312	0.100	0.412	0.100	5.81	0.412	4.86	1.195	0.085	C_4H_8	5.00	--	--	68.0
C_5H_{10} 70.130				1.120	0.135	9.47	0.422	0.135	0.557	0.135	9.47	0.672	5.45	1.738	0.123	C_4 POLY GASO.	5.98	12.08	2.019	1.5
C_5H_{12} 72.146				0.253	0.030	2.16	0.095	0.030	0.125	0.030	2.16	0.153	5.25	0.411	0.029	C_4H_{10}	4.86	(5.81) 5.29	(1.195) 1.089	68.0
C_6H_{12} 84.156				0.417	0.050	4.21	0.157	0.050	0.207	0.050	4.21	0.299	5.54	0.760	0.054	C_4 FREE GASO.			10.954	5.8
C_5-C_6											52.26	3.707		10.762	0.764	C_4 POLY TAR	7.53	1.72	0.228	
TOTAL		38.329	498.06		12.011	302.19	37.647	75.976	57.085											
H_2+CO	96.936	37.155	1410031 SCFH	4.923			15.433	52.588	20.356	-32.232							gal/hr	gal/MCF	Bbl/Day	
H_2/CO		1.55	Factor 709204	5.65			5.66	2.12	5.65	1.33						10 # RVP 400 EP GASOLINE	14.062	0.9973	5407	
Weight Recovery, % 94.96			Catalyst Age, hrs.			Space Velocity, vhv 1081			RECOVERED OIL	** 0.424	59.50	4.220		9.223	0.654	GAS OIL	1.214	0.0861	467	
Pressure, psig 408			Inlet Velocity, Ft/sec 0.92			Catalyst, Vol. CF 13.04			TOTAL OIL		111.76	7.927		19.985	1.418	FUEL OIL	0.824	0.0584	317	
Temperature, °F 678			Bed Depth, Ft 19.75			Weight, # 1877			WATER SOLUBLE CHEMICALS	** 0.291	15.45	1.096		1.980	0.140	POLY TAR	0.344	0.0244	132	
Recycle Ratio 0.98			Bed Density, #/CF 144			Effluent Shift Ratio $\frac{(H_2)(CO_2)}{(H_2O)(CO)}$ = 13.99			TOTAL LIQUID PRODUCTS C_3+		127.21	9.023		21.965	1.558	TOTAL	16.444	1.1662	6323	
FRESH FEED CONVERSION — %				TOTAL FEED CONVERSION — %			SELECTIVITY		NET WATER	** 6.712	120.92	8.576		14.516	1.029	W.S. CHEM.	1.980	0.1404	761	
Contraction	CO	H_2	H_2+CO	CO	H_2	CO+H_2	C_3+/C_1+		GROSS WATER		136.37	9.672		16.496	1169	TOTAL	18.424	1.3066	7084	
68.66	94.91	81.49	86.75	81.87	51.57	61.29	78.81		HYDROCARBON TOTAL—C_1+		161.42	11.450								

Form ML—11

**Included in Reactor Effluent Total

g/NCM = 16.91 × #/MCF

*9488 MCFH H_2 + CO, Bbl/Day = 5421.6 × gal/MCF

THE TEXAS COMPANY — MONTEBELLO LABORATORY
DATA SUMMARY

RUN NO. 59-FF
HOURS 709-733

OPERATING CONDITIONS				PRODUCT TESTS			CATALYST DATA					
PRESSURES PSIG		RATES S.C.F.H.			OIL	WATER	INVENTORY DATA		PARTICLE SIZE			
Oxygen	429	Fresh Feed	14546	°API	51.3	11.0	In Reactor at Start of Period		Screen Analysis			Sedimentation
Natural Gas	426	Recycle	14287	Neut. No.	37.0	33.8	Fresh Catalyst Added	36	Mesh	Microns	%	Microns %
Generator Outlet	412	Combined Feed	28833	Sap. No.	47.9	35.4	Total		On 40	419+	39.0	80+
Reactor Inlet	408	Wet Gas—Measured	4180	Hydrox. No.			Catalyst Recovered	76.5	100	150	39.8	40—80
Condenser Inlet		Adjusted	4558	Bromine No.	95		In Reactor at End of Period		150	105	8.7	20—40
Product Accumulator	356	Loss	378	Pour °F.					200	74	6.7	10—20
				Chemicals, % by K_2CO_3		12.0	REACTOR d-p, Inches H_2O		250	62	1.2	0—20
							No. Height		325	44	2.4	
TEMPERATURES—°F.		Recycle/Fresh Feed	0.98				0 See Period A	49	<325		2.2	
Oxygen	316	Inlet Velocity—ft./sec.	0.92				1	71	CATALYST			
Natural Gas	320	Fresh Feed Rate—S.C.F.H. H_2=20	14100	HEMPEL, DIST. %		°API	2	74	Bulk Density, Lbs./Cu.Ft.			
Generator		per Cu.Ft. Dense Bed	1081	205 °F.			3	73	Aerated			149
Quench Accumulator	130	per Lb. Catalyst	7.51	400	76.8	55.8	4	280	Settled			150
Reactor Inlet	373	per Sq. Ft.	21364	400-550	14.4	35.6	Total	547	Compacted			170
Condenser Inlet	565			550+	8.8				Particle Density, gm./cc.			4.31
Product Accumulator	96	Heat Transfer Calculations					CALCULATED FROM dp		NH_3 Value, ml./gm.			
Catalyst No. Height		Steam Rate=409#/hr		A. S. T. M. DIST. ON			Density, Lbs./Cu.Ft.	144	N_2 Surface, m^2/gm.			
1 See Per. A	650	@ 705 psia & 507°F=		Naphtha °F.			Inventory, Lbs.	1877				
2	678	1201 BTU		IBP	108		Bed Depth, Ft.	19.75	CHEMICAL ANALYSIS			
3	683	Water in @ 72°F=40°F		10%	136		Vol., Cu. Ft.	13.04	Fe			69.3
4	673	Net BTU/# Steam=1161		50%	222				C			7.56
5	685	1161x409=474849		90%	352				O			
6	680	Ave. BedTemp=678		EP	392				H			
7	666	dT=678-507=171°F		Rec.	96.0				K_2O, W+, % basis Fe			
8	655	Tube Area=35.7 sq ft							X-Ray Analysis—			
9	643	$K=\frac{474,849}{(35.7)(171)}$ = 77.8 BTU/°F/sq ft							$Fe_{20}C_9$			
10	638								Fe_3O_4			
11	613								Fe			

RUN NO. 59-GG
HOURS 733-757
CATALYST Spent CM&S

THE TEXAS COMPANY — MONTEBELLO LABORATORY
YIELD CALCULATIONS

	FRESH FEED %	FRESH FEED m/hr	FRESH FEED #/hr	WET GAS %	WET GAS At Wt. Balance m/hr	WET GAS At Wt. Balance #/hr	RECYCLE m/hr	COMBINED FEED m/hr	EFFLUENT m/hr	NET CHANGE m/hr	NET CHANGE #/hr	CONDENSATE #/MCF	CONDENSATE #/gal	CONDENSATE gal/hr	CONDENSATE gal/MCF
CO 28.010	38.327	14.928	418.12	5.453	0.675	18.91	2.108	17.036	2.783	-14.253	-399.21				
H_2 2.016	58.946	22.959	46.29	35.306	4.430	8.93	13.837	36.796	18.267	-18.529	-37.36				
CO_2 44.010	1.743	0.679	29.88	32.920	4.073	179.25	12.722	13.401	16.795	3.394	149.37	10.389			
N_2 28.016	0.377	0.147	4.12	2.010	0.249	6.98	0.777	0.924	1.026						
CH_4 16.042	0.607	0.236	3.79	11.603	1.436	23.04	4.484	4.720	5.920	1.200	19.25	1.339			
C_2H_4 28.052				3.167	0.392	11.00	1.224	1.224	1.616	0.392	11.00	0.765			
C_2H_6 30.068				1.590	0.197	5.92	0.614	0.614	0.811	0.197	5.92	0.412			
C_1+C_2											36.17	2.516			
C_3H_6 42.078				3.257	0.403	16.96	1.259	1.259	1.662	0.403	16.96	1.180	4.32	3.926	0.273
C_3H_8 44.094				0.360	0.045	1.98	0.139	0.139	0.184	0.045	1.98	0.138	4.24	0.467	0.032
C_4H_8 56.104				1.877	0.232	13.02	0.725	0.725	0.957	0.232	13.02	0.906	5.00	2.604	0.181
C_4H_{10} 58.120				0.567	0.070	4.07	0.219	0.219	0.289	0.070	4.07	0.283	4.86	0.837	0.058
C_5H_{10} 70.130				0.877	0.109	7.64	0.339	0.339	0.448	0.109	7.64	0.531	5.45	1.402	0.098
C_5H_{12} 72.146				0.220	0.027	1.95	0.085	0.085	0.112	0.027	1.95	0.136	5.25	0.371	0.026
C_6H_{12} 84.156				0.293	0.036	3.03	0.113	0.113	0.149	0.036	3.03	0.211	5.54	0.547	0.038
C_3-C_6											48.65	3.385		10.154	0.706
TOTAL		38.949	502.20		12.374	302.68	38.645	77.594	58.563						
H_2+CO	97.273	37.887	1437792 SCFH		5.105		15.945	53.832	21.050	-32.782					
H_2/CO		1.54	Factor 695510		6.56		6.56	2.16	6.56	1.30					
									RECOVERED OIL	** 0.436	61.18	4.255		9.488	0.660
									TOTAL OIL		109.83	7.640		19.642	1.366
									WATER SOLUBLE CHEMICALS	** 0.294	15.58	1.084		1.953	0.136
									TOTAL LIQUID PRODUCTS C_3+	**	125.41	8.724		21.595	1.502
									NET WATER	** 6.814	122.76	8.538		14.737	1.025
									GROSS WATER		138.34	9.622		16.690	1.161
									HYDROCARBON TOTAL—C_1+		161.58	11.240			

Weight Recovery, % 94.57 | Catalyst Age, hrs. | Space Velocity, vhv 1103

Pressure, psig 418 | Inlet Velocity, Ft/sec 0.92 | Catalyst, Vol. CF 13.04

Temperature, °F 679 | Bed Depth, Ft 19.75 | Weight, # 1812

Recycle Ratio 0.99 | Bed Density, #/CF 139 | Effluent Shift Ratio $\frac{(H_2)(CO_2)}{(H_2O)(CO)}$ = 17.60

FRESH FEED CONVERSION — %				TOTAL FEED CONVERSION — %			SELECTIVITY
Contraction	CO	H_2	H_2+CO	CO	H_2	CO+H_2	C_3+ /C_1+
68.23	95.48	80.70	86.53	83.66	50.36	60.90	77.61

YIELDS BASIS BROWNSVILLE DESIGN FEED RATE*	CORRECTED HEMPEL. %	gal/hr	TREATING RECOVERY.%	gal/hr
400 EP	78.6	7.458	98.0	7.309
400-550	13.6	1.290	91.4	1.179
550 +	7.8	0.740	114.6	0.848

	RECOVERY %	#/hr	gal/hr
PROPYLENE	44.8	7.60	
C_3 POLY GASO.	87.5	6.65	1.112
C_3 POLY TAR	12.5	0.95	0.126

	#/gal	#/hr	gal/hr	RVP
C_4H_8	5.00	0.99	0.198	68.0
C_4 POLY GASO.	5.98	10.53	1.760	1.5
C_4H_{10}	4.86	4.07	0.837	68.0
C_4-FREE GASO.			10.741	5.8
C_4 POLY TAR	7.53	1.50	0.199	

	gal/hr	gal/MCF	Bbl/Day
10 # RVP 400 EP GASOLINE	13.536	0.9414	5104
GAS OIL	1.179	0.0820	445
FUEL OIL	0.848	0.0590	320
POLY TAR	0.325	0.0226	123
TOTAL	15.888	1.1050	5992
W. S CHEM.	1.953	0.1358	736
TOTAL	17.841	1.2408	6728

Form ML—11

** Included in Reactor Effluent Total

g/NCM = 16.91 × #/MCF *9488 MCFH H_2 + CO, Bbl/Day = 5421.6 × gal/MCF

THE TEXAS COMPANY — MONTEBELLO LABORATORY
DATA SUMMARY

RUN NO. 59-GG
HOURS 733-757

OPERATING CONDITIONS			
PRESSURES PSIG		RATES S.C.F.H.	
Oxygen	441	Fresh Feed	14781
Natural Gas	438	Recycle	14666
Generator Outlet	423	Combined Feed	29.447
Reactor Inlet	418	Wet Gas—Measured	4273
Condenser Inlet		Adjusted	4696
Product Accumulator	367	Loss	423
TEMPERATURES—°F.		Recycle/Fresh Feed	0.99
Oxygen	343	Inlet Velocity—ft./sec.	0.92
Natural Gas	309	Fresh Feed Rate—S.C.F.H. H_2+CO	14378
Generator		per Cu. Ft. Dense Bed	1103
Quench Accumulator	137	per Lb. Catalyst	7.93
Reactor Inlet	368	per Sq. Ft.	21785
Condenser Inlet	563		
Product Accumulator	96	Heat Transfer Calculations	
Catalyst No. Height		Steam Rate=416#/hr	
1 See Per. A	652	@ 705 psia & 506°Fs	
2	680	1201 BTU	
3	681	Water in @ 72°F=40	
4	671	Net BTU/# steam=1161	
5	687	1161x416=482976	
6	684	Ave. Bed Temp=679°F	
7	670	dT=679-506=173°F	
8	658	Tube Area=35.7 sq ft	
9	646	$K = \frac{482976}{(35.7)(173)} = 78.2$ BTU/°F/sq ft	
10	640		
11	617		

PRODUCT TESTS	OIL	WATER
°API	51.2	10.8
Neut. No.	37.0	32.3
Sap. No.	47.6	34.6
Hydrox. No.		
Bromine No.	95	
Pour °F.		
Chemicals, % by K_2CO_3		11.7
HEMPEL, DIST. %		°API
205 °F.		
400	77.6	56.0
400-550	13.6	35.8
550+	8.8	
A. S. T. M. DIST. ON		
Naphtha °F.		
IBP	100	
10%	130	
50%	220	
90%	350	
EP	388	
Rec.	96.0	

CATALYST DATA						
INVENTORY DATA		PARTICLE SIZE				
		Screen Analysis			Sedimentation	
Fresh Catalyst Added	35	Mesh	Microns	%	Microns	%
Total		On 40	419+	36.1	80+	
Catalyst Recovered	87.8	100	150	40.6	40—80	
In Reactor at End of Period		150	105	9.9	20—40	
		200	74	6.8	10—20	
REACTOR d-p, Inches H_2O		250	62	0.6	0—20	
No. Height		325	44	2.4		
0 See Period A	48	<325		3.6		
1	70	CATALYST				
2	70	Bulk Density, Lbs./Cu.Ft.				
3	70	Aerated			146	
4	270	Settled			148	
Total	528	Compacted			169	
		Particle Density, gm./cc.			4.25	
CALCULATED FROM dp		NH_3 Value, ml./gm.				
Density, Lbs./Cu.Ft.	139	N_2 Surface, m^2/gm.				
Inventory, Lbs.	1812					
Bed Depth, Ft.	19.75	CHEMICAL ANALYSIS				
Vol., Cu. Ft.	13.04	Fe			68.5	
		C			8.02	
		O				
		H				
		K_2O, W+, % basis Fe				
		X-Ray Analysis—				
		$Fe_{20}C_9$				
		Fe_3O_4				
		Fe				

RUN NO. 59-HH
HOURS 757-781
CATALYST Spent CM&S

THE TEXAS COMPANY — MONTEBELLO LABORATORY
YIELD CALCULATIONS

	FRESH FEED			WET GAS			RECYCLE	COMBINED FEED	EFFLUENT	NET CHANGE		YIELD BASIS H_2+CO FED			
					At Wt. Balance							CONDENSATE			
	%	m/hr	#/hr	%	m/hr	#/hr	m/hr	m/hr	m/hr	m/hr	#/hr	#/MCF	#/gal	gal/hr	gal/MCF
CO 28.010	37.540	14.753	413.21	5.210	0.636	17.81	1.995	16.748	2.631	-14.117	-395.40				
H_2 2.016	59.370	23.331	47.04	34.603	4.223	8.51	13.253	36.584	17.476	-19.108	-38.53				
CO_2 44.010	2.437	0.958	42.16	35.027	4.273	188.05	13.414	14.372	17.687	3.315	145.89	10.094			
N_2 28.016	0.203	0.080	2.24	2.000	0.244	6.84	0.766	0.846	1.010						
CH_4 16.042	0.450	0.177	2.84	11.524	1.406	22.56	4.413	4.590	5.819	1.229	19.72	1.364			
C_2H_4 28.052				3.103	0.379	10.63	1.188	1.188	1.567	0.379	10.63	0.735			
C_2H_6 30.068				1.463	0.179	5.38	0.560	0.560	0.739	0.179	5.38	0.372			
C_1+C_2											35.73	2.471			
C_3H_6 42.079				2.720	0.332	13.97	1.042	1.042	1.374	0.332	13.97	0.967	4.32	3.234	0.224
C_3H_8 44.094				0.307	0.037	1.63	0.118	0.118	0.155	0.037	1.63	0.113	4.24	0.384	0.027
C_4H_8 56.104				1.843	0.225	12.62	0.706	0.706	0.931	0.225	12.62	0.873	5.00	2.524	0.175
C_4H_{10} 58.120				0.607	0.074	4.30	0.232	0.232	0.306	0.074	4.30	0.298	4.86	0.885	0.061
C_5H_{10} 70.130				0.990	0.121	8.49	0.379	0.379	0.500	0.121	8.49	0.587	5.45	1.558	0.108
C_5H_{12} 72.146				0.213	0.026	1.88	0.082	0.082	0.108	0.026	1.88	0.130	5.25	0.358	0.025
C_6H_{12} 84.156				0.390	0.048	4.04	0.149	0.149	0.197	0.048	4.04	0.280	5.54	0.729	0.050
C_3-C_6											46.93	3.248		9.672	0.670
TOTAL		39.299	507.49		12.203	306.71	38.297	77.596	58.050						
H_2+CO	96.910	38.084	1445316 SCFH		4.859		15.248	53.332	20.107	-33.225					
H_2/CO		1.58	Factor 691890		6.64		6.64	2.18	6.64	1.35					

Weight Recovery, % 95.39	Catalyst Age, hrs.	Space Velocity, vhv 1109	RECOVERED OIL	** 0.446	62.57	4.329	9.669	0.669
Pressure, psig 417	Inlet Velocity, Ft/sec 0.93	Catalyst, Vol. CF 13.03	TOTAL OIL		109.50	7.577	19.341	1.339
Temperature, °F 680	Bed Depth, Ft 19.74	Weight, # 1785	WATER SOLUBLE CHEMICALS	** 0.291	15.46	1.070	1.952	0.135
Recycle Ratio 0.97	Bed Density, #/CF 137	Effluent $(H_2)(CO_2)$ / Shift Ratio $(H_2O)(CO)$ = 17.24	TOTAL LIQUID PRODUCTS C_5+		124.96	8.647	21.293	1.474
			NET WATER	** 6.813	122.75	8.493	14.736	1.020
			GROSS WATER		138.21	9.563	16.688	1.155
			HYDROCARBON TOTAL—C_1+		160.69	11.118		

FRESH FEED CONVERSION — %				TOTAL FEED CONVERSION — %			SELECTIVITY
Contraction	CO	H_2	H_2+CO	CO	H_2	$CO+H_2$	C_3+/C_1+
68.95	95.69	81.90	87.24	84.29	52.23	62.30	77.76

YIELDS BASIS BROWNSVILLE DESIGN FEED RATE*				
	CORRECTED HEMPEL, %	gal/hr	TREATING RECOVERY, %	gal/hr
400 EP	76.3	7.378	98.0	7.230
400-550	13.2	1.276	91.4	1.166
550 +	10.5	1.015	114.6	1.163
	RECOVERY %	#/hr	gal/hr	
PROPYLENE	46.0	6.43		
C_3 POLY GASO.	87.5	5.63	0.941	
C_3 POLY TAR	12.5	0.80	0.106	
	#/gal	#/hr	gal/hr	RVP
C_4H_8	5.00	0.76	0.152	68.0
C_4 POLY GASO.	5.98	10.38	1.735	1.5
C_4H_{10}	4.86	4.30	0.895	68.0
C_4-FREE GASO.			10.816	5.8
C_4 POLY TAR	7.53	1.48	0.197	
	gal/hr	gal/MCF	Bbl/Day	
10 # RVP 400 EP GASOLINE	13.588	0.9401	5097	
GAS OIL	1.166	0.0807	438	
FUEL OIL	1.163	0.0805	436	
POLY TAR	0.303	0.0210	114	
TOTAL	16.220	1.1223	6085	
W. S CHEM.	1.952	0.1351	732	
TOTAL	18.172	1.2574	6817	

Form ML—11

** Included in Reactor Effluent Total

g/NCM = 16.91 × #/MCF *9488 MCFH H_2+CO, Bbl/Day = 5421.6 × gal/MCF

THE TEXAS COMPANY — MONTEBELLO LABORATORY
DATA SUMMARY

RUN NO. 59-HH
HOURS 757-781

OPERATING CONDITIONS				PRODUCT TESTS			CATALYST DATA					
PRESSURES PSIG		RATES S.C.F.H.			OIL	WATER	INVENTORY DATA		PARTICLE SIZE			
									Screen Analysis			Sedimentation
Oxygen	441	Fresh Feed	14914	°API	50.9	10.8	In Reactor at Start of Period		Mesh	Microns	%	Microns %
Natural Gas	437	Recycle	14534	Neut. No.	38.2	33.1	Fresh Catalyst Added	27	On 40	419+	44.8	80+
Generator Outlet	422	Combined Feed	29448	Sap. No.	47.9	34.2	Total		100	150	36.8	40—80
Reactor Inlet	417	Wet Gas—Measured	4278	Hydrox. No.			Catalyst Recovered	70.5	150	105	7.6	20—40
Condenser Inlet		Adjusted	4631	Bromine No.	92		In Reactor at End of Period		200	74	6.4	10—20
Product Accumulator	366	Loss	353	Pour °F.					250	62	0.4	0—20
				Chemicals, % by K_2CO_3		11.7	REACTOR d-p, Inches H_2O		325	44	3.2	
							No. Height					
TEMPERATURES—°F.		Recycle/Fresh Feed	0.97				0 See Period A	47	<325		0.8	
Oxygen	338	Inlet Velocity—ft./sec.	0.93				1	69	CATALYST			
Natural Gas	303	Fresh Feed Rate—S.C.F.H. H_2+CO	14453	HEMPEL. DIST. %		°API	2	70	Bulk Density, Lbs./Cu.Ft.			
Generator		per Cu.Ft. Dense Bed	1109	205 °F.			3	69	Aerated			144
Quench Accumulator	144	per Lb. Catalyst	8.10	400	75.3	55.0	4	265	Settled			145
Reactor Inlet	364	per Sq. Ft.	21898	400-550	13.2	35.6	Total	520	Compacted			172
Condenser Inlet	558			550+	11.5				Particle Density, gm./cc.			4.22
Product Accumulator	97	Heat Transfer Calculations					CALCULATED FROM dp		NH_3 Value, ml./gm.			
Catalyst No. Height		Steam Rate=404#/hr		A. S. T. M. DIST. ON			Density, Lbs./Cu.Ft.	137	N_2 Surface, m^2/gm.			
1 See Per. A	657	@ 705 psia & 507°F=		Naphtha °F.			Inventory, Lbs.	1785				
2	683	1201 BTU		IBP	102		Bed Depth, Ft.	19.74	CHEMICAL ANALYSIS			
3	682	Water in @ 76°F=44°F		10%	138		Vol., Cu. Ft.	13.03	Fe			68.4
4	673	Net BTU/# steam=1157		50%	226				C			8.46
5	688	1157x404=467428		90%	348				O			
6	684	Ave. Bed Temp=680°F		EP	394				H			
7	672	dT=680-507=173°F		Rec.	96.5				K_2O, W+, % basis Fe			
8	659	Tube Area=35.7 sq ft							X-Ray Analysis—			
9	647	$K = \frac{467428}{(35.7)(173)} = 75.7$ BTU/°F/sq ft							$Fe_{20}C_9$			
10	642								Fe_3O_4			
11	618								Fe			

RUN NO. 59-II
HOURS 781-796
CATALYST Spent CM&S

THE TEXAS COMPANY — MONTEBELLO LABORATORY
YIELD CALCULATIONS

	FRESH FEED			WET GAS	At Wt. Balance		RECYCLE	COMBINED FEED	EFFLUENT	NET CHANGE		YIELD BASIS H_2+CO FED								
	%	m/hr	#/hr	%	m/hr	#/hr	m/hr	m/hr	m/hr	m/hr	#/hr	CONDENSATE #/MCF	#/gal	gal/hr	gal/MCF	YIELDS BASIS BROWNSVILLE DESIGN FEED RATE*				
CO 28.010	38.583	14.752	413.20	6.000	0.749	20.98	2.318	17.070	3.067	-14.003	-392.22						CORRECTED HEMPEL, %	gal/hr	TREATING RECOVERY, %	gal/hr
H_2 2.016	57.140	21.848	44.05	35.176	4.392	8.85	13.593	35.441	17.985	-17.456	35.20					400 EP	79.0	7.601	98.0	7.449
CO_2 44.010	2.690	1.029	45.29	33.157	4.137	182.07	12.812	13.841	16.949	3.108	136.78	9.848				400-550	13.2	1.270	91.4	1.161
N_2 28.016	0.710	0.271	7.59	1.500	0.187	5.24	0.580	0.851	0.767							550 +	7.8	0.750	114.6	0.860
CH_4 16.042	0.877	0.335	5.37	12.267	1.532	24.58	4.740	5.075	6.272	1.197	19.21	1.383								
C_2H_4 28.052				3.120	0.390	10.94	1.206	1.206	1.596	0.390	10.94	0.788					RECOVERY %	#/hr	gal/hr	
C_2H_6 30.068				1.447	0.181	5.44	0.559	0.559	0.740	0.181	5.44	0.392				PROPYLENE	43.4	6.83		
C_1+C_2											35.59	2.563				C_3 POLY GASO.	87.5	5.98	1.000	
C_3H_6 42.078				2.997	0.374	15.74	1.158	1.158	1.532	0.374	15.74	1.133	4.32	3.644	0.262	C_3 POLY TAR	12.5	0.85	0.113	
C_3H_8 44.094				0.293	0.037	1.63	0.113	0.113	0.150	0.037	1.63	0.117	4.24	0.384	0.028					
C_4H_8 56.104				1.947	0.243	13.63	0.752	0.752	0.995	0.243	13.63	0.981	5.00	2.726	0.196		#/gal	#/hr	gal/hr	RVP
C_4H_{10} 58.120				0.573	0.072	4.18	0.221	0.221	0.293	0.072	4.18	0.301	4.86	0.860	0.062	C_4H_8	5.00	1.04	0.208	68.0
C_5H_{10} 70.130				1.047	0.131	9.19	0.405	0.405	0.536	0.131	9.19	0.662	5.45	1.686	0.121	C_4 POLY GASO.	5.98	11.02	1.842	1.5
C_5H_{12} 72.146				0.143	0.018	1.30	0.055	0.055	0.073	0.018	1.30	0.094	5.25	0.248	0.018	C_4H_{10}	4.86	4.18	0.860	68.0
C_6H_{12} 84.156				0.333	0.042	3.53	0.129	0.129	0.171	0.042	3.53	0.254	5.54	0.637	0.046	C_4 FREE GASO.			11.020	5.8
C_5-C_6											49.20	3.542		10.185	0.733	C_4 POLY TAR	7.53	1.57	0.208	
TOTAL		38.235	515.50		12.485	307.30	38.641	76.876	59.104											
H_2+CO	95.723	36.600	13889407 SCFH	5.141			15.911	52.511	21.052	-31.459							gal/hr	gal/MCF	Bbl/Day	
H_2/CO		1.48	Factor 719973	5.86			5.86	2.08	5.86	1.25						10 # RVP 400 EP GASOLINE	13.930	1.0029	5437	
Weight Recovery, % 96.42			Catalyst Age, hrs.			Space Velocity, vhv 1072		RECOVERED OIL	**	0.445	62.38	4.491		9.621	0.693	GAS OIL	1.161	0.0836	453	
Pressure, psig 415			Inlet Velocity, Ft/sec 0.92			Catalyst, Vol CF 12.96		TOTAL OIL			111.58	8.033		19.806	1.426	FUEL OIL	0.860	0.0619	336	
Temperature, °F 678			Bed Depth, Ft 19.63			Weight, # 1788		WATER SOLUBLE CHEMICALS	**	0.288	15.29	1.101		1.937	0.139	POLY TAR	0.321	0.0231	125	
Recycle Ratio 1.01			Bed Density, #/CF 138			Effluent Shift Ratio $\frac{(H_2)(CO_2)}{(H_2O)(CO)}$ = 13.72		TOTAL LIQUID PRODUCTS C_3+			126.87	9.134		21.743	1.565	TOTAL	16.272	1.1715	6351	
FRESH FEED CONVERSION — %				TOTAL FEED CONVERSION — %			SELECTIVITY	NET WATER	**	7.245	130.53	9.398		15.670	1.128	W. S. CHEM.	1.937	0.1395	756	
Contraction	CO	H_2	H_2+CO	CO	H_2	$CO+H_2$	C_3+/C_1+	GROSS WATER			145.82	10.499		17.607	1.267	TOTAL	18.209	1.3110	7107	
67.35	94.92	79.90	85.95	82.03	49.25	59.91	78.09	HYDROCARBON TOTAL—C_1+			162.46	11.697								

Form ML—11

**Included in Reactor Effluent Total

g/NCM = 16.91 × #/MCF *9488 MCFH H_2+CO, Bbl/Day = 5421.6 × gal/MCF

THE TEXAS COMPANY — MONTEBELLO LABORATORY
DATA SUMMARY

RUN NO. 59-II
HOURS 781-796

OPERATING CONDITIONS				PRODUCT TESTS			CATALYST DATA				
PRESSURES PSIG		RATES S.C.F.H.			OIL	WATER	INVENTORY DATA		PARTICLE SIZE		
Oxygen	439	Fresh Feed	14510	°API	50.5	10.8	In Reactor at Start of Period		Screen Analysis		Sedimentation
Natural Gas	435	Recycle	14664	Neut. No.	38.0	34.1	Fresh Catalyst Added	41	Mesh	Microns %	Microns %
Generator Outlet	420	Combined Feed	29174	Sap. No.	47.1	35.2	Total		On 40	419+	80+
Reactor Inlet	415	Wet Gas—Measured	4454	Hydrox. No.			Catalyst Recovered	52.8	100	150	40—80
Condenser Inlet		Adjusted	4738	Bromine No.	92		In Reactor at End of Period		150	105	20—40
Product Accumulator	366	Loss	284	Pour °F.					200	74	10—20
				Chemicals, % by K_2CO_3		11.0	REACTOR d-p, Inches H_2O		250	62	0—20
							No. Height		325	44	
TEMPERATURES—°F.		Recycle/Fresh Feed	1.01				0 See Period A	47	<325		
Oxygen	328	Inlet Velocity—ft./sec.	0.92				1	69	CATALYST		
Natural Gas	312	Fresh Feed Rate—S.C.F.H. H_2+CO	13889	HEMPEL. DIST. %		°API	2	70	Bulk Density, Lbs./Cu.Ft.		
Generator		per Cu. Ft. Dense Bed	1072	205 °F.			3	70	Aerated		
Quench Accumulator	143	per Lb. Catalyst	7.77	400	78.0	55.5	4	265	Settled		
Reactor Inlet	368	per Sq. Ft.	21044	400-550	13.2	33.6	Total	521	Compacted		
Condenser Inlet	549			550+	8.8				Particle Density, gm./cc.		
Product Accumulator	99	Heat Transfer Calculations					CALCULATED FROM dp		NH_3 Value, ml./gm.		
Catalyst No. Height		Steam Rate=405#/hr		A. S. T. M. DIST. ON			Density, Lbs./Cu.Ft.	138	N_2 Surface, m^2/gm.		
1 See Per. A	651	705 psia & 507°F=		Naphtha °F.			Inventory, Lbs.	1788			
2	680	1201 BTU		IBP	102		Bed Depth, Ft.	19.63	CHEMICAL ANALYSIS		
3	680	Water in @ 86°F=54°F		10%	138		Vol., Cu. Ft.	12.96	Fe		
4	670	Net BTU/# Steam=1147		50%	232				C		
5	685	1147x405=464535		90%	362				O		
6	682	Ave. Bed Temp=678°F		EP	398				H		
7	668	dT=678-507=171°F		Rec.	95.5				K_2O, W+, % basis Fe		
8	657	Tube Area=35.4 sq ft							X-Ray Analysis—		
9	645	$K=\frac{464535}{(171)(35.4)}$ = 76.7 BTU/°F/sq ft							$Fe_{20}C_9$		
10	641								Fe_3O_4		
11	616								Fe		

RUN NO. 59-JJ
HOURS 796-806
CATALYST Spent CM&S

THE TEXAS COMPANY — MONTEBELLO LABORATORY
YIELD CALCULATIONS

	FRESH FEED %	FRESH FEED m/hr	FRESH FEED #/hr	WET GAS %	WET GAS At Wt. Balance m/hr	WET GAS At Wt. Balance #/hr	RECYCLE m/hr	COMBINED FEED m/hr	EFFLUENT m/hr	NET CHANGE m/hr	NET CHANGE #/hr
CO 28.010	37.150	14.373	402.57	5.225	0.574	16.08	2.010	16.383	2.584	-13.799	-386.49
H_2 2.016	59.210	22.907	46.18	31.745	3.491	7.04	12.211	35.118	15.702	-19.416	39.14
CO_2 44.010	2.530	0.979	43.09	33.875	3.725	163.96	13.030	14.009	16.755	2.746	120.87
N_2 28.016	0.220	0.085	2.38	1.800	0.198	5.55	0.692	0.777	0.890		
CH_4 16.042	0.890	0.344	5.52	15.965	1.755	28.15	6.141	6.485	7.896	1.411	22.63
C_2H_4 28.052				2.755	0.303	8.50	1.060	1.060	1.363	0.303	8.50
C_2H_6 30.068				1.700	0.187	5.62	0.654	0.654	0.841	0.187	5.62
C_1+C_2											36.75
C_3H_6 42.078				2.650	0.291	12.24	1.019	1.019	1.310	0.291	12.24
C_3H_8 44.094				0.285	0.031	1.37	0.110	0.110	0.141	0.031	1.37
C_4H_8 56.104				1.680	0.185	10.38	0.646	0.646	0.831	0.185	10.38
C_4H_{10} 58.120				0.910	0.100	5.81	0.350	0.350	0.450	0.100	5.81
C_5H_{10} 70.130				0.870	0.096	6.73	0.335	0.335	0.431	0.096	6.73
C_5H_{12} 72.146				0.250	0.027	1.95	0.096	0.096	0.123	0.027	1.95
C_6H_{12} 84.156				0.290	0.032	2.69	0.112	0.112	0.144	0.032	2.69
C_3-C_6											41.17
TOTAL		38.688	499.74		10.995	276.07	38.466	77.154	57.982		
H_2+CO	96.360	37.280	141475752 SCFH		4.065		14.221	51.501	18.286	-33.215	
H_2/CO		1.59	Factor 706839		6.08		6.08	2.14	6.08	1.41	

CONDENSATE #/MCF	CONDENSATE #/gal	CONDENSATE gal/hr	CONDENSATE gal/MCF
0.601			
0.397			
2.598			
0.865	4.32	2.833	0.200
0.097	4.24	0.323	0.023
0.734	5.00	2.076	0.147
0.411	4.86	1.195	0.084
0.476	5.45	1.235	0.087
0.138	5.25	0.371	0.026
0.190	5.54	0.486	0.034
2.911		8.519	0.601

YIELDS BASIS BROWNSVILLE DESIGN FEED RATE*

	CORRECTED HEMPEL. %	gal/hr	TREATING RECOVERY, %	gal/hr
400 EP	76.7	8.092	98.0	7.930
400-550	14.0	1.477	91.4	1.350
550 +	9.3	0.981	114.6	1.124

	RECOVERY %	#/hr	gal/hr	
PROPYLENE	50.7	6.21		
C_3 POLY GASO.	87.5	5.43	0.908	
C_3 POLY TAR	12.5	0.73	0.104	

	#/gal	#/hr	gal/hr	RVP
C_4H_8	5.00	--	--	68.0
C_4 POLY GASO.	5.98	9.08	1.519	1.5
C_4H_{10}	4.86	(5.81) 4.93	(1.195) 1.014	68.0
C_4-FREE GASO.			10.930	5.8
C_4 POLY TAR	7.53	1.30	0.173	

	gal/hr	gal/MCF	Bbl/Day
10 # RVP 400 EP GASOLINE	13.463	0.9516	5159
GAS OIL	1.350	0.0954	517
FUEL OIL	1.124	0.0794	430
POLY TAR	0.277	0.0196	106
TOTAL	16.214	1.1460	6212
W.S.CHEM.	2.004	0.1417	768
TOTAL	18.218	1.2877	6980

Weight Recovery, %	97.61	Catalyst Age, hrs.		Space Velocity, vhv	1118	RECOVERED OIL	** 0.488	68.44
Pressure, psig	420	Inlet Velocity, Ft/sec	0.92	Catalyst, Vol. CF	12.65	TOTAL OIL		109.61
Temperature, °F	683	Bed Depth, Ft	19.16	Weight, #	1733	WATER SOLUBLE CHEMICALS	** 0.299	15.89
Recycle Ratio	0.99	Bed Density, #/CF	137	Effluent $(H_2)(CO_2)$ / Shift Ratio $(H_2O)(CO)$	= 13.16	TOTAL LIQUID PRODUCTS C_3+		125.50
						NET WATER	** 7.734	139.34
						GROSS WATER		155.23
						HYDROCARBON TOTAL—C_1+		162.25

FRESH FEED CONVERSION — % Contraction	CO	H_2	H_2+CO	TOTAL FEED CONVERSION — % CO	H_2	CO+H_2	SELECTIVITY C_3 + / C_1 +
71.58	96.01	84.76	89.10	84.23	55.29	64.40	77.35

9.849	16.728	1.182	W.S.CHEM.	2.004	0.1417	768
10.972	18.732	1.324	TOTAL	18.218	1.2877	6980
11.470						

Form ML—11

**Included in Reactor Effluent Total

g/NCM = 16.91 × #/MCF *9488 MCFH H_2 + CO, Bbl/Day = 5421.6 × gal/MCF

THE TEXAS COMPANY — MONTEBELLO LABORATORY
DATA SUMMARY

RUN NO. 59-JJ
HOURS 796-806

OPERATING CONDITIONS		RATES S.C.F.H.	
PRESSURES PSIG			
Oxygen	441	Fresh Feed	14682
Natural Gas	438	Recycle	14598
Generator Outlet	425	Combined Feed	29280
Reactor Inlet	420	Wet Gas—Measured	3992
Condenser Inlet		Adjusted	4173
Product Accumulator	375	Loss	181
TEMPERATURES—°F.		Recycle/Fresh Feed	0.99
Oxygen	331	Inlet Velocity—ft./sec.	0.92
Natural Gas	283	Fresh Feed Rate—S.C.F.H.	14148
Generator	2428	H_2+CO per Cu. Ft. Dense Bed	1118
Quench Accumulator	136	per Lb. Catalyst	8.16
Reactor Inlet	340	per Sq. Ft.	21436
Condenser Inlet	535		
Product Accumulator	95	Heat Transfer Calculations	
Catalyst No. Height		Steam Rate=437#/hr	
1 See Per. A	657	@ 705 psia & 506°F=	
2	685	1201 BTU	
3	683	Water in @ 71°F=39	
4	671	Net BTU/# Steam=1162	
5	692	1162x437=507794	
6	688	Ave. Bed Temp=683°F	
7	676	Tube Area=34.8 sq ft	
8	658	dT=683-506=177	
9	650	K= 507794 / (177)(34.8) = 82.4 BTU/°F/sq ft	
10	645		
11	616		

PRODUCT TESTS	OIL	WATER
°API	50.1	10.7
Neut. No.	36.4	30.3
Sap. No.	44.4	33.0
Hydrox. No.		
Bromine No.	92	
Pour °F.		
Chemicals, % by K_2CO_3		10.7
HEMPEL. DIST. %		°API
205 °F.		
400	77.0	56.1
400-550	14.4	36.2
550+	8.6	
A. S. T. M. DIST. ON		
Naphtha °F.		
IBP	106	
10%	140	
50%	232	
90%	360	
EP	406	
Rec.	95.0	

CATALYST DATA — INVENTORY DATA	
In Reactor at Start of Period	
Fresh Catalyst Added	--
Total	
Catalyst Recovered	29
In Reactor at End of Period	
REACTOR d-p, Inches H_2O	
No. Height	
0 See Period A	47
1	68
2	71
3	69
4	250
Total	505
CALCULATED FROM dp	
Density, Lbs./Cu.Ft.	137
Inventory, Lbs.	1733
Bed Depth, Ft.	19.16
Vol., Cu. Ft.	12.65

PARTICLE SIZE

Screen Analysis Mesh	Microns	%	Sedimentation Microns	%
On 40	419+	43.3	80+	
100	150	34.8	40—80	
150	105	8.5	20—40	
200	74	5.7	10—20	
250	62	2.6	0—20	
325	44	1.4		
<325		3.7		

CATALYST	
Bulk Density, Lbs./Cu.Ft.	
Aerated	144
Settled	145
Compacted	169
Particle Density, gm./cc.	4.40
NH_3 Value, ml./gm.	
N_2 Surface, m^2/gm.	

CHEMICAL ANALYSIS

Fe	
C	6.69
O	
H	
K_2O, W+, % basis Fe	
X-Ray Analysis—	
$Fe_{20}C_9$	
Fe_3O_4	
Fe	1.77

RUN NO. 59-KK
HOURS 806-830
CATALYST Spent CM&S

THE TEXAS COMPANY — MONTEBELLO LABORATORY
YIELD CALCULATIONS

	FRESH FEED			WET GAS			RECYCLE	COMBINED FEED	EFFLUENT	NET CHANGE		YIELD BASIS H_2+CO FED							
	%	m/hr	#/hr	%	At Wt. Balance m/hr	#/hr	m/hr	m/hr	m/hr	m/hr	#/hr	CONDENSATE #/MCF	#/gal	gal/hr	gal/MCF	YIELDS BASIS BROWNSVILLE DESIGN FEED RATE*	CORRECTED HEMPEL, %	gal/hr	TREATING RECOVERY,%	gal/hr
CO 28.010	37.423	14.371	402.54	6.374	0.787	22.04	2.487	16.858	3.274	-13.584	-380.50									
H_2 2.016	58.373	22.416	45.19	35.360	4.365	8.80	13.797	36.213	18.162	-18.051	-36.39					400 EP	78.0	7.777	98.0	7.621
CO_2 44.010	3.217	1.235	54.35	33.324	4.114	181.08	13.003	14.238	17.117	2.879	126.73	9.078				400-550	14.4	1.436	91.4	1.313
N_2 28.016	0.177	0.068	1.91	1.663	0.205	5.74	0.649	0.717	0.854							550 +	7.6	0.758	114.6	0.869
CH_4 16.042	0.810	0.311	4.99	11.747	1.450	23.26	4.584	4.895	6.034	1.139	18.27	1.309								
C_2H_4 28.052				2.623	0.324	9.09	1.023	1.023	1.347	0.324	9.09	0.651					RECOVERY %	#/hr	gal/hr	
C_2H_6 30.068				1.553	0.192	5.77	0.606	0.606	0.798	0.192	5.77	0.413				PROPYLENE	44.3	6.41		
C_1+C_2											33.13	2.373				C_3 POLY GASO.	87.5	5.61	0.938	
C_3H_6 42.078				2.783	0.344	14.47	1.086	1.086	1.430	0.344	14.47	1.037	4.32	3.350	0.240	C_3 POLY TAR	12.5	0.80	0.106	
C_3H_8 44.094				0.333	0.041	1.81	0.130	0.130	0.171	0.041	1.81	0.130	4.24	0.427	0.031					
C_4H_8 56.104				2.193	0.271	15.20	0.856	0.856	1.127	0.271	15.20	1.089	5.00	3.040	0.218		#/gal	#/hr	gal/hr	RVP
C_4H_{10} 58.120				0.587	0.072	4.18	0.229	0.229	0.301	0.072	4.18	0.299	4.86	0.860	0.062	C_4H_8	5.00	1.18	0.236	68.0
C_5H_{10} 70.130				0.987	0.122	8.56	0.385	0.385	0.507	0.122	8.56	0.613	5.45	1.571	0.113	C_4 POLY GASO.	5.98	12.27	2.051	1.5
C_5H_{12} 72.146				0.173	0.021	1.52	0.068	0.068	0.089	0.021	1.52	0.109	5.25	0.290	0.021	C_4H_{10}	4.86	4.18	0.860	68.0
C_6H_{12} 84.156				0.300	0.037	3.12	0.117	0.117	0.154	0.037	3.12	0.223	5.54	0.563	0.040	C_4-FREE GASO.			10.983	5.8
C_3-C_6											48.86	3.500		10.101	0.725	C_4 POLY TAR	7.53	1.75	0.232	
TOTAL		38.401	508.98		12.345	304.64	39.020	77.421	59.046											
H_2+CO	95.796	36.787	13960351 SCFH	5.152			16.284	53.071	21.436	-31.635							gal/hr	gal / MCF	Bbl/Day	
H_2 CO		1.56	Factor 716314	5.55			5.55	2.15	5.55	1.33						10 # RVP 400 EP GASOLINE	14.130	1.0122	5488	
									RECOVERED OIL	** 0.460	64.57	4.625		9.971	0.714	GAS OIL	1.313	0.0941	510	
									TOTAL OIL		113.43	8.125		20.072	1.439	FUEL OIL	0.869	0.0622	337	
									WATER SOLUBLE CHEMICALS	** 0.276	14.65	1.049		1.856	0.133	POLY TAR	0.338	0.0241	131	
									TOTAL LIQUID PRODUCTS C_3+		128.08	9.174		21.928	1.572	TOTAL	16.650	1.1926	6466	
									NET WATER	** 6.945	125.12	8.963		15.020	1.076	W. S. CHEM.	1.856	0.1329	721	
									GROSS WATER		139.77	10.012		16.876	1.209	TOTAL	18.506	1.3255	7187	
									HYDROCARBON TOTAL—C_1+		161.21	11.547							

Weight Recovery, % 93.94 | Catalyst Age, hrs. | Space Velocity, vhv 1134
Pressure, psig 420 | Inlet Velocity, Ft/sec 0.91 | Catalyst, Vol CF 12.31
Temperature, °F 675 | Bed Depth, Ft 18.65 | Weight, # 1637
Recycle Ratio 1.02 | Bed Density, #/CF 133 | Effluent $(H_2)(CO_2)$ / Shift Ratio $(H_2O)(CO)$ = 13.67

FRESH FEED CONVERSION — %: Contraction 67.85 | CO 94.52 | H_2 80.53 | H_2+CO 85.99
TOTAL FEED CONVERSION — %: CO 80.58 | H_2 49.85 | CO+H_2 59.61
SELECTIVITY: C_3 + C_1 + 79.45

Form ML—11

**Included in Reactor Effluent Total

g/NCM = 16.91 × #/MCF *9488 MCFH H_2 + CO, Bbl/Day = 5421.6 × gal/MCF

THE TEXAS COMPANY — MONTEBELLO LABORATORY
DATA SUMMARY

RUN NO. 59-KK
HOURS 806-830

OPERATING CONDITIONS				PRODUCT TESTS			CATALYST DATA				
PRESSURES PSIG		RATES S.C.F.H.			OIL	WATER	INVENTORY DATA		PARTICLE SIZE		
Oxygen	442	Fresh Feed	14573	°API	50.4	10.8	In Reactor at Start of Period		Screen Analysis		Sedimentation
Natural Gas	439	Recycle	14808	Neut. No.	39.2	33.6	Fresh Catalyst Added	--	Mesh	Microns %	Microns %
Generator Outlet	425	Combined Feed	29381	Sap. No.	47.7	35.2	Total		On 40	419+ 58.6	80+
Reactor Inlet	420	Wet Gas—Measured	4203	Hydrox. No.			Catalyst Recovered	70.5	100	150 34.1	40—80
Condenser Inlet		Adjusted	4685	Bromine No.	94		In Reactor at End of Period		150	105 4.5	20—40
Product Accumulator	374	Loss	482	Pour °F.					200	74 1.6	10—20
				Chemicals, % by K_2CO_3		11.0	REACTOR d-p, Inches H_2O		250	62 0.2	0—20
							No. Height		325	44 0.4	
TEMPERATURES—°F.		Recycle/Fresh Feed	1.02				0 See Period A	46	<325	0.6	
Oxygen	329	Inlet Velocity—ft./sec.	0.91				1	67	CATALYST		
Natural Gas	306	Fresh Feed Rate—S.C.F.H.	13960	HEMPEL. DIST. %		°API	2	68	Bulk Density, Lbs./Cu.Ft.		
Generator	2435	H_2+CO per Cu. Ft. Dense Bed	1134	205 °F.			3	66	Aerated		142
Quench Accumulator	131	per Lb. Catalyst	8.53	400	77.0	56.1	4	230	Settled		144
Reactor Inlet	340	per Sq. Ft.	21152	400-550	14.4	36.2	Total	477	Compacted		163
Condenser Inlet	541			550+	8.6				Particle Density, gm. cc.		4.52
Product Accumulator	98	Heat Transfer Calculations					CALCULATED FROM dp		NH_3 Value, ml./gm.		
Catalyst No. Height		Steam Rate=413#/hr		A. S. T. M. DIST. ON			Density, Lbs./Cu.Ft.	133	N_2 Surface, m^2/gm.		
1 See Per. A	644	@ 705 psia & 506°F=		Naphtha °F.			Inventory, Lbs.	1637			
2	677	1201 BTU		IBP	104		Bed Depth, Ft.	18.65	CHEMICAL ANALYSIS		
3	677	Water in @ 78°F=46		10%	136		Vol., Cu. Ft.	12.31	Fe		
4	662	Net BTU/# Steam=1155		50%	230				C		7.45
5	685	1155x413=477015		90%	362				O		
6	682	Ave. Bed Temp=675		EP	396				H		
7	670	dT=675-506=169°F		Rec.	95.0				K_2O, W+, % basis Fe		
8	656	Tube Area=34.0 sq ft							X-Ray Analysis—		
9	646	$K = \frac{477015}{(34.0)(169)} = 83.0$ BTU/°F/sq ft							$Fe_{20}C_9$		
10	644								Fe_3O_4		
11	620								Fe		

RUN NO. 59-LL
HOURS 830-843
CATALYST Spent CM&S

THE TEXAS COMPANY — MONTEBELLO LABORATORY
YIELD CALCULATIONS

	FRESH FEED %	FRESH FEED m/hr	FRESH FEED #/hr	WET GAS %	WET GAS At Wt. Balance m/hr	WET GAS At Wt. Balance #/hr	RECYCLE m/hr	COMBINED FEED m/hr	EFFLUENT m/hr	NET CHANGE m/hr	NET CHANGE #/hr	YIELD BASIS H_2+CO FED — CONDENSATE #/MCF	CONDENSATE #/gal	CONDENSATE gal/hr	CONDENSATE gal/MCF
CO 28.010	37.370	14.346	401.86	5.485	0.678	18.99	2.152	16.498	2.830	-13.668	-382.87				
H_2 2.016	58.845	22.592	45.55	35.720	4.414	8.90	14.016	36.608	18.430	-18.178	-36.65				
CO_2 44.010	2.405	0.923	40.62	33.105	4.091	180.03	12.990	13.913	17.081	3.168	139.41	9.945			
N_2 28.016	0.280	0.107	3.00	1.210	0.150	4.20	0.475	0.582	0.625						
CH_4 16.042	1.100	0.422	6.77	13.010	1.608	25.80	5.105	5.527	6.713	1.186	19.03	1.358			
C_2H_2 26.038				2.835	0.350	9.82	1.112	1.112	1.462	0.350	9.82	0.701			
C_2H_4 30.068				1.530	0.189	5.68	0.600	0.600	0.789	0.189	5.68	0.405			
C_1+C_2											34.53	2.464			
C_3H_6 42.079				2.940	0.363	15.27	1.154	1.154	1.517	0.363	15.27	1.089	4.32	3.535	0.252
C_4H_8 44.094				0.380	0.047	2.07	0.149	0.149	0.196	0.047	2.07	0.148	4.24	0.488	0.035
C_4H_6 56.104				1.945	0.240	13.46	0.763	0.763	1.003	0.240	13.46	0.960	5.00	2.692	0.192
C_4H_{10} 58.120				0.630	0.078	4.53	0.247	0.247	0.325	0.078	4.53	0.323	4.86	0.932	0.066
C_5H_{10} 70.130				0.820	0.101	7.08	0.322	0.322	0.423	0.101	7.08	0.505	5.45	1.299	0.093
C_5H_{12} 72.146				0.175	0.022	1.59	0.069	0.069	0.091	0.022	1.59	0.113	5.25	0.303	0.022
C_6H_{12} 84.156				0.215	0.027	2.27	0.084	0.084	0.111	0.027	2.27	0.162	5.54	0.410	0.029
C_3-C_6											46.27	3.300		9.659	0.689
TOTAL		38.390	497.80		12.358	299.69	39.238	77.628	59.232						
H_2+CO	96.215	36.938	14017563 SCFH	5.092			16.168	53.106	21.260	-31.846					
H_2/CO		1.57	Factor 713390	6.51			6.51	2.22	6.51	1.33					

Weight Recovery, % 97.31	Catalyst Age, hrs.	Space Velocity, vhv 1121	RECOVERED OIL	** 0.419	58.71	4.188
Pressure, psig 420	Inlet Velocity, Ft/sec 0.92	Catalyst, Vol CF 12.51	TOTAL OIL		104.98	7.488
Temperature, °F 676	Bed Depth, Ft 18.95	Weight, # 1689	WATER SOLUBLE CHEMICALS	** 0.267	14.19	1.012
Recycle Ratio 1.02	Bed Density, #/CF 135	Effluent $(H_2)(CO_2)$ / Shift Ratio $(H_2O)(CO)$ = 16.01	TOTAL LIQUID PRODUCTS C_5+		119.17	8.500
			NET WATER	** 6.950	125.21	8.932
			GROSS WATER		139.40	9.944
			HYDROCARBON TOTAL—C_1+		153.70	10.964

FRESH FEED CONVERSION — %				TOTAL FEED CONVERSION — %			SELECTIVITY
Contraction	CO	H_2	H_2+CO	CO	H_2	$CO+H_2$	C_3+/C_1+
67.81	95.27	80.46	86.21	82.85	49.66	59.97	77.53

YIELDS BASIS BROWNSVILLE DESIGN FEED RATE*	CORRECTED HEMPEL, %	gal/hr	TREATING RECOVERY, %	gal/hr
400 EP	76.6	6.931	98.0	6792
400-550	15.6	1.412	91.4	1.291
550 +	7.8	0.706	114.6	0.809

	RECOVERY %	#/hr	gal/hr
PROPYLENE	44.2	6.75	
C_3 POLY GASO.	87.5	5.91	0.988
C_3 POLY TAR	12.5	0.84	0.112

	#/gal	#/hr	gal/hr	RVP
C_4H_8	5.00	0.30	0.060	68.0
C_4 POLY GASO.	5.98	11.52	1.926	1.5
C_4H_{10}	4.86	4.53	0.932	68.0
C_4-FREE GASO.			9.792	5.8
C_4 POLY TAR	7.53	1.64	0.218	

	gal/hr	gal/MCF	Bbl/Day
10 # RVP 400 EP GASOLINE	12.710	0.9067	4916
GAS OIL	1.291	0.0921	499
FUEL OIL	0.809	0.0577	313
POLY TAR	0.330	0.0235	127
TOTAL	15.140	1.0800	5855
W.S. CHEM.	1.801	0.1285	697
TOTAL	16.941	1.2085	6552

Form ML—11

**Included in Reactor Effluent Total

g/NCM = 16.91 × #/MCF *9488 MCFH H_2 + CO, Bbl/Day = 5421.6 × gal/MCF

RUN NO. 59-LL
HOURS 830-843

THE TEXAS COMPANY — MONTEBELLO LABORATORY
DATA SUMMARY

OPERATING CONDITIONS				PRODUCT TESTS			CATALYST DATA			
PRESSURES PSIG		RATES S.C.F.H.			OIL	WATER	INVENTORY DATA		PARTICLE SIZE	
Oxygen	441	Fresh Feed	14569	°API	50.3	10.8	In Reactor at Start of Period		Screen Analysis	Sedimentation
Natural Gas	438	Recycle	14891	Neut. No.	38.6	34.4	Fresh Catalyst Added	35	Mesh / Microns / %	Microns / %
Generator Outlet	425	Combined Feed	29460	Sap. No.	46.5	35.2	Total		On 40 / 419+	80+
Reactor Inlet	420	Wet Gas—Measured	4480	Hydrox. No.			Catalyst Recovered	39	100 / 150	40—80
Condenser Inlet		Adjusted	4690	Bromine No.	94		In Reactor at End of Period		150 / 105	20—40
Product Accumulator	376	Loss	210	Pour °F.					200 / 74	10—20
				Chemicals, % by K_2CO_3		10.7	REACTOR d-p, Inches H_2O		250 / 62	0—20
							No. Height		325 / 44	
TEMPERATURES—°F.		Recycle/Fresh Feed	1.02				0 See Period A	47	<325	
Oxygen	350	Inlet Velocity—ft./sec.	0.92				1	68	CATALYST	
Natural Gas	309	Fresh Feed Rate—S.C.F.H. H_2+CO	14018	HEMPEL. DIST. %		°API	2	69	Bulk Density, Lbs./Cu.Ft.	
Generator	--	per Cu. Ft. Dense Bed	1121	205 °F.			3	68	Aerated	
Quench Accumulator	136	per Lb. Catalyst	8.30	400	75.6	56.1	4	240	Settled	
Reactor Inlet	354	per Sq. Ft.	21239	400-550	15.6	36.2	Total	492	Compacted	
Condenser Inlet	533			550+	8.8				Particle Density, gm./cc.	
Product Accumulator	101	Heat Transfer Calculations					CALCULATED FROM dp		NH_3 Value, ml./gm.	
Catalyst No. Height		Steam Rate=420#/hr		A. S. T. M. DIST. ON			Density, Lbs./Cu.Ft.	135	N_2 Surface, m^2/gm.	
1 See Per. A	644	@ 705 psia & 506°F=		Naphtha °F.			Inventory, Lbs.	1689		
2	676	1201 BTU		IBP	104		Bed Depth, Ft.	18.95	CHEMICAL ANALYSIS	
3	679	Water in @ 91°F=59°F		10%	136		Vol., Cu. Ft.	12.51	Fe	
4	667	Net BTU/# Steam=1142		50%	228				C	
5	683	1142x420=479640		90%	348				O	
6	680	Ave. Bed Temp=676°F		EP	394				H	
7	669	dT=676-506=170°F		Rec.	96.0				K_2O, W+, % basis Fe	
8	652	Tube Area=34.4 sq ft							X-Ray Analysis—	
9	643	K= 479640 / (34.4)(170) = 82.0 BTU/°F/sq ft							$Fe_{20}C_9$	
10	641								Fe_3O_4	
11	615								Fe	

THE TEXAS COMPANY — MONTEBELLO LABORATORY

RATE CALCULATIONS

RUN NO. 59-A
HOURS 0-14

	GAS ANALYSES				GENERATOR BALANCE										WEIGHT BALANCE		
HOUR	2200	0200	0600	AVERAGE	M/HR	C	H	O		Mol %	M/Hr	C	H	O		#/hr Measured	At Wt. Balance
FRESH FEED									O_2 32.000	0.21	11.678 0.030			23.416	WET GAS	309.57	309.24
CO 28.010	36.61	36.32	36.94	36.623	16.267	16.267		16.267	CO_2 44.010	1.26	0.180	0.180		0.360	OIL	93.14	93.14
H_2 2.016	60.34	60.03	60.71	60.361	26.810		53.620		N_2 28.016	0.80	0.114				WATER	158.53	158.53
CO_2 44.010	2.47	2.85	1.71	2.343	1.041	1.041		2.082	CH_4 16.042	81.83	11.684	11.684	46.736		TOTAL	561.24	560.91
N_2 28.016	0.12	0.15	0.09	0.120	0.053				C_2H_4 30.068	6.65	0.950	1.900	5.700		FRESH FEED	560.91	
CH_4 16.042	0.46	0.65	0.55	0.553	0.246	0.246	0.984		C_2H_6 44.094	6.97	0.995	2.985	7.960		WEIGHT BALANCE	100.0588	
			M. W	12.628					C_4H_{10} 58.120	1.61	0.230	0.920	2.300				
			H_2O 18.016				10.049	5.025	C_5H_{12} 72.146	0.67	0.096	0.480	1.152		WET GAS FACTOR	998934	
						17.554	64.653	23.374	MW =	20.465					INDICATED LOSS—S C F H	-5	
			BALANCE			96.72	101.26	98.31	TOTAL		25.957	18.149	63.848	23.776			

WET GAS					GAS FLOW RATES							LIQUID PRODUCT RATES								Basis 8 hours
CO 28.010	8.05	8.23	8.04	8.107		$\sqrt{P}$	PRESSURE	TEMP.	M. W.	S. C. F. H.	M/HR	HOUR	GAGE	GAL.	°F	FACTOR	GAL. AT 60	API° #/GAL.	#	#/HR GAL HR
H_2 2.016	32.22	34.21	34.78	33.736	FRESH FEED							OIL	3'3"	174.73	60	1.0000	174.73	49.4	1.50	93.14
CO_2 44.010	32.78	33.65	33.70	33.376	79.31	6.800	20.785	0.9933	1.5139	16857	44.418		1'2"	60.66	64	0.9980	60.54	6.512	743.61	14.274
N_2 28.016	1.59	1.11	0.99	1.230	WET GAS												114.19		745.11	
CH_4 16.042	15.23	12.97	11.93	13.377	158.44	6.93	4.049	0.9924	1.088	4800	12.648									
C_2H_4 28.052	2.10	2.21	2.83	2.380	RECYCLE															
C_2H_6 33.068	1.51	1.56	1.32	1.397	79.31	8.18	20.833	0.9428	1.088	13864	36.532									
C_3H_6 42.078	2.87	2.86	2.90	2.877	BLEED															
C_3H_8 44.094	0.53	0.55	0.51	0.530	5.02	8.40	20.833	1.0000	1.088	956	2.519	WATER	4'6"	240.20	77	0.99804	239.73	10.6	1988.08	
C_4H_8 56.104	1.62	1.62	1.64	1.627	NATURAL GAS								1'8"	87.01	80	0.99759	86.80	8.293	719.83	158.53
C_4H_{10} 58.120	0.71	0.50	0.56	0.590	28.43	8.50	21.307	0.8849	1.1894	5419	14.279						152.93		1268.25	19.116
C_5H_{10} 70.130	0.57	0.57	0.60	0.580	OXYGEN															
C_5H_{12} 72.146	0.11	0.07	0.09	0.090	27.07	7.719	21.354	0.9933		4432	11.678									
C_6H_{12} 84.156	0.11	0.09	0.11	0.103	STEAM		40.7-10.0 +14.7 45.4													
			M. W.	24.476	215.7	4.9	0.3307		350 #/hr.											

THE TEXAS COMPANY — MONTEBELLO LABORATORY

RATE CALCULATIONS

RUN NO. 59-B
HOURS 14-38

	GAS ANALYSES				GENERATOR BALANCE										WEIGHT BALANCE		
HOUR	2200	1400	0600	AVERAGE	M/HR	C	H	O		Mol %	M/Hr	C	H	O		#/hr Measured	At Wt. Balance
FRESH FEED									O_2 32.000	0.25	11.668 0.036			23.408	WET GAS	311.32	308.84
CO 28.010	37.14	36.67	36.01	36.607	16.394	16.394		16.394	CO_2 44.010	1.14	0.166	0.166		0.332	OIL	80.49	80.49
H_2 2.016	60.74	59.84	61.14	60.573	27.128		54.256		N_2 28.016	0.58	0.084				WATER	169.59	169.59
CO_2 44.010	1.43	2.26	2.14	1.943	0.870	0.870		1.740	CH_4 16.042	84.06	12.243	12.243	48.972		TOTAL	561.40	558.92
N_2 28.016	0.07	0.10	0.07	0.080	0.036				C_2H_4 30.068	5.58	0.813	1.626	4.878		FRESH FEED	558.92	
CH_4 16.042	0.62	1.13	0.64	0.797	0.357	0.357	1.428		C_2H_6 44.094	5.77	0.840	2.520	6.720		WEIGHT BALANCE	100.48	
			M. W	12.48015					C_4H_{10} 58.120	1.79	0.261	1.044	2.610				
			H_2O 18.016				10.080	5.040	C_5H_{12} 72.146	0.83	0.121	0.605	1.452		WET GAS FACTOR	992033	
						17.621	65.764	23.174	MW =	20.09029					INDICATED LOSS—S C F H	-40	
			BALANCE			96.80	101.75	97.62	TOTAL			18.204	64.632	23.740			

WET GAS					GAS FLOW RATES							LIQUID PRODUCT RATES								
CO 28.010	8.96	9.26	9.29	9.170		$\sqrt{P}$	PRESSURE	TEMP.	M. W.	S. C. F. H.	M/HR	HOUR	GAGE	GAL.	°F	FACTOR	GAL. AT 60	API° #/GAL.	#	#/HR GAL HR
H_2 2.016	37.81	35.82	37.22	36.950	FRESH FEED				2319683			OIL	7'1½"	377.68	66	0.9970	376.55	50.8 6.462	2433.27	
CO_2 44.010	31.56	31.86	32.32	31.913	79.31	6.927	20.833	0.9750	1.5231	16996	44.785		3'3"	174.73	60	1.0000	174.73	49.4 6.512	1137.84	
N_2 28.016	1.04	1.08	0.94	1.020	WET GAS				1216614				2'6"	133.50	58	1.0010	133.63	50.8	863.52	
CH_4 16.042	11.14	12.62	10.77	11.510	158.44	7.045	4.075	0.9896	1.1030	4965	13.083		0'8"	35.15	60	1.0000	35.15	6.462	227.14	
C_2H_4 28.052	2.15	1.97	2.07	2.063	RECYCLE												300.30		1931.81	80.49
C_2H_6 33.068	0.97	0.90	0.97	0.947	79.31	8.075	20.881	0.9452	1.1030	13942	36.738									12.513
C_3H_6 42.078	2.61	2.23	2.80	2.547	BLEED															
C_3H_8 44.094	0.29	0.17	0.33	0.263	5.02	8.480	20.881	1.0000	1.1030	980	2.582	WATER	7'1½"	376.59	78	0.99788	375.79	8.287 10.7	3114.17	
C_4H_8 56.104	1.79	1.83	1.79	1.803	NATURAL GAS				1440994				4'6"	240.20	77	0.99804	239.73	10.6 8.293	1988.08	
C_4H_{10} 58.120	0.43	0.81	0.37	0.537	28.43	8.523	21.424	0.8870	1.2004	5527	14.564		6'11½"	368.95	71	0.99883	368.52	10.7	3053.93	
C_5H_{10} 70.130	0.86	0.94	0.81	0.870	OXYGEN								0'3"	13.28	70	0.99896	13.27	8.287	109.97	
C_5H_{12} 72.146	0.17	0.26	0.13	0.187	27.07	7.713	21.448	0.9887		4428	11.668						492.31		4070.05	169.59
C_6H_{12} 84.156	0.22	0.25	0.19	0.220	STEAM		54.9-10.0 +14.7													20.513
			M. W.	23.795535	215.7	5.150	0.3288		365 #/hr.											

THE TEXAS COMPANY — MONTEBELLO LABORATORY

RATE CALCULATIONS

RUN NO. 59-C
HOURS 38-62

	GAS ANALYSES				GENERATOR BALANCE										WEIGHT BALANCE		
HOUR	1400	2200	0600	AVERAGE	M/HR	C	H	O		Mol %	M/Hr	C	H	O		#/hr Measured	At Wt. Balance
FRESH FEED									O_2 32.000	0.21	11.642 0.030			23.344	WET GAS	319.74	335.66
CO 28.010	36.38	36.49	36.29	36.387	16.293	16.293		16.293	CO_2 44.010	1.21	0.174	0.174		0.348	OIL	76.05	76.05
H_2 2.016	60.44	60.47	60.44	60.450	27.070		54.140		N_2 28.016	4.64	0.666				WATER	151.61	151.61
CO_2 44.010	2.23	2.34	2.37	2.313	1.036	1.036		2.072	CH_4 16.042	80.13	11.498	11.498	45.992		TOTAL	547.40	563.32
N_2 28.016	0.10	0.15	0.12	0.123	0.055				C_2H_4 30.068	5.33	0.765	1.530	4.590		FRESH FEED	563.32	
CH_4 16.042	0.85	0.55	0.78	0.727	0.326	0.326	1.304		C_2H_6 44.094	5.72	0.821	2.463	6.568		WEIGHT BALANCE	97.17	
			M. W	12.579707					C_4H_{10} 58.120	1.82	0.261	1.044	2.610				
			H_2O 18.016				8.295	4.148	C_5H_{12} 72.146	0.94	0.135	0.675	1.620		WET GAS FACTOR	104979	
						17.655	63.739	22.513	MW =	20.61488					INDICATED LOSS—S C F H	245	
			BALANCE			101.56	103.84	95.02	TOTAL			17.384	61.380	23.692			

WET GAS					GAS FLOW RATES							LIQUID PRODUCT RATES								
CO 28.010	6.56	6.41	6.64	6.536		$\sqrt{H}$	PRESSURE	TEMP.	M. W.	S. C. F. H.	M/HR	HOUR	GAGE	GAL.	°F	FACTOR	GAL. AT 60	API° #/GAL.	#	#/HR GAL HR
H_2 2.016	35.39	35.34	37.06	35.930	FRESH FEED		420.0	102.5	2301325			OIL	7'2½"	380.96	63	0.9985	380.39	50.6 6.469	2460.74	
CO_2 44.010	33.79	34.57	33.34	33.900	79.31	7.046	20.849	0.9615	1.5170	16994	44.780		2'6"	133.50	58	1.0010	133.63	50.8 6.462	863.52	
N_2 28.016	1.85	1.75	1.78	1.793	WET GAS		1.94	68.2	1175975				0'11½"	49.82	58	1.0010	49.87	50.6	322.61	
CH_4 16.042	12.24	11.06	11.56	11.620	158.44	7.088	4.079	0.9922	1.0844	4929	12.988		0'3½"	15.49	60	1.0000	15.49	6.469	100.20	
C_2H_4 28.052	2.09	2.23	2.18	2.167	RECYCLE		422.4	124.3									+0.85		+5.50	
C_2H_6 33.068	1.15	1.04	1.01	1.067	79.31	8.025	20.907	0.9434	1.0844	13613	35.871						281.99		1825.13	76.05
C_3H_6 42.078	1.94	2.88	2.28	2.367	BLEED															11.750
C_3H_8 44.094	0.15	0.32	0.21	0.227	5.02	8.417	20.907	0.9434	1.0844	904	2.382	WATER	7'3"	384.23	78	0.99788	383.42	10.8	3175.48	
C_4H_8 56.104	1.97	2.18	1.78	1.977	NATURAL GAS		445.0	203.4	1404325				0'4"	17.70	60	1.00000	17.70	8.282	146.59	
C_4H_{10} 58.120	1.06	0.65	0.69	0.800	28.43	8.517	21.441	0.8853	1.1850	5446	14.350		1'8"	87.01	72	0.99872	86.90	10.8	719.71	
C_5H_{10} 70.130	1.06	1.08	0.93	1.023	OXYGEN		447.3	73.5					0'3"	13.28	60	1.00000	13.28	8.282	109.98	
C_5H_{12} 72.146	0.46	0.21	0.29	0.320	27.07	7.692	21.494	0.9872		4418	11.642						439.34		3638.62	151.61
C_6H_{12} 84.156	0.29	0.28	0.25	0.273	STEAM		41.1													18.306
			M. W.	24.61785	215.7	5.083	0.3322		364 #/hr.											

THE TEXAS COMPANY — MONTEBELLO LABORATORY

RATE CALCULATIONS

RUN NO. 59-D
HOURS 58-82

	GAS ANALYSES				GENERATOR BALANCE										WEIGHT BALANCE		
HOUR	1400	2200	0600	AVERAGE	M/HR	C	H	O		Mol %	M/Hr	C	H	O		#/hr Measured	At Wt. Balance
FRESH FEED									O_2 32.000	0.22	11.755 0.032			23.574	WET GAS	320.55	321.01
CO 28.010	36.46	36.74	36.15	36.450	16.327	16.327		16.327	CO_2 44.010	1.18	0.170	0.170		0.340	OIL	83.04	83.04
H_2 2.016	59.65	60.25	60.77	60.223	26.975		53.950		N_2 28.016	1.53	0.221				WATER	163.27	163.27
CO_2 44.010	2.43	2.54	2.55	2.507	1.123	1.123		2.246	CH_4 16.042	82.61	11.933	11.933	47.732		TOTAL	566.86	567.32
N_2 28.016	0.00	0.05	0.12	0.057	0.026				C_2H_4 30.068	5.84	0.844	1.688	5.064		FRESH FEED	567.32	
CH_4 16.042	1.46	0.42	0.41	0.763	0.342	0.342	1.368		C_2H_6 44.094	5.91	0.854	2.562	6.832		WEIGHT BALANCE	99.92	
			M. W	12.66544					C_4H_{10} 58.120	1.80	0.260	1.040	2.600				
			H_2O 18.016				9.582	4.791	C_5H_{12} 72.146	0.91	0.131	0.655	1.572		WET GAS FACTOR	1001435	
						17.792	64.900	23.364	MW =	20.33527					INDICATED LOSS—S C F H	7	
			BALANCE			98.58	101.72	97.70	TOTAL			18.048	63.800	23.914			

WET GAS					GAS FLOW RATES							LIQUID PRODUCT RATES								
CO 28.010	6.51	5.53	6.14	6.060		$\sqrt{H}$	PRESSURE	TEMP.	M. W.	S. C. F. H.	M/HR	HOUR	GAGE	GAL.	°F	FACTOR	GAL. AT 60	API° #/GAL.	#	#/HR GAL HR
H_2 2.016	32.37	33.48	37.42	34.423	FRESH FEED		420.8	102.1	2285747			OIL	6'9"	358.04	61	0.9995	357.86	51.1 6.451	2308.55	
CO_2 44.010	34.63	35.65	33.48	34.586	79.31	7.063	20.869	0.9618	1.5119	16999	44.793		0'11½"	49.82	58	1.0010	49.87	50.6 6.469	322.61	
N_2 28.016	1.86	1.52	1.33	1.570	WET GAS		1.99	67.3	1144010								+1.09		+2.00	
CH_4 16.042	13.74	10.55	11.43	11.907	158.44	6.992	4.085	0.9930	1.0696	4807	12.667						309.08		1992.94	83.04
C_2H_4 28.052	2.38	2.45	2.40	2.410	RECYCLE		422.6	123.5												12.878
C_2H_6 33.068	1.17	1.14	1.10	1.137	79.31	8.008	20.913	0.9440	1.0696	13303	35.054									
C_3H_6 42.078	2.82	2.62	2.90	2.780	BLEED															
C_3H_8 44.094	0.33	0.35	0.30	0.327	5.02	8.527	20.912	0.9440	1.0696	904	2.382	WATER	7'6½"	399.50	78	0.99788	398.65	10.7 8.287	3303.61	
C_4H_8 56.104	2.04	2.90	1.83	2.257	NATURAL GAS		445.3	202.5	1423634				1'8"	87.01	72	0.99872	86.90	10.8 8.282	719.71	
C_4H_{10} 58.120	0.62	1.24	0.39	0.750	28.43	8.504	21.448	0.8860	1.1932	5482	14.445		3'3½"	176.91	78	0.99788	176.53	10.7	1462.90	
C_5H_{10} 70.130	1.03	1.52	0.87	1.140	OXYGEN		448.8	74.9					0'3½"	15.49	62	0.99982	15.49	8.287	128.37	
C_5H_{12} 72.146	0.23	0.59	0.18	0.333	27.07	7.763	21.529	0.9860		4461	11.755						472.79		3918.43	163.27
C_6H_{12} 84.156	0.27	0.46	0.23	0.320	STEAM		41.1													19.700
			M. W.	25.30578	215.7	5.154	0.3321		369 #/hr.											

THE TEXAS COMPANY — MONTEBELLO LABORATORY

RATE CALCULATIONS

RUN NO. 59-E
HOURS 82-106

HOUR	GAS ANALYSES 1400	2200	0600	AVERAGE
FRESH FEED				
CO 28.010	35.59	35.87	35.45	35.637
H_2 2.016	61.04	61.29	61.64	61.323
CO_2 44.010	2.29	2.38	2.44	2.370
N_2 28.016	0.12	0.16	0.16	0.147
CH_4 16.042	0.96	0.30	0.31	0.523
			M. W	12.386
			H_2O 18.016	
			BALANCE	
WET GAS				
CO 28.010	5.18	5.25	5.75	5.393
H_2 2.016	36.20	37.30	37.40	36.967
CO_2 44.010	34.12	35.10	34.57	34.596
N_2 28.016	1.15	1.23	1.33	1.237
CH_4 16.042	12.41	10.63	10.22	11.087
C_2H_4 28.052	2.37	2.34	2.36	2.357
C_2H_6 30.068	1.06	1.08	1.07	1.070
C_3H_8 42.078	2.60	2.85	2.94	2.797
C_3H_6 44.094	0.29	0.32	0.33	0.313
C_4H_8 56.104	2.19	1.97	2.05	2.070
C_4H_{10} 58.120	0.73	0.52	0.53	0.593
C_5H_{10} 70.130	1.12	0.95	1.00	1.023
C_5H_{12} 72.146	0.29	0.21	0.18	0.227
C_6H_{12} 84.156	0.29	0.25	0.27	0.270
			M. W.	24.5189

GENERATOR BALANCE

M/HR	C	H	O		Mol %	M/Hr	C	H	O
				O_2 32.000	0.20	11.773 0.029			23.604
16.126	16.126		16.126	CO_2 44.010	1.05	0.151	0.151		0.302
27.748		55.496		N_2 28.016	1.57	0.226			
1.072	1.072		2.144	CH_4 16.042	82.54	11.877	11.877	47.508	
0.067				C_2H_4 30.068	5.74	0.826	1.652	4.956	
0.237	0.237	0.948		C_2H_6 44.094	6.06	0.872	2.616	6.976	
				C_4H_{10} 58.120	1.82	0.262	1.048	2.620	
		9.326	4.663	C_5H_{12} 72.146	1.02	0.147	0.735	1.764	
	17.435	65.770	22.933	MW =	20.3987				
	96.44	103.05	95.93	TOTAL			18.079	63.824	23.906

GAS FLOW RATES

	$\sqrt{h}$	PRESSURE	TEMP.	M. W.	S. C. F. H.	M/HR
FRESH FEED		432	101.8	233731		
	7.083	20.785	0.9620	1.5288	17172	45.249
WET GAS		16.6	67.0	1.18072		
158.44	6.921	4.074	0.9933	1.0866	4822	12.706
RECYCLE		435	122.7			
79.31	8.035	20.857	0.9447	1.0866	13644	35.952
BLEED						
5.02	8.700	20.857	1.0000	1.0866	990	2.609
NATURAL GAS		457	200.8	14192		
28.43	8.508	21.378	0.8865	1.1913	5461	14.390
OXYGEN		461	74.8			
27.07	7.794	21.471	0.9863		4468	11.773
STEAM		57.4				
215.7	4.900	0.3685		389 #/hr.		

WEIGHT BALANCE

	#/hr Measured	At Wt. Balance
WET GAS	311.54	324.29
OIL	76.92	76.92
WATER	159.24	159.24
TOTAL	547.70	560.45
FRESH FEED	560.45	
WEIGHT BALANCE	97.73	
WET GAS FACTOR	1.0409	
INDICATED LOSS—S C F H	179	

LIQUID PRODUCT RATES

HOUR	GAGE	GAL.	°F	FACTOR	GAL. AT 60	API° #/GAL.	#	#/HR GAL HR
OIL	7'3"	384.23	60	1.0000	384.23	51.0 6.455	2480.20	
	6'9"	358.04	61	0.9995	357.86	51.1 6.451	2308.55	
	5'3"	279.48	63	0.9985	279.06	51.0	1801.33	
	0'5"	22.13	60	1.0000	22.13	6.455	142.85	
					÷2.48		÷16.00	76.92
					285.78		1846.13	11.908
WATER	7'4⅛"	390.78	82	0.99726	389.71	10.8 8.282	3227.58	
	3'3⅛"	176.91	78	0.99788	176.53	10.7 8.287	1462.90	
	4'11"	262.02	74	0.99846	261.62	10.8	2166.74	
	0'3"	13.28	80	0.99759	13.25	8.282	109.74	
					461.55		3821.68	159.24
								19.231

THE TEXAS COMPANY — MONTEBELLO LABORATORY

RATE CALCULATIONS

RUN NO. 59-F
HOURS 106-130

HOUR	GAS ANALYSES 1400	2200	0600	AVERAGE
FRESH FEED				
CO 28.010	34.78	34.70	35.69	35.057
H_2 2.016	62.03	62.56	62.04	62.210
CO_2 44.010	2.33	2.36	1.83	2.173
N_2 28.016	0.06	0.10	0.10	0.087
CH_4 16.042	0.80	0.28	0.34	0.473
			M. W	12.1302
			H_2O 18.016	
			BALANCE	
WET GAS				
CO 28.010	5.74	6.34	6.83	6.303
H_2 2.016	39.35	38.06	43.08	40.167
CO_2 44.010	32.22	33.90	28.18	31.430
N_2 28.016	1.25	1.20	1.18	1.210
CH_4 16.042	12.07	9.29	9.67	10.343
C_2H_4 28.052	2.17	2.30	2.52	2.330
C_2H_6 30.068	1.03	1.04	1.05	1.040
C_3H_8 42.078	2.13	3.04	3.15	2.773
C_3H_6 44.094	0.21	0.31	0.35	0.290
C_4H_8 56.104	1.65	2.30	2.13	2.027
C_4H_{10} 58.120	0.71	0.61	0.42	0.580
C_5H_{10} 70.130	0.89	1.10	1.01	1.000
C_5H_{12} 72.146	0.27	0.22	0.17	0.220
C_6H_{12} 84.156	0.31	0.29	0.26	0.287
			M. W.	23.2427

GENERATOR BALANCE

M/HR	C	H	O		Mol %	M/Hr	C	H	O
				O_2 32.000	0.23	11.379 0.033			22.824
15.996	15.996		15.996	CO_2 44.010	1.14	0.165	0.165		0.330
28.365		56.770		N_2 28.016	2.16	0.312			
0.991	0.991		1.982	CH_4 16.042	82.53	11.917	11.917	47.668	
0.040				C_2H_4 30.068	5.79	0.836	1.672	5.016	
0.216	0.216	0.864		C_2H_6 44.094	5.71	0.825	2.475	6.600	
				C_4H_{10} 58.120	1.66	0.240	0.960	2.400	
		7.994	3.997	C_5H_{12} 72.146	0.78	0.113	0.565	1.356	
	17.203	65.628	21.975	MW =	20.2062				
	96.90	104.11	94.91	TOTAL			17.754	63.040	23.154

GAS FLOW RATES

	$\sqrt{h}$	PRESSURE	TEMP.	M. W.	S. C. F. H.	M/HR
FRESH FEED		415.7	99.3	2.3866		
	7.065	20.746	0.9643	1.5448	17316	45.628
WET GAS		1.96	65.9	1.24555		
158.44	7.138	4.082	0.9944	1.1160	5122	13.497
RECYCLE		418.2	121.0			
79.31	8.095	20.806	0.9460	1.1160	14102	37.159
BLEED						
5.02	8.550	20.806	1.0000	1.1160	997	2.627
NATURAL GAS		439.1	200.2	1.43273		
28.43	8.515	21.303	0.8877	1.1969	5480	14.440
OXYGEN		443.5	73.4			
27.07	7.788	21.406	0.9872		4455	11.739
STEAM		39.7				
215.7	4.853	0.3272		343 #/hr.		

WEIGHT BALANCE

	#/hr Measured	At Wt. Balance
WET GAS	313.71	320.51
OIL	75.69	75.69
WATER	157.28	157.28
TOTAL	546.68	553.48
FRESH FEED	553.48	
WEIGHT BALANCE	98.771	
WET GAS FACTOR	1021676	
INDICATED LOSS—S C F H	111	

LIQUID PRODUCT RATES

HOUR	GAGE	GAL.	°F	FACTOR	GAL. AT 60	API° #/GAL.	#	#/HR GAL HR
OIL	7'1⅜"	377.68	69	0.9956	376.02	52.1 6.416	2412.54	
	5'3"	279.48	63	0.9985	279.06	51.0 6.455	1801.33	
	3'8⅝"	199.82	56	1.0020	200.22	52.1	1284.61	
	0'3"	13.28	82	0.9891	13.14	6.416	84.31	
					÷0.78		÷5.00	75.69
					284.82		1816.51	11.868
WATER	7'2⅝"	383.14	64	0.99963	383.00	10.8 8.282	3172.01	
	4'11"	262.02	74	0.99846	261.62	10.8 8.282	2166.74	
	6'7⅛"	350.40	74	0.99846	349.86	10.8	2897.54	
	0'3⅛"	15.49	79	0.99775	15.46	8.282	128.04	
					455.78		3774.77	157.28
								18.991

THE TEXAS COMPANY — MONTEBELLO LABORATORY

RATE CALCULATIONS

RUN NO. 59-G

HOURS 130-154

	GAS ANALYSES				GENERATOR BALANCE										WEIGHT BALANCE		
HOUR	1400	2200	0600	AVERAGE	M/HR	C	H	O		Mol %	M/Hr	C	H	O		#/hr Measured	At Wt. Balance
FRESH FEED									O_2 32.000	0.23	11.734 0.033			23.534	WET GAS	326.81	337.10
CO 28.010	35.09	34.70	35.19	34.993	15.999	15.999		15.999	CO_2 44.010	1.28	0.185	0.185		0.370	OIL	69.90	69.90
H_2 2.016	61.51	62.55	62.18	62.080	28.384		56.768		N_2 28.016	1.68	0.243				WATER	150.34	150.34
CO_2 44.010	2.43	2.39	2.24	2.353	1.076	1.076		2.152	CH_4 16.042	83.13	12.024	12.024	48.096		TOTAL	547.05	557.34
N_2 28.016	0.21	-	0.02	0.077	0.035				C_2H_6 30.068	5.57	0.806	1.612	4.836		FRESH FEED	557.34	
CH_4 16.042	0.76	0.36	0.37	0.497	0.227	0.227	0.908		C_3H_8 44.094	5.54	0.801	2.403	6.408		WEIGHT BALANCE	98.15	
			M. W	12.18993					C_4H_{10} 58.120	1.73	0.250	1.000	2.500				
			H_2O 18.016				8.567	4.284	C_5H_{12} 72.146	0.84	0.122	0.610	1.464		WET GAS FACTOR	1.031486	
						17.302	66.243	22.435	MW =	20.17241					INDICATED LOSS—S C F H	171	
			BALANCE			97.02	104.64	93.85	TOTAL			17.834	63.304	23.904			

WET GAS					GAS FLOW RATES								LIQUID PRODUCT RATES								
CO 28.010	6.56	7.66	7.90	7.373		$\sqrt{h}$	PRESSURE	TEMP.	M. W.	S. C. F. H.	M/HR	HOUR	GAGE	GAL.	°F	FACTOR	GAL. AT 60	API° #/GAL.	#	#/HR GAL HR
H_2 2.016	38.60	42.19	42.46	41.084	FRESH FEED		415.7	100.4	2374911			OIL	7'0½"	373.32	70	0.9951	371.49	50.2 6.484	2408.74	
CO_2 44.010	32.66	30.79	30.66	31.370		7.104	20.746	0.9632	1.5411	17351	45.721		3'8¾"	199.82	56	1.0020	200.22	52.1 6.416	1284.61	
N_2 28.016	1.46	1.17	1.18	1.270	WET GAS		2.00	66.8	1269837				2'0½"	107.43	59	1.0005	107.48	50.2	696.90	
CH_4 16.042	10.67	9.40	8.91	9.660	158.44	7.504	4.087	0.9935	1.1269	5440	14.335		0'5"	22.13	60	1.0000	22.13	6.484	143.49	
C_2H_6 28.032	2.15	1.90	1.99	2.013	RECYCLE		418.1	120.3									256.62		1677.54	69.90
C_3H_8 33.068	1.01	0.97	0.93	0.970	79.31	8.067	20.804	0.9467	1.1269	14200	37.418									10.693
C_3H_6 42.078	2.73	2.69	2.18	2.533	BLEED															
C_3H_8 44.094	0.28	0.26	0.26	0.267	5.02	8.121	20.804	1.0000	1.1269	956	2.519	WATER	7'0½"	373.32	72	0.99872	372.84	10.7	3089.73	
C_4H_8 56.104	2.02	1.69	1.66	1.790	NATURAL GAS		439.8	199.6	1435128				0'3½"	15.49	65	0.99953	15.48	8.287	128.28	
C_4H_{10} 58.120	0.50	0.24	0.60	0.447	28.43	8.513	21.319	0.8880	1.1980	5489	14.464		1'9"	91.50	78	0.99788	91.31	"	756.69	
C_5H_{10} 70.130	0.97	0.77	0.84	0.860	OXYGEN		443.8	74.8					0'3"	13.28	58	1.00018	13.28	"	110.05	
C_5H_{12} 72.146	0.17	0.10	0.21	0.160	27.07	7.792	21.413	0.9860		4453	11.734						435.39		3608.09	150.34
C_6H_{12} 84.156	0.22	0.17	0.22	0.203	STEAM		39.2													18.141
			M. W.	22.79819	215.7	4.675	0.3255		328 #/hr.											

THE TEXAS COMPANY — MONTEBELLO LABORATORY

RATE CALCULATIONS

RUN NO. 59-H

HOURS 154-174

	GAS ANALYSES				GENERATOR BALANCE										WEIGHT BALANCE		
HOUR	1400	2200	0600	AVERAGE	M/HR	C	H	O		Mol %	M/Hr	C	H	O		#/hr Measured	At Wt. Balance
FRESH FEED									O_2 32.000	0.24	11.694 0.035			23.458	WET GAS	339.62	347.79
CO 28.010	35.31	32.23	35.37	34.303	15.677	15.677		15.677	CO_2 44.010	0.74	0.108	0.108		0.216	OIL	67.94	67.94
H_2 2.016	61.01	64.14	61.66	62.271	28.459		56.918		N_2 28.016	0.82	0.119				WATER	140.48	140.48
CO_2 44.010	2.30	3.08	2.55	2.643	1.208	1.208		2.416	CH_4 16.042	84.52	12.288	12.288	49.152		TOTAL	548.04	556.21
N_2 28.016	0.05	0.23	0.17	0.150	0.069				C_2H_6 30.068	5.74	0.834	1.668	5.004		FRESH FEED	556.21	
CH_4 16.042	1.33	0.32	0.25	0.633	0.289	0.289	1.156		C_3H_8 44.094	5.56	0.808	2.424	6.464		WEIGHT BALANCE	98.53	
			M. W	12.17041					C_4H_{10} 58.120	1.65	0.240	0.960	2.400				
			H_2O 18.016				8.690	4.345	C_5H_{12} 72.146	0.73	0.106	0.530	1.272		WET GAS FACTOR	1024056	
						17.174	66.764	22.438	MW =	19.954079					INDICATED LOSS—S C F H	137	
			BALANCE			95.53	103.84	94.78	TOTAL			17.978	64.292	23.674			

WET GAS					GAS FLOW RATES								LIQUID PRODUCT RATES Basis 20 hours								
CO 28.010	7.23	7.85		7.540		$\sqrt{h}$	PRESSURE	TEMP.	M. W.	S. C. F. H.	M/HR	HOUR	GAGE	GAL.	°F	FACTOR	GAL. AT 60	API° #/GAL.	#	#/HR GAL HR
H_2 2.016	41.92	41.84		41.880	FRESH FEED		415.5	104.9	237872			OIL	5'11¾"	317.67	65	0.9975	316.88	50.1 6.487	2055.60	
CO_2 44.010	29.26	30.81		30.035		7.125	20.741	0.9595	1.5423	17344	45.702		2'0½"	107.43	59	1.0005	107.48	50.2 6.484	696.90	
N_2 28.016	1.08	1.17		1.125	WET GAS		2.00	70.2	1283235								209.40		1358.70	67.94
CH_4 16.042	11.04	8.77		9.905	158.44	7.865	4.087	0.9903	1.1328	5713	15.054									10.470
C_2H_6 28.032	1.95	2.00		1.975	RECYCLE		417.9	122.3												
C_3H_8 33.068	0.96	0.93		0.945	79.31	8.020	20.799	0.9450	1.1328	14162	37.318									
C_3H_6 42.078	2.24	2.04		2.140	BLEED															
C_3H_8 44.094	0.29	0.27		0.280	5.02	8.040	20.799	1.0000	1.1328	951	2.506	WATER	7'0"	371.14	80	0.99759	370.25	10.8 8.282	3066.41	
C_4H_8 56.104	1.96	1.95		1.955	NATURAL GAS		439.4	200.6	1458138				1'9"	91.50	78	0.99788	91.31	10.7 8.287	756.69	
C_4H_{10} 58.120	0.56	0.74		0.650	28.43	8.500	21.310	0.8873	1.2075	5517	14.538		1'6"	78.16	72	0.99872	78.06	10.8	646.49	
C_5H_{10} 70.130	0.98	1.05		1.015	OXYGEN		443.1	79.9					0'4"	17.70	60	1.00000	17.70	8.282	146.59	
C_5H_{12} 72.146	0.28	0.29		0.285	27.07	7.808	21.396	0.9814		4438	11.694						339.30		2809.62	140.48
C_6H_{12} 84.156	0.25	0.29		0.270	STEAM		39.6													16.965
			M. W.	22.56017	215.7	4.511	0.3270		318 #/hr.											

THE TEXAS COMPANY — MONTEBELLO LABORATORY

RATE CALCULATIONS

RUN NO. 59-I
HOURS 178-206

	GAS ANALYSES				GENERATOR BALANCE									
HOUR	1400	2200	0600	AVERAGE	M/HR	C	H	O		Mol %	M/Hr	C	H	O
FRESH FEED									O_2 32.000	0.425	11.491 0.062			23.106
CO 28.010	37.44	37.93	36.08	37.150	16.376	16.376		16.376	CO_2 44.010	1.320	0.193	0.193		0.386
H_2 2.016	58.32	58.74	59.66	58.907	25.968		51.936		N_2 28.016	0.265	0.039			
CO_2 44.010	2.67	2.13	2.62	2.473	1.090	1.090		2.180	CH_4 16.042	84.715	12.381	12.381	49.524	
N_2 28.016	--	--	0.23	0.077	0.034				C_2H_6 30.068	6.455	0.943	1.986	5.658	
CH_4 16.042	1.57	1.20	1.41	1.393	0.614	0.614	2.456		C_3H_8 44.094	4.375	0.639	1.917	5.112	
			M.W 12.92668						C_4H_{10} 58.120	1.670	0.244	0.976	2.440	
			H_2O 18.016				9.785	4.893	C_5H_{12} 72.146	0.775	0.113	0.565	1.356	
						18.080	64.177	23.449	MW= 19.780892					
			BALANCE			100.90	100.14	99.82	TOTAL			17.918	64.090	23.492

WEIGHT BALANCE		
	#/hr Measured	At Wt. Balance
WET GAS	317.32	340.19
OIL	78.06	78.06
WATER	151.58	151.58
TOTAL	546.96	569.33
FRESH FEED	569.83	
WEIGHT BALANCE	95.99	
WET GAS FACTOR	1072072	
INDICATED LOSS—S C F H	380	

0600	WET GAS				GAS FLOW RATES							LIQUID PRODUCT RATES 20 hours basis							
						$\sqrt{h}$	PRESSURE	TEMP.	M. W.	S. C. F. H.	M/HR	HOUR	GAGE	GAL.	°F	FACTOR	GAL. AT 60	API° #/GAL.	#	# HR GAL HR
7.52	CO 28.010	9.57	9.54	8.72	8.587															
34.10	H_2 2.016	37.57	39.00	36.74	36.852	FRESH FEED		403.5	105.6	2239554										
29.51	CO_2 44.010	29.63	28.28	30.71	29.532	79.31	7.188	20.450	0.9589	1.4965	16729	44.082	OIL	4'8-3/8	250.56	63	0.9985	250.18	49.0	1632.67	
1.55	N_2 28.016	1.68	1.56	1.93	1.680			1.91	70.1	1267387			20 hrs	0'3"	13.28	78	0.9911	13.16	6.526	85.88	
13.27	CH_4 16.042	13.36	12.91	12.93	14.593	WET GAS												+2.22		+14.50	
2.00	C_2H_4 28.052	2.52	2.32	2.52	2.465	158.44	7.322	4.076	0.9904	1.1258	5272	13.992						239.24		1561.29	78.06
1.38	C_2H_6 30.068	0.95	1.10	1.02	1.113	RECYCLE		407.6	127.1												11.962
1.38	C_3H_8 42.078	1.53	2.73	1.99	1.908	79.31	8.021	20.550	0.9411	1.1258	13850	36.495									
0.24	C_3H_6 44.094	0.17	0.33	0.18	0.230	BLEED															
1.10	C_4H_8 56.104	0.67	1.49	1.33	1.147	5.02	8.300	20.550	1.0000	1.1258	964	2.540	WATER	7'9"	410.41	78	0.99788	409.54	10.5	3398.77	
0.75	C_4H_{10} 58.120	0.69	0.35	0.71	0.625			428.8	203.0	1463533			20 hrs	3'7"	192.18	72	0.99872	191.93	8.299	1592.83	
0.62	C_5H_{10} 70.130	0.69	0.70	0.77	0.695	NATURAL GAS								3'1"	165.75	79	0.99775	165.38	"	1372.49	
0.32	C_5H_{12} 72.146	0.19	--	0.20	0.178	28.43	8.646	21.059	0.9856	1.2098	5546	14.614									
0.26	C_6H_{12} 84.156	0.78	0.19	0.35	0.395			431.8	79.3					0'4"	17.70	64	0.99963	17.69	"	146.81	
				M. W. 22.84227		OXYGEN															
						27.07	7.763	21.131	0.9820		4361	11.491						365.30		3031.62	151.58
								42.7													
						STEAM															
						215.7	4.750	0.3375		346 #/hr											18.265

THE TEXAS COMPANY — MONTEBELLO LABORATORY

RATE CALCULATIONS

RUN NO. 59-J
HOURS 206-230

	GAS ANALYSES				GENERATOR BALANCE									
HOUR	1400	2200	0600	AVERAGE	M/HR	C	H	O		Mol %	M/Hr	C	H	O
FRESH FEED									O_2 32.000	0.28	11.347 0.040			22.774
CO 28.010	37.18	37.49	37.76	37.477	16.399	16.399		16.399	CO_2 44.010	1.44	0.207	0.207		0.414
H_2 2.016	58.46	58.85	58.19	58.500	25.598		51.196		N_2 28.016	2.42	0.347			
CO_2 44.010	2.48	2.27	2.55	2.433	1.065	1.065		2.130	CH_4 16.042	81.93	11.754	11.754	47.016	
N_2 28.016	0.19	0.19	0.07	0.150	0.066				C_2H_6 30.068	6.89	0.989	1.978	5.934	
CH_4 16.042	1.69	1.20	1.43	1.440	0.630	0.630	2.520		C_3H_8 44.094	4.78	0.686	2.058	5.488	
			M.W 13.02046						C_4H_{10} 58.120	1.65	0.237	0.948	2.370	
			H_2O 18.016				8.733	4.367	C_5H_{12} 72.146	0.61	0.088	0.440	1.056	
						18.094	62.449	22.996	MW= 20.12299					
			BALANCE			104.08	100.95	98.74	TOTAL			17.385	61.864	23.188

WEIGHT BALANCE		
	#/hr Measured	At Wt. Balance
WET GAS	332.75	350.03
OIL	74.33	74.33
WATER	145.39	145.39
TOTAL	552.47	569.75
FRESH FEED	569.75	
WEIGHT BALANCE	96.97	
WET GAS FACTOR	1051930	
INDICATED LOSS—S C F H	282	

WET GAS					GAS FLOW RATES							LIQUID PRODUCT RATES							
						$\sqrt{h}$	PRESSURE	TEMP.	M. W.	S. C. F. H.	M/HR	HOUR	GAGE	GAL.	°F	FACTOR	GAL. AT 60	API° #/GAL.	#	# HR GAL HR
CO 28.010	5.86	6.98	N	6.420																
H_2 2.016	37.80	36.90	O	37.350	FRESH FEED		401.6	102.4	2223423			OIL	7'5"	392.96	76	0.9920	389.82	49.3 6.516	2540.07	
CO_2 44.010	30.73	31.78		31.255	79.31	7.158	20.403	0.9615	1.4911	16606	43.758		4'8 3/8	250.56	63	0.9985	250.18	49.0 6.526	1632.67	
N_2 28.016	2.23	2.33	S	2.280			1.91	67.8	1243453				2'10"	151.93	62	0.9990	151.73	49.3	989.00	
CH_4 16.042	13.56	13.06	A	13.360	WET GAS 158.44	7.588	4.076	0.9926	1.1151	5424	14.292		0'4 3/4	21.02	80	0.9901	20.81	6.516	135.60	
C_2H_4 28.052	2.72	2.46	M	2.590			404.9	124.8									+23.53		+23.00	74.33
C_2H_6 30.068	0.71	1.04	P	0.875	RECYCLE 79.31	8.100	20.482	0.9430	1.1151	13836	36.458						274.14		1783.80	11.423
C_3H_8 42.078	2.25	2.11	L	2.180																
C_3H_6 44.094	0.24	0.16	E	0.200	BLEED 5.02	8.396	20.482	1.0000	1.1151	963	2.538	WATER	7'2½"	392.05	82	0.99726	381.00	10.5 8.299	3161.92	
C_4H_8 56.104	1.66	1.45		1.555			426.8	200.2	1438653				3'1"	165.75	79	0.99775	165.38	10.5 8.299	1372.49	
C_4H_{10} 58.120	0.66	0.60		0.630	NATURAL GAS 28.43	8.563	21.012	0.8875	1.1994	5445	14.348		4'1"	218.37	72	0.99872	218.09	"	1809.93	
C_5H_{10} 70.130	0.93	0.66		0.795			429.2	77.5					0'3"	13.28	76	0.99819	13.26	"	110.04	
C_5H_{12} 72.146	0.20	0.25		0.225	OXYGEN 27.07	7.675	21.069	0.9836		4306	11.347						420.45		3489.32	145.39
C_6H_{12} 84.156	0.25	0.22		0.235			38.6													17.519
			M. W. 23.28193		STEAM 215.7	4.525	0.3234		316#/hr											

THE TEXAS COMPANY — MONTEBELLO LABORATORY

RUN NO. 59-K

HOURS 230-254

RATE CALCULATIONS

	GAS ANALYSES			
HOUR	1400	2200	0600	AVERAGE
FRESH FEED				
CO 28.010	37.26	37.51	38.11	37.627
H_2 2.016	58.39	58.96	59.28	58.843
CO_2 44.010	2.48	2.52	1.72	2.240
N_2 28.016	0.19	0.25	0.29	0.243
CH_4 16.042	1.68	0.86	0.60	1.047
			M. W	12.94746
			H_2O 18.016	
			BALANCE	
WET GAS				
CO 28.010	10.72	11.61	11.96	11.430
H_2 2.016	40.58	39.71	38.28	39.523
CO_2 44.010	26.02	29.10	30.06	28.393
N_2 28.016	1.46	1.39	1.07	1.307
CH_4 16.042	11.70	9.27	9.34	10.103
C_2H_6 28.052	2.53	2.67	2.68	2.627
C_2H_4 33.068	0.96	0.96	1.12	1.013
C_3H_6 42.078	2.36	1.95	2.21	2.173
C_3H_8 44.094	0.30	0.10	0.19	0.197
C_4H_8 56.104	1.74	1.29	1.46	1.497
C_4H_{10} 58.120	0.42	0.66	0.49	0.523
C_5H_{10} 70.130	0.85	0.73	0.73	0.770
C_5H_{12} 72.146	0.19	0.30	0.22	0.237
C_6H_{12} 84.156	0.17	0.26	0.19	0.207
			M. W.	22.55275

GENERATOR BALANCE										
M/HR	C	H	O		Mol %	M/Hr	C	H	O.
				O_2 32.000	0.31	10.430 / 0.040			20.940
14.947	14.947		14.947	CO_2 44.010	1.44	0.185	0.185		0.370
23.373		46.746		N_2 28.016	0.15	0.019			
0.890	0.890		1.780	CH_4 16.042	82.82	10.616	10.616	42.464	
0.097				C_2H_6 30.068	7.15	0.917	1.834	5.502	
0.416	0.416	1.664		C_3H_8 44.094	5.48	0.702	2.106	5.616	
				C_4H_{10} 58.120	1.83	0.235	0.940	2.350	
		8.974	4.487	C_5H_{12} 72.146	0.82	0.105	0.525	1.260	
	16.253	57.384	21.214	MW=	20.28236				
	100.29	100.34	99.55	TOTAL			16.206	57.192	21.310

WEIGHT BALANCE		
	#/hr Measured	At Wt. Balance
WET GAS	293.03	315.38
OIL	66.34	66.34
WATER	132.59	132.59
TOTAL	491.96	514.31
FRESH FEED	514.31	
WEIGHT BALANCE	95.65	
WET GAS FACTOR	1076272	
INDICATED LOSS—S C F H	376	

GAS FLOW RATES						
	√h	PRESSURE	TEMP.	M. W.	S. C. F. H.	M/HR
FRESH FEED		405.8	100.9	2235959		
79.31	6.438	20.506	0.9629	1.4953	15075	39.723
WET GAS		1.77	68.0	1283657		
158.44	6.821	4.058	0.9924	1.1330	4931	12.993
RECYCLE		408.8	119.4			
79.31	8.667	20.579	0.9474	1.1330	15184	40.011
BLEED						
5.02	8.021	20.579	1.0000	1.1330	939	2.474
NATURAL GAS		430.1	197.8	1427348		
28.43	7.638	21.090	0.8891	1.1947	4865	12.819
OXYGEN		430.6	77.1			
27.07	7.042	21.102	0.9839		3958	10.430
STEAM		39.7				
215.7	3.917	0.3272		276 #/hr		

LIQUID PRODUCT RATES							
HOUR	GAGE	GAL.	°F	FACTOR	GAL. AT 60	API° #/GAL.	# / # HR GAL HR
OIL	7'6½"	399.50	65	0.9975	398.50	51.8 6.427	2561.16
	2'10"	151.93	62	0.9990	151.78	49.3 6.516	989.00
					+3.11		+20.00
					249.83		1592.16 / 66.34
							10.410
WATER	7'5"	392.96	76	0.99819	392.25	10.7 8.287	3250.58
	4'1"	218.37	72	0.99872	218.09	10.5 8.299	1809.93
	4'2 3/4	226.01	76	0.99819	225.60	10.7	1869.55
	0'3½"	15.49	85	0.99674	15.44	8.287	127.95
					384.32		3182.25 / 132.59
							16.013

RATE CALCULATIONS

HOURS 254-267

	GAS ANALYSES			
HOUR	1800	2200	0600	AVERAGE
FRESH FEED				
CO 28.010	36.95	36.18	36.18	36.437
H_2 2.016	59.57	60.48	60.49	60.180
CO_2 44.010	2.39	2.54	2.46	2.463
N_2 28.016	0.07	0.07	0.18	0.107
CH_4 16.042	1.02	0.73	0.69	0.813
			M. W	12.66360
			H_2O 18.016	
			BALANCE	
WET GAS				
CO 28.010	9.16	9.44	9.48	9.360
H_2 2.016	33.70	34.07	34.35	34.040
CO_2 44.010	31.95	33.38	33.15	32.826
N_2 28.016	1.41	1.46	1.50	1.457
CH_4 16.042	13.32	10.66	11.00	11.660
C_2H_6 28.052	2.54	2.50	2.63	2.557
C_2H_4 33.068	1.46	1.46	1.36	1.427
C_3H_6 42.078	2.57	2.70	2.56	2.610
C_3H_8 44.094	0.38	0.25	0.31	0.313
C_4H_8 56.104	1.62	1.92	1.72	1.753
C_4H_{10} 58.120	0.71	0.86	0.63	0.733
C_5H_{10} 70.130	0.78	0.92	0.82	0.840
C_5H_{12} 72.146	0.21	0.20	0.21	0.207
C_6H_{12} 84.156	0.19	0.18	0.28	0.217
			M. W.	24.74658

GENERATOR BALANCE										
M/HR	C	H	O		Mol %	M/Hr	C	H	O
				O_2 32.000	0.29	10.503 / 0.037			21.080
14.514	14.514		14.514	CO_2 44.010	1.41	0.179	0.179		0.358
23.972		47.944		N_2 28.016	0.15	0.019			
0.981	0.981		1.962	CH_4 16.042	83.27	10.599	10.599	42.396	
0.043				C_2H_6 30.068	7.13	0.907	1.814	5.442	
0.324	0.324	1.296		C_3H_8 44.094	5.22	0.664	1.992	5.312	
				C_4H_{10} 58.120	1.80	0.229	0.916	2.290	
		8.620	4.310	C_5H_{12} 72.146	0.73	0.093	0.465	1.116	
	15.819	57.860	20.786	MW=	20.131919				
	99.09	102.31	96.96	TOTAL			15.965	56.556	21.438

WEIGHT BALANCE		
	#/hr Measured	At Wt. Balance
WET GAS	283.20	293.39
OIL	70.47	70.47
WATER	140.58	140.58
TOTAL	494.25	504.44
FRESH FEED	504.44	
WEIGHT BALANCE	97.98	
WET GAS FACTOR	1035981	
INDICATED LOSS—S C F H	156	

GAS FLOW RATES						
	√h	PRESSURE	TEMP.	M. W.	S. C. F. H.	M/HR
FRESH FEED		410.4	92.1	2286079		
79.31	6.300	20.618	0.9705	1.5120	15117	39.834
WET GAS		1.68	61.6	1169850		
158.44	6.271	4.047	0.9985	1.0816	4343	11.444
RECYCLE		415.2	109.7			
79.31	8.884	20.734	0.9553	1.0816	15095	39.776
BLEED						
5.02	7.993	20.734	1.0000	1.0816	900	2.372
NATURAL GAS		434.6	196.9	1438014		
28.43	7.512	21.197	0.8898	1.1992	4830	12.727
OXYGEN		434.6	68.1			
27.07	7.000	21.197	0.9923	--	3986	10.503
STEAM		43.7				
215.7	4.885	0.3408		359#/hr		

LIQUID PRODUCT RATES 12 hours basis

HOUR	GAGE	GAL.	°F	FACTOR	GAL. AT 60	API° #/GAL.	# / # HR GAL HR
OIL	3'5¼"	184.55	59	1.0005	184.64	51.9 6.423	1185.94
12hrs	1'0½"	54.14	74	0.9930	53.76	"	345.30
					+0.78		+5.00
					131.66		845.64 / 70.47
							10.972
WATER	7'1½"	377.68	76	0.99819	377.00	10.8	3122.31
12hrs	5'2"	275.11	77	0.99804	274.57	8.282	2273.99
	2'2"	114.67	71	0.99883	114.54	10.8	948.62
	0'3"	13.28	58	1.00018	13.28	8.282	109.98
					203.69		1686.96 / 140.58
							16.974

THE TEXAS COMPANY — MONTEBELLO LABORATORY

RATE CALCULATIONS

RUN NO. 59-M
HOURS 267-291

	GAS ANALYSES				GENERATOR BALANCE										WEIGHT BALANCE		
HOUR	1400	1800	0600	AVERAGE	M/HR	C	H	O		Mol %	M/Hr	C	H	O		#/hr Measured	At Wt. Balance
FRESH FEED									O_2 32.000	0.20	10.506 0.025			21.062	WET GAS	278.29	288.45
CO 28.010	38.33	35.07	38.60	37.333	14.247	14.247		14.247	CO_2 44.010	1.43	0.182	0.182		0.364	OIL	63.70	63.70
H_2 2.016	57.80	61.67	57.85	59.107	22.556		45.112		N_2 28.016	3.07	0.391				WATER	142.49	142.49
CO_2 44.010	2.42	2.58	2.88	2.627	1.002	1.002		2.004	CH_4 16.042	81.68	10.394	10.394	41.576		TOTAL	484.48	494.64
N_2 28.016	0.07	0.07	0.05	0.063	0.024				C_2H_4 30.068	6.91	0.879	1.758	5.274		FRESH FEED	494.64	
CH_4 16.042	1.38	0.61	0.62	0.870	0.332	0.332	1.328		C_2H_6 44.094	4.55	0.579	2.037	5.432		WEIGHT BALANCE	97.95	
			M. W 12	.961929					C_3H_{10} 58.120	1.55	0.197	0.788	1.550				
			H_2O 18.016				9.339	4.670	C_5H_{12} 72.146	0.61	0.078	0.390	0.936		WET GAS FACTOR	1036508	
						15.583	55.779	20.921	MW= 20.081466						INDICATED LOSS—S C F H 149		
			BALANCE			100.22	101.35	97.64	TOTAL			15.549	54.768	21.426			

WET GAS	GAS FLOW RATES												LIQUID PRODUCT RATES						
CO 28.010	8.43	7.46	7.63	7.840		$\sqrt{H}$	PRESSURE	TEMP.	M. W.	S. C. F. H.	M/HR	HOUR	GAGE	GAL.	°F	FACTOR	GAL. AT 60	API° #/GAL.	#	# HR GAL HR
H_2 2.016	31.26	33.44	29.75	31.484	FRESH FEED		416.6	98.2	2233463			OIL	7'3½"	386.41	63	0.9985	385.83	52.5 6.402	2470.08	
CO_2 44.010	33.26	32.32	37.22	34.267	79.31	6.096	20.738	0.9651	1.4945	14482	38.161		3'5¼"	184.55	59	1.0005	184.64	51.9 6.423	1185.94	
N_2 28.016	2.10	1.76	1.73	1.863			1.71	65.6	1116527				1'0"	52.00	57	1.0015	52.08	52.5	333.42	
CH_4 16.042	13.24	11.98	10.64	11.953	WET GAS 158.44	6.038	4.051	0.9947	1.0567	4.073	10.733		0'3½"	15.49	56	1.0020	15.52	6.402	99.36	
C_2H_4 28.052	2.61	3.06	2.98	2.950			419.3	121.6									+1.64		+10.50	63.70
C_2H_6 30.068	1.55	1.66	1.62	1.610	RECYCLE 79.31	8.913	20.933	0.9456	1.0567	14715	38.775						239.39		1528.70	9.975
C_3H_6 42.078	2.96	3.62	3.48	3.353	BLEED															
C_3H_8 44.094	0.37	0.40	0.43	0.400	5.02	8.167	20.833	1.0000	1.0567	903	2.379	WATER	7'4"	388.59	78	0.99788	387.77	10.8	3211.51	
C_4H_8 56.104	2.10	2.29	2.38	2.257			439.7	200.5	1441627				2'2"	114.67	71	0.99883	114.54	8.282	948.62	
C_4H_{10} 58.120	0.74	0.63	0.69	0.687	NATURAL GAS 28.43	7.479	21.317	0.9873	1.2007	4829	12.725		2'10-¾	155.38	72	0.99872	155.18	10.8	1285.20	
C_5H_{10} 70.130	0.99	0.95	1.10	1.013			440.2	74.9					0'3½"	15.49	60	1.00000	15.49	8.282	128.29	
C_5H_{12} 72.146	0.21	0.23	0.19	0.210	OXYGEN 27.07	7.004	21.328	0.9860	--	3987	10.506						412.92		3419.80	142.49
C_6H_{12} 84.156	0.18	0;20	0.26	0.213			44.3													17.205
			M. W.	25.92860	STEAM 215.7	5.267	0.3427		389 #/hr											

THE TEXAS COMPANY — MONTEBELLO LABORATORY

RATE CALCULATIONS

RUN NO. 59-N
HOURS 291-315

	GAS ANALYSES				GENERATOR BALANCE										WEIGHT BALANCE		
HOUR	1400	2200	0600	AVERAGE	M/HR	C	H	O		Mol %	M/Hr	C	H	O		#/hr Measured	At Wt. Balance
FRESH FEED									O_2 32.000	0.27	10.559 0.035			21.188	WET GAS	267.55	288.37
CO 28.010	38.33	38.19	38.44	38.420	14.040	14.040		14.040	CO_2 44.010	1.48	0.190	0.190		0.380	OIL	56.14	56.14
H_2 2.016	57.64	57.98	58.02	57.880	21.150		42.300		N_2 28.016	0.07	0.009				WATER	141.20	141.20
CO_2 44.010	2.57	2.70	2.76	2.676	0.978	0.978		1.956	CH_4 16.042	84.33	10.847	10.847	43.388		TOTAL	464.89	485.71
N_2 28.016	0.09	0.21	0.23	0.177	0.065				C_2H_4 30.068	6.73	0.866	1.732	5.196		FRESH FEED	485.71	
CH_4 16.042	1.37	0.02	0.55	0.647	0.310	0.310	1.240		C_2H_6 44.094	4.94	0.635	1.905	5.080		WEIGHT BALANCE	95.71	
			M. W	13.29147			13.080	5.572	C_3H_{10} 58.120	1.57	0.202	0.808	2.020				
			H_2O 18.016				12.112	6.056	C_5H_{12} 72.146	0.61	0.078	0.390	0.936		WET GAS FACTOR	1077817	
						15.328	55.652	22.052	MW= 19.83997						INDICATED LOSS—S C F H 302		
			BALANCE			96.57	98.29	102.24	TOTAL			15.872	56.620	21.568			

WET GAS	GAS FLOW RATES												LIQUID PRODUCT RATES						
CO 28.010	7.18	7.95	7.88	7.670		$\sqrt{H}$	PRESSURE	TEMP.	M. W.	S. C. F. H.	M/HR	HOUR	GAGE	GAL.	°F	FACTOR	GAL. AT 60	API° #/GAL.	#	# HR GAL HR
H_2 2.016	30.55	31.49	31.87	31.302			419.7	99.3	2178088			OIL	5'11"	314.39	62	0.9990	314.08	53.5 6.368	2000.06	
CO_2 44.010	35.67	37.50	36.63	36.600	FRESH FEED 79.31	5.896	20.842	0.9642	1.4758	13868	36543		1'11½"	102.89	57	1.0015	103.04	52.5 6.402	659.66	
N_2 28.016	1.68	1.59	1.58	1.617			1.73	66.1	1104866								+1.09		+7.00	
CH_4 16.042	12.49	10.69	11.06	11.413	WET GAS 158.44	5.775	4.053	0.9942	1.0511	3.875	10.211						212.13		1347.40	56.14
C_2H_4 28.052	2.92	2.51	2.81	2.747			421.4	120.3												8.839
C_2H_6 30.068	1.54	1.65	1.68	1.623	RECYCLE 79.31	8.950	20.883	0.9466	1.0511	14749	38864									
C_3H_6 42.078	3.13	2.53	2.64	2.767	BLEED															
C_3H_8 44.094	0.35	0.28	0.32	0.317	5.02	8.058	20.883	1.0000	1.0511	888	2.340	WATER	6'11½"	368.95	84	0.99692	367.81	10.7 8.287	3048.04	
C_4H_8 56.104	2.25	1.67	1.68	1.867			441.1	202.3	1459175				2'10 3/4	155.38	72	0.99872	155.18	10.8 8.282	1285.20	
C_4H_{10} 58.120	0.58	0.81	0.53	0.640	NATURAL GAS 28.43	7.513	21.349	0.8861	1.2080	4881	12.862		3'11"	209.64	69	0.99907	209.45	10.7	1735.71	
C_5H_{10} 70.130	1.17	0.98	0.87	0.973			441.7	78.4					0'3"	13.28	80	0.99759	13.25	8.287	109.80	141.20
C_5H_{12} 72.146	0.21	0.19	0.19	0.197	OXYGEN 27.07	7.050	21.364	0.9828	--	4007	10.559						408.83		3388.75	17.035
C_6H_{12} 84.156	0.28	0.26	0.26	0.267			42.8													
			M. W	26.20225	STEAM 215.7	5.238	0.3379		382 #/hr											

THE TEXAS COMPANY — MONTEBELLO LABORATORY

RATE CALCULATIONS

RUN NO. 59-0
HOURS 315-339

	GAS ANALYSES				GENERATOR BALANCE										WEIGHT BALANCE		
HOUR	1400	2200	0600	AVERAGE	M/HR	C	H	O		Mol %	M/Hr	C	H	O		#/hr Measured	At Wt. Balance
FRESH FEED									O_2 32.000	0.09	10.509 0.012			21.042	WET GAS	264.64	292.15
CO 28.010	37.66	38.28	38.10	38.013	13.313	13.313		13.313	CO_2 44.010	0.84	0.109	0.109		0.218	OIL	48.06	48.06
H_2 2.016	57.99	57.80	58.30	58.030	20.323		40.646		N_2 28.016	0.05	0.006				WATER	124.04	124.04
CO_2 44.010	2.79	2.89	2.64	2.773	0.971	0.971		1.942	CH_4 16.042	85.44	11.097	11.097	44.388		TOTAL	436.74	464.25
N_2 28.016	0.17	0.17	0.37	0.237	0.083				C_2H_6 30.068	7.22	0.938	1.876	5.628		FRESH FEED	464.25	
CH_4 16.042	1.39	0.86	0.59	0.947	0.332	0.332	1.328		C_3H_8 44.094	4.72	0.613	1.839	4.904		WEIGHT BALANCE	94.07	
			M. W	13.25604					C_4H_{10} 58.120	1.23	0.160	0.640	1.600				
			H_2O 18.016				13.191	6.596	C_5H_{12} 72.146	0.41	0.053	0.265	0.636		WET GAS FACTOR	1103952	
						14.616	55.165	21.851	MW=	19.38160					INDICATED LOSS—S C F H	405	
			BALANCE			92.35	97.90	102.78	TOTAL			15.826	56.346	21.260			

WET GAS					GAS FLOW RATES							LIQUID PRODUCT RATES							
CO 28.010	8.07	7.88	9.62	8.523		$\sqrt{h}$	PRESSURE	TEMP.	M. W.	S. C. F. H.	M/HR	HOUR	GAGE	GAL.	°F	FACTOR	GAL. AT 60	API° #/GAL.	#	#/HR GAL HR
H_2 2.016	31.59	32.08	32.36	32.010	FRESH FEED		419.2	105.9	2183910			OIL	Liquid level controller not working. Average of Periods							
CO_2 44.010	34.57	35.26	37.87	35.900	79.31	5.679	20.330	0.9586	1.4772	13291	35.022		59-0 and 59-P was used for oil and water yields.							
N_2 28.016	1.39	1.32	1.24	1.317	WET GAS		1.73	72.0	1123601											
CH_4 16.042	12.88	11.91	9.49	11.427	158.44	5.792	4.053	0.9887	1.0600	3898	10.271									48.06
C_2H_4 28.052	2.77	2.77	2.21	2.583	RECYCLE		422.1	125.0												7.520
C_2H_6 33.068	1.56	1.65	1.54	1.583	79.31	8.967	20.900	0.9428	1.0600	14854	39.141									
C_2H_2 42.078	2.85	2.91	2.65	2.803	BLEED															
C_3H_8 44.094	0.28	0.40	0.26	0.313	5.02	8.046	20.900	1.0000	1.0600	895	2.358	WATER								124.04
C_4H_8 56.104	1.92	1.80	1.41	1.710	NATURAL GAS		441.2	203.9	1493684											14.983
C_4H_{10} 58.120	0.63	0.55	0.55	0.577	28.43	7.508	21.352	0.9849	1.2222	4929	12.988									
C_5H_{10} 70.130	0.96	0.92	0.51	0.797	OXYGEN		441.8	84.8												
C_5H_{12} 72.146	0.23	0.20	0.20	0.210	27.07	7.058	21.366	0.9770		3988	10.509									
C_6H_{12} 84.156	0.30	0.35	0.09	0.247	STEAM		41.4													
			M. W.	25.765353	215.7	5.208	0.3332		374 #/hr											

THE TEXAS COMPANY — MONTEBELLO LABORATORY

RATE CALCULATIONS

RUN NO. 59-P
HOURS 339-363

	GAS ANALYSES				GENERATOR BALANCE										WEIGHT BALANCE		
HOUR	1400	2200	0600	AVERAGE	M/HR	C	H	O		Mol %	M/Hr	C	H	O		#/hr Measured	At Wt. Balance
FRESH FEED									O_2 32.000	0.23	10.440 0.029			20.938	WET GAS	254.82	259.12
CO 28.010	37.87	36.80	36.59	37.087	12.356	12.356		12.356	CO_2 44.010	1.49	0.191	0.191		0.382	OIL	48.06	48.06
H_2 2.016	57.56	59.62	60.16	59.113	19.693		39.386		N_2 28.016	2.66	0.340				WATER	124.04	124.04
CO_2 44.010	2.51	2.62	2.63	2.620	0.873	0.873		1.746	CH_4 16.042	82.05	10.501	10.501	42.004		TOTAL	426.92	431.22
N_2 28.016	0.12	0.25	0.17	0.180	0.060				C_2H_6 30.068	6.85	0.877	1.754	5.262		FRESH FEED	431.22	
CH_4 16.042	1.94	0.71	0.45	1.000	0.333	0.333	1.332		C_3H_8 44.094	4.23	0.541	1.623	4.328		WEIGHT BALANCE	99.00	
			M. W	12.943698			14.268	7.218	C_4H_{10} 58.120	1.70	0.218	0.872	2.180				
			H_2O 18.016				14.352	7.176	C_5H_{12} 72.146	0.79	0.101	0.505	1.212		WET GAS FACTOR	1016874	
						13.562	55.070	21.278	MW=	20.119863					INDICATED LOSS—S C F H	64	
			BALANCE			87.90	100.15	99.90	TOTAL			15.446	54.986	21.320			

WET GAS					GAS FLOW RATES							LIQUID PRODUCT RATES							
CO 28.010	8.98	10.33	9.40	9.570		$\sqrt{h}$	PRESSURE	TEMP.	M. W.	S. C. F. H.	M/HR	HOUR	GAGE	GAL.	°F	FACTOR	GAL. AT 60	API° #/GAL.	#	#/HR GAL HR
H_2 2.016	33.10	35.50	32.69	33.763	FRESH FEED		418.7	106.0	2236609			OIL	Liquid level controller not working. Average of Periods							
CO_2 44.010	41.78	31.24	33.72	35.580	79.31	5.342	20.818	0.9585	1.4955	12643	33.315		59-0 and 59-P was used for oil and water yields							
N_2 28.016	1.25	1.86	1.69	1.600	WET GAS		1.68	72.4	1133716											
CH_4 16.042	8.22	10.45	9.57	9.413	158.44	5.613	4.047	0.9883	1.0648	3787	9.979									48.06
C_2H_4 28.052	1.48	2.42	2.61	2.170	RECYCLE		420.4	125.6												7.520
C_2H_6 33.068	0.87	1.56	1.69	1.373	79.31	8.971	20.859	0.9424	1.0648	14892	39.241									
C_2H_2 42.078	1.48	2.76	3.17	2.470	BLEED															
C_3H_8 44.094	0.17	0.30	0.39	0.287	5.02	7.979	20.859	1.0000	1.0648	890	2.345	WATER								124.04
C_4H_8 56.104	1.10	1.64	2.38	1.707	NATURAL GAS		440.9	197.2	1438876											14.983
C_4H_{10} 58.120	0.47	0.64	0.96	0.690	28.43	7.500	21.345	0.9896	1.1995	4857	12.798									
C_5H_{10} 70.130	0.63	0.80	1.20	0.877	OXYGEN		441.9	85.7												
C_5H_{12} 72.146	0.17	0.18	0.19	0.180	27.07	7.017	21.368	0.9761	--	3962	10.440									
C_6H_{12} 84.156	0.30	0.32	0.34	0.320	STEAM		40.1													
			M. W.	25.535489	215.7	4.942	0.3285		350#/hr											

THE TEXAS COMPANY — MONTEBELLO LABORATORY

RATE CALCULATIONS

RUN NO. 59-Q
HOURS 363-387

	GAS ANALYSES				GENERATOR BALANCE									
HOUR	1400	2200	0600	AVERAGE	M/HR	C	H	O		Mol %	M/Hr	C	H	O
FRESH FEED									O_2 32.000	0.23	10.440 0.029			20.938
CO 28.010	35.81	35.93	35.82	35.583	11.801	11.801		11.801	CO_2 44.010	1.46	0.187	0.187		0.374
H_2 2.016	60.56	60.99	60.85	60.767	20.001		40.002		N_2 28.016	2.37	0.304			
CO_2 44.010	2.18	2.35	2.37	2.300	0.757	0.757		1.514	CH_4 16.042	82.21	10.530	10.530	42.120	
N_2 28.016	0.02	0.20	0.10	0.107	0.035				C_2H_4 30.068	6.65	0.852	1.704	5.112	
CH_4 16.042	1.43	0.63	0.86	0.973	0.320	0.320	1.280		C_2H_6 44.094	4.67	0.598	1.794	4.784	
			M. W	12.46578					C_4H_{10} 58.120	1.67	0.214	0.856	2.140	
			H_2O 18.016				15.004	7.502	C_5H_{12} 72.146	0.74	0.095	0.475	1.140	
						12.878	56.286	20.817	MW=	20.13145				
			BALANCE			82.84	101.79	97.68	TOTAL			15.546	55.296	21.312

WEIGHT BALANCE		
	#/hr Measured	At Wt. Balance
WET GAS	241.40	238.85
OIL	48.74	48.74
WATER	122.71	122.71
TOTAL	412.85	410.30
FRESH FEED	410.30	
WEIGHT BALANCE	100.62	
WET GAS FACTOR	98.9436	
INDICATED LOSS—S C F H	-41	

WET GAS				
CO 28.010	9.73	10.59	10.23	10.183
H_2 2.016	35.78	36.89	37.00	36.556
CO_2 44.010	27.90	30.29	30.42	29.537
N_2 28.016	1.80	1.80	1.96	1.853
CH_4 16.042	14.29	10.27	10.17	11.577
C_2H_4 28.052	2.18	2.31	2.38	2.290
C_2H_6 30.068	1.70	1.57	1.60	1.623
C_3H_6 42.078	2.45	2.53	2.51	2.497
C_3H_8 44.094	0.46	0.27	0.25	0.327
C_4H_8 56.104	1.70	1.57	1.54	1.603
C_4H_{10} 58.120	0.66	0.71	0.63	0.667
C_5H_{10} 70.130	0.83	0.78	0.78	0.797
C_5H_{12} 72.146	0.19	0.18	0.19	0.187
C_6H_{12} 84.156	0.33	0.24	0.34	0.303
			M. W.	23.525899

GAS FLOW RATES							
	$\sqrt{H}$	PRESSURE	TEMP.	M. W.	S. C. F. H.	M/HR
FRESH FEED	79.31	415.4 20.739	99.9 0.9637	2322357 1.5239	12,491	32.914
WET GAS	158.44	1.59 4.036	70.0 0.9905	1230558 1.1093	3,894	10.261
RECYCLE	79.31	417.4 20.787	122.2 0.9450	1.1093	15,597	41.099
BLEED	5.02	8.117	20.787	1.0000	1.1093	940	2.477
NATURAL GAS	28.43	7.529	437.2 21.258	195.3 0.8908	1438048 1.1992	4,861	12.809
OXYGEN	27.07	7.021	438.2 21.281	81.9 0.9796	--	3,962	10.440
STEAM	215.7	4.642	40.3 0.3291		330#/hr		

LIQUID PRODUCT RATES							Basis 17 hours
HOUR	GAGE	GAL.	°F	FACTOR	GAL. AT 60	API° #/GAL.	#	#/HR GAL HR
OIL	3'5"	183.46	62	0.9990	183.28	52.7	1172.26	
	1'0-3/4	55.23	80	0.9901	54.68	6.396	349.73	
					40.94		46.00	48.74
					129.54		828.53	7.620
WATER	7'5"	392.96	79	0.99775	392.08	11.0	3242.50	
	5'6½"	294.75	80	0.99759	294.04	8.270	2431.71	
	2'11½"	167.69	72	0.99872	167.48		1385.06	
	0'3"	13.28	66	0.99942	13.27		109.74	122.71
					252.25		2086.11	14.838

THE TEXAS COMPANY — MONTEBELLO LABORATORY

RATE CALCULATIONS

RUN NO. 59-R
HOURS 387-411

	GAS ANALYSES				GENERATOR BALANCE									
HOUR	1400	2200	0600	AVERAGE	M/HR	C	H	O		Mol %	M/Hr	C	H	O
FRESH FEED									O_2 32.000	0.23	10.437 0.030			20.934
CO 28.010	37.53	37.15	37.44	37.374	11.602	11.602		11.602	CO_2 44.010	0.59	0.077	0.077		0.154
H_2 2.016	57.56	58.82	58.91	58.430	18.139		36.278		N_2 28.016	3.14	0.409			
CO_2 44.010	2.90	2.75	2.65	2.733	0.848	0.848		1.696	CH_4 16.042	84.16	10.958	10.958	43.832	
N_2 28.016	0.24	0.36	0.33	0.310	0.096				C_2H_4 30.068	6.49	0.845	1.690	5.070	
CH_4 16.042	1.87	0.92	0.67	1.153	0.358	0.358	1.432		C_2H_6 44.094	3.89	0.507	1.521	4.056	
			M. W	13.121013					C_4H_{10} 58.120	1.15	0.150	0.600	1.500	
			H_2O 18.016				16.440	8.220	C_5H_{12} 72.146	0.35	0.046	0.230	0.552	
						12.808	54.150	21.518	MW=	19.301469				
			BALANCE			84.96	98.44	102.04	TOTAL			15.076	55.010	21.088

WEIGHT BALANCE		
	#/hr Measured	At Wt. Balance
WET GAS	243.23	262.34
OIL	43.23	43.23
WATER	101.75	101.75
TOTAL	388.21	407.32
FRESH FEED	407.32	
WEIGHT BALANCE	95.31	
WET GAS FACTOR	1078567	
INDICATED LOSS—S C F H	287	

WET GAS				
CO 28.010	10.10	10.30	10.00	10.133
H_2 2.016	33.77	30.63	35.52	33.307
CO_2 44.010	30.86	33.16	31.64	31.887
N_2 28.016	1.71	1.56	1.82	1.697
CH_4 16.042	12.38	10.30	9.82	10.833
C_2H_4 28.052	2.54	2.65	2.43	2.540
C_2H_6 30.068	1.62	1.75	1.64	1.670
C_3H_6 42.078	2.73	3.83	2.55	3.037
C_3H_8 44.094	0.33	0.43	0.27	0.343
C_4H_8 56.104	1.90	2.72	1.84	2.153
C_4H_{10} 58.120	0.59	0.90	0.91	0.800
C_5H_{10} 70.130	0.97	1.18	1.00	1.050
C_5H_{12} 72.146	0.21	0.21	0.20	0.207
C_6H_{12} 84.156	0.29	0.38	0.36	0.343
			M. W.	25.24750

GAS FLOW RATES							
	$\sqrt{H}$	PRESSURE	TEMP.	M. W.	S. C. F. H.	M/HR
FRESH FEED	79.31	413.9 5.000	97.1 20.702	2206384 0.9661	1.4854	11781	31.043
WET GAS	158.44	1.64 5.383	70.2 4.042	1146648 0.9903	1.0708	3656	9.634
RECYCLE	79.31	416.3 9.008	123.4 20.761	0.9440	1.0708	14993	39.507
BLEED	5.02	8.188	20.761	1.0000	1.0708	914	2.408
NATURAL GAS	28.43	7.512	435.1 21.208	195.0 0.8910	1499885 1.2247	4942	13.022
OXYGEN	27.07	7.008	436.0 21.230	77.5 0.9835		3961	10.437
STEAM	215.7	4.396	37.0 0.3177		301#/hr		

LIQUID PRODUCT RATES								
HOUR	GAGE	GAL.	°F	FACTOR	GAL. AT 60	API° #/GAL	#	#/HR GAL HR
OIL	6'5½"	342.76	66	0.9970	341.73	51.6 6.434	2198.69	
	3'5"	183.46	62	0.9990	183.28	52.7 6.396	1172.26	
					41.71		411.00	
					160.16		1037.43	43.23
								6.673
WATER	7'0"	371.14	79	0.99775	370.30	10.8 8.282	3066.82	
	2'11½"	167.69	72	0.99872	167.48	11.0 8.270	1385.06	
	2'0"	105.19	72	0.99872	105.06	10.8	870.11	
	0'3"	13.28	60	1.00000	13.28	8.282	109.98	
					294.60		2441.89	101.75
								12.275

THE TEXAS COMPANY — MONTEBELLO LABORATORY

RATE CALCULATIONS

RUN NO. 59-S
HOURS 411-421

	GAS ANALYSES				GENERATOR BALANCE										WEIGHT BALANCE		
HOUR	2200	0200	0600	AVERAGE	M/HR	C	H	O		Mol %	M/Hr	C	H	O		#/hr Measured	At Wt. Balance
FRESH FEED									O_2 32.000	0.28	10.519 0.036			21.110	WET GAS	288.47	319.39
CO 28.010	38.81	37.42	37.61	37.947	14.576	14.576		14.576	CO_2 44.010	1.41	0.179	0.179		0.358	OIL	61.48	61.48
H_2 2.016	57.78	59.85	58.92	58.850	22.605		45.210		N_2 28.016	0.07	0.009				WATER	121.82	121.82
CO_2 44.010	2.66	2.17	2.85	2.560	0.983	0.983		1.966	CH_4 16.042	83.35	10.575	10.575	42.300		TOTAL	471.77	502.69
N_2 28.016	0.26	0.39	0.40	0.350	0.134				C_2H_4 30.068	7.01	0.889	1.778	5.334		FRESH FEED	502.69	
CH_4 16.042	0.49	0.17	0.22	0.293	0.113	0.113	0.452		C_2H_6 44.094	5.25	0.666	1.998	5.328		WEIGHT BALANCE	93.85	
			M. W	13.087086			10.848	4.926	C_4H_{10} 58.120	1.81	0.230	0.920	2.300				
			H_2O 18.016				10.350	5.175	C_5H_{12} 72.146	0.82	0.104	0.520	1.248		WET GAS FACTOR	110718	
						15.672	56.012	21.717	MW=	20.16703					INDICATED LOSS—S C F H	547	
			BALANCE			98.13	99.12	101.16	TOTAL			15.970	56.510	21.468			

WET GAS					GAS FLOW RATES										LIQUID PRODUCT RATES 8 hrs basis					
CO 28.010	9.92	11.61	12.94	11.490		$\sqrt{H}$	PRESSURE	TEMP.	M. W.	S. C. F. H.	M/HR	HOUR	GAGE	GAL.	°F	FACTOR	GAL. AT 60	API° #/GAL.	#	#/HR GAL HR
H_2 2.016	37.65	42.10	45.72	41.824	FRESH FEED		415.9	98.1	221210			OIL	1'9"	91.50	66	0.9970	91.23	50.0	592.08	
CO_2 44.010	26.22	27.58	23.07	25.623	79.31	6.170	20.751	0.9652	1.4873	14577	38.411		0'3½"	15.49	66	0.9970	15.44	6.490	100.21	
N_2 28.016	1.67	1.66	1.88	1.737	WET GAS		1.63	71.1	134920								75.79		491.87	61.48
CH_4 16.042	14.22	8.17	8.25	10.213	158.44	6.933	4.041	0.9895	1.1616	5102	13.444									9.474
C_2H_4 28.052	2.34	2.34	2.23	2.303	RECYCLE		418.1	125.1												
C_2H_6 33.068	1.73	1.07	1.14	1.313	79.31	8.900	20.804	0.9428	1.1616	16082	42.377									
C_3H_6 42.078	1.85	2.05	2.11	2.003	BLEED															
C_3H_8 44.094	0.77	0.24	0.20	0.403	5.02	8.175	20.804	1.0000	1.1616	992	2.614	WATER	5'7"	296.94	74	0.99846	296.48	10.8	2455.45	
C_4H_8 56.104	1.37	1.49	1.09	1.317	NATURAL GAS		436.3	200.2	143551				3'4"	179.09	74	0.99846	178.81	8.282	1480.90	
C_4H_{10} 58.120	0.90	0.61	0.55	0.687	28.43	7.500	21.237	0.8875	1.1981	4815	12.688						117.67		974.55	121.82
C_5H_{10} 70.130	0.82	0.78	0.52	0.707	OXYGEN		437.1	70.4												14.709
C_5H_{12} 72.146	0.23	0.15	0.15	0.177	27.07	7.006	21.256	0.9903	--	3992	10.519									
C_6H_{12} 84.156	0.31	0.15	0.15	0.203	STEAM		33.5													
			M. W.	21.45709	215.7	4.133	0.3050		272#/hr											

THE TEXAS COMPANY — MONTEBELLO LABORATORY

RATE CALCULATIONS

RUN NO. 59-T
HOURS 421-445

	GAS ANALYSES				GENERATOR BALANCE										WEIGHT BALANCE		
HOUR	1400	2200	0600	AVERAGE	M/HR	C	H	O		Mol %	M/Hr	C	H	O		#/hr Measured	At Wt. Balance
FRESH FEED									O_2 32.000	0.35	10.482 0.044			21.052	WET GAS	313.37	336.05
CO 28.010	37.85	38.61	38.06	38.173	14.530	14.530		14.530	CO_2 44.010	1.85	0.235	0.235		0.470	OIL	49.86	49.86
H_2 2.016	59.01	57.80	58.17	58.327	22.201		44.402		N_2 28.016	1.20	0.153				WATER	119.46	119.46
CO_2 44.010	2.63	2.94	3.14	2.903	1.105	1.105		2.210	CH_4 16.042	82.38	10.469	10.469	41.876		TOTAL	482.69	505.37
N_2 28.016	0.09	0.35	0.45	0.297	0.113				C_2H_4 30.068	7.01	0.891	1.782	5.346		FRESH FEED	505.37	
CH_4 16.042	0.42	0.30	0.18	0.300	0.114	0.114	0.456		C_2H_6 44.094	4.71	0.599	1.797	4.792		WEIGHT BALANCE	95.51	
			M. W	13.27707					C_4H_{10} 58.120	1.80	0.229	0.916	2.290				
			H_2O 18.016				10.039	5.020	C_5H_{12} 72.146	0.70	0.089	0.445	1.068		WET GAS FACTOR	1072374	
						15.749	54.897	21.760	MW=	20.213553					INDICATED LOSS—S C F H	371	
			BALANCE			100.67	99.14	101.11	TOTAL			15.644	55.372	21.522			

WET GAS					GAS FLOW RATES										LIQUID PRODUCT RATES					
CO 28.010	12.12	11.56	10.97	11.550		$\sqrt{H}$	PRESSURE	TEMP.	M. W.	S. C. F. H.	M/HR	HOUR	GAGE	GAL.	°F	FACTOR	GAL. AT 60	API° #/GAL.	#	#/HR GAL HR
H_2 2.016	40.37	38.91	39.19	39.490	FRESH FEED		418.5	101.4	2180450			OIL	5'2"	275.11	62	0.9990	274.83	50.4 6.476	1779.80	
CO_2 44.010	29.41	31.37	31.41	30.730	79.31	6.158	20.813	0.9624	1.4766	14445	38.063		1'9"	91.50	66	0.9970	91.23	50.0 6.490	592.08	
N_2 28.016	1.63	1.70	1.62	1.650	WET GAS		1.83	74.0	1247084								41.39		49.00	
CH_4 16.042	8.17	7.38	7.30	7.617	158.44	7.217	4.066	0.9868	1.1167	5123	13.499						184.99		1196.72	49.86
C_2H_4 28.052	2.11	2.17	2.34	2.207	RECYCLE		420.4	125.2												7.708
C_2H_6 33.068	1.08	1.19	1.28	1.183	79.31	8.950	20.859	0.9427	1.1167	15587	41.072									
C_3H_6 42.078	2.05	2.23	2.27	2.183	BLEED															
C_3H_8 44.094	0.27	0.29	0.29	0.283	5.02	8.583	20.859	1.0000	1.1167	1004	2.646	WATER	6'9½"	360.22	74	0.99846	359.67	10.8	2978.79	
C_4H_8 56.104	1.27	1.48	1.50	1.417	NATURAL GAS		439.4	199.6	1432207				5'7"	296.94	74	0.99846	296.48	8.282	2455.45	
C_4H_{10} 58.120	0.46	0.55	0.60	0.537	28.43	7.492	21.310	0.9880	1.1967	4823	12.709		5'8"	301.30	78	0.99788	300.66	"	2490.07	
C_5H_{10} 70.130	0.68	0.77	0.80	0.750	OXYGEN		440.8	76.1					0'4"	17.70	69	0.99907	17.68	"	146.43	
C_5H_{12} 72.146	0.13	0.13	0.14	0.133	27.07	6.992	21.342	0.9849	--	3978	10.482						346.17		2866.98	119.46
C_6H_{12} 84.156	0.25	0.27	0.29	0.270	STEAM		35.5													14.424
			M. W.	23.214139	215.7	4163	0.3123		280#/hr											

THE TEXAS COMPANY — MONTEBELLO LABORATORY

RATE CALCULATIONS

RUN NO. 59-U
HOURS 445-469

	GAS ANALYSES			
HOUR	1400	2200	0500	AVERAGE
FRESH FEED				
CO 28.010	37.70	39.27	37.69	38.220
H_2 2.016	58.85	56.98	58.76	58.197
CO_2 44.010	2.57	3.14	2.94	2.883
N_2 28.016	0.46	0.48	0.46	0.467
CH_4 16.042	0.42	0.13	0.15	0.233
			M. W	13.315694
			H_2O 18.016	
			BALANCE	
WET GAS				
CO 28.010	7.54	7.67	7.08	7.430
H_2 2.016	34.70	32.45	34.66	33.936
CO_2 44.010	32.92	36.85	34.90	34.890
N_2 28.016	2.67	3.56	2.73	2.987
CH_4 16.042	10.51	7.97	9.02	9.167
C_2H_4 28.052	2.67	1.10	2.91	2.227
C_2H_6 30.068	1.50	1.39	1.59	1.493
C_3H_6 42.078	3.03	2.27	2.98	2.760
C_3H_8 44.094	0.36	0.10	0.35	0.270
C_4H_8 56.104	1.91	4.44	1.84	2.730
C_4H_{10} 58.120	0.76	0.65	0.62	0.677
C_5H_{10} 70.130	0.97	0.97	0.87	0.937
C_5H_{12} 72.146	0.15	0.19	0.15	0.163
C_6H_{12} 84.156	0.31	0.39	0.30	0.333
			M. W	25.761897

	GENERATOR BALANCE											
	M/HR	C	H	O		Mol %	M/Hr	C	H	O
					O_2 32.000	0.33	10.527 0.042			21.138
	14.623	14.623		14.623	CO_2 44.010	1.42	0.181	0.181		0.362
	22.267		44.534		N_2 28.016	1.87	0.238			
	1.103	1.103		2.206	CH_4 16.042	82.06	10.453	10.453	41.812	
	0.179				C_2H_4 30.068	6.90	0.879	1.758	5.274	
	0.089	0.089	0.356		C_2H_6 44.094	4.85	0.618	1.854	4.944	
					C_4H_{10} 58.120	1.80	0.229	0.916	2.229	
			10.052	5.026	C_5H_{12} 72.146	0.77	0.098	0.490	1.176	
		15.815	54.942	21.855	MW=	20.23344				
		101.04	99.11	101.65	TOTAL			15.652	55.435	21.500

	WEIGHT BALANCE		
	#/hr Measured	At Wt. Balance
WET GAS	286.73	314.04
OIL	61.68	61.68
WATER	133.75	133.75
TOTAL	482.16	509.47
FRESH FEED	509.47	
WEIGHT BALANCE	94.64	
WET GAS FACTOR	1095246	
INDICATED LOSS—S C F H	402	

	GAS FLOW RATES							
		$\sqrt{H}$	PRESSURE	TEMP.	M. W.	S. C. F. H.	M/HR	
FRESH FEED	79.31	6.175	421.9 20.895	101.6 0.9623	2174126 1.4745	14520	38.261	
WET GAS	158.44	6.267	1.76 4.057	71.4 0.9892	1123752 1.0601	4224	11.130	
RECYCLE	79.31	8.921	424.2 20.950	125.6 0.9424	1.0601	14808	39.020	
BLEED	5.02	8.429	20.950	1.0000	1.0601	940	2.477	
NATURAL GAS	28.43	7.475	443.8 21.413	199.3 0.8881	1430799 1.1962	4834	41.497 12.738	
OXYGEN	27.07	6.992	445.3 21.448	76.8 0.9842	--	3995	10.527	
STEAM	215.7	4.838	39.6 0.3268		341#/hr			

	LIQUID PRODUCT RATES						
HOUR	GAGE	GAL.	°F	FACTOR	GAL. AT 60	API° #/GAL.	#	# HR GAL HR
OIL	7'0½"	373.32	78	0.9911	370.00	52.0 6.420	2375.40	
	5'2"	275.11	62	0.9990	274.83	50.4 6.476	1779.80	
	2'11"	156.54	60	1.0000	156.54	52.0	1004.99	
	0'5"	22.13	90	0.9851	21.80	6.420	139.96	
					*3.08		*19.75	61.68
					232.99		1480.38	9.708
WATER	6'9½"	360.22	78	0.99788	359.46	10.8 8.282	2977.05	
	5'8"	301.30	78	0.99788	300.66	10.8 8.282	2490.07	
	6'5½"	342.76	78	0.99788	342.03	10.8	2832.69	
	0'3"	13.28	77	0.99804	13.25	8.282	109.74	133.75
					387.58		3209.93	16.149

THE TEXAS COMPANY — MONTEBELLO LABORATORY

RATE CALCULATIONS

RUN NO. 59-V
HOURS 469-493

	GAS ANALYSES			
HOUR	1400		0600	AVERAGE
FRESH FEED				
CO 28.010	38.78		39.14	38.960
H_2 2.016	57.56		57.79	57.675
CO_2 44.010	2.66		2.72	2.690
N_2 28.016	0.07		0.16	0.115
CH_4 16.042	0.93		0.19	0.560
			M. W	13.38135
			H_2O 18.016	
			BALANCE	
WET GAS				
CO 28.010	10.64	10.36	10.45	10.483
H_2 2.016	33.69	33.92	34.26	33.957
CO_2 44.010	32.29	34.04	33.46	33.263
N_2 28.016	1.51	1.72	1.80	1.677
CH_4 16.042	10.44	8.91	8.58	9.310
C_2H_4 28.052	2.59	2.66	2.71	2.653
C_2H_6 30.068	1.46	1.47	1.51	1.480
C_3H_6 42.078	2.84	2.86	3.00	2.900
C_3H_8 44.094	0.31	0.33	0.31	0.317
C_4H_8 56.104	1.77	1.69	1.89	1.783
C_4H_{10} 58.120	1.22	0.66	0.67	0.850
C_5H_{10} 70.130	0.84	0.90	0.96	0.900
C_5H_{12} 72.146	0.13	0.13	0.13	0.130
C_6H_{12} 84.156	0.27	0.35	0.27	0.297
			M. W.	25.24177

	GENERATOR BALANCE											
	M/HR	C	H	O		Mol %	M/Hr	C	H	O
					O_2 32.000	0.26	10.543 0.033			21.152
	14.876	14.876		14.876	CO_2 44.010	1.47	0.188	0.188		0.376
	22.023		44.046		N_2 28.016	0.97	0.124			
	1.027	1.027		2.054	CH_4 16.042	83.13	10.619	10.619	42.476	
	0.044				C_2H_6 30.068	6.80	0.869	1.738	5.214	
	0.214	0.214	0.856		C_2H_6 44.094	4.96	0.634	1.902	5.072	
					C_4H_{10} 58.120	1.69	0.216	0.864	2.160	
			10.160	5.080	C_5H_{12} 72.146	0.72	0.092	0.460	1.104	
		16.117	55.062	22.010	MW=	20.07098				
		102.19	98.28	102.24	TOTAL			15.771	56.026	21.528

	WEIGHT BALANCE	
	#/hr Measured	At Wt. Balance
WET GAS	285.86	311.32
OIL	61.85	61.85
WATER	137.78	137.78
TOTAL	485.49	510.95
FRESH FEED	510.95	
WEIGHT BALANCE	95.02	
WET GAS FACTOR	1089064	
INDICATED LOSS—S C F H	383	

	GAS FLOW RATES						
		$\sqrt{H}$	PRESSURE	TEMP.	M. W.	S. C. F. H.	M/HR
FRESH FEED	79.31	6.188	421.8 20.893	103.2 0.9608	2163458 1.4709	14491	38.184
WET GAS	158.44	6.308	1.70 4.050	69.0 0.9915	1146908 1.0709	4298	11.325
RECYCLE	79.31	8.908	423.1 20.924	125.4 0.9424	1.0709	14919	39.312
BLEED	5.02	8.200	20.924	1.0000	1.0709	922	2.430
NATURAL GAS	28.43	7.475	442.7 21.387	199.3 0.8881	1442380 1.2010	4848	12.775
OXYGEN	27.07	7.008	445.3 21.448	77.7 0.9833	--	4001	10.543
STEAM	215.7	4.975	44.3 0.3427		368#/hr		

	LIQUID PRODUCT RATES						
HOUR	GAGE	GAL.	°F	FACTOR	GAL. AT 60	API° #/GAL.	#	# HR GAL HR
OIL	7'1"	375.50	65	0.9975	374.56	52.6 6.399	2396.81	
	2'11"	156.54	60	1.0000	156.54	52.0 6.420	1004.99	
	0'5"	22.13	60	1.0000	22.13	52.6	141.61	
	0'3"	13.28	60	1.0000	13.28	6.399	84.98	
					*5.63		*36.00	61.85
					232.50		1484.45	9.688
WATER	7'0-3/4	374.41	76	0.99819	373.73	10.9 8.276	3092.99	
	6'5½"	342.76	78	0.99788	342.03	10.8 8.282	2832.69	
	6'11"	366.77	80	0.99759	365.89	10.9	3028.11	
	0'3"	13.28	62	0.99982	13.28	8.276	109.91	
	0'6½"	28.77	60	1.0000	28.77	10.9	238.10	
	0'3"	13.28	60	1.0000	13.28	8.276	109.91	137.78

THE TEXAS COMPANY — MONTEBELLO LABORATORY

RATE CALCULATIONS

RUN NO. 59-W
HOURS 493-517

	GAS ANALYSES			
HOUR	1400	2200	0600	AVERAGE
FRESH FEED				
CO 28.010	36.55	38.14	36.71	37.133
H_2 2.016	60.06	58.57	60.24	59.624
CO_2 44.010	2.42	2.95	2.71	2.693
N_2 28.016	0.24	0.11	0.07	0.140
CH_4 16.042	0.73	0.23	0.27	0.410
			M. W.	12.89316
			H_2O 18.016	
			BALANCE	
WET GAS				
CO 28.010	9.83	9.52	8.04	9.130
H_2 2.016	33.10	35.25	36.40	34.917
CO_2 44.010	33.96	33.50	33.64	33.700
N_2 28.016	2.11	1.81	1.79	1.903
CH_4 16.042	9.52	8.51	8.67	8.900
C_2H_4 28.052	2.65	2.79	2.82	2.753
C_2H_6 30.068	1.44	1.47	1.46	1.457
C_3H_6 42.078	2.92	2.87	2.96	2.917
C_3H_8 44.094	0.31	0.30	0.29	0.300
C_4H_8 56.104	1.89	1.86	1.90	1.883
C_4H_{10} 58.120	0.72	0.65	0.67	0.680
C_5H_{10} 70.130	0.99	0.99	0.96	0.980
C_5H_{12} 72.146	0.20	0.13	0.13	0.153
C_6H_{12} 84.156	0.36	0.35	0.27	0.327
			M. W.	25.14805

GENERATOR BALANCE										
M/HR	C	H	O		Mol %	M/Hr	C	H	O	
				O_2 32.000	0.30	10.495 0.038			21.066	
14.369	14.369		14.369	CO_2 44.010	1.64	0.209	0.209		0.418	
23.072		46.144		N_2 28.016	2.15	0.273				
1.042	1.042		2.084	CH_4 16.042	81.75	10.397	10.397	41.588		
0.054				C_2H_4 30.068	6.80	0.865	1.730	5.190		
0.159	0.159	0.636		C_2H_6 44.094	4.91	0.625	1.875	5.000		
				C_4H_{10} 58.120	1.68	0.214	0.856	2.140		
		9.188	4.594	C_5H_{12} 72.146	0.77	0.098	0.490	1.176		
	15.570	55.968	21.047	MW=	20.27602					
	100.08	101.59	97.97	TOTAL			15.557	55.094	21.484	

WEIGHT BALANCE		
	#/hr Measured	At Wt. Balance
WET GAS	279.12	306.45
OIL	63.34	63.34
WATER	129.12	129.12
TOTAL	471.58	498.91
FRESH FEED	498.91	
WEIGHT BALANCE	94.52	
WET GAS FACTOR	1097914	
INDICATED LOSS—S C F H	412	

GAS FLOW RATES						
	$\sqrt{H}$	PRESSURE	TEMP.	M. W.	S. C. F. H.	M/HR
FRESH FEED		421.2	103.8	2245376		
79.31	6.163	20.878	0.9603	1.4985	14685	38.696
WET GAS		1.70	70.4	1151182		
158.44	6.179	4.050	0.9901	1.0729	4212	11.099
RECYCLE		422.8	129.4			
79.31	8.942	20.917	0.9392	1.0729	14948	39.389
BLEED						
5.02	8.375	20.917	1.0000	1.0729	944	2.487
NATURAL GAS		442.1	198.2	1427795		
28.43	7.479	21.373	0.8889	1.1949	4827	12.719
OXYGEN		444.8	79.4			
27.07	6.992	21.436	0.9818	--	3983	10.495
STEAM		44.3				
215.7	4.946	0.3427		366#/hr		

LIQUID PRODUCT RATES								
HOUR	GAGE	GAL.	°F	FACTOR	GAL. AT 60	API° #/GAL.	#	# HR GAL HR
OIL	4'9½"	255.47	62	0.9990	255.21	52.4 6.406	1634.88	
	0'5"	22.13	60	1.0000	22.13	52.6 6.399	141.61	
					*4.21		*27.00	
					237.29		1520.27	63.34
								9.887
WATER	7'7"	401.69	75	0.99832	401.02	10.9 8.276	3318.84	
	0'6½"	28.77	60	1.00000	28.77	10.9 8.276	238.10	
	0'4"	17.70	65	0.99953	17.69	10.9	146.40	
	0'3½"	15.49	62	0.99982	15.49	8.276	128.20	129.12
					374.45		3098.94	15.602

THE TEXAS COMPANY — MONTEBELLO LABORATORY

RATE CALCULATIONS

RUN NO. 59-X
HOURS 517-541

	GAS ANALYSES			
HOUR	1400	2200	0600	AVERAGE
FRESH FEED				
CO 28.010	37.92	38.40	37.61	37.977
H_2 2.016	58.37	58.13	59.18	58.560
CO_2 44.010	2.76	2.94	2.91	2.970
N_2 28.016	0.07	0.24	0.09	0.133
CH_4 16.042	0.88	0.29	0.21	0.460
			M. W.	13.1921
			H_2O 18.016	
			BALANCE	
WET GAS				
CO 28.010	9.92	9.75	9.86	9.843
H_2 2.016	34.26	33.74	35.46	34.486
CO_2 44.010	32.20	34.43	33.64	33.423
N_2 28.016	1.63	1.69	1.73	1.683
CH_4 16.042	10.34	9.34	9.00	9.560
C_2H_4 28.052	2.86	2.81	2.55	2.740
C_2H_6 30.068	1.44	1.46	1.47	1.457
C_3H_6 42.078	2.77	2.54	2.52	2.610
C_3H_8 44.094	0.30	0.30	0.26	0.287
C_4H_8 56.104	2.00	1.64	1.57	1.737
C_4H_{10} 58.120	0.70	0.69	0.70	0.697
C_5H_{10} 70.130	1.07	1.01	0.82	0.967
C_5H_{12} 72.146	0.14	0.14	0.14	0.140
C_6H_{12} 84.156	0.37	0.46	0.28	0.370
			M. W.	25.0685

GENERATOR BALANCE										
M/HR	C	H	O		Mol %	M/Hr	C	H	O	
				O_2 32.000	0.23	10.290 0.029			20.638	
14.638	14.638		14.638	CO_2 44.010	1.06	0.135	0.135		0.270	
22.573		45.146		N_2 28.016	2.29	0.293				
1.106	1.106		2.212	CH_4 16.042	82.20	10.506	10.506	42.024		
0.051				C_2H_4 30.068	6.81	0.870	1.740	5.220		
0.177	0.177	0.708		C_2H_6 44.094	4.85	0.620	1.860	4.960		
				C_4H_{10} 58.120	1.78	0.227	0.908	2.270		
		8.968	4.484	C_5H_{12} 72.146	0.78	0.100	0.500	1.200		
	15.921	54.822	21.334	MW=	20.151661					
	101.74	98.47	102.04	TOTAL			15.649	55.674	20.908	

WEIGHT BALANCE		
	#/hr Measured	At Wt. Balance
WET GAS	282.20	306.86
OIL	58.66	58.66
WATER	142.97	142.97
TOTAL	483.83	508.49
FRESH FEED	508.49	
WEIGHT BALANCE	95.15	
WET GAS FACTOR	1087384	
INDICATED LOSS—S C F H	373	

GAS FLOW RATES						
	$\sqrt{H}$	PRESSURE	TEMP.	M. W.	S. C. F. H.	M/HR
FRESH FEED		420.6	106.7	2194495		
79.31	6.229	20.864	0.9580	1.4814	14628	38.545
WET GAS		1.70	73.4	1154835		
158.44	6.275	4.050	0.9873	1.0746	4272	11.257
RECYCLE		421.9	132.6			
79.31	8.950	20.895	0.9368	1.0746	14931	39.344
BLEED						
5.02	8.250	20.895	1.0000	1.0746	930	2.451
NATURAL GAS		442.0	197.9	1436606		
28.43	7.492	21.371	0.8890	1.1986	4850	12.780
OXYGEN		444.9	83.4			
27.07	6.992	21.093	0.9782	--	3905	10.290
STEAM		43.6				
215.7	5.079	0.3403		373#/hr		

LIQUID PRODUCT RATES								
HOUR	GAGE	GAL.	°F	FACTOR	GAL. AT 60	API° #/GAL.	#	# HR GAL HR
OIL	7'1"	375.50	82	0.9891	371.41	52.11 8.416	2382.97	
	4'9½"	255.47	62	0.9990	255.21	52.4 8.406	1634.88	
	2'3½"	121.98	64	0.9980	121.74	52.1	781.08	
	0'5"	22.13	84	0.9881	21.87	6.416	140.32	
					*2.96		*19.00	58.66
					219.03		1407.85	9.126
WATER	7'4"	388.59	82	0.99726	387.53	11.0 8.270	3204.87	
	0'4"	17.70	65	0.99953	17.69	10.9 8.276	146.40	
	1'1½"	58.47	78	0.99788	58.35	11.0	482.55	
	0'3"	13.28	64	0.99963	13.28	8.270	109.83	
					414.91		3431.19	142.97
								17.288

THE TEXAS COMPANY — MONTEBELLO LABORATORY

RATE CALCULATIONS

RUN NO. 59-Y
HOURS 541-565

	GAS ANALYSES			
HOUR	1400'	2200	0600	AVERAGE
FRESH FEED				
CO 28.010	39.21	38.15	38.28	38.547
H_2 2.016	57.78	58.02	58.43	58.076
CO_2 44.010	1.79	2.92	2.67	2.460
N_2 28.016	0.38	0.30	0.25	0.310
CH_4 16.042	0.84	0.61	0.37	0.607
			M. W.	13.234697
			H_2O 18.016	
			BALANCE	
WET GAS				
CO 28.010	9.93	9.64	9.64	9.737
H_2 2.016	33.78	35.50	35.62	34.966
CO_2 44.010	32.58	32.99	33.24	32.937
N_2 28.016	1.87	1.91	1.63	1.803
CH_4 16.042	11.03	10.10	9.28	10.137
C_2H_4 28.052	2.66	2.60	2.55	2.603
C_2H_6 33.068	1.28	1.34	1.33	1.317
C_3H_6 42.078	2.61	2.58	3.00	2.730
C_3H_8 44.094	0.30	0.34	0.32	0.320
C_4H_8 56.104	1.70	1.47	1.71	1.627
C_4H_{10} 58.120	0.68	0.42	0.54	0.547
C_5H_{10} 70.130	0.96	0.73	0.75	0.813
C_5H_{12} 72.146	0.19	0.13	0.13	0.150
C_6H_{12} 84.156	0.43	0.25	0.26	0.313
			M. W.	24.64766

GENERATOR BALANCE									
M/HR	C	H	O		Mol %	M/Hr	C	H	O
				O_2 32.000	0.26	10.422 0.033			20.910
14.711	14.711		14.711	CO_2 44.010	1.18	0.151	0.151		0.302
22.163		44.326		N_2 28.016	2.10	0.269			
0.939	0.939		1.878	CH_4 16.042	83.39	10.700	10.700	42.800	
0.118				C_2H_4 30.068	6.28	0.806	1.612	4.836	
0.232	0.232	0.928		C_2H_6 44.094	4.45	0.571	1.713	4.568	
				C_4H_{10} 58.120	1.62	0.208	0.832	2.080	
		9.690	4.845	C_5H_{12} 72.146	0.72	0.092	0.460	1.104	
	15.882	54.944	21.434	MW=	19.879726				
	102.68	99.20	101.05	TOTAL			15.468	55.388	21.212

GAS FLOW RATES						
	$\sqrt{H}$	PRESSURE	TEMP.	M. W.	S. C. F. H.	M/HR
FRESH FEED		415.6	108.1	2187432		
79.31	6.221	20.744	0.9568	1.4790	14483	38.163
WET GAS		1.76	75.0	1174553		
158.44	6.375	4.057	0.9859	1.0838	4379	11.539
RECYCLE		418.1	134.4			
79.31	8.283	20.804	0.9353	1.0838	13854	36.506
BLEED						
5.02	8.384	20.804	1.0000	1.0838	949	2.501
NATURAL GAS		438.4	199.5	1456257		
28.43	7.508	21.286	0.8880	1.2068	4869	12.830
OXYGEN		441.4	85.7			
27.07	7.008	21.356	0.9761	—	3955	10.422
STEAM		46.9				
215.7	4.704	0.3510		356#/hr		

WEIGHT BALANCE		
	#/hr Measured	At Wt. Balance
WET GAS	284.41	309.35
OIL	57.97	57.97
WATER	137.76	137.76
TOTAL	480.14	505.08
FRESH FEED	505.08	
WEIGHT BALANCE	95.06	
WET GAS FACTOR	1087690	
INDICATED LOSS—S C F H	384	

LIQUID PRODUCT RATES						
HOUR	GAGE	GAL.	°F	FACTOR	GAL. AT 60	API° #/GAL.
OIL	6'4"	336.22	70	0.9951	334.57	52.0 6.420
	2'3½"	121.98	64	0.9980	121.74	52.1 6.416
					43.82	
					216.65	
WATER	7'1"	375.50	82	0.99726	374.47	11.0 8.270
	1'1½"	58.47	78	0.99788	58.35	11.0 8.270
	1'10½"	98.28	82	0.99726	98.01	11.0
	0'3"	13.28	70	0.99896	13.27	8.270
					400.86	

#	#/HR GAL/HR
2147.94	
781.08	
+26.50	57.97
1391.36	9.027
3096.87	
482.55	
801.54	
109.74	137.76
3306.12	16.703

THE TEXAS COMPANY — MONTEBELLO LABORATORY

RATE CALCULATIONS

RUN NO. 59-Z
HOURS 565-589

	GAS ANALYSES			
HOUR	1400	2200	0600	AVERAGE
FRESH FEED				
CO 28.010	40.47	40.33	39.32	40.040
H_2 2.016	56.56	56.14	57.45	56.717
CO_2 44.010	1.80	2.85	2.74	2.463
N_2 28.016	0.02	0.33	0.29	0.213
CH_4 16.042	1.15	0.35	0.20	0.567
			M. W.	13.59322
			H_2O 18.016	
			BALANCE	
WET GAS				
CO 28.010	8.53	7.92	8.49	8.313
H_2 2.016	34.83	34.74	39.65	36.407
CO_2 44.010	33.22	33.91	29.95	32.360
N_2 28.016	1.80	1.77	1.85	1.807
CH_4 16.042	11.04	9.00	8.85	9.630
C_2H_4 28.052	2.58	2.75	2.63	2.653
C_2H_6 33.068	1.35	1.44	1.34	1.377
C_3H_6 42.078	2.58	3.28	2.74	2.867
C_3H_8 44.094	0.34	0.40	0.29	0.343
C_4H_8 56.104	1.71	2.33	1.67	1.903
C_4H_{10} 58.120	0.68	0.67	1.34	0.897
C_5H_{10} 70.130	0.93	1.22	0.80	0.983
C_5H_{12} 72.146	0.14	0.13	0.13	0.133
C_6H_{12} 84.156	0.27	0.44	0.27	0.327
			M. W.	24.52056

GENERATOR BALANCE									
M/HR	C	H	O		Mol %	M/Hr	C	H	O
				O_2 32.000	0.21	10.337 0.027			20.728
15.074	15.074		15.074	CO_2 44.010	1.47	0.186	0.186		0.372
21.352		42.074		N_2 28.016	0.26	0.033			
0.927	0.927		1.854	CH_4 16.042	81.81	10.354	10.354	41.416	
0.080				C_2H_6 30.068	9.41	1.191	2.382	7.146	
0.214	0.214	0.856		C_3H_8 44.094	4.49	0.568	1.704	4.544	
				C_4H_{10} 58.120	1.58	0.200	0.800	2.000	
		10.527	5.264	C_5H_{12} 72.146	0.77	0.097	0.485	1.164	
	16215	54.087	22.192	MW=	20.19399				
	101.91	96.12	105.18	TOTAL			15.911	56.270	21.100

GAS FLOW RATES						
	$\sqrt{H}$	PRESSURE	TEMP.	M. W.	S. C. F. H.	M/HR
FRESH FEED		412.5	87.7	2129738		
79.31	6.129	20.669	0.9744	1.4594	14287	37.647
WET GAS		1.74	77.2	1180641		
158.44	6.596	4.055	0.9839	1.0866	4531	11.939
RECYCLE		m414.4	137.3			
79.31	8.213	20.715	0.9331	1.0866	13681	36.050
BLEED						
5.02	8.196	20.715	1.0000	1.0866	926	2.440
NATURAL GAS		433.3	201.3	1433594		
28.43	7.517	21.166	0.8868	1.1973	4803	12.656
OXYGEN		435.8	87.8			
27.07	7.008	21.225	0.9743	—	3923	10.337
STEAM		41.3				
215.7	4.467	0.3328		321#/hr		

WEIGHT BALANCE		
	#/hr Measured	At Wt. Balance
WET GAS	292.75	317.24
OIL	58.67	58.67
WATER	135.83	135.83
TOTAL	487.25	511.74
FRESH FEED	511.74	
WEIGHT BALANCE	95.21	
WET GAS FACTOR	1083654	
INDICATED LOSS—S C F H	379	

LIQUID PRODUCT RATES							
HOUR	GAGE	GAL.	°F	FACTOR	GAL. AT 60	API° #/GAL.	#
OIL	7'3½"	385.32	74	0.9930	382.62	52.3 6.410	2452.59
	6'4"	336.22	70	0.9951	334.57	52.0 6.420	2147.94
	3'5"	183.46	68	0.9961	182.74	52.3	1171.36
	0'3"	13.28	89	0.9856	13.09	6.410	83.91
					+2.50		+16.00
					220.20		1408.10
WATER						11.1	
	NOTE: A leak occurred in the line					8.270	
	between the accumulator and the						
	water gauging tank. A wet gas loss of						
	379 SCFH (average of periods X and Y)						
	was assumed and gross water yield calculated to be						

#/HR GAL/HR
58.67
9.175
135.83
16.484

THE TEXAS COMPANY — MONTEBELLO LABORATORY

RATE CALCULATIONS

RUN NO. 59-AA
HOURS 589-613

	GAS ANALYSES				GENERATOR BALANCE										WEIGHT BALANCE		
HOUR	1400	2200	0600	AVERAGE	M/HR	C	H	O		Mol %	M/Hr	C	H	O		#/hr Measured	At Wt. Balance
FRESH FEED									O_2 32.000	0.24	10.361 0.030			20.782	WET GAS	291.02	320.52
CO 28.010	39.31	39.94	39.09	39.446	14.825	14.825		14.825	CO_2 44.010	1.08	0.155	0.155		0.270	OIL	57.09	57.09
H_2 2.016	56.36	56.74	57.25	56.783	21.342		42.684		N_2 28.016	2.45	0.307				WATER	133.88	133.88
CO_2 44.010	2.75	2.70	2.94	2.797	1.051	1.051		2.102	CH_4 16.042	81.04	10.168	10.168	40.672		TOTAL	481.99	511.49
N_2 28.016	0.31	0.20	0.20	0.237	0.089				C_2H_6 30.068	7.20	0.903	1.806	5.418		FRESH FEED	511.49	
CH_4 16.042	1.27	0.42	0.52	0.737	0.277	0.277	1.108		C_3H_8 44.094	5.20	0.652	1.956	5.216		WEIGHT BALANCE	94.23	
			M. W.	13.609157					C_4H_{10} 58.120	1.85	0.232	0.928	2.320				
			H_2O 18.016				9.750	4.875	C_5H_{12} 72.146	0.94	0.118	0.590	1.416		WET GAS FACTOR	1101367	
						16.153	53.542	21.802	MW=	20.450113					INDICATED LOSS—S C F H	446	
			BALANCE			103.66	97.27	103.56	TOTAL			15.583	55.042	21.052			

WET GAS					GAS FLOW RATES							LIQUID PRODUCT RATES							
CO 28.010	7.47	7.95	7.54	7.653		$\sqrt{h}$	PRESSURE	TEMP.	M. W.	S. C. F. H.	M/HR	HOUR	GAGE	GAL.	°F	FACTOR	GAL. AT 60	API° #/GAL.	#	# HR GAL HR
H_2 2.016	34.16	36.11	35.88	35.384	FRESH FEED		413.0	82.9	2127244			OIL	7'4½"	390.78	70	0.9951	388.87	51.6 6.434	2501.99	
CO_2 44.010	34.53	35.00	35.43	34.987	79.31	6.092	20.681	0.9787	1.4585	14263	37.584		4'1½"	216.19	74	0.9930	214.68		1381.25	
N_2 28.016	2.07	1.86	1.91	1.947			1.75	76.9	1153350								÷3.26		÷21.00	57.09
CH_4 16.042	10.35	8.35	9.16	9.287	WET GAS 158.44	6.479	4.056	0.9841	1.0739	4400	11.594	20hrs					177.45		1141.74	8.875
C_2H_6 28.052	2.76	2.58	2.53	2.623			414.2	137.2												
C_3H_8 33.068	1.33	1.36	1.29	1.327	RECYCLE 79.31	8.150	20.710	0.9332	1.0739	13415	35.849									
C_3H_8 42.078	2.69	2.55	2.60	2.613																
C_3H_8 44.094	0.35	0.33	0.29	0.323	BLEED 5.02	8.158	20.710	1.0000	1.0739	911	2.401	WATER	7'2½"	382.05	84	0.99692	380.87	11.0 8.270	3149.79	
C_4H_8 56.104	2.00	1.79	1.55	1.780			434.1	205.6	1415640				2'4"	124.28	80	0.99759	123.98	"	1025.31	
C_4H_{10} 58.120	0.62	0.60	0.60	0.607	NATURAL GAS 28.43	7.517	21.185	0.8839	1.1898	4761	12.545		1'7"	82.59	84	0.99692	82.34	"	680.95	
C_5H_{10} 70.130	1.13	1.00	0.79	0.973			436.8	86.4					0'3½"	15.49	76	0.99819	15.46	"	127.85	
C_5H_{12} 72.146	0.15	0.14	0.14	0.143	OXYGEN 27.07	7.008	21.249	0.9755	--	3932	10.361						323.77		2677.58	133.88
C_6H_{12} 84.156	0.39	0.38	0.29	0.353			41.6													161.89
			M. W.	25.100789	STEAM 215.7	4.667	0.3337		336#/hr											

THE TEXAS COMPANY — MONTEBELLO LABORATORY

RATE CALCULATIONS

RUN NO. 59-BB
HOURS 613-637

	GAS ANALYSES				GENERATOR BALANCE										WEIGHT BALANCE		
HOUR	1400	2200	0600	AVERAGE	M/HR	C	H	O		Mol %	M/Hr	C	H	O		#/hr Measured	At Wt. Balance
FRESH FEED									O_2 32.000	0.21	10.335 0.026			20.722	WET GAS	285.32	305.85
CO 28.010	37.77	37.65	37.27	37.563	14.583	14.583		14.583	CO_2 44.010	1.32	0.166	0.166		0.332	OIL	56.48	56.48
H_2 2.016	60.36	59.15	59.65	59.720	23.184		46.368		N_2 28.014	1.80	0.226				WATER	131.83	131.83
CO_2 44.010	0.66	2.62	2.62	1.967	0.764	0.764		1.528	CH_4 16.042	81.59	10.238	10.238	40.952		TOTAL	473.63	494.16
N_2 28.016	0.14	0.14	0.16	0.147	0.057				C_2H_6 30.068	7.17	0.900	1.800	5.400		FRESH FEED	494.16	
CH_4 16.042	1.07	0.44	0.30	0.603	0.234	0.234	0.936		C_3H_8 44.094	5.27	0.661	1.983	5.288		WEIGHT BALANCE	95.85	
			M. W.	12.72894			7.862	4.943	C_4H_{10} 58.120	1.78	0.223	0.892	2.230				
			H_2O 18.016				8.874	4.437	C_5H_{12} 72.146	0.86	0.108	0.540	1.296		WET GAS FACTOR	1071954	
						15.581	56.178	20.548	MW=	20.37571					INDICATED LOSS—S C F H	318	
			BALANCE			99.76	101.83	97.60	TOTAL			15.619	55.166	21.054			

WET GAS					GAS FLOW RATES							LIQUID PRODUCT RATES							
CO 28.010	10.51	9.40	8.93	9.613		$\sqrt{h}$	PRESSURE	TEMP.	M. W.	S. C. F. H.	M/HR	HOUR	GAGE	GAL.	°F	FACTOR	GAL. AT 60	API° #/GAL.	#	# HR GAL HR
H_2 2.016	36.11	35.60	36.58	36.096			410.5	83.7	2274344			OIL	4'4¼"	232.56	70	0.9951	231.42	51.8 6.427	1487.34	
CO_2 44.010	30.63	33.05	33.47	32.383	FRESH FEED 79.31	6.108	20.620	0.9780	1.5081	14733	38.822		0'5¼"	23.23	68	0.9961	23.14	51.6 6.434	148.88	
N_2 28.016	1.74	1.88	1.90	1.840			1.75	77.3	1180965								÷2.65		÷17.00	
CH_4 16.042	10.08	8.96	8.64	9.227	WET GAS 158.44	6.429	4.056	0.9838	1.0867	4417	11.639						210.93		1355.46	56.48
C_2H_6 28.052	2.63	2.76	2.74	2.710			413.0	134.3												8.789
C_3H_8 33.068	1.25	1.30	1.27	1.273	RECYCLE 79.31	8.125	20.681	0.9354	1.0867	13547	35.697									
C_3H_8 42.078	2.82	2.69	2.49	2.667																
C_3H_8 44.094	0.28	0.30	0.29	0.290	BLEED 5.02	7.488	20.681	1.0000	1.0867	845	2.227	WATER	7'0⅛"	372.23	85	0.99674	371.02	11.0 8.270	3068.34	
C_4H_8 56.104	1.95	1.83	1.67	1.817			431.7	204.2	1420809				1'7"	82.59	84	0.99692	82.34	11.0 8.270	680.95	
C_4H_{10} 58.120	0.53	0.70	0.68	0.637	NATURAL GAS 28.43	7.517	21.128	0.8848	1.1920	4762	12.548		2'0⅛"	107.43	80	0.99759	107.17	11.0	886.30	
C_5H_{10} 70.130	1.00	1.02	0.93	0.983			434.0	87.4					0'3"	13.28	68	0.99920	13.27	8.270	109.74	
C_5H_{12} 72.146	0.13	0.14	0.14	0.137	OXYGEN 27.07	7.017	21.183	0.9746	--	3922	10.335						382.58		3163.95	131.83
C_6H_{12} 84.156	0.34	0.37	0.27	0.327			43.1													15.941
			M. W.	24.51385	STEAM 215.7	4.975	0.3388		364#/hr											

THE TEXAS COMPANY — MONTEBELLO LABORATORY

RATE CALCULATIONS

RUN NO. 59-CC
HOURS 637-661

HOUR	GAS ANALYSES 1400	2200	0600	AVERAGE
FRESH FEED				
CO 28.010	37.67	38.32	37.98	37.990
H_2 2.016	57.84	58.08	58.31	58.077
CO_2 44.010	2.79	2.86	3.00	2.883
N_2 28.016	0.40	0.17	0.38	0.317
CH_4 16.042	1.30	0.57	0.33	0.733
			M. W.	13.28704
			H_2O 18.016	
			BALANCE	
WET GAS				
CO 28.010	4.94	5.17	4.84	4.983
H_2 2.016	33.81	34.33	35.92	34.687
CO_2 44.010	33.11	34.23	34.43	33.924
N_2 28.016	2.71	2.08	2.03	2.273
CH_4 16.042	12.72	10.78	10.16	11.220
C_2H_4 28.052	3.14	3.14	3.10	3.127
C_2H_6 33.068	1.66	1.69	1.62	1.657
C_3H_6 42.078	3.21	3.43	3.12	3.253
C_3H_8 44.094	0.36	0.42	0.31	0.363
C_4H_8 56.104	2.02	2.31	2.10	2.143
C_4H_{10} 58.120	0.59	0.65	0.76	0.667
C_5H_{10} 70.130	1.09	1.19	1.07	1.117
C_6H_{12} 72.146	0.21	0.16	0.21	0.193
C_6H_{12} 84.156	0.43	0.42	0.33	0.393
			M. W.	25.20926

	M/HR	C	H	O
CO	14.430	14.430		14.430
H_2	22.060		44.120	
CO_2	1.095	1.095		2.190
N_2	0.120			
CH_4	0.279	0.279	1.116	
		15.904	54.765	21.385
		101.35	98.70	101.72

	Mol %	M/Hr	C	H	O
O_2 32.000	0.21	10.324 0.027			20.702
CO_2 44.010	1.27	0.161	0.161		0.322
N_2 28.016	1.41	0.179			
CH_4 16.042	83.06	10.529	10.529	42.116	
C_2H_4 30.068	6.76	0.857	1.714	5.142	
C_2H_6 44.094	4.75	0.602	1.806	4.816	
C_4H_{10} 58.120	1.78	0.226	0.904	2.260	
C_5H_{12} 72.146	0.76	0.096	0.480	1.152	
MW=	20.05555				
TOTAL			15.594	55.486	21.024

GAS FLOW RATES	$\sqrt{H}$	PRESSURE	TEMP.	M. W.	S. C. F. H.	M/HR
FRESH FEED 79.31	6.117	408.4 20.569	83.0 0.9786	2178814 1.4761	14415	37.984
WET GAS 158.44	6.504	1.75 4.056	76.0 0.9850	1148387 1.0716	4412	11.626
RECYCLE 79.31	8.075	410.5 20.620	127.5 0.9408	1.0716	13313	35.080
BLEED 5.02	7.996	20.620	1.0000	1.0716	887	2.337
NATURAL GAS 28.43	7.525	428.8 21.059	198.3 0.9888	1443490 1.2015	4811	12.677
OXYGEN 27.07	7.017	431.5 21.123	85.2 0.9766	--	3918	10324
STEAM 215.7	4.925	44.3 0.3427	364#/hr			

LIQUID PRODUCT RATES HOUR	GAGE	GAL.	°F	FACTOR	GAL. AT 60	API° #/GAL.	#	#/HR GAL HR
OIL	7'1"	375.50	83	0.9886	371.22	51.9 6.423	2384.35	
	4'4½"	232.56	70	0.9951	231.42	51.8 6.427	1487.34	
	1'8"	87.01	64	0.9980	86.84	51.9	557.77	
	0'3½"	14.38	72	0.9941	14.30	6.423	91.85	
					+2.02		+13.00	57.33
					214.36		1375.93	8.932
WATER	6'11"	366.77	88	0.99619	365.37	10.8 8.282	3025.99	
	2'0½"	107.43	80	0.99759	107.17	11.0 8.270	886.30	
	2'9½"	149.62	80	0.99759	149.26	10.8	1236.17	
	0'3½"	15.49	70	0.99896	15.47	8.282	128.12	
					391.99		3247.74	135.32
								16.333

WEIGHT BALANCE	#/hr Measured	At Wt. Balance
WET GAS	293.08	312.04
OIL	57.33	57.33
WATER	135.32	135.32
TOTAL	485.73	504.69
FRESH FEED	504.69	
WEIGHT BALANCE	96.24	
WET GAS FACTOR	1064692	
INDICATED LOSS—S C F H	285	

THE TEXAS COMPANY — MONTEBELLO LABORATORY

RATE CALCULATIONS

RUN NO. 59-DD
HOURS 661-685

HOUR	GAS ANALYSES 1400	2200	0600	AVERAGE
FRESH FEED				
CO 28.010	39.47	39.09	39.48	39.347
H_2 2.016	56.60	57.34	57.22	57.053
CO_2 44.010	2.32	2.75	2.72	2.597
N_2 28.016	0.42	0.39	0.24	0.350
CH_4 16.042	1.19	0.43	0.34	0.653
			M. W.	13.51703
			H_2O 18.016	
			BALANCE	
WET GAS				
CO 28.010	8.65	9.08	8.29	8.673
H_2 2.016	33.81	33.73	34.49	34.010
CO_2 44.010	32.14	33.41	33.87	33.140
N_2 28.016	1.38	1.50	1.40	1.426
CH_4 16.042	13.20	11.20	11.28	11.893
C_2H_4 28.052	2.72	2.81	2.74	2.757
C_2H_6 33.068	1.30	1.36	1.38	1.347
C_3H_6 42.078	2.80	2.91	2.76	2.823
C_3H_8 44.094	0.31	0.34	0.31	0.320
C_4H_8 56.104	1.84	1.84	1.71	1.797
C_4H_{10} 58.120	0.48	0.50	0.58	0.520
C_5H_{10} 70.130	0.94	0.98	0.84	0.887
C_6H_{12} 72.146	0.12	0.12	0.12	0.120
C_6H_{12} 84.156	0.31	0.32	0.23	0.287
			M. W.	24.77519

	M/HR	C	H	O
CO	14.996	14.996		14.996
H_2	21.745		43.490	
CO_2	0.990	0.990		1.980
N_2	0.133			
CH_4	0.249	0.249	0.996	
			12.152	
			10.114	5.057
		16.235	54.600	22.033
		103.30	96.40	104.85

	Mol %	M/Hr	C	H	O
O_2 32.000	0.11	10.390 0.014			20.808
CO_2 44.010	0.80	0.103	0.103		0.206
N_2 28.016	0.15	0.019			
CH_4 16.042	86.24	11.074	11.074	44.296	
C_2H_4 30.068	6.02	0.773	1.546	4.638	
C_2H_6 44.094	4.22	0.542	1.626	4.336	
C_4H_{10} 58.120	1.65	0.212	0.848	2.120	
C_5H_{12} 72.146	0.81	0.104	0.520	1.248	
MW=	19.47815				
TOTAL			15.717	56.638	21.014

GAS FLOW RATES	$\sqrt{H}$	PRESSURE	TEMP.	M. W.	S. C. F. H.	M/HR
FRESH FEED 79.31	6.154	410.3 20.616	79.0 0.9822	2141742 1.4635	14464	38.113
WET GAS 158.44	6.385	1.72 4.052	72.5 0.9882	1168507 1.0810	4378	11.536
RECYCLE 79.31	8.042	411.4 20.642	125.0 0.9428	1.0810	13418	35.357
BLEED 5.02	8.125	20.642	1.0000	1.0810	910	2.398
NATUPAL GAS 28.43	7.492	431.2 21.116	198.4 0.8887	1486280 1.2191	4873	12.841
OXYGEN 27.07	7.013	434.5 21.194	81.3 0.9801	--	3943	10.390
STEAM 21.57	5.338	46.8 0.3508		404#/hr		

LIQUID PRODUCT RATES HOUR	GAGE	GAL.	°F	FACTOR	GAL. AT 60	API° #/GAL.	#	#/HR GAL HR
OIL	5'9"	305.66	64	0.9980	305.05	51.2 6.448	1966.96	
	1'8"	87.01	64	0.9980	86.84	51.9 6.423	557.77	
					+3.10		+20.00	59.55
					221.31		1429.19	9.221
WATER	7'6"	397.32	88	0.99619	395.81	10.8 8.282	3278.10	
	2'9½"	149.62	80	0.99759	149.26	10.8 8.282	1236.17	
	2'11-3/4	159.99	78	0.99788	159.65	"	1322.22	
	0'3"	13.28	70	0.99896	13.27	"	109.90	
					392.93		3254.25	135.59
								16.372

WEIGHT BALANCE	#/hr Measured	At Wt. Balance
WET GAS	285.81	320.05
OIL	59.55	59.55
WATER	135.59	135.59
TOTAL	480.95	515.17
FRESH FEED	515.17	
WEIGHT BALANCE	93.36	
WET GAS FACTOR	1119729	
INDICATED LOSS—S C F H	524	

THE TEXAS COMPANY — MONTEBELLO LABORATORY

RATE CALCULATIONS

RUN NO. 59-EE
HOURS 685-709

	GAS ANALYSES				GENERATOR BALANCE										WEIGHT BALANCE		
HOUR	1400	2200	0600	AVERAGE	M/HR	C	H	O		Mol %	M/Hr	C	H	O		#/hr Measured	At Wt. Balance
FRESH FEED									O_2 32.000	0.22	10.377 0.028			20.810	WET GAS	278.58	304.58
CO 28.010	38.26	38.65	38.08	38.330	14.622	14.622		14.622	CO_2 44.010	1.69	0.212	0.212		0.424	OIL	63.28	63.28
H_2 2.016	58.83	56.46	58.99	58.094	22.162		44.324		N_2 28.016	0.62	0.078				WATER	139.69	139.69
CO_2 44.010	2.07	4.13	2.44	2.880	1.099	1.099		2.198	CH_4 16.042	81.64	10.229	10.229	40.916		TOTAL	481.55	507.55
N_2 28.016	--	0.31	0.15	0.153	0.058				C_2H_6 30.068	7.44	0.932	1.864	5.592		FRESH FEED	507.55	
CH_4 16.042	0.84	0.45	0.34	0.543	0.207	0.207	0.828		C_3H_8 44.094	5.30	0.664	1.992	5.312		WEIGHT BALANCE	94.88	
			M. W	13.30487					C_4H_{10} 58.120	2.09	0.262	1.048	2.620				
			H_2O 18.016				9.808	4.904	C_5H_{12} 72.146	1.00	0.125	0.625	1.500		WET GAS FACTOR	1093330	
						15.928	54.960	21.724	MW	20.594766					INDICATED LOSS—S C F H	392	
			BALANCE			99.74	98.25	102.31	TOTAL			15.970	55.940	21.234			

WET GAS					GAS FLOW RATES							LIQUID PRODUCT RATES								
CO 28.010	6.05	6.66	6.55	6.420		$\sqrt{H}$	PRESSURE	TEMP.	M. W.	S. C. F. H.	M/HR	HOUR	GAGE	GAL.	°F	FACTOR	GAL. AT 60	API° #/GAL.	#	# HR GAL HR
H_2 2.016	34.14	34.43	33.66	34.076	FRESH FEED		409.6	76.8	2175894			OIL	7'3¼"	385.32	75	0.9925	382.43	51.5 6.437	2461.70	
CO_2 44.010	33.72	33.34	34.38	33.793	79.31	6.104	20.599	0.9842	1.4751	14477	38.148		5'9"	305.66	64	0.9980	305.05	51.2 6.448	1966.96	
N_2 28.016	1.78	2.12	2.43	2.110			1.74	70.7	1150072				3'2½"	172.54	64	0.9980	172.19	51.5	1108.39	
CH_4 16.042	12.59	10.78	10.49	11.287	WET GAS 158.44	6.158	4.055	0.9899	1.0724	4200	11.067		0'3"	13.28	85	0.9876	13.12	6.437	84.45	63.28
C_2H_4 28.052	3.23	3.48	3.15	3.287			410.2	122.5									236.45		1518.68	9.852
C_2H_6 30.068	1.25	1.71	1.56	1.507	RECYCLE 79.31	8.042	20.613	0.9448	1.0724	13321	35.101									
C_3H_8 42.078	2.98	3.18	3.03	3.063																
C_3H_8 44.094	0.40	0.32	0.32	0.347	BLEED 5.02	8.179	20.613	1.0000	1.0724	908	2.393	WATER	7'2"	379.86	83	0.99709	378.75	10.9 8.276	3134.54	
C_4H_8 56.104	1.73	1.89	2.01	1.877			431.1	197.4	1405696				2'11-3/4	159.99	78	0.99788	159.65	10.8 8.282	1322.22	
C_4H_{10} 58.120	0.75	0.50	0.74	0.663	NATURAL GAS 28.43	7.513	21.114	0.8894	1.1856	4755	12.530		3'9¼"	202.01	78	0.99788	201.58	10.9	1668.28	
C_5H_{10} 70.130	0.85	0.97	1.04	0.953			434.1	79.3					0'3½"	15.49	72	0.99872	15.47	8.276	128.03	
C_5H_{12} 72.146	0.23	0.22	0.30	0.250	OXYGEN 27.07	6.992	21.185	0.9820	--	3938	10.377						405.21		3352.57	139.69
C_6H_{12} 84.156	0.30	0.40	0.40	0.367			46.0													16.884
			M. W.	25.17233	STEAM 215.7	5.375	0.3482		404#/hr											

THE TEXAS COMPANY — MONTEBELLO LABORATORY

RATE CALCULATIONS

RUN NO. 59-FF
HOURS 709-733

	GAS ANALYSES				GENERATOR BALANCE										WEIGHT BALANCE		
HOUR	1400	2200	0600	AVERAGE	M/HR	C	H	O		Mol %	M/Hr	C	H	O		#/hr Measured	At Wt. Balance
FRESH FEED									O_2 32.000	0.23	10.311 0.029			20.680	WET GAS	277.10	302.19
CO 28.010	37.69	38.12	38.09	37.966	14.552	14.552		14.552	CO_2 44.010	1.60	0.200	0.200		0.400	OIL	59.50	59.50
H_2 2.016	58.65	59.04	59.22	58.970	22.603		45.206		N_2 28.016	0.45	0.056				WATER	136.37	136.37
CO_2 44.010	2.42	2.37	2.35	2.380	0.912	0.912		1.824	CH_4 16.042	81.75	10.221	10.221	40.884		TOTAL	472.97	498.06
N_2 28.016	0.20	0.05	0.10	0.117	0.045				C_2H_6 30.068	7.78	0.973	1.946	5.838		FRESH FEED	498.06	
CH_4 16.042	1.04	0.42	0.24	0.567	0.217	0.217	0.868		C_3H_8 44.094	5.33	0.666	1.998	5.328		WEIGHT BALANCE	94.96	
			M. W	12.99429					C_4H_{10} 58.120	1.98	0.248	0.992	2.480				
			H_2O 18.016				9.592	4.796	C_5H_{12} 72.146	0.88	0.110	0.550	1.320		WET GAS FACTOR	1090544	
						15.681	55.666	21.172	MW	20.49333					INDICATED LOSS—S C F H	378	
			BALANCE			98.58	99.67	100.44	TOTAL			15.907	55.850	21.080			

WET GAS					GAS FLOW RATES							LIQUID PRODUCT RATES								
CO 28.010	5.89	6.02	6.57	6.160		$\sqrt{H}$	PRESSURE	TEMP.	M. W.	S. C. F. H.	M/HR	HOUR	GAGE	GAL.	°F	FACTOR	GAL. AT 60	API° #/GAL.	#	# HR GAL HR
H_2 2.016	34.73	34.86	34.91	34.834	FRESH FEED		407.7	75.5	2227901			OIL	7'1-3/4	378.77	68	0.9961	377.29	51.3 6.445	2431.63	
CO_2 44.010	32.92	33.88	33.52	33.440	79.31	6.067	20.552	0.9855	1.4926	14546	38.329		3'2⅛"	172.54	64	0.9980	172.19	51.5 6.437	1108.39	
N_2 28.016	1.79	1.86	1.99	1.880			1.66	71.4	1150698				0'7⅛"	33.06	64	0.9980	32.99	51.3	212.62	
CH_4 16.042	12.04	10.56	9.86	10.820	WET GAS 158.44	6.146	4.045	0.9892	1.0727	4180	11.014		0'4½"	18.81	64	0.9980	18.77	6.445	120.97	
C_2H_4 28.052	3.35	3.46	3.19	3.333			406.9	123.8									42.02		413.00	59.50
C_2H_6 30.068	1.49	1.53	1.64	1.553	RECYCLE 79.31	8.092	20.533	0.9438	1.0727	13341	35.154						221.34		1427.89	9.223
C_3H_8 42.078	3.00	3.11	2.96	3.023																
C_3H_8 44.094	0.25	0.35	0.27	0.290	BLEED 5.02	8.558	20.533	1.0000	1.0727	946	2.493	WATER	7'3½"	386.41	85	0.99674	385.15	11.0 8.270	3185.19	
C_4H_8 56.104	1.99	2.03	2.12	2.047			426.4	198.0	1412654				3'9¼"	202.01	78	0.99788	201.58	10.9 8.276	1668.28	
C_4H_{10} 58.120	0.81	0.63	1.05	0.830	NATURAL GAS 28.43	7.521	21.002	0.8890	1.1886	4745	12.503		4'2-3/4	226.01	77	0.99804	225.57	11.0	1865.46	
C_5H_{10} 70.130	1.11	1.08	1.17	1.120			429.1	78.4					0'3"	13.28	82	0.99726	13.24	8.270	109.49	136.37
C_5H_{12} 72.146	0.23	0.23	0.30	0.253	OXYGEN 27.07	6.983	21.067	0.9827	--	3913	10.311						395.90		3272.88	16.496
C_6H_{12} 84.156	0.40	0.40	0.45	0.417			45.2													
			M. W.	25.158639	STEAM 215.7	5.488	0.3457		409#/hr											

THE TEXAS COMPANY — MONTEBELLO LABORATORY

RATE CALCULATIONS

RUN NO. 59-HH
HOURS 757-781

	GAS ANALYSES				GENERATOR BALANCE										WEIGHT BALANCE		
HOUR	1400	2200	0600	AVERAGE	M/HR	C	H	O		Mol %	M/Hr	C	H	O		#/hr Measured	At Wt. Balance
FRESH FEED									O_2 32.000	0.16	10.445 0.021			20.932	WET GAS	283.34	306.71
CO 28.010	37.24	38.10	37.28	37.540	14.753	14.753		14.753	CO_2 44.010	1.53	0.197	0.197		0.394	OIL	62.57	62.57
H_2 2.016	59.16	59.46	59.49	59.370	23.331		46.662		N_2 28.016	--					WATER	138.21	138.21
CO_2 44.010	2.65	1.93	2.73	2.437	0.958	0.958		1.916	CH_4 16.042	84.75	10.893	10.893	43.572		TOTAL	484.12	507.49
N_2 28.016	0.14	0.16	0.31	0.203	0.080				C_2H_6 30.068	6.55	0.842	1.684	5.052		FRESH FEED	507.49	
CH_4 16.042	0.81	0.35	0.19	0.450	0.177	0.177	0.708		C_3H_8 44.094	4.59	0.590	1.770	4.720		WEIGHT BALANCE	95.39	
			M. W.	12.91344			9.276	4.657	C_4H_{10} 58.120	1.67	0.215	0.860	2.150				
			H_2O 18.016				9.295	4.648	C_5H_{12} 72.146	0.75	0.096	0.480	1.152		WET GAS FACTOR	1082480	
						15.888	56.665	21.317	MW	19.82522					INDICATED LOSS—S C F H	353	
			BALANCE			100.03	100.03	99.96	TOTAL			15.884	56.646	21.326			

WET GAS					GAS FLOW RATES							LIQUID PRODUCT RATES							
CO 28.010	5.04	5.07	5.52	5.210		$\sqrt{H}$	PRESSURE	TEMP.	M. W.	S. C. F. H.	M/HR	HOUR	GAGE	GAL.	°F	FACTOR	GAL. AT 60	API° #/GAL.	#	# HR GAL HR
H_2 2.016	36.05	35.20	32.56	34.603	FRESH FEED		417.3	77.2	2241850			OIL	7'4½"	390.78	78	0.9911	387.30	50.9 6.459	2501.57	
CO_2 44.010	33.79	35.25	36.04	35.027	79.31	6.142	20.785	0.9838	1.4973	14914	39.299		4'10½"	259.84	63	0.9985	259.45	51.2 6.448	1672.93	
N_2 28.016	1.64	1.86	2.50	2.000	WET GAS		1.71	71.5	1151803				2'2½"	115.92	64	0.9980	115.69	50.9	747.24	
CH_4 16.042	12.69	10.92	10.96	11.524	158.44	6.279	4.051	0.9891	1.0732	4278	11.273		0'3"	13.28	74	0.9930	13.19	6.459	85.19	
C_2H_4 28.052	2.95	3.11	3.25	3.103	RECYCLE		418.2	123.6									+1.70		+11.00	62.57
C_2H_6 30.068	1.40	1.46	1.53	1.463	79.31	8.154	20.806	0.9440	1.0732	13631	35.918						232.05		1501.69	9.669
C_3H_6 42.078	2.88	2.77	2.81	2.720	BLEED															
C_3H_8 44.094	0.30	0.31	0.31	0.307	5.02	8.054	20.806	1.0000	1.0732	903	2.379	WATER	7'4½"	390.78	82	0.99726	389.71	10.8 8.282	3227.58	
C_4H_8 56.104	1.64	1.82	2.07	1.843	NATURAL GAS		436.8	198.7	1460261				5'0¼"	267.47	80	0.99759	266.83	10.8 8.282	2209.89	
C_4H_{10} 58.120	0.58	0.60	0.64	0.607	28.43	7.521	21.249	0.8885	1.2084	4878	12.854		5'5-3/4	291.48	78	0.99788	290.86	10.8	2408.90	
C_5H_{10} 70.130	0.81	1.03	1.13	0.990	OXYGEN		440.7	79.8					0'3"	13.28	86	0.99656	13.23	8.282	109.57	
C_5H_{12} 72.146	0.21	0.22	0.21	0.213	27.07	6.992	21.340	0.9815	--	3964	10.445						409.51		3317.02	138.21
C_6H_{12} 84.156	0.32	0.38	0.47	0.390	STEAM		44.8													16.688
			M. W.	25.13449	215.7	5.442	0.3444		404#/hr											

THE TEXAS COMPANY — MONTEBELLO LABORATORY

RATE CALCULATIONS

RUN NO. 59-GG
HOURS 733-757

	GAS ANALYSES				GENERATOR BALANCE										WEIGHT BALANCE		
HOUR	1400	2000	0600	AVERAGE	M/HR	C	H	O		Mol %	M/Hr	C	H	O		#/hr Measured	At Wt. Balance
FRESH FEED									O_2 32.000	0.17	10.456 0.022			20.956	WET GAS	275.42	302.68
CO 28.010	38.68	37.92	38.38	38.327	14.928	14.928		14.928	CO_2 44.010	1.29	0.164	0.164		0.328	OIL	61.18	61.18
H_2 2.016	57.39	60.22	59.23	58.946	22.959		45.918		N_2 28.016	0.12	0.015				WATER	138.34	138.34
CO_2 44.010	2.73	0.73	1.77	1.743	0.679	0.679		1.358	CH_4 16.042	83.39	10.626	10.626	42.054		TOTAL	474.94	502.20
N_2 28.016	0.07	0.75	0.31	0.377	0.147				C_2H_6 30.068	7.33	0.934	1.868	5.604		FRESH FEED	502.20	
CH_4 16.042	1.13	0.38	0.31	0.607	0.236	0.236	0.944		C_3H_8 44.094	5.16	0.658	1.974	5.264		WEIGHT BALANCE	94.57	
			M. W.	12.89383			9.920	4.998	C_4H_{10} 58.120	1.83	0.233	0.932	2.330				
			H_2O 18.016				9.958	4.979	C_5H_{12} 72.146	0.71	0.090	0.450	1.080		WET GAS FACTOR	1098976	
						15843	56.820	21.265	MW	20.08824					INDICATED LOSS—S C F H	423	
			BALANCE			98.33	100.07	99.91	TOTAL			16.014	56.782	21.284			

WET GAS					GAS FLOW RATES							LIQUID PRODUCT RATES							
CO 28.010	5.09	6.33	4.94	5.453		$\sqrt{H}$	PRESSURE	TEMP.	M. W.	S. C. F. H.	M/HR	HOUR	GAGE	GAL.	°F	FACTOR	GAL. AT 60	API° #/GAL.	#	# HR GAL HR
H_2 2.016	32.68	36.32	38.42	35.806	FRESH FEED		418.0	76.1	2245259			OIL	4'10½"	259.84	63	0.9985	259.45	51.2 6.448	1672.93	
CO_2 44.010	34.94	32.22	31.70	32.920	79.31	6.071	20.801	0.9849	1.4984	14781	38.949		0'7½"	33.06	64	0.9980	32.99	51.3 6.445	212.62	
N_2 28.016	2.16	1.96	1.91	2.010	WET GAS		1.74	71.3	1183542								+1.24		+8.00	
CH_4 16.042	13.24	11.06	10.51	11.503	158.44	6.179	4.055	0.9893	1.0879	4273	11.260						227.70		1468.31	61.18
C_2H_4 28.052	3.10	3.17	3.23	3.167	RECYCLE		418.5	126.2												9.488
C_2H_6 30.068	1.61	1.56	1.60	1.590	79.31	8.125	20.813	0.9419	1.0879	13743	36213									
C_3H_6 42.078	3.13	3.31	3.33	3.257	BLEED															
C_3H_8 44.094	0.37	0.35	0.36	0.360	5.02	8.121	20.813	1.0000	1.0879	923	2.432	WATER	7'1"	375.50	78	0.99788	374.70	10.9 8.282	3103.27	
C_4H_8 56.104	1.74	1.93	1.96	1.877	NATURAL GAS		437.7	200.5	1441141				4'2-3/4	226.01	77	0.99804	225.57	11.0 8.270	1865.46	
C_4H_{10} 58.120	0.55	0.51	0.64	0.567	28.43	7.508	21.270	0.8873	1.2005	4836	12.743		5'0¼"	267.47	80	0.99759	266.83	10.8	2209.89	
C_5H_{10} 70.130	0.87	0.94	0.92	0.877	OXYGEN		441.0	79.1					0'3½"	15.49	94	0.99505	15.41	8.282	127.63	138.34
C_5H_{12} 72.146	0.22	0.21	0.23	0.220	27.07	6.992	21.347	0.9821		3968	10.456						400.55		3320.07	16.690
C_6H_{12} 84.156	0.40	0.23	0.25	0.293	STEAM		43.9													
			M. W.	24.460459	215.7	5.654	0.3414		416#/hr											

THE TEXAS COMPANY — MONTEBELLO LABORATORY

RATE CALCULATIONS

RUN NO. 59-II
HOURS 781-796

	GAS ANALYSES			
HOUR	1400	1800	2200	AVERAGE
FRESH FEED				
CO 28.010	40.61	37.51	37.63	38.583
H_2 2.016	53.11	58.97	59.34	57.140
CO_2 44.010	3.38	2.43	2.26	2.690
N_2 28.016	1.82	0.21	0.10	0.710
CH_4 16.042	1.08	0.88	0.67	0.877
			M. W.	13.48251
			H_2O 18.016	
			BALANCE	
WET GAS				
CO 28.010	6.03	6.08	5.89	6.000
H_2 2.016	35.10	35.49	34.94	35.176
CO_2 44.010	33.37	33.07	33.03	33.157
N_2 28.016	1.33	1.57	1.60	1.500
CH_4 16.042	13.22	12.17	11.41	12.267
C_2H_4 28.052	3.08	3.07	3.21	3.120
C_2H_6 30.068	1.41	1.45	1.48	1.447
C_3H_6 42.078	2.79	2.90	3.30	2.997
C_3H_8 44.094	0.26	0.29	0.33	0.293
C_4H_8 56.104	1.62	1.86	2.36	1.947
C_4H_{10} 58.120	0.46	0.57	0.69	0.573
C_5H_{10} 70.130	0.87	1.00	1.27	1.047
C_5H_{12} 72.146	0.15	0.14	0.14	0.143
C_6H_{12} 84.156	0.31	0.34	0.35	0.333
			M. W.	24.613877

GENERATOR BALANCE										
M/HR	C	H	O		Mol %	M/Hr	C	H	O
				O_2 32.000	0.22	10.324 0.028			20.704
14.752	14.752		14.752	CO_2 44.010	1.48	0.189	0.189		0.378
21.848		43.696		N_2 28.016	0.13	0.017			
1.029	1.092		2.058	CH_4 16.042	83.91	10.690	10.690	42.760	
0.271				C_2H_4 30.068	6.79	0.865	1.730	5.190	
0.335	0.335	1.340		C_3H_8 44.094	4.75	0.605	1.815	4.840	
				C_4H_{10} 58.120	1.84	0.234	0.936	2.340	
		9.991	4.996	C_5H_{12} 72.146	0.88	0.112	0.560	1.344	
	16.179	55.027	21.806	MW	20.059386				
	101.63	97.44	103.43	TOTAL			15.920	56.474	21.082

GAS FLOW RATES						
	$\sqrt{H}$	PRESSURE	TEMP.	M. W.	S. C. F. H.	M/HR
FRESH FEED		414.8	87.1	2147226		
79.31	6.180	20.724	0.9749	1.4653	14510	38.235
WET GAS		1.75	79.0	1176165		
158.44	6.507	4.056	0.9822	1.0845	4454	11.736
RECYCLE		417.1	126.7			
79.31	8.167	20.780	0.9414	1.0845	13742	36.211
BLEED						
5.02	8.147	20.780	1.0000	1.0845	922	2.430
NATURAL GAS		435.2	195.4	1443214		
28.43	7.493	21.211	0.8907	1.2013	4835	12.740
OXYGEN		439.3	91.3			
27.07	6.993	21.307	0.9713	--	3918	10.324
STEAM		44.7				
215.7	5.453	0.3440		405#/hr		

WEIGHT BALANCE		
	#/hr Measured	At Wt. Balance
WET GAS	288.87	307.30
OIL	62.38	62.38
WATER	145.82	145.82
TOTAL	497.07	515.50
FRESH FEED	515.50	
WEIGHT BALANCE	96.42	
WET GAS FACTOR	1063800	
INDICATED LOSS—S C F H	284	

LIQUID PRODUCT RATES Basis 15 hours

HOUR	GAGE	GAL.	°F	FACTOR	GAL. AT 60	API° #/GAL.	#	# HR GAL HR
OIL	4'11"	262.02	78	0.9911	259.69	50.5 6.473	1680.97	
	2'2¼"	115.92	64	0.9980	115.69	50.9 6.459	747.24	
					*0.31		*2.00	62.38
					144.31		935.73	9.621
WATER	7'5"	392.96	80	0.99759	392.01	10.8 8.282	3246.63	
	5'5-3/4	291.48	78	0.99788	290.86	10.8 8.282	2408.90	
	3'4½"	181.27	88	0.99619	180.58	10.8	1495.56	
	0'4"	17.70	89	0.99600	17.63	8.282	146.01	
					264.10		2187.28	145.82
								17.607

THE TEXAS COMPANY — MONTEBELLO LABORATORY

RATE CALCULATIONS

RUN NO. 59-JJ
HOURS 796-806

	GAS ANALYSES			
HOUR	2200	0600	--	AVERAGE
FRESH FEED				
CO 28.010	36.67	37.63		37.150
H_2 2.016	59.30	59.12		59.210
CO_2 44.010	2.54	2.52		2.530
N_2 28.016	0.15	0.29		0.220
CH_4 16.042	1.34	0.44		0.990
			M. W.	12.91725
			H_2O 18.016	
			BALANCE	
WET GAS				
CO 28.010	4.75	5.70		5.225
H_2 2.016	29.61	33.88		31.745
CO_2 44.010	32.16	35.59		33.875
N_2 28.016	1.67	1.93		1.800
CH_4 16.042	20.12	11.81		15.965
C_2H_4 28.052	2.81	2.70		2.755
C_2H_6 30.068	1.87	1.53		1.700
C_3H_6 42.078	2.93	2.37		2.650
C_3H_8 44.094	0.47	0.10		0.285
C_4H_8 56.104	1.78	1.58		1.680
C_4H_{10} 58.120	0.67	1.15		0.910
C_5H_{10} 70.130	0.83	0.91		0.870
C_5H_{12} 72.146	0.15	0.35		0.250
C_6H_{12} 84.156	0.18	0.40		0.290
			M. W.	25.107994

GENERATOR BALANCE										
M/HR	C	H	O		Mol %	M/Hr	C	H	O
				O_2 32.000	0.34	10.506 0.041			21.094
14.373	14.373		14.373	CO_2 44.010	1.50	0.180	0.180		0.360
22.907		45.814		N_2 28.016	0.63	0.076			
0.979	0.979		1.958	CH_4 16.042	83.97	10.101	10.101	40.404	
0.085				C_2H_4 30.068	6.66	0.801	1.602	4.806	
0.344	0.344	1.376		C_3H_8 44.094	4.49	0.540	1.620	4.320	
				C_4H_{10} 58.120	1.68	0.202	0.808	2.020	
		7.831	3.916	C_5H_{12} 72.146	0.73	0.088	0.440	1.056	
	15.696	55.021	20.247	MW	19.901349				
	106.41	104.59	94.37	TOTAL			14.751	52.606	21.454

GAS FLOW RATES						
	$\sqrt{H}$	PRESSURE	TEMP.	M. W.	S. C. F. H.	M/HR
FRESH FEED		420.3	70.5	2241189		
79.31	5.989	20.856	0.9900	1.4971	14682	38.688
WET GAS		1.52	67.1	1153019		
158.44	5.867	4.027	0.9932	1.0738	3992	10.519
RECYCLE		420.8	118.8			
79.31	8.120	20.869	0.9479	1.0738	13680	36.047
BLEED						
5.02	8.160	20.869	1.0000	1.0738	918	2.419
NATURAL GAS		438.0	198.4	1454675		
28.43	7.040	21.277	0.8887	1.2061	4565	12.029
OXYGEN		440.8	72.1			
27.07	6.980	21.342	0.9886		3987	10.506
STEAM		45.8				
215.7	5.830	0.3476		437#/hr		

WEIGHT BALANCE		
	#/hr Measured	At Wt. Balance
WET GAS	264.11	276.07
OIL	68.44	68.44
WATER	155.23	155.23
TOTAL	487.78	499.74
FRESH FEED	499.74	
WEIGHT BALANCE	97.61	
WET GAS FACTOR	1045284	
INDICATED LOSS—S C F H	181	

LIQUID PRODUCT RATES Basis 10 hours

HOUR	GAGE	GAL.	°F	FACTOR	GAL. AT 60	API° #/GAL.	#	# HR GAL HR
OIL	6'10-3/4	365.68	70	0.9951	363.89	50.1	2360.55	
	4'11½	263.11	82	0.9891	260.24	6.437	1688.18	
					*1.85		*12.00	68.44
					105.50		684.37	10.550
								18.732
WATER	7'0"	371.14	80	0.99759	370.25	10.7	3068.26	
	3'5"	183.46	83	0.99709	182.93	8.287	1515.94	
					187.32		1552.32	155.23

THE TEXAS COMPANY — MONTEBELLO LABORATORY

RATE CALCULATIONS

RUN NO. 59-KK
HOURS 806-830

	GAS ANALYSES				GENERATOR BALANCE										WEIGHT BALANCE		
HOUR	1400	2200	0600	AVERAGE	M/HR	C	H	O		Mol %	M/Hr	C	H	O		#/hr Measured	At Wt. Balance
FRESH FEED									O_2 32.000	0.17	10.242 0.022			20.528	WET GAS	273.29	304.64
CO 28.010	36.66	37.81	37.80	37.423	14.371	14.371		14.371	CO_2 44.010	1.35	0.173	0.173		0.346	OIL	64.57	64.57
H_2 2.016	57.10	58.83	59.19	58.373	22.416		44.832		N_2 28.016	0.46	0.059				WATER	139.77	139.77
CO_2 44.010	4.72	2.43	2.50	3.217	1.235	1.235		2.470	CH_4 16.042	83.84	10.727	10.727	42.908		TOTAL	477.63	508.98
N_2 28.016	0.23	0.17	0.13	0.177	0.068				C_2H_6 30.068	6.83	0.974	1.748	5.244		FRESH FEED	508.98	
CH_4 16.042	1.29	0.76	0.38	0.810	0.311	0.311	1.244		C_3H_8 44.094	4.90	0.614	1.842	4.912		WEIGHT BALANCE	93.84	
			M. W.	13.25431					C_4H_{10} 58.120	1.70	0.218	0.872	2.180				
			H_2O 18.016				9.271	4.636	C_5H_{12} 72.146	0.85	0.109	0.545	1.308		WET GAS FACTOR	1114713	
						15.917	55.347	21.477	MW	19.998459					INDICATED LOSS—S C F H 482		
			BALANCE			100.06	97.87	102.89	TOTAL			15.907	56.552	20.874			

WET GAS					GAS FLOW RATES							LIQUID PRODUCT RATES								
CO 28.010	5.66	7.53	5.93	6.374		$\sqrt{H}$	PRESSURE	TEMP.	M. W.	S. C. F. H.	M/HR	HOUR	GAGE	GAL.	°F	FACTOR	GAL. AT 60	API° #/GAL.	#	# HR GAL HR
H_2 2.016	34.64	35.43	36.01	35.360	FRESH FEED		419.9	81.9	2184195			OIL	7'1"	375.50	69	0.9956	373.85	50.1	2425.16	
CO_2 44.010	32.82	32.38	34.77	33.324	79.31	6.088	20.847	0.9796	1.4779	14573	38.401		6'10-3/4	365.68	70	0.9951	363.89	6.487	2360.55	
N_2 28.016	1.74	1.47	1.78	1.663	WET GAS		1.75	75.0	1173200				4'5-3/4	239.01	66	0.9970	238.29	50.4 6.476	1543.17	
CH_4 16.042	13.27	11.25	10.72	11.747	158.44	6.125	4.056	0.9859	1.0831	4203	11.075		0'3"	13.28	62	0.9990	13.27	50.1 6.487	86.08	
C_2H_6 28.052	2.43	2.85	2.59	2.623	RECYCLE		420.4	123.7									4.32		28.00	64.57
C_3H_8 33.068	1.71	1.49	1.46	1.553	79.31	8.188	20.859	0.9439	1.0831	13848	36.490						239.30		1549.70	9.971
C_3H_6 42.079	2.85	2.94	2.56	2.783	BLEED															
C_3H_8 44.094	0.36	0.36	0.28	0.333	5.02	8.467	20.859	1.0000	1.0831	960	2.530	WATER	7'4"	388.59	80	0.99759	387.65	10.7	3212.46	
C_4H_8 56.104	2.43	2.18	1.97	2.193			439.2	199.6	1447611				7'0"	371.14	80	0.99759	370.25	8.287	3068.26	
C_4H_{10} 58.120	0.56	0.56	0.64	0.587	NATURAL GAS 28.43	7.504	21.305	0.8879	1.2032	4856	12.796		7'3½"	386.41	81	0.99743	385.42	10.8 8.282	3192.05	
C_5H_{10} 70.130	1.11	0.98	0.87	0.987			442.4	84.8					0'3"	13.28	64	0.99963	13.28	10.7 8.287	110.05	
C_5H_{12} 72.146	0.13	0.20	0.19	0.173	OXYGEN 27.07	6.988	21.033	0.9770	--	3887	10.242		0'7"	30.98	67	0.99932	30.96	10.8	256.41	
C_6H_{12} 84.156	0.29	0.38	0.23	0.300			44.2						0'3½"	15.49	65	0.99953	15.48	8.282	128.21	139.77
			M. W.	24.67608	STEAM 215.7	5.592	0.3424		413#/hr								405.02		3354.40	16.876

THE TEXAS COMPANY — MONTEBELLO LABORATORY

RATE CALCULATIONS

RUN NO. 59-LL
HOURS 830-843

	GAS ANALYSES				GENERATOR BALANCE										WEIGHT BALANCE		
HOUR	1400	1800		AVERAGE	M/HR	C	H	O		Mol %	M/Hr	C	H	O		#/hr Measured	At Wt. Balance
FRESH FEED									O_2 32.000	0.19	10.256 0.024			20.560	WET GAS	286.29	299.69
CO 28.010	37.40	37.34		37.370	14.346	14.346		14.346	CO_2 44.010	1.23	0.156	0.156		0.312	OIL	58.71	58.71
H_2 2.016	58.78	58.91		58.845	22.592		45.184		N_2 28.016	0.94	0.119				WATER	139.40	139.40
CO_2 44.010	2.23	2.58		2.405	0.923	0.923		1.846	CH_4 16.042	82.12	10.411	10.411	41.644		TOTAL	484.40	497.80
N_2 28.016	0.28	0.28		0.280	0.107				C_2H_6 30.068	6.83	0.866	1.732	5.196		FRESH FEED	497.80	
CH_4 16.042	1.31	0.89		1.100	0.422	0.422	1.688		C_3H_8 44.094	5.99	0.759	2.277	6.072		WEIGHT BALANCE	97.31	
			M. W.	12.966999					C_4H_{10} 58.120	1.83	0.232	0.928	2.320				
			H_2O 18.016				9.520	4.760	C_5H_{12} 72.146	0.87	0.110	0.550	1.320		WET GAS FACTOR	1046805	
						15.691	56.392	20.952	MW	20.425305					INDICATED LOSS—S C F H 210		
			BALANCE			97.74	99.72	100.38	TOTAL			16.054	56.552	20.872			

WET GAS					GAS FLOW RATES							LIQUID PRODUCT RATES								Basis 13 hours
CO 28.010	5.51	5.46		5.485		$\sqrt{H}$	PRESSURE	TEMP.	M. W.	S. C. F. H.	M/HR	HOUR	GAGE	GAL.	°F	FACTOR	GAL. AT 60	API° #/GAL.	#	# HR GAL HR
H_2 2.016	35.58	35.86		35.720	FRESH FEED		420.3	95.4	2232590			OIL	6'9½"	360.22	84	0.9881	355.93	50.3 6.480	2306.43	
CO_2 44.010	32.82	33.39		33.105	79.31	6.092	20.857	0.9676	1.4942	14569	38.390		4'5-3/4	239.01	66	0.9970	238.29	50.4 6.476	1543.17	
N_2 28.016	1.48	0.94		1.210	WET GAS		1.71	84.8	1193734								117.64		763.26	58.71
CH_4 16.042	12.89	13.13		13.010	158.44	6.542	4.051	0.9766	1.0926	4480	11.805									9.049
C_2H_6 28.052	2.96	2.71		2.835	RECYCLE		419.8	127.0												
C_3H_8 33.068	1.55	1.51		1.530	79.31	8.208	20.845	0.9412	1.0926	13954	36.769									
C_3H_6 42.078	3.01	2.87		2.940	BLEED															
C_3H_8 44.094	0.38	0.38		0.380	5.02	8.192	20.845	1.0000	1.0926	937	2.469	WATER	4'8½"	251.11	96	0.99467	249.77	10.8	2068.60	
C_4H_8 56.104	2.03	1.86		1.945			437.5	197.6	1417359				0'7"	30.98	67	0.99932	30.96	8.282	256.41	
C_4H_{10} 58.120	0.62	0.64		0.630	NATURAL GAS 28.43	7.517	21.265	0.8893	1.1905	4811	12.677						218.81		1812.19	139.40
C_5H_{10} 70.130	0.86	0.78		0.820			441.4	100.8												16.832
C_5H_{12} 72.146	0.14	0.21		0.175	OXYGEN 27.07	6.992	21.356	0.9629	--	3892	10.256									
C_6H_{12} 84.156	0.17	0.26		0.215			45.1													
			M. W.	24.25163	STEAM 215.7	5.633	0.3453		420#/hr											

RUN NO. 60-0 (A-D)
HOURS 0-88
CATALYST

THE TEXAS COMPANY — MONTEBELLO LABORATORY
YIELD CALCULATIONS

	FRESH FEED %	FRESH FEED m/hr	FRESH FEED #/hr	WET GAS %	WET GAS At Wt. Balance m/hr	WET GAS At Wt. Balance #/hr	RECYCLE m/hr	COMBINED FEED m/hr	EFFLUENT m/hr	NET CHANGE m/hr	NET CHANGE #/hr	CONDENSATE #/MCF	CONDENSATE #/gal	CONDENSATE gal/hr	CONDENSATE gal/MCF
CO 28.010		11.181						17.579		-9.352	-261.95				
H_2 2.016		17.318						36.056		-12.152	-24.50				
CO_2 44.010										1.937	85.25	7.883			
N_2 28.016															
CH_4 16.042										0.668	10.72	0.991			
C_2H_4 28.052										0.164	4.60	0.425			
C_2H_6 30.068										0.092	2.77	0.256			
C_1+C_2											18.09	1.673			
C_3H_6 42.078										0.198	8.33	0.770	4.32	1.928	0.178
C_3H_8 44.094										0.031	1.37	0.127	4.24	0.323	0.030
C_4H_8 56.104										0.148	8.30	0.767	5.00	1.660	0.153
C_4H_{10} 58.120										0.059	3.43	0.317	4.86	0.706	0.065
C_5H_{10} 70.130										0.064	-4.49	0.415	5.45	0.824	0.076
C_5H_{12} 72.146										0.016	1.15	0.106	5.25	0.219	0.020
C_6H_{12} 84.156										0.019	1.60	0.148	5.54	0.289	0.027
C_3-C_6											28.67	2.651		5.949	0.550
TOTAL															
H_2+CO		28.499	10815 SCFH					53.635		-21.504					
H_2/CO			Factor 924641												

YIELDS BASIS BROWNSVILLE DESIGN FEED RATE*	CORRECTED HEMPEL, %	gal/hr	TREATING RECOVERY, %	gal/hr
400 EP	66.8	5.672	98.0	5.559
400-550	18.2	1.545	91.4	1.412
550 +	15.0	1.274	114.6	1.460

	RECOVERY %	#/hr	gal/hr
PROPYLENE	40.5	3.374	
C_3 POLY GASO.	87.5	2.952	0.494
C_3 POLY TAR	12.5	0.422	0.056

	#/gal	#/hr	gal/hr	RVP
C_4H_8	5.00	0.03	0.006	68.0
C_4 POLY GASO.	5.98	7.24	1.210	1.5
C_4H_{10}	4.86	3.43	0.706	68.0
C_4-FREE GASO.			7.385	5.8
C_4 POLY TAR	7.53	1.03	0.137	

	gal/hr	gal/MCF	Bbl/Day
10 # RVP 400 EP GASOLINE	9.307	0.8606	4666
GAS OIL	1.412	0.1306	708
FUEL OIL	1.460	0.1350	732
POLY TAR	0.193	0.0178	97
TOTAL	12.372	1.1440	6202
W. S. CHEM.	0.564 0.876	0.0521 0.0810	282 439
TOTAL	13.813	1.2771	6924

Weight Recovery, %	93.7	Catalyst Age, hrs. Ave. =	40	Space Velocity, vhv	1431	RECOVERED OIL	55.48	5.130 / 8.491 / 0.785
Pressure, psig	369	Inlet Velocity, Ft/sec	0.88	Catalyst Vol., CF	7.82	TOTAL OIL	84.15	7.781 / 14.440 / 1.335
Temperature, °F	657	Bed Depth, Ft	11.9	Weight, #	1096	WATER SOLUBLE CHEMICALS	4.71 7.31	0.436 / 0.564 / 0.052 0.676 / 0.876 / 0.081
Recycle Ratio	1.48	Bed Density, #/CF	144	Effluent $(H_2)(CO_2)$ / Shift Ratio $(H_2O)(CO)$ =	10.30	TOTAL LIQUID PRODUCTS C_3+	96.17	8.892 / 15.880 / 1.468
						NET WATER	84.28	7.793 / 10.119 / 0.926
						GROSS WATER	95.62	8.841 / 11.478 / 1.061
						HYDROCARBON TOTAL—C_1+	114.26	10.565

FRESH FEED CONVERSION — %				TOTAL FEED CONVERSION — %			SELECTIVITY
Contraction	CO	H_2	H_2+CO	CO	H_2	CO+H_2	C_3 + /C_1 +
61.49	83.64	70.17	75.46	53.20	33.70	40.09	84.07

Form ML—11 AI=(37.83)(0.6101)=23.08 Acids = (0.117)(42.1)=4.93%

g/NCM = 16.91 × #/MCF *9488 MCFH H_2 + CO, Bbl/Day = 5421.6 × gal/MCF

RUN NO. 60-1 (E-G)
HOURS 88-160
CATALYST Fresh CM&S

THE TEXAS COMPANY — MONTEBELLO LABORATORY
YIELD CALCULATIONS

	FRESH FEED %	FRESH FEED m/hr	FRESH FEED #/hr	WET GAS %	WET GAS At Wt. Balance m/hr	WET GAS At Wt. Balance #/hr	RECYCLE m/hr	COMBINED FEED m/hr	EFFLUENT m/hr	NET CHANGE m/hr	NET CHANGE #/hr	CONDENSATE #/MCF	CONDENSATE #/gal	CONDENSATE gal/hr	CONDENSATE gal/MCF
CO 28.010		11.154						18.133		-9.266	-259.54				
H_2 2.016		17.516						38.560		-11.824	-23.84				
CO_2 44.010										2.174	95.68	8.794			
N_2 28.016															
CH_4 16.042										0.588	9.43	0.867			
C_2H_4 28.052										0.168	4.71	0.433			
C_2H_6 30.068										0.080	2.41	0.222			
C_1+C_2											16.55	1.521			
C_3H_6 42.078										0.213	8.96	0.824	4.32	2.074	0.191
C_3H_8 44.094										0.040	1.76	0.162	4.24	0.415	0.038
C_4H_8 56.104										0.148	8.30	0.763	5.00	1.660	0.153
C_4H_{10} 58.120										0.046	2.67	0.245	4.86	0.549	0.050
C_5H_{10} 70.130										0.062	4.35	0.400	5.45	0.798	0.073
C_5H_{12} 72.146										0.003	0.22	0.020	5.25	0.042	0.004
C_6H_{12} 84.156										0.021	1.77	0.163	5.54	0.319	0.029
C_3-C_6											28.03	2.576		5.857	0.538
TOTAL															
H_2+CO		28.670	10880 SCFH					56.693		-21.090					
H_2/CO			Factor 919117												

YIELDS BASIS BROWNSVILLE DESIGN FEED RATE*	CORRECTED HEMPEL, %	gal/hr	TREATING RECOVERY, %	gal/hr
400 EP	71.7	5.819	98.0	5.703
400-550	16.6	1.347	91.4	1.231
550 +	11.7	0.950	114.6	1.089

	RECOVERY %	#/hr	gal/hr
PROPYLENE	34.2	3.064	
C_3 POLY GASO.	87.5	2.681	0.448
C_3 POLY TAR	12.5	0.383	0.051

	#/gal	#/hr	gal/hr	RVP
C_4H_8	5.00	0.72	0.144	68.0
C_4 POLY GASO.	5.98	6.63	1.109	1.5
C_4H_{10}	4.86	2.67	0.549	68.0
C_4-FREE GASO.			7.310	5.8
C_4 POLY TAR	7.53	0.95	0.126	

	gal/hr	gal/MCF	Bbl/Day
10 # RVP 400 EP GASOLINE	9.112	0.8375	4541
GAS OIL	1.231	0.1131	613
FUEL OIL	1.089	0.1001	543
POLY TAR	0.177	0.0163	88
TOTAL	11.609	1.0670	5785
W. S. CHEM.	0.558 0.992	0.0513 0.0912	278 494
TOTAL	13.159	1.2095	6557

Weight Recovery, %	94.27	Catalyst Age, hrs. Ave.	97	Space Velocity, vhv	1222	RECOVERED OIL	52.47	4.823 / 8.116 / 0.746
Pressure, psig	366	Inlet Velocity, Ft/sec	0.89	Catalyst Vol., CF	8.91	TOTAL OIL	80.50	7.399 / 13.973 / 1.284
Temperature, °F	654	Bed Depth, Ft	13.5	Weight, #	1437	WATER SOLUBLE CHEMICALS	4.56 8.10	0.419 / 0.558 / 0.051 0.744 / 0.992 / 0.091
Recycle Ratio	1.51	Bed Density, #/CF	161	Effluent $(H_2)(CO_2)$ / Shift Ratio $(H_2O)(CO)$ =	8.90	TOTAL LIQUID PRODUCTS C_3+	93.16	8.562 / 15.523 / 1.427
						NET WATER	75.13	6.905 / 9.009 / 0.828
						GROSS WATER	87.79	8.069 / 10.559 / 0.970
						HYDROCARBON TOTAL—C_1+	109.71	10.084

FRESH FEED CONVERSION — %				TOTAL FEED CONVERSION — %			SELECTIVITY
Contraction	CO	H_2	H_2+CO	CO	H_2	CO+H_2	C_3 + /C_1 +
59.09	83.07	67.50	73.56	51.10	30.66	37.20	84.91

Form ML—11 AI = 34.96 x 0.5777 = 20.20

g/NCM = 16.91 × #/MCF *9488 MCFH H_2 + CO, Bbl/Day = 5421.6 × gal/MCF

SUMMARY OF SYNTHESIS RUN NO. 60

Period	A		B		C		D		E		F		G											
Hours	0-25		25-40		40-64		64-88		88-112		112-136		136-160											
Press., Psig	403		406		405		406		406		406		403											
Temp. °F.	659		651		661		657		655		654		652											
Flow Rates-SCFH																								
Fresh Feed	10746		11361		11290		11286		11222		11214		11179											
Recycle	13789		17492		17875		17058		17038		16971		16844											
Wet Gas (Adj.)	2333		4972		5501		4796		4559		4607		4587											
Catalyst Data (by Δp)																								
Weight, lbs.	1245		971		992		1177		1479		1441		1390											
Vol.-Cu. Ft.	11.02		6.61		6.44		7.22		8.91		8.90		8.91											
Depth.-Ft.	16.70		10.01		9.76		10.94		13.50		13.48		13.50											
Feed Rates-H_2+CO																								
SCFH	10391		11042		10963		10967		10883		10900		10857											
SCFH/Sq.Ft.	15744		16730		16611		16617		16489		16515		16450											
SCFH/CF Cat.	943		1670		1702		1519		1221		1225		1219											
SCFH/# Cat.	8.35		11.37		11.05		9.32		7.36		7.56		7.81											
Recycle Ratio	1.28		1.54		1.58		1.51		1.52		1.51		1.51											
Inlet Vel.Ft/Sec.	0.77		0.91		0.93		0.90		0.89		0.89		0.89											
Ratio of H_2/CO in																								
Fresh Feed	1.46		1.60		1.56		1.57		1.57		1.56		1.58											
Combined Feed	2.09		2.09		2.06		1.99		2.14		2.11		2.13											
Wet Gas	7.59		2.75		2.70		2.58		3.08		2.97		3.00											
Consumed	1.38		1.29		1.19		1.31		1.27		1.27		1.29											
Yields/MCF of CO+H_2 Fed	lbs.	gal.	lbs.	gal.	lbs.	gal.	lbs.	gal.	lbs.	gal.	lbs.	gal.	lbs.	gal.	lbs.	gal.	lbs.	gal.	lbs.	gal.	lbs.	gal.	lbs.	gal.
C_3	0.88		0.94		1.07		0.79		1.05		0.91		1.00											
C_4	1.22		0.99		1.15		0.94		1.03		0.92		1.08											
C_5	0.63		0.48		0.48		0.48		0.38		0.42		0.45											
C_6	0.21		0.14		0.08		0.17		0.15		0.19		0.14											
C_3 - C_6	2.94	0.60	2.55	0.53	2.78	0.58	2.38	0.49	2.61	0.55	2.44	0.51	2.67	0.56										
400 EP	4.12	0.65	3.12	0.49	2.69	0.43	2.96	0.47	3.41	0.55	3.48	0.55	3.07	0.49										
C_3 - 400 EP	7.06	1.26	5.67	1.02	5.47	1.01	5.34	0.96	6.02	1.10	5.92	1.06	5.74	1.05										
400+	2.85	0.41	1.89	0.27	1.38	0.20	1.48	0.21	1.67	0.24	1.45	0.21	1.39	0.20										
WS Chem	0.66	0.08	0.68	0.08	0.66	0.08	0.71	0.09	0.73	0.09	0.75	0.09	0.76	0.09										
Total C_3+	10.57	1.74	8.24	1.37	7.51	1.29	7.53	1.26	8.42	1.43	8.12	1.36	7.89	1.34										
C_1	1.23		0.88		1.00		0.82		0.89		0.87		0.85											
C_2	0.78		0.61		0.68		0.63		0.61		0.68		0.67											
C_1 + C_2	2.01		1.49		1.68		1.45		1.50		1.55		1.52											
Total C_1+	12.58		9.72		9.19		8.98		9.91		9.67		9.40											
CO_2	7.20		7.87		7.55		8.89		8.49		8.87		9.02											
Net Water	11.78		6.70		6.72		6.97		7.44		7.26		7.27											
Shift $(H_2)(CO_2)$ Ratio $(H_2O)(CO)$	18.55		7.90		7.00		7.73		8.87		8.80		9.04											
Conv.Basis F.F.																								
CO %	98.2		79.0		75.8		79.6		83.5		82.8		82.9											
H_2 %	90.6		63.9		58.1		66.4		67.6		67.2		67.7											
H_2 + CO %	93.7		69.7		65.0		71.6		73.8		73.3		73.6											
Selectivity $\frac{C_3+}{C_1+}$ %	84.0		84.7		81.7		83.8		84.9		84.0		83.9											
Weight Bal. %	92.7		94.4		92.5		95.2		95.8		96.6		90.4											

THE TEXAS COMPANY — MONTEBELLO LABORATORY
YIELD CALCULATIONS

RUN NO. 60-A
HOURS 0-25
CATALYST AGE 25

	FRESH FEED %	FRESH FEED m/hr	FRESH FEED #/hr	WET GAS %	WET GAS At Wt. Balance m/hr	WET GAS At Wt. Balance #/hr	RECYCLE m/hr	COMBINED FEED m/hr	EFFLUENT m/hr	NET CHANGE m/hr	NET CHANGE #/hr	CONDENSATE #/MCF	CONDENSATE #/gal	CONDENSATE gal/hr	CONDENSATE gal/MCF
CO 28.010	38.780	10.981	307.58	3.290	0.202	5.66	1.195	12.176	1.397	-10.779	-301.92				
H_2 2.016	57.920	16.401	33.06	24.967	1.535	3.09	9.072	25.473	10.607	-14.866	-29.97				
CO_2 44.010	2.473	0.700	30.81	39.067	2.401	105.67	14.195	14.895	16.596	1.701	74.86	7.204			
N_2 28.016	0.077	0.022	0.61	2.617	0.161	4.51	0.951	0.973	1.112						
CH_4 16.042	0.750	0.212	3.40	16.375	1.006	16.14	5.950	6.162	6.956	0.794	12.74	1.226			
C_2H_4 28.052				2.897	0.178	4.99	1.053	1.053	1.231	0.178	4.99	0.480			
C_2H_6 30.068				1.707	0.105	3.16	0.620	0.620	0.725	0.105	3.16	0.304			
C_1+C_2											20.89	2.010			
C_3H_6 42.078				3.080	0.189	7.95	1.119	1.119	1.308	0.189	7.95	0.765	4.32	1.840	0.177
C_3H_8 44.094				0.418	0.026	1.15	0.152	0.152	0.178	0.026	1.15	0.111	4.24	0.271	0.026
C_4H_8 56.104				2.548	0.157	8.81	0.926	0.926	1.083	0.157	8.81	0.848	5.00	1.762	0.170
C_4H_{10} 58.120				1.093	0.067	3.89	0.397	0.397	0.464	0.067	3.89	0.374	4.86	0.800	0.077
C_5H_{10} 70.130				1.185	0.073	5.12	0.430	0.430	0.503	0.073	5.12	0.493	5.45	0.939	0.090
C_5H_{12} 72.146				0.328	0.020	1.44	0.119	0.119	0.139	0.020	1.44	0.139	5.25	0.274	0.026
C_6H_{12} 84.156				0.428	0.026	2.19	0.156	0.156	0.182	0.026	2.19	0.211	5.54	0.395	0.038
C_3-C_6											30.55	2.940		6.281	0.604
TOTAL		28.316	375.46		6.147		36.335	64.651	49.920						
H_2+CO	96.700	27.382	10391.469	SCFH	1.737		10.267	37.649	12.004	-25.645					
H_2/CO		1.46	Factor. 9623278		7.59		7.59	2.09	7.59	1.38					

	m/hr	#/hr	#/MCF	#/gal	gal/hr	gal/MCF
RECOVERED OIL	0.516**	72.42	6.969		11.003	1.059
TOTAL OIL		102.97	9.908		17.284	1.663
WATER SOLUBLE CHEMICALS	0.129**	6.85	0.659		0.823	0.079
TOTAL LIQUID PRODUCTS C_3+		109.82	10.568		18.107	1.742
NET WATER	6.793**	122.39	11.778		14.696	1.414
GROSS WATER		129.24	12.437		15.519	1.493
HYDROCARBON TOTAL—C_1+		130.71	12.579			

YIELD BASIS H_2+CO FED

YIELDS BASIS BROWNSVILLE DESIGN FEED RATE*	CORRECTED HEMPEL, %	gal/hr	TREATING RECOVERY, %	gal/hr
400 EP	62.3	6.855	98.0	6.718
400-550	19.2	2.113	91.4	1.931
550 +	18.5	2.035	114.6	2.333
	RECOVERY %	#/hr	gal/hr	
PROPYLENE	63.3	5.032		
C_3 POLY GASO.	87.5	4.403	0.736	
C_3 POLY TAR	12.5	0.629	0.084	
	#/gal	#/hr	gal/hr	RVP
C_4H_8	5.00		0.041	68.0
C_4 POLY GASO.	5.98		1.259	1.5
C_4H_{10}	4.86		0.800	68.0
C_4-FREE GASO.			9.062	5.8
C_4 POLY TAR	7.53		0.143	
	gal/hr	gal/MCF	Bbl/Day	
10 # RVP 400 EP GASOLINE	11.162	1.0742	5824	
GAS OIL	1.931	0.1858	1007	
FUEL OIL	2.333	0.2245	1217	
POLY TAR	0.227	0.0218	118	
TOTAL	15.653	1.5063	8167	
W. S. CHEM.	0.823	0.0792	429	
TOTAL	16.476	1.5855	8596	

OPERATING DATA

V/hr/V = 943

Pressure, psig	403	Inlet Velocity, Ft/sec	0.77	Catalyst	Fresh CM&S
Temperature, °F	659	Bed Depth, Ft	16.7	Weight, #	1245
Recycle Ratio	1.28	Bed Density, #/CF	113	Volume, Cu ft	11.02

FRESH FEED CONVERSION — %				TOTAL FEED CONVERSION — %			SELECTIVITY
Contraction	CO	H_2	H_2+CO	CO	H_2	CO+H_2	C_3+/C_1+
78.29	98.16	90.84	93.66	88.53	58.36	68.12	84.62

Form ML-11 K_{shift} = 18.5 **Included in Reactor Effluent Total g/NCM = 16.91×#/MCF *9488 MCFH H_2 + CO, Bbl/Day = 5421.6×gal/MCF

OPERATING CONDITIONS

PRESSURES PSIG		RATES S.C.F.H.	
Oxygen	421	Fresh Feed	10746
Natural Gas	420	Recycle	13789
Generator Outlet	408	Combined Feed	24535
Reactor Inlet	403	Wet Gas—Measured	1964
Condenser Inlet		Adjusted	2333
Product Accumulator	369	Loss	369
TEMPERATURES—°F.		Recycle/Fresh Feed	1.28
Oxygen	461	Inlet Velocity—ft./sec.	0.77
Natural Gas	809	Fresh Feed Rate—S.C.F.H. H_2 + CO	10391
Generator	2434	per Cu. Ft. Dense Bed	943
Quench Accumulator	137	per Lb. Catalyst	8.35
Reactor Inlet	265	per Sq. Ft.	15744
Condenser Inlet	593		
Product Accumulator	95		
Catalyst No. Height			
1 0'0"			
2 0'9"			
3 1'9"	656		
4 4'5"	650		
5 7'0"	661		
6 12'3"	657		
7 17'5"	672		
8 20'0"	681		
9 22'7"	702		
10 25'2"	678		
11 26'11"	666		

PRODUCT TESTS

	OIL	WATER
°API	47.5	10.0
Neut. No.	36.1	33.2
Sap. No.	41.2	34.0
Hydrox. No.		
Bromine No.	91	
Pour °F.	+20	
Chemicals, % by K_2CO_3		5.3
Additional layer 5.7% assumed to be non-chemical		
HEMPEL. DIST. %		°API
205 °F.		
400	61.3	56.3
400-550	19.2	37.9
550+	19.5	
A. S. T. M. DIST. ON		
Naphtha °F.		
IBP	110	
10%	146	
50%	246	
90%	358	
EP	402	
Rec.	96	

CATALYST DATA

INVENTORY DATA		
In Reactor at Start of Period		
Fresh Catalyst Added		
Total		
Catalyst Recovered		71
In Reactor at End of Period		
REACTOR d-p, Inches H_2O		
No.	Height	End
0	0-21 3/8	35
1	21 3/8-52 3/4	50
2	52 3/4-84	51
3	84-115 3/8	58
4	115 3/8-353 1/8	175
Total		369
CALCULATED FROM dp		Average
Density, Lbs./Cu.Ft.		113
Inventory, Lbs.		1245
Bed Depth, Ft.		16.70
Vol., Cu. Ft.		11.02
	Start	End
Density	156	106
Inventory	1122	1267
Depth	10.9	18.1
Volume	7.19	11.95

PARTICLE SIZE

Screen Analysis Mesh	Microns	%	Sedimentation Microns	%
On 40	419+	26.5	80+	
100	150	30.2	40—80	
150	105	10.7	20—40	
200	74	8.9	10—20	
250	62	2.6	0—20	
325	44	9.1		
<325		12.0		

CATALYST	
Bulk Density, Lbs./Cu.Ft.	
Aerated	147
Settled	150
Compacted	175
Particle Density, gm./cc.	6.06
NH_3 Value, ml./gm.	
N_2 Surface, m^2/gm.	
CHEMICAL ANALYSIS	
Fe	87.3
C	
O	
H	
K_2O, W+, % basis Fe	
X-Ray Analysis—	
$Fe_{20}C_9$	
Fe_3O_4	
Fe	

1400	HOUR	2200	0600	1000	AVERAGE	M/HR	C	H	O
	FRESH FEED								
38.81	CO 28.010	39.12	39.03	38.16	38.780	10.981	10.981		10.981
57.82	H_2 2.016	57.70	57.90	58.26	57.920	16.401		32.802	
2.09	CO_2 44.010	2.61	2.56	2.63	2.473	0.700	0.700		1.400
0.03	N_2 28.016	0.13	0.03	0.12	0.077	0.022			
1.25	CH_4 16.042	0.44	0.48	0.83	0.750	0.212	0.212	0.848	
				M. W	13.26020				
				H_2O 18.016				7.445	3.723
							11.893	41.095	16.104
				BALANCE			106.79	95.19	106.89

	Mol %	M/Hr	C	H	O
O_2 32.000	0.17	7.393 0.016			14.818
CO_2 44.010	1.27	0.124	0.124		0.248
N_2 28.016	0.26	0.025			
CH_4 16.042	83.75	8.155	8.155	32.620	
C_2H_6 30.068	6.61	0.644	1.288	3.864	
C_3H_8 44.094	5.92	0.576	1.728	4.608	
C_4H_{10} 58.120	1.47	0.143	0.572	1.430	
C_5H_{12} 72.146	0.55	0.054	0.270	0.648	
MW =	19.97037				
TOTAL			11.137	43.170	15.066

	#/hr Measured	At Wt. Balance
WET GAS	146.33	173.82
OIL	72.42	72.42
WATER	129.24	129.24
TOTAL	347.99	375.48
FRESH FEED	375.48	
WEIGHT BALANCE	92.68	
WET GAS FACTOR	1.18786	
INDICATED LOSS—S C F H	369 2333	

1400	WET GAS	2200	0600	1000	
3.53	CO 28.010	3.58	3.40	2.65	3.290
24.82	H_2 2.016	24.98	25.49	24.58	24.967
36.16	CO_2 44.010	40.06	40.27	39.78	39.067
2.34	N_2 28.016	2.20	2.47	3.46	2.617
20.35	CH_4 16.042	14.79	15.38	14.98	16.375
2.74	C_2H_4 28.052	2.81	3.07	2.97	2.897
1.54	C_2H_6 30.068	1.76	1.81	1.72	1.707
2.39	C_3H_6 42.078	3.47	3.26	3.20	3.080
0.26	C_3H_8 44.094	0.50	0.47	0.44	0.418
2.34	C_4H_8 56.104	2.84	2.25	2.76	2.548
1.31	C_4H_{10} 58.120	1.05	0.79	1.22	1.093
1.23	C_5H_{10} 70.130	1.27	0.93	1.31	1.185
0.51	C_5H_{12} 72.146	0.28	0.14	0.38	0.328
0.48	C_6H_{12} 84.156	0.41	0.27	0.55	0.428
				M. W.	28.277198

GAS FLOW RATES

		√H	PRESSURE	TEMP.	M. W.	S. C. F. H.	M/HR
FRESH FEED	50.54	7.165	405.6 20.501	81.9 0.9796	2183224 1.4776	10,746	28.316
WET GAS	79.31	6.187	1.36 4.007	73.4 0.9873	1023793 1.0118	1,964	5.175
RECYCLE	79.31	8.319	408.6 20.574	127.2 0.9411	1.0118	12,926	34.061
BLEED	5.02	8.256	20.574	1.0000	1.0118	863	2.274
NATURAL GAS	19.79	8.322	422.7 20.914	195.0 0.8910	1449647 1.2040	3,695	9.737
OXYGEN	18.82	7.277	424.2 20.950	83.8 0.9779		2,806	7.393
STEAM	215.7		31.8				

LIQUID PRODUCT RATES Basis 23 hours

HOUR	GAGE	GAL.	°F	FACTOR	GAL. AT 60	API° #/GAL.	#	#/HR GAL HR
OIL	5'4½"	286.02	70	0.9951	284.62	47.5	1873.37	
	0'7½"	33.06	78	0.9911	32.77	6.582	215.69	
					+1.22		+8.00	
					253.07		1665.68	72.42
								11.003
WATER	7'4½"	390.78	80	0.99759	389.84	10.0	3246.59	
	0'7½"	33.06	92	0.99543	32.91	8.328	274.07	
					356.93		2972.52	129.24
								15.519

THE TEXAS COMPANY — MONTEBELLO LABORATORY
YIELD CALCULATIONS

RUN NO. 60-B
HOURS 25-40
CATALYST AGE

	FRESH FEED			WET GAS	At Wt. Balance		RECYCLE	COMBINED FEED	EFFLUENT	NET CHANGE		YIELD BASIS H_2+CO FED				
	%	m/hr	#/hr	%	m/hr	#/hr	m/hr	m/hr	m/hr	m/hr	#/hr	#/MCF	CONDENSATE #/gal	gal/hr	gal/MCF	YIELDS' BASIS BROWNSVILLE DESIGN FEED RATE*
CO 28.010	37.435	11.207	313.92	17.970	2.354	65.94	8.283	19.490	10.637	8.853						
H_2 2.016	59.755	17.889	36.06	49.360	6.467	13.04	22.752	40.641	29.219	11.422						400 EP
CO_2 44.010	2.135	0.639	28.12	19.940	2.613	115.00	9.191	9.830	11.804	1.974	86.88	7.868				400-550
N_2 28.016	0.130	0.039	1.09	1.070	0.140	3.92	0.495	0.532	0.633							550 +
CH_4 16.042	0.545	0.163	2.62	5.855	0.767	12.30	2.699	2.862	3.466	0.604	9.68	0.877				
C_2H_4 28.052				1.030	0.135	3.79	0.475	0.475	0.610	0.135	3.79	0.343				
C_2H_6 30.068				0.740	0.097	2.92	0.341	0.341	0.438	0.097	2.92	0.264				PROPYLENE
C_3+C_4											16.39	1.464				C_3 POLY GASO.
C_3H_6 42.078				1.580	0.207	8.71	0.728	0.728	0.935	0.207	8.71	0.789	4.32	2.016		C_3 POLY TAR
C_3H_8 44.094				0.280	0.037	1.63	0.129	0.129	0.166	0.037	1.63	0.148	4.24	0.384		
C_4H_6 54.104				0.890	0.117	6.56	0.410	0.410	0.527	0.117	6.56	0.594	5.00	1.312		
C_4H_{10} 58.120				0.575	0.075	4.36	0.265	0.265	0.340	0.075	4.36	0.395	4.86	0.897		C_4H_8
C_5H_{10} 70.130				0.320	0.042	2.95	0.147	0.147	0.189	0.042	2.95	0.267	5.48	0.541		C_4 POLY GASO.
C_5H_{12} 72.146				0.255	0.033	2.38	0.118	0.118	0.151	0.033	2.38	0.216	5.25	0.453		C_4H_{10}
C_6H_{12} 84.156				0.135	0.018	1.51	0.062	0.062	0.080	0.018	1.51	0.137	5.54	0.273		C_4 FREE GASO.
C_5-C_6											28.10	2.545		5.876	0.532	C_4 POLY TAR
TOTAL		29.937	381.81		13.102	245.01	46.093	76.030	63.836							
H_2+CO	97.190	29.096	11041756 SCFH		8.821		31.035	60.131	39.856	20.275						
H_2/CO		1.60	Factor. 905653		2.75		2.75	2.09	2.75	1.29						10 # RVP 400 EP GASOLINE
GAS OIL																
FUEL OIL																
POLY TAR																
TOTAL																
W. S. CHEM.																
TOTAL																

	gal/hr	gal/MCF	Bbl/Day
10 # RVP 400 EP GASOLINE	8.704	0.7883	4274
GAS OIL	1.259	0.1140	618
FUEL OIL	1.713	0.1551	841
POLY TAR	0.155	0.0140	76
TOTAL	11.831	1.0715	5809
W. S. CHEM.	0.878	0.0795	431
TOTAL	12.709	1.1510	6240

	BROWNSVILLE DESIGN FEED RATE*			
	CORRECTED HEMPEL %	gal/hr	TREATING RECOVERY,%	gal/hr
400 EP	65.8	5.526	98.0	5.415
400-550	16.4	1.377	91.4	1.259
550 +	17.8	1.495	114.6	1.713

	RECOVERY %	#/hr	gal/hr
PROPYLENE	32.0	2.787	
C_3 POLY GASO.	87.5	2.439	0.408
C_3 POLY TAR	12.5	0.348	0.046

	#/gal	#/hr	gal/hr	RVP
C_4H_8	5.00		-	68.0
C_4 POLY GASO.	5.98		0.960	1.5
C_4H_{10}	4.86		0.654	68.0
C_4 FREE GASO.			7.090	5.8
C_4 POLY TAR	7.53		0.109	

OPERATING DATA — V/hr/V = 1670

Pressure, psig	406	Inlet Velocity, Ft/sec	0.91	Catalyst	Fresh CM&S
Temperature, °F	651	Bed Depth, Ft	10.01	Weight, #	971
Recycle Ratio	1.54	Bed Density, #/C.F	147	Volume, Cu.ft	6.61

	RECOVERED OIL	TOTAL OIL	WATER SOLUBLE CHEMICALS	TOTAL LIQUID PRODUCTS C_5+	NET WATER	GROSS WATER	HYDROCARBON TOTAL—C_1+
	0.395**	83.50	0.141**	90.97	4.105**	81.42	107.36

FRESH FEED CONVERSION — % | TOTAL FEED CONVERSION — % | SELECTIVITY

Contraction	CO	H_2	H_2+CO	CO	H_2	$CO+H_2$	C_3+/C_1+
56.23	79.00	63.85	69.68	45.42	28.10	33.71	84.73

Form ML-11

**Included in Reactor Effluent Total

g/NCM = 16.01 × #/MCF — 89188 MCFH H_2+CO, Bbl/Day = 5421.6 × gal/MCF

OPERATING CONDITIONS			
PRESSURES PSIG		RATES S.C.F.H.	
Oxygen	427	Fresh Feed	11,361
Natural Gas	427	Recycle	17,492
Generator Outlet	414	Combined Feed	28,853
Reactor Inlet	406	Wet Gas—Measured	4,536
Condenser Inlet		Adjusted	4,972
Product Accumulator	370	Loss	436
TEMPERATURES—°F.		Recycle/Fresh Feed	1.54
Oxygen	490	Inlet Velocity—ft./sec.	0.91
Natural Gas	819	Fresh Feed Rate—S.C.F.H. H_2+CO	11042
Generator	2446	per Cu. Ft. Dense Bed	1670
Quench Accumulator	150	per Lb. Catalyst	11.37
Reactor Inlet	490	per Sq. Ft.	16730
Condenser Inlet	645		
Product Accumulator	77	Heat Transfer Calculations	
Catalyst No. Height		Steam Rate = 326 E/hr.	
1 See Period A	621	@698 psia & 511°F =	
2	654	1200 Btu/#	
3	652	Water in @69°F = 37 Btu/#	
4	647	Net Heat Transferred/# steam	
5	652	= 1163 Btu	
6	642	(1163)(326) = 379,138 Btu/hr.	
7	689	Ave. Bed Temp. = 651°F	
8	703	dT = 651-511 = 140°F	
9	701	Tube Area = 18.0 ft.^{2}	
10	696	K = $\frac{379,138}{(140)(18.0)}$ =	
11	691	= 150.5 Btu/°F/ft.^{2}	

PRODUCT TESTS	OIL	WATER
°API	47.1	9.7
Neut. No.	34.8	45.3
Sap. No.	39.3	45.8
Hydrox. No.		
Bromine No.	85	
Pour °F.		
Chemicals, % by K_2CO_3		9.0
HEMPEL, DIST. %		°API
205 °F.		
400	64.8	58.1
400-550	16.4	40.0
550+	18.8	
A. S. T. M. DIST. ON		
Naphtha °F.		
IBP	102	
10%	140	
50%	240	
90%	360	
EP	404	
Rec.	95.5	

CATALYST DATA					
INVENTORY DATA		PARTICLE SIZE			
In Reactor at Start of Period		Screen Analysis			Sedimentation
Fresh Catalyst Added		Mesh	Microns	%	Microns %
Total		On 40	419+		80+
Catalyst Recovered	72	100	150		40—80
In Reactor at End of Period		150	105		20—40
		200	74		10—20
REACTOR d-p, Inches H_2O		250	62		0—20
No. Height		325	44		
0 See Period A	55	<325			
1 "	78	CATALYST			
2 "	85	Bulk Density, Lbs./Cu.Ft.			
3 "	60	Aerated			
4 "	5	Settled			
Total	283	Compacted			
		Particle Density, gm./cc.			
CALCULATED FROM dp		NH_3 Value, ml./gm.			
Density, Lbs./Cu.Ft.	147	N_2 Surface, m^2/gm.			
Inventory, Lbs.	971				
Bed Depth, Ft.	10.01	CHEMICAL ANALYSIS			
Vol., Cu. Ft.	6.61	Fe			
		C			
		O			
		H			
		K_2O, W+, % basis Fe			
		X-Ray Analysis—			
		$Fe_{20}C_9$			
		Fe_3O_4			
		Fe			

	GAS ANALYSES			
HOUR	2200	0600		AVERAGE
FRESH FEED				
CO 28.010	37.53	37.34		37.435
H_2 2.016	59.82	59.69		59.755
CO_2 44.010	2.19	2.08		2.135
N_2 28.016	0.09	0.17		0.130
CH_4 16.042	0.37	0.72		0.545
			M.W	12.75367
			H_2O 18.016	
			BALANCE	
WET GAS				
CO 28.010	17.76	18.18		17.970
H_2 2.016	50.33	48.39		49.360
CO_2 44.010	18.41	21.47		19.940
N_2 28.016	1.28	0.86		1.070
CH_4 16.042	5.77	5.94		5.855
C_2H_4 28.052	0.84	1.22		1.030
C_2H_6 30.068	0.82	0.66		0.740
C_3H_6 42.078	2.03	1.13		1.580
C_3H_8 44.094	0.31	0.25		0.280
C_4H_8 56.104	0.87	0.91		0.890
C_4H_{10} 58.120	0.93	0.22		0.575
C_5H_{10} 70.130	0.20	0.44		0.320
C_5H_{12} 72.146	0.37	0.14		0.255
C_6H_{12} 84.156	0.08	0.19		0.135
			M. W.	18.69837

GENERATOR BALANCE							
	M/HR	C	H	O		Mol %	M/Hr
					O_2 32.000	0.20	7.515
							0.019
	11.207	11.207		11.207	CO_2 44.010	0.98	0.095
	17.889		35.778		N_2 28.016	0.87	0.085
	0.639	0.639		1.278	CH_4 16.042	82.45	8.035
	0.039				C_2H_4 30.068	6.62	0.645
	0.163	0.163	0.652		C_2H_6 44.094	6.25	0.609
					C_3H_6 58.120	1.85	0.180
			6.355	3.178	C_3H_8 72.146	0.78	0.076
		12.009	42.785	15.663	MW = 20.35000		
		97.26	98.14	102.65	TOTAL		

	C	H	O
			15.068
	0.095		0.190
	32.140		
	1.290	3.870	
	1.827	4.872	
	1.800		
	0.380	0.912	
	12.347	43.594	15.258

WEIGHT BALANCE	#/hr Measured	At Wt. Balance
WET GAS	223.52	244.99
OIL	55.40	55.40
WATER	81.42	81.42
TOTAL	360.34	381.81
FRESH FEED	381.81	
WEIGHT BALANCE	94.38	
WET GAS FACTOR	1.09605	
INDICATED LOSS—S C F H	436	
	4972	

GAS FLOW RATES							
	V/R	PRESSURE	TEMP.	M. W.	S. C. F. H.	M/HR	
		406.4	74.4	22699			
FRESH FEED	50.54	7.371	20.521	0.9864	1.5066	11,361	29.937
			1.51	71.3	154826		
WET GAS	115.14	7.950	4.026	0.9893	1.2443	4.536	11.954
			410.4	114.4			
RECYCLE	79.31	8.486	20.618	0.9514	1.2443	16.431	43.297
BLEED	5.02	8.238	20.618	1.0000	1.2443	1.061	2.796
		426.9		185.3	1422604		
NATURAL GAS	19.79	8.306	21.014	0.8977	1.1927	3.698	9.744
		426.6		74.1			
OXYGEN	18.82	7.312	21.007	0.9867		2.852	7.515
			31.4				
STEAM	215.7	5.082	0.2970		326#/hr.		

LIQUID PRODUCT RATES							Basis 12 hours
HOUR	GAGE	GAL.	°F	FACTOR	GAL AT 60	API° #/GAL.	# / # HR GAL HR
OIL	3'0"	161.14	62	0.9990	160.98	47.1	1061.82
	1'3"	65.01	75	0.9925	64.52	6.596	425.57
					4.32		28.50
					100.78		664.76 55.40
							8.398
WATER	4'6½"	241.29	70	0.99896	241.04	9.7	2011.72
	2'4"	124.28	80	0.99759	123.98	8.346	1034.74
					117.06		976.98 81.42
							9.755

RUN NO. 60-C
HOURS 40-64
CATALYST AGE

THE TEXAS COMPANY — MONTEBELLO LABORATORY
YIELD CALCULATIONS

	FRESH FEED %	FRESH FEED m/hr	FRESH FEED #/hr	WET GAS %	WET GAS At Wt. Balance m/hr	WET GAS At Wt. Balance #/hr	RECYCLE m/hr	COMBINED FEED m/hr	EFFLUENT m/hr	NET CHANGE m/hr	NET CHANGE #/hr	CONDENSATE #/MCF	CONDENSATE #/gal	CONDENSATE gal/hr	CONDENSATE gal/MCF
CO 28.010	37.977	11.298	316.46	18.856	2.733	76.55	8.881	20.179	11.614	-8.565	-239.91				
H_2 2.016	59.126	17.590	35.46	50.876	7.375	14.87	23.963	41.553	31.338	-10.215	-20.59				
CO_2 44.010	2.067	0.615	27.07	17.217	2.496	109.87	8.109	8.724	10.605	1.881	82.80	7.553			
N_2 28.016	0.160	0.048	1.34	1.150	0.167	4.68	0.542	0.590	0.709						
CH_4 16.042	0.670	0.199	3.19	6.070	0.880	14.12	2.859	3.058	3.739	0.681	10.93	0.997			
C_2H_4 28.052				1.167	0.172	4.82	0.559	0.559	0.731	0.172	4.82	0.440			
C_2H_6 30.068				0.610	0.088	2.65	0.287	0.287	0.375	0.088	2.65	0.242			
C_1+C_2											18.40	1.679			
C_3H_6 42.078				1.590	0.230	9.68	0.749	0.749	0.979	0.230	9.68	0.883	4.32	2.241	0.204
C_3H_8 44.094				0.320	0.046	2.03	0.151	0.151	0.197	0.046	2.03	0.185	4.24	0.479	0.044
C_4H_8 56.104				1.207	0.175	9.82	0.569	0.569	0.744	0.175	9.82	0.896	5.00	1.964	0.179
C_4H_{10} 58.120				0.330	0.048	2.79	0.155	0.155	0.203	0.048	2.79	0.254	4.86	0.574	0.052
C_5H_{10} 70.130				0.447	0.065	4.56	0.211	0.211	0.276	0.065	4.56	0.416	5.45	0.837	0.076
C_5H_{12} 72.146				0.070	0.010	0.72	0.033	0.033	0.043	0.010	0.72	0.066	5.25	0.137	0.012
C_6H_{12} 84.156				0.070	0.010	0.84	0.033	0.033	0.043	0.010	0.84	0.077	5.54	0.152	0.014
C_3-C_6											30.44	2.777		6.384	0.581
TOTAL		29.750	383.52		14.495	258.00	47.101	76.851	66.139						
H_2+CO	97.103	28.888	10962.929	SCFH	10.108		32.844	61.732	42.952	-18.780					
H_2/CO		1.56	Factor. 912164		2.70		2.70	2.06	2.70	1.19					

YIELD BASIS H_2+CO FED

YIELDS BASIS BROWNSVILLE DESIGN FEED RATE*	CORRECTED HEMPEL, %	gal/hr	TREATING RECOVERY, %	gal/hr
400 EP	69.0	4.753	98.0	4.658
400-550	17.4	1.199	91.4	1.096
550 +	13.6	0.937	114.6	1.074

	RECOVERY %	#/hr	gal/hr
PROPYLENE	29.4	2.85	
C_3 POLY GASO.	87.5	2.49	0.416
C_3 POLY TAR	12.5	0.36	0.048

	#/gal	#/hr	gal/hr	RVP
C_4H_8	5.00	0.39	0.078	68.0
C_4 POLY GASO.	5.98	8.25	1.380	1.5
C_4H_{10}	4.86	2.79	0.574	68.0
C_4-FREE GASO.			6.200	5.8
C_4 POLY TAR	7.53	1.18	0.157	

	gal/hr	gal/MCF	Bbl/Day
10 # RVP 400 EP GASOLINE	8.232	0.7509	4071
GAS OIL	1.096	0.1000	542
FUEL OIL	1.074	0.0980	531
POLY TAR	0.205	0.0187	101
TOTAL	10.607	0.9676	5245
W. S. CHEM.	0.875	0.0798	433
TOTAL	11.482	1.0474	5678

OPERATING DATA — V/hr/V = 1702

Pressure, psig	405	Inlet Velocity, Ft/sec	0.93	Catalyst	Fresh CM&S
Temperature, °F	661	Bed Depth, Ft	9.76	Weight, #	992
Recycle Ratio	1.58	Bed Density, #/CF	154	Volume, Cu ft	6.44

	m/hr	#/hr	#/MCF	#/gal	gal/hr	gal/MCF
RECOVERED OIL	0.318**	44.64	4.072		6.889	0.628
TOTAL OIL		75.08	6.849		13.273	1.209
WATER SOLUBLE CHEMICALS	0.136**	7.21	0.658		0.875	0.080
TOTAL LIQUID PRODUCTS C_3+		82.29	7.507		14.148	1.289
NET WATER	4.089**	73.67	6.720		8.844	0.807
GROSS WATER		80.88	7.378		9.719	0.887
HYDROCARBON TOTAL—C_1+		100.69	9.186			

FRESH FEED CONVERSION — % Contraction	CO	H_2	H_2+CO	TOTAL FEED CONVERSION — % CO	H_2	CO+H_2	SELECTIVITY C_3+/C_1+
51.28	75.81	58.07	65.01	42.45	24.58	30.42	81.73

Form ML-11   Kshift = 7.00   **Included in Reactor Effluent Total

g/NCM = 16.01 × #/MCF   *9188 MCFH H_2 + CO, Bbl/Day = 5421.6 × gal/MCF

OPERATING CONDITIONS

PRESSURES PSIG		RATES S.C.F.H.	
Oxygen	425	Fresh Feed	11,290
Natural Gas	425	Recycle	17,875
Generator Outlet	413	Combined Feed	29,165
Reactor Inlet	405	Wet Gas—Measured	4,889
Condenser Inlet		Adjusted	5,501
Product Accumulator	369	Loss	612

TEMPERATURES—°F.			
		Recycle/Fresh Feed	1.58
Oxygen	506	Inlet Velocity—ft./sec.	0.93
Natural Gas	784	Fresh Feed Rate—S.C.F.H. H_2 + CO	10963
Generator	2500	per Cu.Ft. Dense Bed	1702
Quench Accumulator	137	per Lb. Catalyst	11.05
Reactor Inlet	515	per Sq. Ft.	16611
Condenser Inlet	642		
Product Accumulator	82	Heat Transfer Calculations	
Catalyst No. Height		Steam Rate = 227 #/hr.	
1 See Period A	634	@696 psia & 513°F =	
2	662	= 1200 Btu/#	
3	661	Water in @71°F = 39 Btu/#	
4	657	Net Heat Trans./# steam	
5	664	= 1161 Btu	
6	662	Ave. Bed Temp. = 661°F	
7	682	(1161)(227) = 263,547 Btu/hr.	
8	694	dT = 661-513 = 148°F	
9	697	Tube Area = 17.4 ft.²	
10	692	$K = \frac{263,547}{(17.4)(148)} =$	
11	685	= 102.3 Btu/°F/ft.²	

PRODUCT TESTS

	OIL	WATER
°API	48.7	9.9
Neut. No.	35.5	45.8
Sap. No.	43.8	47.4
Hydrox. No.		
Bromine No.	80	
Pour °F.		
Chemicals, % by K_2CO_3		9.0
HEMPEL DIST. %		°API
205 °F.		
400	68.0	56.8
400-550	17.4	39.6
550+	14.6	
A. S. T. M. DIST. ON		
Naphtha °F.		
IBP	102	
10%	146	
50%	247	
90%	364	
EP	403	
Rec.	95.5	

CATALYST DATA

INVENTORY DATA	
In Reactor at Start of Period	
Fresh Catalyst Added	
Total	
Catalyst Recovered	26.8
In Reactor at End of Period	
REACTOR d-p, Inches H_2O	
No. Height	
0 See Period A	56
1	78
2	86
3	69
4	0
Total	289
CALCULATED FROM dp	
Density, Lbs./Cu.Ft.	154
Inventory, Lbs.	992
Bed Depth, Ft.	9.76
Vol., Cu. Ft.	6.44

PARTICLE SIZE

Screen Analysis Mesh	Microns	%	Sedimentation Microns	%
On 40	419+		80+	
100	150		40—80	
150	105		20—40	
200	74		10—20	
250	62		0—20	
325	44			
<325				

CATALYST
- Bulk Density, Lbs./Cu.Ft.
  - Aerated
  - Settled
  - Compacted
- Particle Density, gm./cc.
- NH_3 Value, ml./gm.
- N_2 Surface, m²/gm.

CHEMICAL ANALYSIS
- Fe
- C
- O
- H
- K_2O, W+, % basis Fe

X-Ray Analysis—
- $Fe_{20}C_9$
- Fe_3O_4
- Fe

GAS ANALYSES / GENERATOR BALANCE

HOUR	1400	2200	0600	AVERAGE	M/HR	C	H	O
FRESH FEED								
CO 28.010	37.81	37.92	38.20	37.977	11.298	11.298		11.298
H_2 2.016	58.91	59.35	59.12	59.126	17.590		35.180	
CO_2 44.010	1.95	2.12	2.13	2.067	0.615	0.615		1.230
N_2 28.016	0.24	0.13	0.11	0.160	0.048			
CH_4 16.042	1.09	0.48	0.44	0.670	0.199	0.199	0.796	
			M. W	12.89133				
			H_2O 18.016				5.687	2.844
						12.112	41.663	15.372
			BALANCE			99.86	97.25	103.99

	Mol %	M/Hr	C	H	O
O_2 32.000	0.19	7.265 0.018			14.566
CO_2 44.010	1.12	0.108	0.108		0.216
N_2 28.016	1.58	0.153			
CH_4 16.042	81.91	7.928	7.928	31.712	
C_2H_6 30.068	6.65	0.644	1.288	3.864	
C_3H_8 44.094	5.96	0.577	1.731	4.616	
C_4H_{10} 58.120	1.87	0.181	0.724	1.810	
C_5H_{12} 72.146	0.72	0.070	0.350	0.840	
MW =20.370187					
TOTAL			12.129	42.842	14.782

WEIGHT BALANCE

	#/hr Measured	At Wt. Balance
WET GAS	229.30	258.00
OIL	44.64	44.64
WATER	80.88	80.88
TOTAL	354.82	383.52
FRESH FEED	383.52	
WEIGHT BALANCE	92.52	
WET GAS FACTOR	1125163	
INDICATED LOSS—S C F H	612	

WET GAS	1400	2200	0600	AVERAGE
CO 28.010	19.11	19.76	17.70	18.856
H_2 2.016	53.21	53.33	46.09	50.876
CO_2 44.010	14.35	14.43	22.87	17.217
N_2 28.016	1.07	1.27	1.11	1.150
CH_4 16.042	7.09	5.80	5.32	6.070
C_2H_4 28.052	1.18	1.06	1.32	1.187
C_2H_6 30.068	0.66	0.58	0.59	0.610
C_3H_6 42.078	1.56	1.66	1.55	1.590
C_3H_8 44.094	0.30	0.32	0.34	0.320
C_4H_8 56.104	1.01	1.11	1.50	1.207
C_4H_{10} 58.120	0.16	0.34	0.49	0.330
C_5H_{10} 70.130	0.30	0.34	0.70	0.447
C_5H_{12} 72.146	-	-	0.21	0.070
C_6H_{12} 84.156	-	-	0.21	0.070
			M. W.	17.79876

GAS FLOW RATES

		√H	PRESSURE	TEMP.	M. W.	S. C. F H.	M/HR
FRESH FEED	50.54	7.392	404.8 / 20.482	76.3 / 0.9847	2245695 / 1.4986	11,290	29.750
WET GAS	115.14	8.329	1.70 / 4.050	73.8 / 0.9870	1626517 / 1.2753	4,889	12.883
RECYCLE	79.31	8.508	408.4 / 20.569	119.6 / 0.9473	1.2753	16,768	44.184
BLEED	5.02	8.408	20.569	1.0000	1.2753	1,107	2.917
NATURAL GAS	19.79	8.308	424.9 / 20.967	191.0 / 0.8938	1421194 / 1.1921	3,673	9.679
OXYGEN	18.82	7.225	425.2 / 20.620	77.8 / 0.9833		2,757	7.265
STEAM	215.7	3.263	38.5 / 0.3230		227#/hr.		

LIQUID PRODUCT RATES

HOUR	GAGE	GAL.	°F	FACTOR	GAL. AT 60	API° #/GAL.	#	#HR GAL HR
OIL	6'1"	323.12	62	0.9990	322.80	46.7 6.537	2110.14	
	3'0"	161.14	62	0.9990	160.98	47.1 6.596	1061.82	
					161.82		1048.32	
					+3.52		+23.00	44.64
					165.34		1071.32	6.889
WATER	7'3"	384.23	78	0.99788	383.42	9.9 8.334	3195.42	
	4'6¼"	241.29	70	0.99896	241.04	9.7 8.346	2011.72	
	2'3/4"	108.67	69	0.99907	108.57	9.9	904.82	
	0'4"	17.70	68	0.99920	17.69	8.334	147.43	80.88
					233.26		1941.11	9.719

THE TEXAS COMPANY — MONTEBELLO LABORATORY
YIELD CALCULATIONS

RUN NO. 60-D
HOURS 64-80
CATALYST AGE

	FRESH FEED %	FRESH FEED m/hr	FRESH FEED #/hr	WET GAS %	WET GAS At Wt Balance m/hr	WET GAS At Wt Balance #/hr	RECYCLE m/hr	COMBINED FEED m/hr	EFFLUENT m/hr	NET CHANGE m/hr	NET CHANGE #/hr
CO 28.010	37.853	11.257	315.32	18.143	2.293	64.23	8.155	19.412	10.448	-8.964	-251.09
H_2 2.016	59.324	17.643	35.57	46.883	5.925	11.94	21.073	38.716	26.998	-11.718	-23.63
CO_2 44.010	1.923	0.572	25.17	22.050	2.787	122.66	9.911	10.483	12.698	2.215	97.49
N_2 28.016	0.237	0.070	1.96	1.193	0.151	4.23	0.536	0.606	0.687		
CH_4 16.042	0.663	0.197	3.16	6.003	0.759	12.18	2.698	2.695	3.457	0.562	9.02
C_2H_4 28.052				1.277	0.161	4.52	0.574	0.574	0.735	0.161	4.52
C_2H_6 30.068				0.630	0.080	2.41	0.283	0.283	0.363	0.080	2.41
C_1+C_2											15.95
C_3H_6 42.078				1.357	0.171	7.20	0.610	0.610	0.781	0.171	7.20
C_3H_8 44.094				0.250	0.032	1.41	0.112	0.112	0.145	0.032	1.41
C_4H_8 56.104				1.047	0.132	7.41	0.471	0.471	0.603	0.132	7.41
C_4H_{10} 58.120				0.397	0.050	2.91	0.178	0.178	0.228	0.050	2.91
C_5H_{10} 70.130				0.523	0.066	4.63	0.235	0.235	0.301	0.066	4.63
C_5H_{12} 72.146				0.070	0.009	0.65	0.031	0.031	0.040	0.009	0.65
C_6H_{12} 84.156				0.177	0.022	1.85	0.080	0.080	0.102	0.022	1.85
C_3-C_6											26.06
TOTAL		29.739	381.18		12.638	248.23	44.949	74.688	62.324		
H_2+CO	97.177	28.900	10967.396 SCFH		8.218		29.228	58.128	37.446	-20.682	
H_2/CO		1.57	Factor. 911793		2.58		2.58	1.99	2.58	1.31	

YIELD BASIS H_2+CO FED

	#/MCF	#/gal	gal/hr	gal/MCF
CONDENSATE				
400 EP	8.889			
400-550				
550 +				
	0.822			
	0.412			
PROPYLENE	0.220			
C_3 POLY GASO.	1.454			
C_3 POLY TAR	0.656	4.32	1.667	0.152
	0.129	4.24	0.333	0.030
	0.676	5.00	1.482	0.135
C_4H_8	0.265	4.86	0.599	0.055
C_4 POLY GASO.	0.422	5.45	0.850	0.078
C_4H_{10}	0.059	5.25	0.124	0.011
C_4 FREE GASO.	0.169	5.54	0.334	0.030
C_4 POLY TAR	2.376		5.389	0.491
	2.376		5.389	0.491

YIELDS BASIS BROWNSVILLE DESIGN FEED RATE*

	CORRECTED HEMPEL. %	gal/hr	TREATING RECOVERY %	gal/hr
400 EP	69.8	5.268	98.0	5.163
400-550	19.2	1.446	91.4	1.322
550 +	11.0	0.829	114.6	0.950

	RECOVERY %	#/hr	gal/hr
PROPYLENE	33.1	2.38	
C_3 POLY GASO.	87.5	2.08	0.348
C_3 POLY TAR	12.5	0.30	0.040

	#/gal	#/hr	gal/hr	RVP
C_4H_8	5.00	0.24	0.048	68.0
C_4 POLY GASO.	5.98	5.27	1.049	1.5
C_4H_{10}	4.86	2.91	0.599	68.0
C_4 FREE GASO.			6.809	5.8
C_4 POLY TAR	7.53	0.90	0.120	

	gal/hr	gal./MCF	Bbl/Day
10 # RVP 400 EP GASOLINE	8.505	0.7755	4204
GAS OIL	1.322	0.1205	653
FUEL OIL	0.950	0.0866	470
POLY TAR	0.160	0.0146	79
TOTAL	10.937	0.9972	5406
W. S CHEM.	0.930	0.0848	460
TOTAL	11.867	1.0820	5866

OPERATING DATA — V/hr/V = 1519

Pressure, psig	406	Inlet Velocity, Ft/sec	0.90	Catalyst	Fresh CM&S
Temperature, °F	657	Bed Depth, Ft	10.94	Weight, #	1177
Recycle Ratio	1.51	Bed Density, #/C.F	163	Volume, Cu.ft	7.22

	RECOVERED OIL	0.347##	48.72	4.442		7.533	0.687
	TOTAL OIL		74.78	6.618		12.922	1.178
	WATER SOLUBLE CHEMICALS	0.147##	7.79	0.710		0.930	0.085
	TOTAL LIQUID PRODUCTS C_4+		82.57	7.528		13.852	1.263
	NET WATER	4.243##	76.44	6.970		9.176	0.837
	GROSS WATER		84.23	7.680		10.106	0.922
	HYDROCARBON TOTAL—C_4+		98.52	8.982			

FRESH FEED CONVERSION — %				TOTAL FEED CONVERSION — %			SELECTIVITY
Contraction	CO	H_2	H_2+CO	CO	H_2	CO+H_2	C_3 + C_4
57.50	79.63	66.42	71.56	46.18	30.27	35.58	83.81

Form ML-11 K shift = 7.73 **Included in Reactor Effluent Total

g/NCM = 16.01 × -/MCF 0.0185 MCFH H_2 + CO, Bbl/Day = 5121.6 × gal/MCF

OPERATING CONDITIONS			
PRESSURES PSIG		RATES S.C.F.H.	
Oxygen	426	Fresh Feed	11,286
Natural Gas	426	Recycle	17,058
Generator Outlet	412	Combined Feed	28,344
Reactor Inlet	406	Wet Gas—Measured	4,441
Condenser Inlet		Adjusted	4,796
Product Accumulator	368	Loss	355
TEMPERATURES—°F.		Recycle/Fresh Feed	1.51
Oxygen	478	Inlet Velocity—ft./sec.	0.90
Natural Gas	784	Fresh Feed Rate—S.C.F.H.	10967
Generator	2523	per Cu. Ft. Dense Bed	1519
Quench Accumulator	121	per Lb. Catalyst	9.32
Reactor Inlet	502	per Sq. Ft.	16617
Condenser Inlet	610		
Product Accumulator	82	Heat Transfer Calculations	
Catalyst No. Height		Steam Rate = 246 #/hr.	
1 See Period A	645	@696 psia & 513°F =	
2	659	= 1200 Btu/#	
3	656	Water in @66°F = 34 Btu/#	
4	652	Net Btu/# steam = 1166 Btu	
5	660	(1166)(246) = 286836 Btu/hr.	
6	652	Ave. Bed Temp. = 657°F	
7	667	dT = 657-513 = 144°F	
8	679	Tube Area = 19.8 ft.^{2}	
9	687	K = 286,836 / (19.8)(144)	
10	678	= 100.6 Btu/°F/sq. ft.	
11	660		

PRODUCT TESTS	OIL	WATER
°API	49.4	9.9
Neut. No.	37.0	45.7
Sap. No.	45.0	48.3
Hydrox. No.		
Bromine No.	90	
Pour °F.		
Chemicals, % by K_2CO_3		9.2
HEMPEL DIST. %		°API
205 °F.		
400	68.8	56.9
400-550	19.2	39.4
550+	12.0	
A. S. T. M. DIST. ON		
Naphtha °F.		
IBP	102	
10%	146	
50%	247	
90%	368	
EP	404	
Rec.	95.0	

CATALYST DATA		PARTICLE SIZE				
INVENTORY DATA		Screen Analysis			Sedimentation	
In Reactor at Start of Period		Mesh	Microns	%	Microns	%
Fresh Catalyst Added	175	On 40	419+		80+	
Total		100	150		40—80	
Catalyst Recovered	25	150	105		20—40	
In Reactor at End of Period		200	74		10—20	
		250	62		0—20	
REACTOR d-p, Inches H_2O		325	44			
No. Height		<325				
0 See Period A	56					
1	78	CATALYST				
2	86	Bulk Density, Lbs./Cu.Ft.				
3	83	Aerated				
4	40	Settled				
Total	343	Compacted				
		Particle Density, gm./cc.				
CALCULATED FROM dp		NH_3 Value, ml./gm.				
Density, Lbs./Cu.Ft.	163	N_2 Surface, m^2/gm.				
Inventory, Lbs.	1177					
Bed Depth, Ft.	10.94	CHEMICAL ANALYSIS				
Vol., Cu. Ft.	7.22	Fe				
		C				
		O				
		H				
		K_2O, W+, % basis Fe				
		X-Ray Analysis—				
		$Fe_{20}C_9$				
		Fe_3O_4				
		Fe				

GAS ANALYSES					GENERATOR BALANCE									WEIGHT BALANCE		
HOUR	1400	2200	0600	AVERAGE	M/HR	C	H	O		Mol %	M/Hr	C	H	O		#/hr Measured	At Wt. Balance
FRESH FEED									O_2 32.000	0.21	7.410 0.020			14.860	WET GAS	229.85	248.23
CO 28.010	37.81	38.36	37.39	37.853	11.257	11.257		11.257	CO_2 44.010	1.25	0.122	0.122		0.244	OIL	48.72	48.72
H_2 2.016	59.11	59.12	59.74	59.324	17.643	·	35.286		N_2 28.016	1.33	0.129				WATER	64.23	84.23
CO_2 44.010	1.97	1.76	2.04	1.923	0.572	0.572		1.144	CH_4 16.042	82.47	8.022	8.022	32.088		TOTAL	362.80	381.18
N_2 28.016	0.11	0.24	0.36	0.237	0.070				C_2H_6 30.068	6.49	0.631	1.262	3.786		FRESH FEED	381.18	
CH_4 16.042	1.00	0.52	0.47	0.663	0.197	0.197	0.788		C_3H_8 44.094	5.83	0.567	1.701	4.536		WEIGHT BALANCE	95.18	
			M. W	12.81766					C_4H_{10} 58.120	1.70	0.165	0.660	1.650				
			H_2O 18.016				6.116	3.058	C_5H_{12} 72.146	0.72	0.070	0.350	0.840		WET GAS FACTOR	1079965	
						12.026	42.190	15.459	MW = 20.24936						INDICATED LOSS—S C F H	355	
			BALANCE			99.25	98.34	102.35	TOTAL			12.117	42.900	15.104			

WET GAS					GAS FLOW RATES							LIQUID PRODUCT RATES							
CO 28.010	17.63	18.60	18.20	18.143		V/R	PRESSURE	TEMP.	M. W.	S. C. F. H	M/HR	HOUR	GAGE	GAL.	°F	FACTOR	GAL. AT 60	API° #/GAL.	#	# HR GAL HR
H_2 2.016	46.51	47.00	47.14	46.883	FRESH FEED		405.7	74.3	2258601			OIL	7'3 3/8"	387.50	73	0.9935	384.96	49.4 6.512	2506.99	
CO_2 44.010	22.31	21.71	22.13	22.050		50.54	7.346	20.504	0.9865	1.5029	11,286	29.739		6'1"	323.12	62	0.9990	322.80	48.7 6.537	2110.14	
N_2 28.016	1.09	1.34	1.15	1.193	WET GAS		1.64	73.0	1473903					2'17/8"	139.26	62	0.9990	139.12	49.4	905.95	
CH_4 16.042	6.55	5.80	5.66	6.003		115.14	7.956	4.042	0.9877	1.2140	4,441	11.702		0'15/8"	24.34	84	0.9881	24.05	6.512	156.61	
C_2H_4 28.052	1.25	1.21	1.37	1.277	RECYCLE			408.3	117.7									+3.53		+23.00	48.72
C_2H_6 30.068	0.64	0.63	0.62	0.630		79.31	8.529	20.567	0.9488	1.2140	16,025	42.227						160.78		1169.19	7.533
C_3H_6 42.078	1.62	1.00	1.45	1.357	BLEED																
C_3H_8 44.094	0.32	0.16	0.27	0.250		5.02	8.238	20.567	1.0000	1.2140	1,033	2.722	WATER	6'7 3/4"	351.49	70	0.9986	351.12	9.9	9926.23	
C_4H_8 56.104	1.09	1.03	1.02	1.047	NATURAL GAS		425.6	190.0	1429674					2'3 3/4"	108.67	69	0.9990?	108.57	8.334	904.68	
C_4H_{10} 58.120	0.29	0.55	0.35	0.397		19.79	8.312	20.983	0.8944	1.1957	3,691	9.726						242.55		2021.41	84.23
C_5H_{10} 70.130	0.51	0.55	0.51	0.523	OXYGEN		425.8	76.1													10.106
C_5H_{12} 72.146	-	0.21	-	0.070		18.62	7.229	20.986	0.9649		2,812	7.410									
C_6H_{12} 84.156	0.19	0.21	0.13	0.177	STEAM			38.7													
			M. W.	19.64172		215.7	3.521	0.3238		246#/hr.											

THE TEXAS COMPANY — MONTEBELLO LABORATORY
YIELD CALCULATIONS

RUN NO. 60-E
HOURS 88-112
CATALYST AGE

	FRESH FEED %	FRESH FEED m/hr	FRESH FEED #/hr	WET GAS %	WET GAS At Wt. Balance m/hr	WET GAS At Wt. Balance #/hr	RECYCLE m/hr	COMBINED FEED m/hr	EFFLUENT m/hr	NET CHANGE m/hr	NET CHANGE #/hr	YIELD BASIS H_2+CO FED CONDENSATE #/MCF	#/gal	gal/hr	gal/MCF
CO 28.010	37.770	11.169	312.81	15.337	1.843	51.62	6.886	18.055	8.729	-9.326	-261.19				
H_2 2.016	59.211	17.508	35.30	47.180	5.668	11.43	21.181	38.689	26.849	-11.840	-23.87				
CO_2 44.010	2.163	0.640	28.17	22.796	2.740	120.59	10.234	10.874	12.974	2.100	92.42	8.492			
N_2 28.016	0.173	0.051	1.43	1.543	0.185	5.18	0.693	0.744	0.878						
CH_4 16.042	0.683	0.202	3.24	6.677	0.802	12.87	2.998	3.200	3.800	0.600	9.63	0.885			
C_2H_4 28.052				1.287	0.155	4.35	0.578	0.578	0.733	0.155	4.35	0.400			
C_2H_6 30.068				0.630	0.076	2.29	0.283	0.283	0.359	0.076	2.29	0.210			
C_1+C_2											16.27	1.495			
C_3H_6 42.078				1.827	0.219	9.22	0.820	0.820	1.039	0.219	9.22	0.847	4.32	2.134	0.196
C_3H_8 44.094				0.417	0.050	2.21	0.187	0.187	0.237	0.050	2.21	0.203	4.24	0.521	0.048
C_4H_8 56.104				1.233	0.148	8.30	0.554	0.554	0.702	0.148	8.30	0.763	5.00	1.660	0.153
C_4H_{10} 58.120				0.410	0.049	2.85	0.184	0.184	0.233	0.049	2.85	0.262	4.86	0.586	0.054
C_5H_{10} 70.130				0.453	0.054	3.79	0.203	0.203	0.257	0.054	3.79	0.348	5.45	0.695	0.064
C_5H_{12} 72.146				0.043	0.005	0.36	0.019	0.019	0.024	0.005	0.36	0.033	5.25	0.069	0.006
C_6H_{12} 84.156				0.167	0.020	1.68	0.075	0.075	0.095	0.020	1.68	0.154	5.54	0.303	0.028
C_3-C_6											28.41	2.610		5.968	0.549
TOTAL		29.570	380.95		12.014	236.74	44.895	74.465	61.950						
H_2+CO	96.981	28.677	10883.2078 SCFH	7.511			28.067	56.744	35.578	-21.166					
H_2/CO		1.57	Factor 918846	3.08			3.08	2.14	3.08	1.27					

OPERATING DATA V/hr/V = 1221

							NET CHANGE m/hr	#/hr	#/MCF	#/gal	gal/hr	gal/MCF
Pressure, psig	406	Inlet Velocity, Ft/sec	0.89	Catalyst	Fresh CM&S	RECOVERED OIL	0.394**	55.26	5.078		8.597	0.790
Temperature, °F	655	Bed Depth, Ft	13.50	Weight, #	1479	TOTAL OIL		83.67	7.688		14.565	1.339
Recycle Ratio	1.52	Bed Density, #/CF	166	Volume, Cu ft	8.91	WATER SOLUBLE CHEMICALS	0.150**	7.94	0.730		0.985	0.091
						TOTAL LIQUID PRODUCTS C_3+		91.61	8.418		15.550	1.430
						NET WATER	4.497**	81.01	7.444		9.725	0.894
						GROSS WATER		88.95	8.174		10.710	0.985
						HYDROCARBON TOTAL—C_1+		107.88	9.913			

FRESH FEED CONVERSION — % Contraction	CO	H_2	H_2+CO	TOTAL FEED CONVERSION — % CO	H_2	CO+H_2	SELECTIVITY C_3+/C_1+
59.37	83.50	67.63	73.81	51.65	30.60	37.30	84.92

YIELDS BASIS BROWNSVILLE DESIGN FEED RATE*

	CORRECTED HEMPEL %	gal/hr	TREATING RECOVERY %	gal/hr
400 EP	70.2	6.035	98.0	5.914
400-550	17.2	1.479	91.4	1.352
550 +	12.6	1.083	114.6	1.241

	RECOVERY %	#/hr	gal/hr
PROPYLENE	34.4	3.17	
C_3 POLY GASO.	87.5	2.77	0.463
C_3 POLY TAR	12.5	0.40	0.053

	#/gal	#/hr	gal/hr	RVP
C_4H_8	5.00	0.59	0.118	68.0
C_4 POLY GASO.	5.98	6.75	1.128	1.5
C_4H_{10}	4.86	2.85	0.586	68.0
C_4-FREE GASO.			7.444	5.8
C_4 POLY TAR	7.53	0.96	0.127	

	gal/hr	gal/MCF	Bbl/Day
10 # RVP 400 EP GASOLINE	9.276	0.8523	4621
GAS OIL	1.352	0.1242	673
FUEL OIL	1.241	0.1140	618
POLY TAR	0.180	0.0165	89
TOTAL	12.049	1.1070	6001
W. S. CHEM.	0.985	0.0905	491
TOTAL	13.034	1.1975	6492

Form ML-11 K shift = 8.87 **Included in Reactor Effluent Total g/NCM = 16.91 × #/MCF *9188 MCFH H_2 + CO, Bbl/Day = 5421.6 × gal/MCF

OPERATING CONDITIONS

PRESSURES PSIG		RATES S.C.F.H.	
Oxygen	427	Fresh Feed	11,222
Natural Gas	426	Recycle	17,038
Generator Outlet	413	Combined Feed	28,260
Reactor Inlet	406	Wet Gas—Measured	4,249
Condenser Inlet		Adjusted	4,559
Product Accumulator	367	Loss	310
TEMPERATURES—°F.		Recycle/Fresh Feed	1.52
Oxygen	477	Inlet Velocity—ft./sec.	0.89
Natural Gas	797	Fresh Feed Rate—S.C.F.H. H_2 + CO	10883
Generator	2514	per Cu. Ft. Dense Bed	1221
Quench Accumulator	121	per Lb. Catalyst	7.36
Reactor Inlet	502	per Sq. Ft.	16489
Condenser Inlet	590		
Product Accumulator	83	Heat Transfer Calculations	
Catalyst No. Height		Steam Rate = 279 #/hr.	
1 See Period A	661	@696 psia & 513°F	
2	657	= 1200 Btu/#	
3	654	Water in @71°F = 39 Btu/#	
4	651	Net Btu/# steam = 1161 Btu	
5	658	(1161)(279) = 323,919 Btu/hr.	
6	655	Ave. Bed Temp. = 655°F	
7	651	dT = 655-513 = 142°F	
8	669	Tube Area = 24.4 ft.²	
9	672	$K = \frac{323,919}{(24.4)(142)}$	
10	664	= 93.4 Btu/°F/ft.²	
11	640		

PRODUCT TESTS

	OIL	WATER
°API	50.8	10.1
Neut. No.	37.2	45.3
Sap. No.	46.5	46.9
Hydrox. No.		
Bromine No.	83	
Pour °F.		
Chemicals, % by K_2CO_3		9.2
HEMPEL. DIST. %		°API
205 °F.		
400	69.2	55.8
400-550	17.2	38.8
550+	13.6	
A. S. T. M. DIST. ON Naphtha °F.		
IBP	101	
10%	145	
50%	249	
90%	375	
EP	408	
Rec.	95.0	

CATALYST DATA

INVENTORY DATA	
In Reactor at Start of Period	
Fresh Catalyst Added	181
Total	
Catalyst Recovered	49.5
In Reactor at End of Period	
REACTOR d-p, Inches H_2O No. Height	
0 See Period A	55
1	78
2	85
3	88
4	125
Total	431
CALCULATED FROM dp	
Density, Lbs./Cu.Ft.	166
Inventory, Lbs.	1479
Bed Depth, Ft.	13.50
Vol., Cu. Ft.	8.91

PARTICLE SIZE

Screen Analysis Mesh	Microns	%	Sedimentation Microns	%
On 40	419+		80+	
100	150		40—80	
150	105		20—40	
200	74		10—20	
250	62		0—20	
325	44			
<325				

CATALYST	
Bulk Density, Lbs./Cu.Ft.	
Aerated	
Settled	
Compacted	
Particle Density, gm./cc.	
NH_3 Value, ml./gm.	
N_2 Surface, m²/gm.	
CHEMICAL ANALYSIS	
Fe	
C	
O	
H	
K_2O, W+, % basis Fe	
X-Ray Analysis—	
$Fe_{20}C_9$	
Fe_3O_4	
Fe	

GAS ANALYSES / GENERATOR BALANCE

HOUR	1400	2200	0600	AVERAGE	M/HR	C	H	O
FRESH FEED								
CO 28.010	38.02	37.62	37.67	37.770	11.169	11.169		11.169
H_2 2.016	58.82	59.34	59.47	59.211	17.508		35.016	
CO_2 44.010	2.09	2.21	2.19	2.163	0.640	0.640		1.280
N_2 28.016	0.19	0.17	0.16	0.173	0.051			
CH_4 16.042	0.88	0.66	0.51	0.683	0.202	0.202	0.808	
			M. W.	12.88304				
			H_2O 18.016				6.114	3.057
						12.011	41.938	15.506
			BALANCE			99.12	97.99	102.85

	Mol %	M/Hr	C	H	O
O_2 32.000	0.19	7.375 0.018			14.786
CO_2 44.010	1.49	0.145	0.145		0.290
N_2 28.016	1.33	0.129			
CH_4 16.042	82.14	7.983	7.983	31.932	
C_2H_6 30.068	6.63	0.644	1.288	3.864	
C_3H_8 44.094	5.77	0.561	1.683	4.488	
C_4H_{10} 58.120	1.76	0.171	0.684	1.710	
C_5H_{12} 72.146	0.69	0.067	0.335	0.804	
MW =	20.32451				
TOTAL			12.118	42.798	15.076

WEIGHT BALANCE

	#/hr Measured	At Wt. Balance
WET GAS	220.62	236.74
OIL	55.26	55.26
WATER	88.95	88.95
TOTAL	364.83	380.95
FRESH FEED	380.95	
WEIGHT BALANCE	95.77	
WET GAS FACTOR	1073066	
INDICATED LOSS—S C F H	310	

WET GAS	1400	2200	0600	AVERAGE
CO 28.010	14.25	15.42	16.34	15.337
H_2 2.016	47.18	46.83	47.53	47.180
CO_2 44.010	22.38	23.32	22.69	22.796
N_2 28.016	1.62	1.55	1.46	1.543
CH_4 16.042	7.67	6.51	5.85	6.677
C_2H_4 28.052	1.18	1.19	1.49	1.287
C_2H_6 30.068	0.48	0.76	0.65	0.630
C_3H_6 42.078	2.42	1.57	1.49	1.827
C_3H_8 44.094	0.67	0.27	0.31	0.417
C_4H_8 56.104	1.35	1.25	1.10	1.233
C_4H_{10} 58.120	0.40	0.57	0.26	0.410
C_5H_{10} 70.130	0.27	0.57	0.52	0.453
C_5H_{12} 72.146	-	-	0.13	0.043
C_6H_{12} 84.156	0.13	0.19	0.18	0.167
			M. W.	19.70537

GAS FLOW RATES

	√R	PRESSURE	TEMP.	M. W.	S. C. F. H.	M/HR
FRESH FEED 50.54	7.358	405.6 20.501	79.2 0.9820	2247140 1.4990	11,222	29.570
WET GAS 115.14	7.633	1.65 4.044	74.6 0.9863	1469142 1.2121	4,249	11.196
RECYCLE 79.31	8.529	408.6 20.574	116.5 0.9497	1.2121	16,020	42.213
BLEED 5.02	8.133	20.574	1.0000	1.2121	1,018	2.682
NATURAL GAS 19.79	8.329	426.1 20.995	192.3 0.8929	1424388 1.1935	3,688	9.718
OXYGEN 18.82	7.213	426.9 21.014	80.2 0.9811		2,799	7.375
STEAM 215.7	3.975	39.1 0.3251		279#/hr.		

LIQUID PRODUCT RATES

HOUR	GAGE	GAL.	°F	FACTOR	GAL. AT 60	API° #/GAL.	#	#/HR GAL HR
OIL	6'5½"	342.76	66	0.9970	341.73	50.8 6.462	2208.26	
	2'7¼"	139.26	62	0.9990	139.12	49.4 6.512	905.95	
					+3.71		+24.00	55.26
					206.32		1326.31	8.597
WATER	7'6"	397.32	69	0.99907	396.95	10.1 8.322	3303.42	
	6'7½"	351.49	70	0.99896	351.12	9.9 8.334	2926.23	
	4'3½"	229.28	75	0.99832	228.89	10.1	1904.82	
	0'4"	17.70	72	0.99872	-17.68	8.322	147.13	88.95
					257.04		8134.88	10.710

THE TEXAS COMPANY — MONTEBELLO LABORATORY
YIELD CALCULATIONS

RUN NO. 60-F
HOURS 112-136
CATALYST AGE

	FRESH FEED %	FRESH FEED m/hr	FRESH FEED #/hr	WET GAS %	WET GAS At Wt. Balance m/hr	WET GAS At Wt. Balance #/hr	RECYCLE m/hr	COMBINED FEED m/hr	EFFLUENT m/hr	NET CHANGE m/hr	NET CHANGE #/hr	CONDENSATE #/MCF	CONDENSATE #/gal	CONDENSATE gal/hr	CONDENSATE gal/MCF
CO 28.010	37.963	11.218	314.21	15.897	1.930	54.06	7.109	18.327	9.039	-9.288	-260.15				
H_2 2.016	59.237	17.504	35.29	47.284	5.740	11.57	21.144	38.648	26.884	-11.764	-23.72				
CO_2 44.010	1.957	0.578	25.44	22.863	2.775	122.13	10.224	10.802	12.999	2.197	96.69	8.871			
N_2 28.016	0.240	0.071	1.99	1.363	0.165	4.62	0.610	0.681	0.775						
CH_4 16.042	0.603	0.178	2.86	6.333	0.769	12.34	2.832	3.010	3.601	0.591	9.48	0.870			
C_2H_4 28.052				1.433	0.174	4.88	0.641	0.641	0.815	0.174	4.88	0.448			
C_2H_6 30.068				0.703	0.085	2.56	0.314	0.314	0.399	0.085	2.56	0.235			
C_1+C_2											16.92	1.553			
C_3H_6 42.078				1.627	0.198	8.33	0.728	0.728	0.926	0.198	8.33	0.764	4.32	1.928	0.177
C_3H_8 44.094				0.287	0.035	1.54	0.128	0.128	0.163	0.035	1.54	0.141	4.24	0.363	0.033
C_4H_8 56.104				1.097	0.133	7.46	0.491	0.491	0.624	0.133	7.46	0.684	5.00	1.492	0.137
C_4H_{10} 58.120				0.373	0.045	2.62	0.167	0.167	0.212	0.045	2.62	0.240	4.86	0.539	0.049
C_5H_{10} 70.130				0.533	0.065	4.56	0.238	0.238	0.303	0.065	4.56	0.418	5.45	0.837	0.077
C_5H_{12} 72.146													5.25		
C_6H_{12} 84.156				0.207	0.025	2.10	0.093	0.093	0.118	0.025	2.10	0.193	5.54	0.379	0.035
C_3-C_6											26.61	2.440		5.538	0.508
TOTAL		29.549	379.79		12.139	238.77	44.719	74.268	61.786						
H_2+CO	97.200	28.722	10900.008 SCFH	7.670			28.253	56.975	35.923	-21.052					
H_2/CO		1.56	Factor. 917430	2.97			2.97	2.11	2.97	1.27					

YIELD BASIS H_2+CO FED — YIELDS BASIS BROWNSVILLE DESIGN FEED RATE*

	CORRECTED HEMPEL, %	gal/hr	TREATING RECOVERY, %	gal/hr
400 EP	73.4	6.071	98.0	5.950
400-550	15.6	1.290	91.4	1.179
550 +	11.0	0.910	114.6	1.043

	RECOVERY %	#/hr	gal/hr
PROPYLENE	34.1	2.84	
C_3 POLY GASO.	87.5	2.48	0.415
C_3 POLY TAR	12.5	0.36	0.048

	#/gal	#/hr	gal/hr	RVP
C_4H_8	5.00	0.77	0.154	68.0
C_4 POLY GASO.	5.98	5.85	0.979	1.5
C_4H_{10}	4.86	2.62	0.539	68.0
C_4-FREE GASO.			7.581	5.8
C_4 POLY TAR	7.53	0.84	0.112	

	gal/hr	gal/MCF	Bbl/Day
10 # RVP 400 EP GASOLINE	9.253	0.8489	4602
GAS OIL	1.179	0.1082	587
FUEL OIL	1.043	0.0957	519
POLY TAR	0.160	0.0147	80
TOTAL	11.635	1.0675	5788
W. S. CHEM.	0.997	0.0915	496
TOTAL	12.632	1.1590	6284

	NET CHANGE m/hr	NET CHANGE #/hr	#/MCF	#/gal	gal/hr	gal/MCF
RECOVERED OIL	0.383**	53.76	4.932		8.271	0.759
TOTAL OIL		80.37	7.372		13.809	1.267
WATER SOLUBLE CHEMICALS	0.153**	8.12	0.745		0.997	0.091
TOTAL LIQUID PRODUCTS C_3+		68.49	8.117		14.806	1.358
NET WATER	4.392**	79.12	7.259		9.498	0.872
GROSS WATER		87.24	8.004		10.495	0.963
HYDROCARBON TOTAL—C_1+		105.41	9.670			

OPERATING DATA — V/hr/V = 1225

Pressure, psig	406	Inlet Velocity, Ft/sec	0.89	Catalyst	Fresh CM&S
Temperature, °F	654	Bed Depth, Ft	13.48	Weight, #	1441
Recycle Ratio	1.51	Bed Density, #/CF	162	Volume, Cu ft	8.90

FRESH FEED CONVERSION — % Contraction	CO	H_2	H_2+CO	TOTAL FEED CONVERSION — % CO	H_2	CO+H_2	SELECTIVITY C_3+/C_1+
58.92	83.80	67.21	73.30	50.68	30.44	36.95	83.95

Form ML-11 K shift = 8.80 **Included in Reactor Effluent Total

g/NCM = 16.91 × #/MCF *9188 MCFH H_2 + CO, Bbl/Day = 5421.6 × gal/MCF

OPERATING CONDITIONS

PRESSURES PSIG		RATES S.C.F.H.	
Oxygen	426	Fresh Feed	11,214
Natural Gas	425	Recycle	16,971
Generator Outlet	412	Combined Feed	28,185
Reactor Inlet	406	Wet Gas—Measured	4,359
Condenser Inlet		Adjusted	4,607
Product Accumulator	366	Loss	248
TEMPERATURES—°F.		Recycle/Fresh Feed	1.51
Oxygen	493	Inlet Velocity—ft./sec.	0.89
Natural Gas	799	Fresh Feed Rate—S.C.F.H. H_2 + CO	10900
Generator	2507	per Cu. Ft. Dense Bed	1225
Quench Accumulator	124	per Lb. Catalyst	7.56
Reactor Inlet	489	per Sq. Ft.	16515
Condenser Inlet	580		
Product Accumulator	84	Heat Transfer Calculations	
Catalyst No. Height		Steam Rate = 275 #/hr.	
1 See Period A	655	@ 696 psia & 513°F =	
2	655	= 1200 Btu/#	
3	655	Water in @ 77°F = 45 Btu/#	
4	650	Net Btu/# steam = 1155 Btu	
5	656	(1155)(275) = 317,625 Btu/hr.	
6	655	Ave. Bed Temp. = 654°F	
7	634	dT = 654-513 = 141°F	
8	648	Tube Area = 24.4 ft.^{2}	
9	654	$K = \frac{317,625}{(141)(24.4)}$ =	
10	644	= 92.3 Btu/°F/ft.^{2}	
11	616		

PRODUCT TESTS

	OIL	WATER
°API	50.4	10.2
Neut. No.	36.2	43.5
Sap. No.	48.7	45.6
Hydrox. No.		
Bromine No.	89	
Pour °F.		
Chemicals, % by K_2CO_3		9.5
HEMPEL DIST. %		°API
205 °F.		
400	72.4	55.5
400-550	15.6	39.3
550+	12.0	
A. S. T. M. DIST. ON		
Naphtha °F.		
IBP	104	
10%	144	
50%	247	
90%	360	
EP	416	
Rec.	96.5	

CATALYST DATA

INVENTORY DATA	
In Reactor at Start of Period	
Fresh Catalyst Added	
Total	
Catalyst Recovered	14
In Reactor at End of Period	
REACTOR d-p, Inches H_2O No. Height	
0 See Period A	54
1	77
2	83
3	86
4	120
Total	420
CALCULATED FROM dp	
Density, Lbs./Cu.Ft.	162
Inventory, Lbs.	1441
Bed Depth, Ft.	13.48
Vol., Cu. Ft.	8.90

PARTICLE SIZE

Screen Analysis Mesh	Microns	%	Sedimentation Microns	%
On 40	419+		80+	
100	150		40—80	
150	105		20—40	
200	74		10—20	
250	62		0—20	
325	44			
<325				

CATALYST
- Bulk Density, Lbs./Cu.Ft.
- Aerated
- Settled
- Compacted
- Particle Density, gm./cc.
- NH_3 Value, ml./gm.
- N_2 Surface, m²/gm.

CHEMICAL ANALYSIS
- Fe
- C
- O
- H
- K_2O, Wt. % basis Fe
- X-Ray Analysis—
- $Fe_{20}C_9$
- Fe_3O_4
- Fe

GAS ANALYSES / GENERATOR BALANCE

HOUR	1400	2200	0600	AVERAGE	M/HR	C	H	O		Mol %	M/Hr	C	H	O
FRESH FEED									O_2 32.000	0.18	7.433 0.017			14.900
CO 28.010	37.80	37.73	38.36	37.963	11.218	11.218		11.218	CO_2 44.010	1.29	0.125	0.125		0.250
H_2 2.016	59.07	59.79	58.85	59.237	17.504		35.008		N_2 28.016	1.32	0.127			
CO_2 44.010	1.91	1.76	2.20	1.957	0.578	0.578		1.156	CH_4 16.042	81.42	7.863	7.863	31.452	
N_2 28.016	0.11	0.33	0.28	0.240	0.071				C_2H_6 30.068	6.69	0.646	1.292	3.876	
CH_4 16.042	1.11	0.39	0.31	0.603	0.178	0.178	0.712		C_3H_8 44.094	6.25	0.604	1.812	4.832	
			M. W	12.852902					C_4H_{10} 58.120	1.90	0.183	0.732	1.830	
			H_2O 18.016				6.463	3.232	C_5H_{12} 72.146	0.95	0.092	0.460	1.104	
						11.974	42.183	15.606	MW = 20.613628					
			BALANCE			97.48	97.89	103.01	TOTAL			12.284	43.094	15.150

WEIGHT BALANCE

	#/hr Measured	At Wt. Balance
WET GAS	225.94	238.79
OIL	53.76	53.76
WATER	87.24	87.24
TOTAL	366.94	379.79
FRESH FEED	379.79	
WEIGHT BALANCE	96.62	
WET GAS FACTOR	1056873	
INDICATED LOSS—S C F H	248	

WET GAS

	1400	2200	0600	AVERAGE
CO 28.010	16.08	16.18	15.43	15.897
H_2 2.016	47.11	47.02	47.72	47.284
CO_2 44.010	22.30	23.09	23.20	22.863
N_2 28.016	1.29	1.33	1.47	1.363
CH_4 16.042	7.11	6.07	5.82	6.333
C_2H_4 28.052	1.42	1.41	1.47	1.433
C_2H_6 30.068	0.63	0.73	0.75	0.703
C_3H_6 42.078	1.65	1.65	1.58	1.627
C_3H_8 44.094	0.31	0.30	0.25	0.287
C_4H_8 56.104	1.08	1.19	1.02	1.097
C_4H_{10} 58.120	0.29	0.35	0.48	0.373
C_5H_{10} 70.130	0.52	0.54	0.54	0.533
C_5H_{12} 72.146				-
C_6H_{12} 84.156	0.21	0.14	0.27	0.207
			M. W.	19.670566

GAS FLOW RATES

		$\sqrt{h}$	PRESSURE	TEMP.	M. W.	S. C. F. H.	M/HR
FRESH FEED	50.54	7.358	405.5 / 20.499	81.2 / 0.9802	2252409 / 1.5008	11,214	29.549
WET GAS	115.14	7.871	1.51 / 4.026	76.2 / 0.9848	1471742 / 1.2132	4,359	11.486
RECYCLE	79.31	8.508	407.3 / 20.543	121.1 / 0.9460	1.2132	15,909	41.921
BLEED	5.02	8.492	20.543	1.0000	1.2132	1,062	2.798
NATURAL GAS	19.79	8.338	425.2 / 20.974	191.3 / 0.8936	1404410 / 1.1851	3,665	9.657
OXYGEN	18.82	7.292	426.3 / 21.000	82.8 / 0.9788		2,821	7.433
STEAM	215.7	3.992	37.4 / 0.3191		275#/hr.		

LIQUID PRODUCT RATES

HOUR	GAGE	GAL.	°F	FACTOR	GAL. AT 60	API° #/GAL.	#	#/HR GAL HR
OIL	7'2¼"	380.96	68	0.9961	379.47	50.4 6.476	2457.45	
	6'5½"	342.76	66	0.9970	341.73	50.8 6.462	2208.26	
	3'6¼"	188.91	65	0.9975	188.44	50.4	1220.34	
	0'7"	30.98	72	0.9941	30.80	6.476	199.46	
					+3.13		+20.25	53.76
					198.51		1290.32	8.271
WATER	7'5½"	395.14	82	0.99726	394.06	10.2 8.317	3277.40	
	4'3½"	229.28	75	0.99832	228.89	10.1 8.322	1904.82	
	2'11½"	158.84	71	0.99883	158.65	10.2	1319.49	
	1'7"	82.59	76	0.99819	82.44	8.317	685.65	87.24
					241.38		2006.42	10.495

THE TEXAS COMPANY — MONTEBELLO LABORATORY
YIELD CALCULATIONS

RUN NO. 60-G
HOURS 136-160
CATALYST AGE

	FRESH FEED %	FRESH FEED m/hr	FRESH FEED #/hr	WET GAS %	WET GAS At Wt. Balance m/hr	WET GAS At Wt. Balance #/hr	RECYCLE m/hr	COMBINED FEED m/hr	EFFLUENT m/hr	NET CHANGE m/hr	NET CHANGE #/hr	CONDENSATE #/MCF	CONDENSATE #/gal	CONDENSATE gal/hr	CONDENSATE gal/MCF
CO 28.010	37.593	11.074	310.18	15.646	1.891	52.97	6.944	18.018	8.835	-9.183	-257.21				
H_2 2.016	59.527	17.535	35.35	46.883	5.666	11.42	20.809	38.344	26.475	-11.869	-23.93				
CO_2 44.010	2.057	0.606	26.67	23.420	2.831	124.58	10.395	11.001	13.226	2.225	97.91	9.018			
N_2 28.016	0.263	0.077	2.16	1.293	0.156	4.37	0.574	0.651	0.730						
CH_4 16.042	0.560	0.165	2.65	6.103	0.738	11.84	2.709	2.874	3.447	0.573	9.19	0.846			
C_2H_4 28.052				1.440	0.174	4.88	0.639	0.639	0.813	0.174	4.88	0.450			
C_2H_6 30.068				0.657	0.079	2.38	0.292	0.292	0.371	0.079	2.38	0.219			
C_1+C_2											16.45	1.515			
C_3H_6 42.078				1.827	0.221	9.30	0.811	0.811	1.032	0.221	9.30	0.857	4.32	2.153	0.198
C_3H_8 44.094				0.290	0.035	1.54	0.129	0.129	0.164	0.035	1.54	0.142	4.24	0.363	0.033
C_4H_8 56.104				1.337	0.162	9.09	0.593	0.593	0.755	0.162	9.09	0.837	5.00	1.818	0.167
C_4H_{10} 58.120				0.373	0.045	2.62	0.166	0.166	0.211	0.045	2.62	0.241	4.86	0.539	0.050
C_5H_{10} 70.130				0.557	0.067	4.70	0.247	0.247	0.314	0.067	4.70	0.433	5.45	0.862	0.079
C_5H_{12} 72.146				0.027	0.003	0.22	0.012	0.012	0.015	0.003	0.22	0.020	5.25	0.042	0.004
C_6H_{12} 84.156				0.147	0.018	1.51	0.065	0.065	0.083	0.018	1.51	0.139	5.54	0.273	0.025
C_3-C_6											28.98	2.669		6.050	0.556
TOTAL		29.457	377.01		12.086	241.42	44.385	73.842	61.353						
H_2+CO	97.120	28.609	10857.0448 SCFH	7.557			27.753	56.362	35.310	-21.052					
H_2/CO		1.58	Factor. 921060	3.00			3.00	2.13	3.00	1.29					

OPERATING DATA V/hr/V = 1219

Pressure, psig	403	Inlet Velocity, Ft/sec	0.89	Catalyst	Fresh CM&S
Temperature, °F	652	Bed Depth, Ft	13.50	Weight, #	1390
Recycle Ratio	1.51	Bed Density, #/CF	156	Volume, Cu ft	8.91

FRESH FEED CONVERSION — % Contraction	CO	H_2	H_2+CO	TOTAL FEED CONVERSION — % CO	H_2	$CO+H_2$	SELECTIVITY C_3+/C_1+
58.97	82.92	67.69	73.58	50.97	30.95	37.35	83.88

	NET CHANGE m/hr	NET CHANGE #/hr	#/MCF	#/gal	gal/hr	gal/MCF
RECOVERED OIL	0.345**	48.40	4.458		7.481	0.669
TOTAL OIL		77.38	7.127		13.531	1.245
WATER SOLUBLE CHEMICALS	0.155**	8.24	0.759		0.995	0.092
TOTAL LIQUID PRODUCTS C_3+		85.62	7.886		14.526	1.337
NET WATER	4.382**	78.95	7.272		9.478	0.873
GROSS WATER		87.19	8.031		10.473	0.965
HYDROCARBON TOTAL—C_1+		102.07	9.401			

YIELD BASIS H_2+CO FED — YIELDS BASIS BROWNSVILLE DESIGN FEED RATE*

	CORRECTED HEMPEL, %	gal/hr	TREATING RECOVERY, %	gal/hr
400 EP	71.5	5.349	98.0	5.242
400-550	17.0	1.272	91.4	1.163
550 +	11.5	0.860	114.6	0.986

	RECOVERY %	#/hr	gal/hr
PROPYLENE	34.2	3.18	
C_3 POLY GASO.	87.5	2.78	0.465
C_3 POLY TAR	12.5	0.40	0.053

	#/gal	#/hr	gal/hr	RVP
C_4H_8	5.00	0.70	0.140	68.0
C_4 POLY GASO.	5.98	7.34	1.228	1.5
C_4H_{10}	4.86	2.62	0.539	68.0
C_4-FREE GASO.			6.884	5.8
C_4 POLY TAR	7.53	1.05	0.139	

	gal/hr	gal/MCF	Bbl/Day
10 # RVP 400 EP GASOLINE	8.791	0.8097	4390
GAS OIL	1.163	0.1071	581
FUEL OIL	0.986	0.0908	492
POLY TAR	0.192	0.0177	96
TOTAL	11.132	1.0253	5559
W. S. CHEM.	0.995	0.0916	497
TOTAL	12.127	1.1169	6056

Form ML-11 K shift = 9.04 **Included in Reactor Effluent Total g/NCM = 16.91 × #/MCF *9188 MCFH H_2+CO, Bbl/Day = 5421.6 × gal/MCF

DATA SUMMARY

OPERATING CONDITIONS

PRESSURES PSIG		RATES S.C.F.H.	
Oxygen	425	Fresh Feed	11,179
Natural Gas	424	Recycle	16,844
Generator Outlet	412	Combined Feed	28,023
Reactor Inlet	403	Wet Gas—Measured	4,379
Condenser Inlet		Adjusted	4,587
Product Accumulator	364	Loss	208
TEMPERATURES—°F.		Recycle/Fresh Feed	1.51
Oxygen	510	Inlet Velocity—ft./sec.	0.89
Natural Gas	795	Fresh Feed Rate—S.C.F.H.	10857
Generator	2507	per Cu. Ft. Dense Bed	1219
Quench Accumulator	127	per Lb. Catalyst	7.81
Reactor Inlet	489	per Sq. Ft.	16450
Condenser Inlet	590		
Product Accumulator	84	Heat Transfer Calculations	
Catalyst No. Height		Steam Rate = 263 #/hr.	
1 See Period A	631	@696 psia & 513°F =	
2	652	1200 Btu/#	
3	651	Water in @74°F = 42Btu/#	
4	649	Net Btu/# steam = 1158 Btu	
5	654	1158 X 263 = 304,554 Btu/hr	
6	653	Ave. Bed Temp. = 652°F	
7	633	dT = 652-513 = 139°F	
8	650	Tube Area = 24.4 sq. ft.	
9	660	$K = \frac{304,554}{(24.4)(139)} =$	
10	657	89.8 Btu/°F/sq. ft.	
11	639		

PRODUCT TESTS

	OIL	WATER
°API	50.5	10.1
Neut. No.	39.1	44.4
Sap. No.	46.8	46.2
Hydrox. No.		
Bromine No.	89	
Pour °F.		
Chemicals, % by K_2CO_3		9.5
HEMPEL. DIST. %		
205 °F.		°API
400	70.5	54.2
400-550	17.0	39.1
550+	12.5	
A. S. T. M. DIST. ON		
Naphtha °F.		
IBP	104	
10%	142	
50%	240	
90%	352	
EP	410	
Rec.	97.0	

CATALYST DATA

INVENTORY DATA	
In Reactor at Start of Period	
Fresh Catalyst Added	
Total	
Catalyst Recovered	31.5
In Reactor at End of Period	
REACTOR d-p, Inches H_2O	
No. Height	
0 See Period A	53
1	75
2	80
3	82
4	115
Total	405
CALCULATED FROM dp	
Density, Lbs./Cu.Ft.	156
Inventory, Lbs.	1390
Bed Depth, Ft.	13.50
Vol., Cu. Ft.	8.91

PARTICLE SIZE

Screen Analysis Mesh	Microns	%	Sedimentation Microns	%
On 40	419+		80+	
100	150		40—80	
150	105		20—40	
200	74		10—20	
250	62		0—20	
325	44			
<325				

CATALYST
Bulk Density, Lbs./Cu.Ft.
Aerated
Settled
Compacted
Particle Density, gm./cc.
NH_3 Value, ml./gm.
N_2 Surface, m^2/gm.

CHEMICAL ANALYSIS
Fe
C
O
H
K_2O, W+, % basis Fe
X-Ray Analysis—
$Fe_{20}C_9$
Fe_3O_4
Fe

GAS ANALYSES

HOUR	1400	2200	0600	AVERAGE
FRESH FEED				
CO 28.010	37.54	37.59	37.65	37.593
H_2 2.016	59.35	59.62	59.61	59.527
CO_2 44.010	2.00	2.11	2.06	2.057
N_2 28.016	0.22	0.27	0.30	0.263
CH_4 16.042	0.89	0.41	0.38	0.560
			M. W	12.798667
WET GAS				
CO 28.010	15.28	15.54	16.12	15.646
H_2 2.016	46.92	46.19	47.54	46.883
CO_2 44.010	23.07	24.17	23.02	23.420
N_2 28.016	1.09	1.53	1.26	1.293
CH_4 16.042	6.94	5.97	5.40	6.103
C_2H_4 28.052	1.38	1.39	1.55	1.440
C_2H_6 30.068	0.61	0.66	0.70	0.657
C_3H_6 42.078	1.85	1.84	1.79	1.827
C_3H_8 44.094	0.26	0.26	0.35	0.290
C_4H_8 56.104	1.46	1.29	1.26	1.337
C_4H_{10} 58.120	0.40	0.45	0.27	0.373
C_5H_{10} 70.130	0.61	0.53	0.53	0.557
C_5H_{12} 72.146	-	-	0.08	0.027
C_6H_{12} 84.156	0.13	0.18	0.15	0.147
			M. W.	19.97488

GENERATOR BALANCE

	M/HR	C	H	O
CO	11.074	11.074		11.074
H_2	17.535		35.070	
CO_2	0.606	0.606		1.212
N_2	0.077			
CH_4	0.165	0.165	0.660	
H_2O 18.016			6.501	3.251
		11.845	42.231	15.537
BALANCE		96.54	98.10	102.70

	Mol %	M/Hr	C	H	O
O_2 32.000	0.18	7.423 0.017			14.880
CO_2 44.010	1.29	0.124	0.124		0.248
N_2 28.016	1.32	0.127			
CH_4 16.042	81.42	7.855	7.855	31.420	
C_2H_6 30.068	6.69	0.645	1.290	3.870	
C_3H_8 44.094	6.25	0.603	1.809	4.824	
C_4H_{10} 58.120	1.90	0.183	0.732	1.830	
C_5H_{12} 72.146	0.95	0.092	0.460	1.104	
MW =	20.613628				
TOTAL			12.270	43.048	15.128

WEIGHT BALANCE

	#/hr Measured	At Wt. Balance
WET GAS	230.49	241.42
OIL	48.40	48.40
WATER	87.19	87.19
TOTAL	366.08	377.01
FRESH FEED	377.01	
WEIGHT BALANCE	97.10	
WET GAS FACTOR	104742	
INDICATED LOSS—S C F H	208	

GAS FLOW RATES

		√H	PRESSURE	TEMP.	M. W.	S. C. F. H.	M/HR
FRESH FEED	50.54	7.338	403.3 20.445	81.1 0.9803	2261954 1.5040	11,179	29.457
WET GAS	115.14	7.896	1.74 4.055	74.1 0.9867	144932 1.2039	4,379	11,539
RECYCLE	79.31	8.500	405.7 20.504	124.5 0.9432	1.2039	15,696	41.360
BLEED	5.02	9.263	20.504	1.0000	1.2039	1,148	3.025
NATURAL GAS	19.79	8.354	423.7 20.938	193.1 0.8924	1404410 1.1851	3,661	9.647
OXYGEN	18.82	7.288	425.4 20.978	82.5 0.9790		2,817	7.423
STEAM	215.7	3.829	37.3 0.3188		263#/hr.		

LIQUID PRODUCT RATES

HOUR	GAGE	GAL.	°F	FACTOR	GAL. AT 60	API° #/GAL.	#	#HR GAL HR
OIL	6'11"	366.77	66	0.9970	365.67	50.5 6.473	2366.98	
	3'6¼"	188.91	65	0.9975	188.44	50.4 6.476	1220.34	
					+2.32		+15.00	48.40
					179.55		1161.64	7.481
WATER	7'6"	397.32	74	0.99846	396.71	10.1 8.322	3301.42	
	2'11½"	158.84	71	0.99883	158.65	10.2 8.317	1319.49	
	0'6½"	28.77	64	0.99963	28.76	10.1	239.34	
	0'13½"	15.49	66	0.99942	15.48	8.322	128.82	87.19
					251.34		2092.45	10.473

RUN NO. 61-0 (A-D)
HOURS 0-89
CATALYST Fresh CM&S

THE TEXAS COMPANY — MONTEBELLO LABORATORY
YIELD CALCULATIONS

	FRESH FEED %	FRESH FEED m/hr	FRESH FEED #/hr	WET GAS %	WET GAS At Wt. Balance m/hr	WET GAS At Wt. Balance #/hr	RECYCLE m/hr	COMBINED FEED m/hr	EFFLUENT m/hr	NET CHANGE m/hr	NET CHANGE #/hr	CONDENSATE #/MCF	CONDENSATE #/gal	CONDENSATE gal/hr	CONDENSATE gal/MCF
CO 28.010		11.315						13.300		-10.955	-306.85				
H_2 2.016		18.075						28.995		-16.108	-32.47				
CO_2 44.010										1.960	86.26	7.734			
N_2 28.016															
CH_4 16.042										0.694	11.13	0.998			
C_2H_4 28.052										0.195	5.47	0.490			
C_3H_6 30.068										0.109	3.28	0.294			
C_1+C_2											19.88	1.782			
C_3H_6 42.078										0.234	9.85	0.883	4.32	2.280	0.204
C_3H_8 44.094										0.041	1.81	0.162	4.24	0.427	0.038
C_4H_8 56.104										0.171	9.59	0.860	5.00	1.918	0.172
C_4H_{10} 58.120										0.046	2.67	0.239	4.86	0.549	0.049
C_5H_{10} 70.130										0.069	4.84	0.434	5.45	0.888	0.080
C_5H_{12} 72.146										0.016	1.15	0.103	5.25	0.219	0.020
C_6H_{12} 84.156										0.021	1.77	0.159	5.54	0.319	0.029
C_5-C_6											31.68	2.840		6.600	0.592
TOTAL															
H_2+CO		29.390	11154 SCFH					42.295		-27.063					
H_2/CO			Factor 896539												
									RECOVERED OIL		73.71	6.608		11.327	1.016
									TOTAL OIL		105.39	9.449		17.927	1.607
									WATER SOLUBLE CHEMICALS		4.98 9.51	0.446 0.853		0.610 1.164	0.055 0.104
									TOTAL LIQUID PRODUCTS C_5+		119.88	10.748		19.701	1.766
									NET WATER		109.32	9.801		13.112	1.176
									GROSS WATER		123.81	11.100		14.886	1.335
									HYDROCARBON TOTAL—C_1+		139.76	12.530			

Weight Recovery, %	94.13	Catalyst Age, hrs. Ave.	45	Space Velocity, vhv	754
Pressure, psig	382	Inlet Velocity, Ft/sec	0.80	Catalyst Vol., CF	14.90
Temperature, °F	655	Bed Depth, Ft	22.6	Weight, #	1428
Recycle Ratio	1.27	Bed Density, #/CF	.96	Effluent $(H_2)(CO_2)$ / Shift Ratio $(H_2O)(CO)$	= 15.12

FRESH FEED CONVERSION — %				TOTAL FEED CONVERSION — %			SELECTIVITY
Contraction	CO	H_2	H_2+CO	CO	H_2	$CO+H_2$	C_3+/C_1+
77.45	96.82	89.12	92.08	82.37	55.55	63.99	85.78

YIELDS BASIS BROWNSVILLE DESIGN FEED RATE*	CORRECTED HEMPEL, %	gal/hr	TREATING RECOVERY,%	gal/hr
400 EP	68.7	7.782	98.0	7.626
400-550	17.3	1.960	91.4	1.791
550 +	14.0	1.585	114.6	1.816

	RECOVERY %	#/hr	gal/hr
PROPYLENE	61.6	6.068	
C_3 POLY GASO.	87.5	5.309	0.888
C_3 POLY TAR	12.5	0.759	0.101

	#/gal	#/hr	gal/hr	RVP
C_4H_8	5.00	1.70	0.340	68.0
C_4 POLY GASO.	5.98	6.90	1.154	1.5
C_4H_{10}	4.86	2.67	0.549	68.0
C_4-FREE GASO.			9.940	5.8
C_4 POLY TAR	7.53	0.99	0.131	

	gal/hr	gal/MCF	Bbl/Day
10 # RVP 400 EP GASOLINE	11.983	1.0743	5824
GAS OIL	1.791	0.1606	871
FUEL OIL	1.816	0.1628	883
POLY TAR	0.232	0.0208	113
TOTAL	15.822	1.4185	7691
W. S. CHEM.	0.610 1.164	0.0547 0.1044	297 566
TOTAL	17.596	1.5776	8553

Form ML—11 AI=(27.46)(1.0140)= 27.84

g/NCM = 16.91 × #/MCF *9488 MCFH H_2+CO, Bbl/Day = 5421.6 × gal/MCF

RUN NO. 61-1 (E-K)
HOURS 89-239
CATALYST Fresh CM&S

THE TEXAS COMPANY — MONTEBELLO LABORATORY
YIELD CALCULATIONS

	FRESH FEED %	FRESH FEED m/hr	FRESH FEED #/hr	WET GAS %	WET GAS At Wt. Balance m/hr	WET GAS At Wt. Balance #/hr	RECYCLE m/hr	COMBINED FEED m/hr	EFFLUENT m/hr	NET CHANGE m/hr	NET CHANGE #/hr	CONDENSATE #/MCF	CONDENSATE #/gal	CONDENSATE gal/hr	CONDENSATE gal/MCF
CO 28.010		11.226						14.965		-10.400	-291.30				
H_2 2.016		17.808						33.708		-14.363	-28.96				
CO_2 44.010										2.101	92.47	8.327			
N_2 28.016															
CH_4 16.042										0.689	11.05	0.995			
C_2H_4 28.052										0.203	5.69	0.512			
C_3H_6 30.068										0.125	3.76	0.339			
C_1+C_2											20.50	1.846			
C_3H_6 42.078										0.208	8.76	0.789	4.32	2.028	0.183
C_3H_8 44.094										0.041	1.81	0.163	4.24	0.427	0.038
C_4H_8 56.104										0.168	9.43	0.849	5.00	1.886	0.170
C_4H_{10} 58.120										0.053	3.08	0.277	4.86	0.634	0.057
C_5H_{10} 70.130										0.077	5.40	0.486	5.45	0.991	0.089
C_5H_{12} 72.146										0.018	1.30	0.117	5.25	0.248	0.022
C_6H_{12} 84.156										0.025	2.10	0.189	5.54	0.379	0.034
C_5-C_6											31.88	2.871		6.593	0.594
TOTAL															
H_2+CO		29.034	11105 SCFH					48.673		-24.763					
H_2/CO			Factor 900495												
									RECOVERED OIL		58.81	5.296		9.012	0.812
									TOTAL OIL		90.69	8.167		15.605	1.405
									WATER SOLUBLE CHEMICALS		4.81 9.86	0.433 0.888		0.602 1.234	0.054 0.111
									TOTAL LIQUID PRODUCTS C_5+		105.36	9.488		17.441	1.571
									NET WATER		98.70	8.888		11.825	1.065
									GROSS WATER		113.37	10.209		13.661	1.230
									HYDROCARBON TOTAL—C_1+		125.86	11.334			

Weight Recovery, %	96.45	Catalyst Age, hrs. Ave. =	164	Space Velocity, vhv	692
Pressure, psig	378	Inlet Velocity, Ft/sec	0.85	Catalyst Vol., CF=	15.96
Temperature, °F	669	Bed Depth, Ft	24.2	Weight, #	1251
Recycle Ratio	1.39	Bed Density, #/CF	79	Effluent $(H_2)(CO_2)$ / Shift Ratio $(H_2O)(CO)$	= 11.54

FRESH FEED CONVERSION — %				TOTAL FEED CONVERSION — %			SELECTIVITY
Contraction	CO	H_2	H_2+CO	CO	H_2	$CO+H_2$	C_3+/C_1+
70.29	92.64	80.65	85.29	69.50	42.61	50.88	83.71

YIELDS BASIS BROWNSVILLE DESIGN FEED RATE*	CORRECTED HEMPEL, %	gal/hr	TREATING RECOVERY,%	gal/hr
400 EP	72.8	6.561	98.0	6.430
400-550	18.6	1.676	91.4	1.532
550 +	8.6	0.775	114.6	0.888

	RECOVERY %	#/hr	gal/hr
PROPYLENE	49.23	4.313	
C_3 POLY GASO.	87.5	3.774	0.631
C_3 POLY TAR	12.5	0.539	0.072

	#/gal	#/hr	gal/hr	RVP
C_4H_8	5.00	0.89	0.178	68.0
C_4 POLY GASO.	5.98	7.47	1.250	1.5
C_4H_{10}	4.86	3.08	0.634	68.0
C_4-FREE GASO.			8.679	5.8
C_4 POLY TAR	7.53	1.07	0.142	

	gal/hr	gal/MCF	Bbl/Day
10 # RVP 400 EP GASOLINE	10.741	0.9672	5244
GAS OIL	1.532	0.1380	748
FUEL OIL	0.888	0.0800	434
POLY TAR	0.214	0.0193	105
TOTAL	13.375	1.2044	6530
W. S. CHEM.	0.602 1.234	0.0542 0.1111	294 602
TOTAL	15.211	1.3697	7426

Form ML—11 AI=(26.31)(0.8324)=21.90 Acids = (0.117)(36.20)=4.24% g/NCM = 16.91 × #/MCF *9488 MCFH H_2+CO, Bbl/Day = 5421.6 × gal/MCF

THE TEXAS COMPANY — MONTEBELLO LABORATORY
YIELD CALCULATIONS

RUN NO. 61-A
HOURS 0-17
CATALYST Fresh CM&S

	FRESH FEED %	FRESH FEED m/hr	FRESH FEED #/hr	WET GAS %	WET GAS At Wt. Balance m/hr	WET GAS At Wt. Balance #/hr	RECYCLE m/hr	COMBINED FEED m/hr	EFFLUENT m/hr	NET CHANGE m/hr	NET CHANGE #/hr	CONDENSATE #/MCF	CONDENSATE #/gal	CONDENSATE gal/hr	CONDENSATE gal/MCF
CO 28.010	37.533	11.226	314.44	4.520	0.297	8.32	1.695	12.921	1.992	-10.929	-306.12				
H_2 2.016	59.630	17.835	35.96	25.300	1.663	3.35	9.487	27.322	11.150	-16.172	-32.61				
CO_2 44.010	2.230	0.667	29.35	38.996	2.562	112.75	14.622	15.289	17.184	1.895	83.40	7.562			
N_2 28.016	0.197	0.059	1.65	4.007	0.263	7.37	1.503	1.562	1.766						
CH_4 16.042	0.410	0.123	1.97	13.977	0.918	14.73	5.241	5.364	6.159	0.795	12.76	1.157			
C_2H_4 28.052				2.960	0.194	5.44	1.110	1.110	1.304	0.194	5.44	0.493			
C_2H_6 30.068				1.557	0.102	3.07	0.584	0.584	0.686	0.102	3.07	0.278			
C_1+C_2											21.27	1.928			
C_3H_6 42.078				3.300	0.217	9.13	1.237	1.237	1.454	0.217	9.13	0.828	4.32	2.113	0.192
C_3H_8 44.094				0.600	0.039	1.72	0.225	0.225	0.264	0.039	1.72	0.156	4.24	0.406	0.037
C_4H_8 56.104				2.443	0.161	9.03	0.916	0.916	1.077	0.161	9.03	0.819	5.00	1.806	0.164
C_4H_{10} 58.120				0.683	0.045	2.62	0.256	0.256	0.301	0.045	2.62	0.238	4.86	0.539	0.049
C_5H_{10} 70.130				1.017	0.067	4.70	0.381	0.381	0.448	0.067	4.70	0.426	5.45	0.862	0.078
C_5H_{12} 72.146				0.310	0.020	1.44	0.116	0.116	0.136	0.020	1.44	0.131	5.25	0.274	0.025
C_6H_{12} 84.156				0.330	0.022	1.85	0.124	0.124	0.146	0.022	1.85	0.168	5.54	0.334	0.030
C_3-C_6											30.49	2.766		6.334	0.575
TOTAL		29.910	383.37		6.570	185.52	37.497	67.407	51.180						
H_2+CO	97.163	29.061	11028.972 SCFH		1.960		11.182	40.243	13.142	-27.101					
H_2/CO		1.59	Factor 906702		5.60		5.60	2.11	5.60	1.48					

Weight Recovery, %	89.34	Catalyst Age, hrs.	17	Space Velocity, vhv	858	RECOVERED OIL	0.528**	74.03	6.712		11.337	1.028	
Pressure, psig	413	Inlet Velocity, Ft/sec	0.80	Catalyst Vol., CF	12.86	TOTAL OIL		104.52	9.478		17.671	1.603	
Temperature, °F	665	Bed Depth, Ft	19.49	Weight, #	1338	WATER SOLUBLE CHEMICALS	0.148**	7.86	0.713		0.936	0.085	
Recycle Ratio	1.25	Bed Density, #/CF	104	Effluent Shift Ratio $\frac{(H_2)(CO_2)}{(H_2O)(CO)}$ =	14.9	TOTAL LIQUID PRODUCTS C_3+		112.38	10.191		18.607	1.688	
FRESH FEED CONVERSION — %				TOTAL FEED CONVERSION — %			SELECTIVITY	NET WATER	6.437**	115.96	10.514	13.921	1.262
Contraction	CO	H_2	H_2+CO	CO	H_2	CO+H_2	C_3+/C_1+	GROSS WATER		123.82	11.227	14.857	1.347
78.03	97.35	90.68	93.26	84.58	59.19	67.34	84.09	HYDROCARBON TOTAL—C_1+		133.65	12.119		

YIELD BASIS H_2 + CO FED

YIELDS BASIS BROWNSVILLE DESIGN FEED RATE*	CORRECTED HEMPEL, %	gal/hr	TREATING RECOVERY, %	gal/hr
400 EP	65.0	7.369	98.0	7.222
400-550	17.6	1.995	91.4	1.823
550 +	17.4	1.973	114.6	2.261
	RECOVERY %	#/hr	gal/hr	
PROPYLENE	62.5	5.71		
C_3 POLY GASO.	87.5	5.00	0.836	
C_3 POLY TAR	12.5	0.71	0.094	
	#/gal	#/hr	gal/hr	RVP
C_4H_8	5.00	1.56	0.312	68.0
C_4 POLY GASO.	5.98	6.54	1.093	1.5
C_4H_{10}	4.86	2.62	0.539	68.0
C_4-FREE GASO.			9.528	5.8
C_4 POLY TAR	7.53	0.93	0.124	
	gal/hr	gal/MCF	Bbl/Day	
10 # RVP 400 EP GASOLINE	11.472	1.0402	5640	
GAS OIL	1.823	0.1653	896	
FUEL OIL	2.261	0.2050	1111	
POLY TAR	0.218	0.0198	107	
TOTAL	15.774	1.4303	7754	
W. S. CHEM.	0.936	0.0849	460	
TOTAL	16.710	1.5152	8214	

Form ML—11

**Included in Reactor Effluent Total

g/NCM = 16.91 × #/MCF

*9488 MCFH H_2 + CO, Bbl/Day = 5421.6 × gal/MCF

GAS ANALYSES / GENERATOR BALANCE

HOUR	1400	2200	0600	AVERAGE	M/HR	C	H	O
FRESH FEED								
CO 28.010	37.68	37.49	37.43	37.533	11.226	11.226		11.226
H_2 2.016	59.31	59.65	59.93	59.630	17.835		35.670	
CO_2 44.010	2.14	2.25	2.30	2.230	0.667	0.667		1.334
N_2 28.016	0.17	0.27	0.15	0.197	0.059			
CH_4 16.042	0.70	0.34	0.19	0.410	0.123	0.123	0.492	
			M. W	12.81752				
			H_2O 18.016				6.506	3.253
						12.016	42.668	15.813
			BALANCE			97.64	97.82	103.10

	Mol %	M/Hr	C	H	O
O_2 32.000	0.22	7.536 0.022			15.116
CO_2 44.010	1.12	0.111	0.111		0.222
N_2 28.016	1.39	0.137			
CH_4 16.042	82.56	8.160	8.160	32.640	
C_2H_6 30.068	6.41	0.634	1.268	3.804	
C_3H_8 44.094	5.90	0.583	1.749	4.664	
C_4H_{10} 58.120	1.69	0.167	0.668	1.670	
C_5H_{12} 72.146	0.71	0.070	0.350	0.840	
MW =	20.220379				
TOTAL			12.306	43.618	15.338

WEIGHT BALANCE

	# hr Measured	At Wt. Balance
WET GAS	144.66	185.52
OIL	74.03	74.03
WATER	123.82	123.82
TOTAL	342.51	383.37
FRESH FEED	383.37	
WEIGHT BALANCE	89.34	
WET GAS FACTOR	1282455	
INDICATED LOSS—S C F H	549	

WET GAS	1800	0200	0600	
CO 28.010	4.55	4.54	4.47	4.520
H_2 2.016	23.07	25.33	27.50	25.300
CO_2 44.010	36.55	41.00	39.44	38.996
N_2 28.016	4.21	3.57	4.24	4.007
CH_4 16.042	18.13	12.49	11.31	13.977
C_2H_4 28.052	2.94	3.09	2.95	2.960
C_2H_6 30.068	1.62	1.53	1.52	1.557
C_3H_6 42.078	3.32	3.21	3.37	3.300
C_3H_8 44.094	0.45	0.78	0.57	0.600
C_4H_8 56.104	2.59	2.42	2.32	2.443
C_4H_{10} 58.120	0.91	0.42	0.72	0.683
C_5H_{10} 70.130	1.05	0.98	1.02	1.017
C_5H_{12} 72.146	0.37	0.36	0.20	0.310
C_6H_{12} 84.156	0.34	0.28	0.37	0.330
			M. W.	28.236837

GAS FLOW RATES

		√H	PRESSURE	TEMP.	M. W.	S. C. F. H.	M/HR
FRESH FEED	50.54	7.317	412.3 20.676	72.9 0.9878	2258627 1.5029	11,351	29.910
WET GAS	79.31	6.100	1.29 3.999	68.0 0.9924	1025256 1.0125	1,944	5.123
RECYCLE	79.31	8.480	413.8 20.700	123.8 0.9438	1.0125	13,304	35.057
BLEED	5.02	8.800	20.700	1.0000	1.0125	926	2.440
NATURAL GAS	19.79	8.411	431.1 21.114	193.5 0.8920	1431723 1.1965	3,751	9.884
OXYGEN	18.82	7.306	430.8 21.107	75.6 0.9854		2,860	7.536
STEAM	215.7	3.911	32.4 4.7 37.1 0.3008		254#/hr.		

LIQUID PRODUCT RATES Basis 15 hours

HOUR	GAGE	GAL.	°F	FACTOR	GAL. AT 60	API° #/GAL.	#	# HR GAL HR
OIL	3'5 3/8"	185.09	57	1.0015	185.37	48.9	1210.47	
	0'3½"	15.49	82	0.9891	15.32	6.530	100.04	
					170.05		1110.43	74.03
								11.337
WATER	5'7½"	299.12	75	0.99832	298.62	9.9	2488.70	
	1'5½"	75.97	82	0.99726	75.76	8.334	631.38	
					222.86		1857.32	123.82
								14.857

OPERATING CONDITIONS

PRESSURES PSIG		RATES S.C.F.H.	
Oxygen	431	Fresh Feed	11,351
Natural Gas	431	Recycle	14,230
Generator Outlet	419	Combined Feed	25,581
Reactor Inlet	413	Wet Gas—Measured	1,944
Condenser Inlet		Adjusted	2,493
Product Accumulator	378	Loss	549
TEMPERATURES—°F.		Recycle/Fresh Feed	1.25
Oxygen	545	Inlet Velocity—ft./sec.	0.80
Natural Gas	781	Fresh Feed Rate—S.C.F.H. H_2 + CO	11029
Generator	2292	per Cu. Ft. Dense Bed	858
Quench Accumulator	148	per Lb. Catalyst	8.24
Reactor Inlet	218	per Sq. Ft.	16711
Condenser Inlet	594		
Product Accumulator	87	Heat Transfer Calculations	
Catalyst No. Height		Steam Rate = 254#/hr.	
1 0'0"	422	@703 psia & 507°F. =	
2 0'9"	394	1200 Btu/#	
3 1'9"	668	Water in @64°F. = 32 Btu/#	
4 4'5"	654	Net Btu/# steam = 1168 Btu	
5 7'0"	671	(1168)(254) = 296,672 Btu/hr.	
6 12'3"	669	Ave. Bed Temp. = 665°F	
7 17'5"	662	dT = 665-507 = 158°F	
8 20'0"	683	Tube Area = 35.2 sq. ft.	
9 22'7"	703	$K = \frac{296,672}{(35.2)(158)} =$	
10 25'2"	692	53.3 Btu/°F/sq. ft.	
11 26'11"	649		

PRODUCT TESTS

	OIL	WATER
°API	48.9	9.9
Neut. No.	30.4	30.7
Sap. No.	39.9	32.8
Hydrox. No.		
Bromine No.	82	
Pour °F.	+20	
Chemicals, % by K_2CO_3		6.3
HEMPEL. DIST. %		°API
205 °F.		
400	64.0	56.7
400-550	17.6	36.6
550+	18.4	
A. S. T. M. DIST. ON		
Naphtha °F.		
IBP	102	
10%	136	
50%	236	
90%	364	
EP	408	
Rec.	96.0	

CATALYST DATA

INVENTORY DATA	
In Reactor at Start of Period	
Fresh Catalyst Added	0
Total	
Catalyst Recovered	56
In Reactor at End of Period	
REACTOR d-p, Inches H_2O	
No. Height	
0 0-21 3/8	37
1 21 3/8-52 3/4	48
2 52 3/4-84	60
3 84-115 3/8	50
4 115 3/8-353 1/8	195
Total	390
CALCULATED FROM dp	
Density, Lbs./Cu.Ft.	104
Inventory, Lbs.	1338
Bed Depth, Ft.	19.49
Vol., Cu. Ft.	12.86

PARTICLE SIZE

Screen Analysis Mesh	Microns	%	Sedimentation Microns	%
On 40	419+	24.3	80+	•
100	150	33.3	40—80	
150	105	14.3	20—40	
200	74	11.3	10—20	
250	62	2.1	0—20	
325	44	9.8		
<325		4.9		

CATALYST	
Bulk Density, Lbs./Cu.Ft.	
Aerated	137
Settled	138
Compacted	168
Particle Density, gm./cc.	4.22
NH_3 Value, ml./gm.	
N_2 Surface, m²/gm.	
CHEMICAL ANALYSIS	
Fe	
C	3.88
O	
H	
K_2O, W+, % basis Fe	
X-Ray Analysis—	
$Fe_{20}C_9$	
Fe_3O_4	108
Fe	

THE TEXAS COMPANY — MONTEBELLO LABORATORY
YIELD CALCULATIONS

RUN NO. 61-B
HOURS 17-41
CATALYST Fresh CM&S

	FRESH FEED			WET GAS			RECYCLE	COMBINED FEED	EFFLUENT	NET CHANGE		YIELD BASIS H_2+CO FED								
					At Wt. Balance							CONDENSATE								
	%	m/hr	#/hr	%	m/hr	#/hr	m/hr	m/hr	m/hr	m/hr	#/hr	#/MCF	#/gal	gal/hr	gal/MCF	YIELDS BASIS BROWNSVILLE DESIGN FEED RATE*				
CO 28.010	37.610	11.291	316.27	3.603	0.219	6.13	1.340	12.631	1.559	-11.072	-310.14						CORRECTED HEMPEL, %	gal/hr	TREATING RECOVERY, %	gal/hr
H_2 2.016	59.860	17.971	36.23	25.033	1.521	3.07	9.307	27.278	10.828	-16.450	-33.16					400 EP	67.5	8.436	98.0	8.267
CO_2 44.010	1.827	0.548	24.12	39.987	2.429	106.89	14.866	15.414	17.295	1.881	82.77	7.454				400-550	17.2	2.150	91.4	1.965
N_2 28.016	0.173	0.052	1.46	2.963	0.180	5.04	1.102	1.154	1.282							550 +	15.3	1.912	114.6	2.191
CH_4 16.042	0.530	0.159	2.55	13.800	0.838	13.44	5.131	5.290	5.969	0.679	10.89	0.981								
C_2H_4 28.052				3.117	0.189	5.30	1.159	1.159	1.348	0.189	5.30	0.477					RECOVERY %	#/hr	gal/hr	
C_2H_6 30.068				1.710	0.104	3.13	0.636	0.636	0.740	0.104	3.13	0.282				PROPYLENE	66.5	6.69		
C_1+C_2											19.32	1.740				C_3 POLY GASO.	87.5	5.85	0.972	
C_3H_6 42.078				3.940	0.239	10.06	1.465	1.465	1.704	0.239	10.06	0.906	4.32	2.329	0.210	C_3 POLY TAR	12.5	0.84	0.112	
C_3H_8 44.094				0.637	0.039	1.72	0.237	0.237	0.276	0.039	1.72	0.155	4.24	0.406	0.037					
C_4H_8 56.104				2.813	0.171	9.59	1.046	1.046	1.217	0.171	9.59	0.864	5.00	1.918	0.173		#/gal	#/hr	gal/hr	RVP
C_4H_{10} 58.120				0.740	0.045	2.62	0.275	0.275	0.320	0.045	2.62	0.236	4.86	0.539	0.049	C_4H_8	5.00	1.96	0.392	68.0
C_5H_{10} 70.130				1.097	0.067	4.70	0.408	0.408	0.475	0.067	4.70	0.423	5.45	0.862	0.078	C_4 POLY GASO.	5.98	6.68	1.116	i.5
C_5H_{12} 72.146				0.220	0.013	0.94	0.082	0.082	0.095	0.013	0.94	0.085	5.25	0.179	0.016	C_4H_{10}	4.86	2.62	0.539	68.0
C_6H_{12} 84.156				0.340	0.021	1.77	0.126	0.126	0.147	0.021	1.77	0.159	5.54	0.319	0.029	C_4-FREE GASO.			10.605	5.8
C_3-C_6											31.40	2.828		6.552	0.592	C_4 POLY TAR	7.53	0.95	0.126	
TOTAL		30.021	380.63		6.075	174.40	37.180	67.201	50.426											
H_2+CO	97.470	29.254	11104.757	SCFH	1.740		10.647	39.909	12.387	-27.522							gal/hr	gal/MCF	Bbl/Day	
H_2/CO		1.59	Factor 900514		6.95		6.95	2.16	6.95	1.49						10 # RVP 400 EP GASOLINE	12.652	1.1393	6177	

									m/hr	#/hr	#/MCF	#/gal	gal/hr	gal/MCF				
Weight Recovery, %	95.46	Catalyst Age, hrs.	41	Space Velocity, vhs	720			RECOVERED OIL	0.577**	80.97	7.291		12.498	1.125	GAS OIL	1.965	0.1770	960
Pressure, psig	412	Inlet Velocity, Ft/sec	0.79	Catalyst Vol., CF	15.42			TOTAL OIL		112.37	10.119		19.050	1.717	FUEL OIL	2.191	0.1973	1070
Temperature, °F	651	Bed Depth, Ft	23.37	Weight, #	1496			WATER SOLUBLE CHEMICALS	0.184**	9.78	0.881		1.206	0.109	POLY TAR	0.238	0.0214	116
Recycle Ratio	1.24	Bed Density, #/CF	97	Effluent Shift Ratio $\frac{(H_2)(CO_2)}{(H_2O)(CO)}$ =	18.74			TOTAL LIQUID PRODUCTS C_3+		122.15	11.000		20.256	1.826	TOTAL	17.046	1.5350	8323
FRESH FEED CONVERSION — %				TOTAL FEED CONVERSION — %			SELECTIVITY	NET WATER	6.410**	115.48	10.399		13.863	1.248	W. S. CHEM.	1.206	0.1086	589
Contraction	CO	H_2	H_2+CO	CO	H_2	CO+H_2	C_3+/C_1+	GROSS WATER		125.26	11.280		15.069	1.357	TOTAL	18.252	1.6436	8912
79.76	98.06	91.54	94.08	87.66	60.31	68.96	86.34	HYDROCARBON TOTAL—C_1+		141.47	12.740							

Form ML—11

**Included in Reactor Effluent Total

g/NCM = 16.91 × #/MCF

*9488 MCFH H_2 + CO, Bbl/Day = 5421.6 × gal/MCF

	GAS ANALYSES				GENERATOR BALANCE											WEIGHT BALANCE	
HOUR	1400	2200	0600	AVERAGE	M/HR	C	H	O		Mol %	M/Hr	C	H	O		#/hr Measured	At Wt. Balance
FRESH FEED									O_2 32.000	0.25	7.628 0.025			15.306	WET GAS	157.11	174.40
CO 28.010	37.40	37.60	37.83	37.610	11.291	11.291		11.291	CO_2 44.010	1.10	0.109	0.109		0.218	OIL	80.97	80.97
H_2 2.016	59.81	59.82	59.95	59.860	17.971		35.942		N_2 28.016	1.35	0.134				WATER	125.26	125.26
CO_2 44.010	1.88	1.95	1.65	1.827	0.548	0.548		1.096	CH_4 16.042	82.49	8.177	8.177	32.708		TOTAL	363.34	380.63
N_2 28.016	0.14	0.23	0.15	0.173	0.052				C_2H_6 30.068	6.46	0.640	1.280	3.840		FRESH FEED	380.63	
CH_4 16.042	0.77	0.40	0.42	0.530	0.159	0.159	0.636		C_3H_8 44.094	5.99	0.594	1.782	4.752		WEIGHT BALANCE	95.46	
			M. W	12.67889					C_4H_{10} 58.120	1.62	0.161	0.644	1.610				
			H_2O 18.016				6.691	3.346	C_5H_{12} 72.146	0.74	0.073	0.365	0.876		WET GAS FACTOR	1110050	
						11.995	43.269	15.733	MW = 20.23442						INDICATED LOSS—S C F H	229	
			BALANCE			97.07	99.05	101.35	TOTAL			12.357	43.686	15.524		2306	

WET GAS	1400	1800	0600		GAS FLOW RATES							LIQUID PRODUCT RATES							
CO 28.010	3.06	4.00	3.75	3.603		√H	PRESSURE	TEMP.	M. W.	S. C. F. H.	M/HR	HOUR	GAGE	GAL.	°F	FACTOR	GAL. AT 60	API° #/GAL.	#	# HR GAL HR
H_2 2.016	25.34	25.26	24.50	25.033	FRESH FEED		411.5	75.0	2283322			OIL	7'2¼"	380.96	70	0.9951	379.09	49.8 6.498	2463.33	
CO_2 44.010	40.13	38.96	40.87	39.987	50.54	7.329	20.645	0.9859	1.5111	11,393	30.021		3'5⅜"	185.09	57	1.0015	185.37	48.9 6.530	1210.47	
N_2 28.016	2.93	2.82	3.14	2.963	WET GAS		1.40	68.8	1008506				2'1¼"	111.05	58	1.0010	111.16	49.8	722.32	
CH_4 16.042	14.09	14.40	12.91	13.800	79.31	6.554	4.012	0.9917	1.0042	2,077	5.473		0'3"	13.28	78	0.9911	13.16	6.498	85.51	
C_2H_4 28.052	3.04	3.17	3.14	3.117	RECYCLE		413.1	126.1									+8.23		+53.50	80.97
C_2H_6 30.068	1.63	1.64	1.86	1.710	79.31	8.500	20.683	0.9420	1.0042	13,190	34.756						299.95		1943.17	12.498
C_3H_6 42.078	4.09	3.59	4.14	3.940	BLEED															
C_3H_8 44.094	0.62	0.57	0.72	0.637	5.02	8.821	20.683	1.0000	1.0042	920	2.424	WATER	7'5½"	395.14	76	0.99819	394.42	10.1 8.322	3282.36	
C_4H_8 56.104	2.87	2.85	2.72	2.813	NATURAL GAS		430.4	195.5	1430730				5'7½"	299.12	75	0.99832	298.62	9.9 8.334	2488.70	
C_4H_{10} 58.120	0.68	0.79	0.75	0.740	19.79	8.458	21.097	0.8907	1.1961	3,762	9.913		5'9⅞"	309.48	71	0.99883	309.12	10.1	2572.50	
C_5H_{10} 70.130	1.03	1.26	1.00	1.097	OXYGEN		431.0	76.9					0'10"	43.36	79	0.99775	43.26	8.322	360.01	125.26
C_5H_{12} 72.146	0.22	0.22	0.22	0.220	18.82	7.313	21.112	0.9841		2,859	7.628						361.66		3006.15	15.069
C_6H_{12} 84.156	0.27	0.47	0.28	0.340	STEAM		33.5 4.7													
			M. W.	28.70582	215.7	3.500	0.3050		230#/hr.											

OPERATING CONDITIONS				PRODUCT TESTS			CATALYST DATA						
PRESSURES PSIG		RATES S.C.F.H.			OIL	WATER	INVENTORY DATA		PARTICLE SIZE				
Oxygen	431	Fresh Feed	11,393	°API	49.8	10.1	In Reactor at Start of Period		Screen Analysis			Sedimentation	
Natural Gas	430	Recycle	14,110	Neut. No.	32.8	33.0	Fresh Catalyst Added	0	Mesh	Microns	%	Microns	%
Generator Outlet	419	Combined Feed	25,503	Sap. No.	41.1	34.6	Total		On 40	419+	26.0	80+	
Reactor Inlet	412	Wet Gas—Measured	2,077	Hydrox. No.			Catalyst Recovered	10.5	100	150	28.0	40—80	
Condenser Inlet		Adjusted	2,306	Bromine No.	86		In Reactor at End of Period		150	105	12.8	20—40	
Product Accumulator	380	Loss	229	Pour °F.	+15				200	74	10.2	10—20	
				Chemicals, % by K_2CO_3		8.0	REACTOR d-p, Inches H_2O		250	62	5.4	0—20	
							No. Height		325	44	8.2		
TEMPERATURES—°F.		Recycle/Fresh Feed	1.24				0 See Period A	34	<325		9.4		
Oxygen	506	Inlet Velocity—ft./sec.	0.79				1	46	CATALYST				
Natural Gas	786	Fresh Feed Rate—S.C.F.H. H_2 + CO	11105	HEMPEL DIST. %		°API	2	55	Bulk Density, Lbs./Cu.Ft.				
Generator	2284	per Cu.Ft. Dense Bed	720	205 °F.			3	46	Aerated				124
Quench Accumulator	126	per Lb. Catalyst	7.42	400	66.5	56.1	4	255	Settled				125
Reactor Inlet	186	per Sq. Ft.	16826	400-550	17.2	35.9	Total	436	Compacted				155
Condenser Inlet	571			550+	16.3				Particle Density, gm./cc.				4.0
Product Accumulator	84	Heat Transfer Calculations					CALCULATED FROM dp		NH_3 Value, ml./gm.				
Catalyst No. Height		Steam Rate = 230#/hr.		A. S. T. M. DIST. ON			Density, Lbs./Cu.Ft.	97	N_2 Surface, m²/gm.				
1 See Period A	-	@706 psia & 505°F. =		Naphtha °F.			Inventory, Lbs.	1496					
2	-	1201 Btu/#		IBP	100		Bed Depth, Ft.	23.37	CHEMICAL ANALYSIS				
3	640	Water in @68°F = 36°Btu/#		10%	136		Vol., Cu. Ft.	15.42	Fe				
4	658	Net Btu/# steam = 1165 Btu		50%	236				C				8.81
5	662	(1165)(230) = 267,950 Btu/hr.		90%	378				O				
6	666	Ave. Bed Temp. = 651°F.		EP	410				H				
7	654	dT = 651-505 = 146°F.		Rec.	96.0				K_2O, W+, % basis Fe				
8	644	Tube Area = 38.6 sq. ft.							X-Ray Analysis—				
9	636	$K = \frac{267,950}{(38.6)(146)}$ =							$Fe_{20}C_9$				
10	630	47.5 Btu/°F/sq. ft.							Fe_3O_4				
11	612								Fe				100

THE TEXAS COMPANY — MONTEBELLO LABORATORY

YIELD CALCULATIONS

RUN NO. 61-C
HOURS 41-65
CATALYST Fresh CM&S

FRESH FEED	%	m/hr	#/hr
$CO_{28.010}$	37.407	11.300	316.51
$H_{2\ 2.016}$	59.843	18.077	36.44
$CO_{2\ 44.010}$	2.143	0.647	28.47
$N_{2\ 28.016}$	0.127	0.038	1.06
$CH_{4\ 16.042}$	0.480	0.145	2.33
$C_2H_{2\ 26.038}$			
$C_2H_{6\ 30.068}$			
C_3+C_4			
$C_3H_{6\ 42.078}$			
$C_3H_{8\ 44.094}$			
$C_4H_{8\ 56.104}$			
$C_4H_{10\ 58.120}$			
$C_5H_{10\ 70.130}$			
$C_5H_{12\ 72.146}$			
$C_6H_{12\ 84.156}$			
C_5-C_6			
TOTAL		30.207	384.83
H_2+CO	97.250	29.377	11148.572 SCFH
H_2/CO		1.60	Factor 89697586

WET GAS	%	At Wt. Balance m/hr	At Wt. Balance #/hr
$CO_{28.010}$	5.140	0.339	9.50
$H_{2\ 2.016}$	27.567	1.820	3.67
$CO_{2\ 44.010}$	38.313	2.529	111.30
$N_{2\ 28.016}$	2.647	0.175	4.90
$CH_{4\ 16.042}$	11.697	0.772	12.38
$C_2H_{2\ 26.038}$	3.007	0.198	5.55
$C_2H_{6\ 30.068}$	1.747	0.115	3.46
C_3+C_4			
$C_3H_{6\ 42.078}$	3.883	0.256	10.77
$C_3H_{8\ 44.094}$	0.730	0.048	2.12
$C_4H_{8\ 56.104}$	2.973	0.190	10.66
$C_4H_{10\ 58.120}$	0.683	0.045	2.62
$C_5H_{10\ 70.130}$	1.147	0.076	5.33
$C_5H_{12\ 72.146}$	0.223	0.015	1.08
$C_6H_{12\ 84.156}$	0.343	0.023	1.94
C_5-C_6			
TOTAL		6.601	185.25
H_2+CO	97.250	29.377	11148.572 SCFH
H_2/CO		1.60	Factor 89697586

RECYCLE	COMBINED FEED	EFFLUENT	NET CHANGE	
m/hr	m/hr	m/hr	m/hr	#/hr
1.944	13.244	2.283	-10.961	-307.02
10.426	28.503	12.246	-16.257	-32.77
14.490	15.137	17.019	1.882	82.83
1.001	1.039	1.176		
4.424	4.569	5.196	0.627	10.06
1.137	1.137	1.335	0.198	5.55
0.661	0.661	0.776	0.115	3.46
				19.07
1.468	1.468	1.724	0.256	10.77
0.276	0.276	0.324	0.048	2.12
1.086	1.086	1.276	0.190	10.66
0.258	0.258	0.303	0.045	2.62
0.434	0.434	0.510	0.076	5.33
0.084	0.084	0.099	0.015	1.08
0.130	0.130	0.153	0.023	1.94
				34.52
37.820	68.027	51.570		
12.370	41.747	14.529	-27.218	
5.36	2.17	5.36	1.49	

YIELD BASIS H_2+CO FED	CONDENSATE #/MCF	CONDENSATE #/gal	CONDENSATE gal/hr	CONDENSATE gal/MCF
	0.902			
	0.498			
	0.310			
	1.710			
	0.966	4.32	2.494	0.224
	0.190	4.24	0.499	0.045
	0.956	5.00	2.132	0.191
	0.235	4.88	0.538	0.048
	0.478	5.45	0.978	0.088
	0.097	5.25	0.206	0.018
	0.174	5.84	0.349	0.031
	3.096		7.196	0.646

YIELDS BASIS BROWNSVILLE DESIGN FEED RATE*	CORRECTED HEMPEL, %	gal/hr	TREATING RECOVERY, %	gal/hr
400 EP	70.0	7.950	98.0	7.801
400-550	16.0	2.047	91.4	1.871
550 +	12.0	1.365	114.6	1.564

	RECOVERY %	#/hr	gal/hr	
PROPYLENE	63.0	6.785		
C_3 POLY GASO.	87.5	5.937	0.993	
C_3 POLY TAR	12.5	0.848	0.113	

	#/gal	#/hr	gal/hr	RVP
C_4H_8	5.00	1.98	0.397	68.0
C_4 POLY GASO.	5.98	7.60	1.269	1.5
C_4H_{10}	4.86	2.62	0.538	68.0
C_4 FREE GASO.			10.327	5.8
C_4 POLY TAR	7.53	1.08	0.144	

	gal/hr	gal / MCF	Bbl/Day
13 # RVP 400 EP GASOLINE	12.551	1.1240	6094
GAS OIL	1.871	0.1678	910
FUEL OIL	1.564	0.1403	761
POLY TAR	0.257	0.0230	125
TOTAL	16.223	1.4552	7890
W. S. CHEM.	1.211	0.1086	589
TOTAL	17.434	1.5638	8479

Weight Recovery, %	96.31	Catalyst Age, hrs.	65
Pressure, psig	419	Inlet Velocity, Ft/sec	0.78
Temperature, °F	651	Bed Depth, Ft	24.39
Recycle Ratio	1.25	Bed Density, #/C.F	91

Space Velocity, vhv	692	Catalyst Vol., CF	16.10
Weight, #	1465	Effluent $(H_2)(CO_2)$ / Shift Ratio $(H_2O)(CO)$	=14.18

RECOVERED OIL	0.526**	73.77	6.617
TOTAL OIL		108.22	9.713
WATER SOLUBLE CHEMICALS	0.185**	9.92	0.881
TOTAL LIQUID PRODUCTS, C_5^+		118.11	10.594
NET WATER	6.438**	115.99	10.404
GROSS WATER		125.91	11.285
HYDROCARBON TOTAL—C_5^+		137.18	12.305

	11.372	1.020	
	13.568	1.666	
	1.211	0.109	
	19.779	1.774	
	13.924	1.249	
	15.135	1.358	

FRESH FEED CONVERSION — %			
Contraction	CO	H_2	H_2+CO
78.15	97.00	89.93	92.65

TOTAL FEED CONVERSION — %			
CO	H_2	CO+H_2	C_3^+ / C_5^+
82.76	57.04	65.20	86.10

Form ML—11

**Included in Reactor Effluent Total

g/NCM = 16.01 × #/MCF *0488 MCFH H_2 + CO, Bbl/Day = 5421.6 × gal/MCF

GAS ANALYSES	1400	2200	0600	AVERAGE
FRESH FEED				
$CO_{28.010}$	37.38	37.34	37.50	37.407
$H_{2\ 2.016}$	59.69	59.91	59.93	59.843
$CO_{2\ 44.010}$	2.05	2.14	2.24	2.143
$N_{2\ 28.016}$	0.16	0.14	0.08	0.127
$CH_{4\ 16.042}$	0.72	0.47	0.25	0.480
			M. W	12.73985
			H_2O 18.016	
			BALANCE	

GENERATOR BALANCE	M/HR	C	H	O
FRESH FEED	11.300	11.300		11.300
	18.077		36.154	
	0.647	0.647		1.294
	0.038			
	0.145	0.145	0.580	
			6.398	3.199
		12.092	43.132	15.793
		98.15	98.50	102.13

	Mol %	M/Hr	C	H	O
$O_{2\ 32.000}$	0.24	7.586 0.024			15.220
$CO_{2\ 44.010}$	1.22	0.122	0.122		0.244
$N_{2\ 28.016}$	1.61	0.161			
$CH_{4\ 16.042}$	82.53	8.256	8.256	33.024	
$C_2H_{6\ 30.068}$	6.53	0.653	1.306	3.918	
$C_3H_{8\ 44.094}$	5.69	0.569	1.707	4.552	
$C_4H_{10\ 58.120}$	1.61	0.161	0.644	1.610	
$C_5H_{12\ 72.146}$	0.57	0.057	0.285	0.684	
MW=	20.123595				
TOTAL			12.320	43.788	15.464

WEIGHT BALANCE	# /hr Measured	At Wt. Balance
WET GAS	171.04	185.25
OIL	73.77	73.77
WATER	125.91	125.81
TOTAL	370.62	384.83
FRESH FEED	384.83	
WEIGHT BALANCE	96.31	
WET GAS FACTOR	1.08308	
INDICATED LOSS—S C F H	192	

WET GAS	1400	2200	0600	AVERAGE
$CO_{28.010}$	4.06	4.74	6.62	5.140
$H_{2\ 2.016}$	26.50	24.96	31.24	27.567
$CO_{2\ 44.010}$	38.58	39.73	36.63	38.313
$N_{2\ 28.016}$	2.79	2.85	2.30	2.647
$CH_{4\ 16.042}$	13.99	10.91	10.19	11.697
$C_2H_{2\ 26.038}$	3.09	3.02	2.91	3.007
$C_2H_{6\ 30.068}$	1.84	1.84	1.56	1.747
$C_3H_{6\ 42.078}$	3.90	4.39	3.36	3.883
$C_3H_{8\ 44.094}$	0.70	0.83	0.66	0.730
$C_4H_{8\ 56.104}$	2.57	3.56	2.49	2.873
$C_4H_{10\ 58.120}$	0.57	0.92	0.56	0.683
$C_5H_{10\ 70.130}$	0.92	1.51	1.01	1.147
$C_5H_{12\ 72.146}$	0.22	0.24	0.21	0.223
$C_6H_{12\ 84.156}$	0.27	0.50	0.26	0.343
			M. W.	28.06234

GAS FLOW RATES	$\sqrt{h}$	PRESSURE	TEMP.	M. W.	S. C. F. H.	M/HR
FRESH FEED		418.8	75.9	2272397		
	50.54	7.337	20.821	0.9850	1.5074	11,464
WET GAS			1.41	67.9		
	79.31	7.208	4.014	0.9924	1.0157	2,313
RECYCLE						
	79.31	8.488	20.871	0.9432	1.0157	13,460
BLEED						
	5.02	8.388	20.871	1.0000	1.0157	893
NATURAL GAS						
	19.79	8.463	21.241	0.8897	1.1994	3,796
OXYGEN						
	18.82	7.308	21.300	0.9826		2,879
STEAM			28.4 4.7 33.1			
	215.7	3.838	0.2852		236#/hr	

LIQUID PRODUCT RATES	HOUR	GAGE	GAL.	°F	FACTOR	GAL. AT 60	API° # / GAL.	#	# HR GAL HR
OIL		7'2½"	382.05	61	0.9895	381.86	50.0 6.490	8478.27	
		2'1½"	111.05	58	1.0010	111.16	49.8 6.498	722.32	
						+2.23		+14.50	73.77
						272.93			11.372
WATER		7'6⅜"	387.50	72	0.99872	387.00	10.2 8.317	3218.68	
		5'8⅞"	309.48	71	0.99983	309.12	10.1 8.322	2572.50	
		5'8⅜"	303.48	74	0.99846	303.01	10.2 8.317	2520.13	
		0'4"	17.70	82	0.99726	17.65	"	146.80	
						363.24		3019.51	125.81
									15.135

OPERATING CONDITIONS		RATES S.C.F.H.	
PRESSURES PSIG			
Oxygen	439	Fresh Feed	11,464
Natural Gas	437	Recycle	14,353
Generator Outlet	426	Combined Feed	25,817
Reactor Inlet	419	Wet Gas—Measured	2,313
Condenser Inlet		Adjusted	2,505
Product Accumulator	385	Loss	192
TEMPERATURES—°F.		Recycle/Fresh Feed	1.25
Oxygen	470	Inlet Velocity—ft./sec.	0.78
Natural Gas	776	Fresh Feed Rate—S.C.F.H. H_2 + CO	11149
Generator	2287	per Cu.Ft. Dense Bed	692
Quench Accumulator	139	per Lb. Catalyst	7.61
Reactor Inlet	224	per Sq. Ft.	16892
Condenser Inlet	583		
Product Accumulator	84	Heat Transfer Calculations	
Catalyst No. Height		Steam Rate = 236#/hr.	
1 See Period A	-	@706 psia & 505°F.=	
2	626	1201 Btu/#	
3	646	Water in @66°F = 34 Btu/#	
4	649	Net Btu/# steam = 1167	
5	649	(1167)(236) = 275,412 Btu/hr.	
6	655	Ave Bed Temp. = 651°F.	
7	656	dT = 651-505 = 146°F.	
8	652	Tube Area = 39.1 sq. ft.	
9	653	K = 275,412 / (39.1)(146) =	
10	645	48.2 Btu/°F./sq.ft.	
11	623		

PRODUCT TESTS	OIL	WATER
°API	50.0	10.2
Neut. No.	35.7	36.9
Sap. No.	44.6	38.1
Hydrox. No.		
Bromine No.	84	
Pour °F.	-10	
Chemicals, % by K_2CO_3		8.0
HEMPEL DIST. %		°API
205 °F.		
400	69.0	56.1
400-550	18.0	36.5
550+	13.0	
A. S. T. M. DIST. ON		
Naphtha °F.		
IBP	100	
10%	132	
50%	228	
90%	356	
EP	400	
Rec.	96.5	

CATALYST DATA		PARTICLE SIZE				
INVENTORY DATA		Screen Analysis			Sedimentation	
In Reactor at Start of Period		Mesh	Microns	%	Microns	%
Fresh Catalyst Added	0	On 40	419+	25.4		
Total		100	150	27.6		
Catalyst Recovered	6.5	150	105	11.3		
In Reactor at End of Period		200	74	10.5		
		250	62	4.6		
REACTOR d-p, Inches H_2O		325	44	9.5		
No. Height		<325		10.9		
0 See Period A	34					
1	43	CATALYST				
2	58	Bulk Density, Lbs./Cu.Ft.				
3	37	Aerated			122	
4	255	Settled			123	
Total	427	Compacted			153	
		Particle Density, gm./cc.			3.74	
CALCULATED FROM dp		NH_3 Value, ml./gm.				
Density, Lbs./Cu.Ft.	91	N_2 Surface, m^2/gm.				
Inventory, Lbs.	1465					
Bed Depth, Ft.	24.39	CHEMICAL ANALYSIS				
Vol., Cu. Ft.	16.10	Fe				
		C			9.49	
		O				
		H				
		K_2O, W+, % basis Fe				
		X-Ray Analysis—				
		Fe_3C				
		Fe_3O_4			100	
		Fe				

RUN NO. 61-D
HOURS 65-89 *
CATALYST Fresh CM&S

THE TEXAS COMPANY — MONTEBELLO LABORATORY
YIELD CALCULATIONS

FRESH FEED				WET GAS			RECYCLE	COMBINED FEED	EFFLUENT	NET CHANGE		YIELD BASIS H_2+CO FED				YIELDS BASIS BROWNSVILLE DESIGN FEED RATE*				
	%	m/hr	#/hr	%	At Wt. Balance m/hr	At Wt. Balance #/hr	m/hr	m/hr	m/hr	m/hr	#/hr	CONDENSATE #/MCF	CONDENSATE #/gal	gal/hr	gal/MCF		CORRECTED HEMPEL, %	gal/hr	TREATING RECOVERY, %	gal/hr
CO 28.010	37.456	11.444	320.56	7.340	0.587	16.43	2.961	14.405	3.548	-10.857	-304.13									
H_2 2.016	60.273	18.415	37.12	35.840	2.863	5.77	14.460	32.875	17.323	-15.552	-31.35					400 EP	72.3	7.303	98.0	7.157
CO_2 44.010	1.407	0.430	18.92	32.710	2.613	114.98	13.196	13.626	15.809	2.183	96.06	8.477				400-550	16.4	1.656	91.4	1.514
N_2 28.016	0.247	0.075	2.10	2.250	0.180	5.04	0.908	0.983	1.088							550 +	11.3	1.141	114.6	1.308
CH_4 16.042	0.617	0.189	3.03	10.793	0.863	13.84	4.354	4.543	5.217	0.674	10.81	0.954								
C_2H_4 28.052				2.473	0.198	5.55	0.998	0.998	1.196	0.198	5.55	0.490					RECOVERY %	#/hr	gal/hr	
C_2H_6 30.068				1.450	0.116	3.49	0.585	0.585	0.701	0.116	3.49	0.308				PROPYLENE	54.5	5.14		
C_3+C_4											19.85	1.752				C_3 POLY GASO.	87.5	4.50	0.753	
C_3H_6 42.078				2.797	0.224	9.43	1.128	1.128	1.352	0.224	9.43	0.832	4.32	2.183	0.193	C_3 POLY TAR	12.5	0.64	0.085	
C_3H_8 44.094				0.490	0.039	1.72	0.198	0.198	0.237	0.039	1.72	0.152	4.24	0.406	0.036					
C_4H_8 56.104				2.020	0.162	9.09	0.815	0.815	0.977	0.162	9.09	0.802	5.00	1.918	0.160		#/gal	#/hr	gal/hr	RVP
C_4H_{10} 58.120				0.620	0.050	2.91	0.250	0.250	0.300	0.050	2.91	0.257	4.86	0.599	0.053	C_4H_8	5.00	1.19	0.238	68.0
C_5H_{10} 70.130				0.820	0.066	4.63	0.331	0.331	0.397	0.066	4.63	0.409	5.45	0.850	0.075	C_4 POLY GASO.	5.98	6.91	1.156	1.5
C_6H_{12} 72.146				0.180	0.014	1.01	0.073	0.073	0.087	0.014	1.01	0.089	5.25	0.192	0.017	C_4H_{10}	4.86	2.91	0.599	68.0
C_7H_{14} 84.156				0.217	0.017	1.43	0.088	0.088	0.105	0.017	1.43	0.126	5.54	0.258	0.023	C_4 FREE GASO.			9.210	5.8
C_5-C_8											30.22	2.667		6.306	0.557	C_4 POLY TAR	7.53	0.99	0.131	
TOTAL		30.553	381.73		7.992	195.32	40.345	70.898	55.096											
H_2+CO	97.729	29.859	11331.678	SCFH	3.450		17.421	47.280	20.871	-26.409							gal/hr	gal/MCF	Bbl/Day	
H_2/CO		1.61	Factor 882481		4.88		4.88	2.28	4.88	1.43						10 # RVP 400 EP GASOLINE	11.203	0.9886	5360	
Weight Recovery, %	95.40	Catalyst Age, hrs.	89	Space Velocity, vhv	745	RECOVERED OIL	0.467**	66.06	5.830		10.100	0.891	GAS OIL	1.514	0.1336	724				
Pressure, psig	418	Inlet Velocity, Ft/sec	0.82	Catalyst Vol, CF.	15.22	TOTAL OIL		96.28	8.497		16.406	1.448	FUEL OIL	1.308	0.1154	626				
Temperature, °F	651	Bed Depth, Ft	23.06	Weight, #	1411	WATER SOLUBLE CHEMICALS	0.199**	10.58	0.934		1.303	0.115	POLY TAR	0.216	0.0191	104				
Recycle Ratio	1.32	Bed Density, #/CF	92.7	Effluent $(H_2)/(CO_2)$ Shift Ratio $(H_2O)/(CO)$	= 12.67	TOTAL LIQUID PRODUCTS C_5+		106.86	9.431		17.709	1.563	TOTAL	14.241	1.2567	6814				
FRESH FEED CONVERSION — %				TOTAL FEED CONVERSION — %		SELECTIVITY	NET WATER	6.093**	109.77	9.687		13.178	1.163	W.S.CHEM.	1.303	0.1150	623			
Contraction	CO	H_2	H_2+CO	CO	H_2	CO+H_2	C_3+ /C_1+	GROSS WATER		120.35	10.621		14.481	1.278	TOTAL	15.544	1.3717	7437		
73.84	94.87	84.45	88.45	75.37	47.31	55.96	84.33	HYDROCARBON TOTAL—C_1+		126.71	11.183									

Form ML—11 **Included in Reactor Effluent Total g/NCM = 16.91 × #/MCF *9488 MCFH H_2 + CO, Bbl/Day = 5421.6 × gal/MCF

GAS ANALYSES					GENERATOR BALANCE										WEIGHT BALANCE		
HOUR	1400	2200	0600	AVERAGE	M/HR	C	H	O		Mol %	M/Hr	C	H	O		#/hr Measured	At Wt. Balance
FRESH FEED									O_2 32.000	0.23	7.615 0.023			15.276	WET GAS	177.75	195.32
CO 28.010	37.56	37.72	37.09	37.456	11.444	11.444		11.444	CO_2 44.010	1.25	0.125	0.125		0.250	OIL	66.06	66.06
H_2 2.016	59.97	60.97	59.88	60.273	18.415		36.830		N_2 28.016	1.70	0.170				WATER	120.35	120.35
CO_2 44.010	1.42	0.69	2.11	1.407	0.430	0.430		0.860	CH_4 16.042	81.90	8.206	8.206	32.824		TOTAL	364.16	381.73
N_2 28.016	0.10	0.10	0.54	0.247	0.075				C_2H_6 30.068	6.42	0.643	1.286	3.858		FRESH FEED	381.73	
CH_4 16.042	0.95	0.52	0.39	0.617	0.189	0.189	0.756		C_3H_8 44.094	6.10	0.611	1.833	4.888		WEIGHT BALANCE	95.40	
			M. W	12.49393					C_4H_{10} 58.120	1.72	0.172	0.688	1.720				
			H_2O 18.016				6.482	3.241	C_6H_{12} 72.146	0.68	0.068	0.340	0.816		WET GAS FACTOR	1098846	
						12.063	44.068	15.545	MW =	20.34875					INDICATED LOSS—S C F H	273	
			BALANCE			96.67	99.91	100.12	TOTAL				12.478	44.106	15.526		

WET GAS					GAS FLOW RATES							LIQUID PRODUCT RATES							
						V-R	PRESSURE	TEMP.	M. W.	S. C. F. H.	M/HR	HOUR	GAGE	GAL.	°F	FACTOR	GAL. AT 60	API° #/GAL.	#	# HR GAL HR
H_2 2.016	33.98	35.19	38.35	35.840			417.9	74.8	2317125			OIL	5'4½"	286.02	61	0.9995	285.88	48.6	1869.94	
CO_2 44.010	33.11	33.22	31.80	32.710	FRESH FEED	7.350	20.789	0.9859	1.5222	11.595	30.353		0'10⅜"	45.50	54	1.0030	45.64	6.541	298.53	
N_2 28.016	2.49	2.21	2.05	2.250			1.50	69.0	1184543								+2.16		+14.00	
CH_4 16.042	12.58	10.51	9.29	10.793	WET GAS 79.31	8.011	4.025	0.9915	1.0884	2,760	7.273						242.40		1585.41	10.100
C_2H_4 28.052	2.57	2.47	2.38	2.473			420.4	122.8												66.06
C_2H_6 30.068	1.51	1.45	1.39	1.450	RECYCLE 79.31	8.430	20.859	0.9444	1.0884	14,335	37.773									
C_3H_6 42.078	2.93	2.95	2.51	2.797			420.4	60												
C_3H_8 44.094	0.51	0.48	0.48	0.490	BLEED 5.02	8.568	20.859	1.0000	1.0884	976	2.572	WATER	5'5¾"	291.48	74	0.99846	291.03	10.3	2418.75	
C_4H_8 56.104	2.10	2.11	1.85	2.020			436.8	195.2	1422691				0'3"	13.28	72	0.99872	13.26	8.311	110.20	
C_4H_{10} 58.120	0.54	0.84	0.48	0.620	NATURAL GAS 19.79	8.508	21.249	0.8910	1.1928	3,802	10.018		7'0½"	373.32	73	0.99858	372.79		3098.26	
C_5H_{10} 70.130	0.82	0.86	0.78	0.820			439.5	76.2					5'8⅝"	303.48	74	0.99846	303.01		2518.32	
C_6H_{12} 72.146	0.21	0.20	0.13	0.180	OXYGEN 18.82	7.316	21.312	0.9850		2,890	7.615						347.55		2888.49	14.481
C_6H_{12} 84.156	0.21	0.31	0.13	0.217			31.7 4.7 36.4													120.35
			M. W.	24.4398	STEAM 215.7	4.208	0.2981		271 #/hr.											

OPERATING CONDITIONS				PRODUCT TESTS			CATALYST DATA			
PRESSURES PSIG		RATES S.C.F.H.			OIL	WATER	INVENTORY DATA		PARTICLE SIZE	
Oxygen	440	Fresh Feed	11,595	°API	48.6	10.3	In Reactor at Start of Period		Screen Analysis	Sedimentation
Natural Gas	437	Recycle	15,311	Neut. No.	40.8	36.8	Fresh Catalyst Added		Mesh Microns %	Microns %
Generator Outlet	426	Combined Feed	26,906	Sap. No.	51.7	39.1	Total		On 40 419+ 21.3	80+
Reactor Inlet	418	Wet Gas—Measured	2,760	Hydrox. No.			Catalyst Recovered	20	100 150 28.4	40—80
Condenser Inlet		Adjusted	3,033	Bromine No.	86		In Reactor at End of Period		150 105 10.6	20—40
Product Accumulator	384	Loss	273	Pour °F.	-30				200 74 9.9	10—20
				Chemicals, % by K_2CO_3		9.0	REACTOR d-p, Inches H_2O		250 62 1.4	0—20
							No. Height		325 44 10.4	
TEMPERATURES—°F.		Recycle/Fresh Feed	1.32				0 See Period A	32	<325 18.0	
Oxygen	496	Inlet Velocity—ft./sec.	0.82				1	40	CATALYST	
Natural Gas	762	Fresh Feed Rate—S.C.F.H. H_2 + CO	11332	HEMPEL, DIST. %		°API	2	60	Bulk Density, Lbs./Cu.Ft.	
Generator	2281	per Cu.Ft. Dense Bed	745	205 °F.			3	39	Aerated	116
Quench Accumulator	128	per Lb. Catalyst	8.03	400	71.3	55.4	4	240	Settled	116
Reactor Inlet	345	per Sq. Ft.	17170	400-550	16.4	35.8	Total	411	Compacted	155
Condenser Inlet	599			550+	12.3				Particle Density, gm./cc.	3.66
Product Accumulator	89	Heat Transfer Calculations					CALCULATED FROM dp		NH_3 Value, ml./gm.	
Catalyst No. Height		Steam Rate = 271#/hr.		A. S. T. M. DIST. ON			Density, Lbs./Cu.Ft.	92.7	N_2 Surface, m^2/gm.	
1 See Period A	551	@706 psia & 505°F. =		Naphtha °F.			Inventory, Lbs.	1411		
2	636	1201 Btu/#		IBP	100		Bed Depth, Ft.	23.06	CHEMICAL ANALYSIS	
3	643	Water in @57°F.= 35 Btu/#		10%	136		Vol., Cu. Ft.	15.22	Fe	
4	648	Net Btu/#steam = 1165 Btu		50%	232				C	12.2
5	651	(1166)(271) = 315,986 Btu/hr		90%	360				O	
6	655	Ave. Bed Temp. = 651°F.		EP	400				H	
7	656	dT = 651-505 = 146°F		Rec.	96.0				K_2O, W+, % basis Fe	
8	659	Tube Area = 38.3 sq. ft.							X-Ray Analysis—	
9	659	K = 315,986 / (38.3)(146) = 56.5 Btu/°F./sq.ft.							$Fe_{20}C_9$	
10	659								Fe_3O_4	
11	658								Fe	100

RUN NO. 61-E
HOURS 89-113
CATALYST Fresh CM&S

THE TEXAS COMPANY — MONTEBELLO LABORATORY
YIELD CALCULATIONS

	FRESH FEED			WET GAS			RECYCLE	COMBINED FEED	EFFLUENT	NET CHANGE		YIELD BASIS H_2+CO FED			
					At Wt. Balance							CONDENSATE			
	%	m/hr	#/hr	%	m/hr	#/hr	m/hr	m/hr	m/hr	m/hr	#/hr	#/MCF	#/gal	gal/hr	gal/MCF
CO 28.010	37.603	11.501	322.13	9.520	0.871	24.39	3.936	15.437	4.807	-10.630	-297.74				
H_2 2.016	59.620	18.234	36.76	39.000	3.567	7.19	16.125	34.359	19.692	-14.667	-29.57				
CO_2 44.010	1.883	0.576	25.35	29.540	2.697	118.68	12.214	12.790	14.911	2.121	93.33	8.271			
N_2 28.016	0.127	0.039	1.09	1.850	0.169	4.73	0.765	0.804	0.934						
CH_4 16.042	0.767	0.235	3.77	9.197	0.841	13.49	3.803	4.038	4.644	0.606	9.72	0.861			
C_2H_6 30.068				2.214	0.202	5.67	0.915	0.915	1.117	0.202	5.67	0.502			
C_3H_6 42.080				1.320	0.121	3.64	0.546	0.546	0.667	0.121	3.64	0.323			
C_3+C_4											19.03	1.686			
C_3H_8 44.094				2.583	0.236	9.93	1.068	1.068	1.304	0.236	9.93	0.680	4.32	2.299	0.204
C_3H_8 44.094				0.423	0.039	1.72	0.175	0.175	0.214	0.039	1.72	0.152	4.24	0.406	0.036
C_4H_8 56.104				2.183	0.200	11.22	0.903	0.903	1.103	0.200	11.22	0.994	5.00	2.244	0.199
C_4H_{10} 58.120				0.707	0.065	3.78	0.292	0.292	0.357	0.065	3.78	0.335	4.86	0.778	0.069
C_4H_{10} 70.130				0.950	0.089	6.24	0.393	0.393	0.482	0.089	6.24	0.553	5.45	1.145	0.101
C_5H_{12} 72.146				0.223	0.020	1.44	0.092	0.092	0.112	0.020	1.44	0.128	5.25	0.274	0.024
C_5H_{12} 84.162				0.290	0.027	2.27	0.120	0.120	0.147	0.027	2.27	0.201	5.54	0.410	0.036
C_5-C_6											36.60	3.243		7.556	0.669
TOTAL		30.585	389.10		9.144	214.39	41.347	71.932	56.681						
H_2+CO	97.223	29.735	11284.674	SCFH	4.438		20.061	49.796	24.499	-25.297					
H_2/CO		1.59	Factor	886157	4.10		4.10	2.23	4.10	1.38					

YIELDS BASIS BROWNSVILLE DESIGN FEED RATE*				
	CORRECTED HEMPEL, %	gal/hr	TREATING RECOVERY, %	gal/hr
400 EP	73.0	7.147	98.0	7.004
400-550	18.8	1.841	91.4	1.683
550 +	8.2	0.803	114.6	0.920
	RECOVERY %	#/hr	gal/hr	
PROPYLENE	47.7	4.74		
C_3 POLY GASO.	87.5	4.15	0.694	
C_3 POLY TAR	12.5	0.59	0.078	
	#/gal	#/hr	gal/hr	RVP
C_4H_8	5.00	0.69	0.138	68.0
C_4 POLY GASO.	5.98	9.21	1.541	1.5
C_4H_{10}	4.86	3.78	0.778	68.0
C_4 FREE GASO.			9.527	5.8
C_4 POLY TAR	7.53	1.32	0.175	
	gal/hr	gal/MCF	Bbl/Day	
10 # RVP 400 EP GASOLINE	11.984	1.0620	5758	
GAS OIL	1.683	0.1491	808	
FUEL OIL	0.920	0.0815	442	
POLY TAR	0.253	0.0224	121	
TOTAL	14.840	1.3150	7129	
W. S CHEM.	1.228	0.1088	590	
TOTAL	16.068	1.4238	7719	

Weight Recovery, %	96.61	Catalyst Age, hrs.	113	Space Velocity, vhv	760	RECOVERED OIL	0.463**	64.94	5.755	9.791	0.868
Pressure, psig	419	Inlet Velocity, Ft/sec	0.83	Catalyst Vol., CF	14.84	TOTAL OIL		101.54	8.998	17.347	1.537
Temperature, °F	649	Bed Depth, Ft	22.49	Weight, #	1455	WATER SOLUBLE CHEMICALS	0.188**	9.98	0.884	1.228	0.109
Recycle Ratio	1.35	Bed Density, #/CF	98	Effluent $\frac{(H_2)(CO_2)}{\text{Shift Ratio } (H_2O)(CO)}$ =	11.03	TOTAL LIQUID PRODUCTS C_5^+		111.52	9.882	18.575	1.646
						NET WATER	5.539**	99.79	8.843	11.980	1.062
						GROSS WATER		109.77	9.727	13.208	1.171
						HYDROCARBON TOTAL—C_1^+		130.55	11.568		

FRESH FEED CONVERSION — %				TOTAL FEED CONVERSION — %			SELECTIVITY
Contraction	CO	H_2	H_2+CO	CO	H_2	$CO+H_2$	$C_3^+ + C_1^+$
70.10	92.43	80.44	85.07	68.86	42.69	50.80	85.42

Form ML—11

**Included in Reactor Effluent Total

g/NCM = 16.91 × #/MCF

*9488 MCFH H_2+CO, Bbl/Day = 5421.6 × gal/MCF

	GAS ANALYSES				GENERATOR BALANCE										WEIGHT BALANCE		
HOUR	1400	2200	0600	AVERAGE	M/HR	C	H	O		Mol %	M/Hr	C	H	O		#/hr Measured	At Wt. Balance
FRESH FEED									O_2 32.000	0.21	7.626 0.021			15.294	WET GAS	201.21	214.39
CO 28.010	37.43	37.38	38.00	37.603	11.501	11.501		11.501	CO_2 44.010	0.46	0.047	0.047		0.094	OIL	64.94	64.94
H_2 2.016	59.33	59.39	59.54	59.620	18.234		36.468		N_2 28.016	1.49	0.150				WATER	109.77	109.77
CO_2 44.010	1.77	1.92	1.96	1.883	0.576	0.576		1.152	CH_4 16.042	81.74	8.252	8.252	33.008		TOTAL	375.92	389.10
N_2 28.016	0.18	0.08	0.12	0.127	0.039				C_2H_6 30.068	6.74	0.680	1.360	4.080		FRESH FEED	389.10	
CH_4 16.042	1.29	0.63	0.38	0.767	0.235	0.235	0.940		C_3H_8 44.094	6.66	0.672	2.016	5.376		WEIGHT BALANCE	96.61	
			M. W	12.72187					C_4H_{10} 58.120	1.20	0.182	0.728	1.820				
			H_2O 18.016				6.719	3.360	C_5H_{12} 72.146	0.90	0.091	0.455	1.092		WET GAS FACTOR	1065503	
						12.312	44.127	16.013	MW =	20.45853					INDICATED LOSS—S C F H	213	
			BALANCE			95.75	97.25	104.06	TOTAL				12.858	45.376	15.388		

WET GAS					GAS FLOW RATES								LIQUID PRODUCT RATES							
CO 28.010	7.90	9.79	10.87	9.520		$\sqrt{T}R$	PRESSURE	TEMP.	M. W.	S. C. F. H.	M/HR	HOUR	GAGE	GAL.	°F	FACTOR	GAL. AT 60	API° #/GAL.	#	# HR GAL HR
H_2 2.016	36.41	39.50	41.09	39.000	FRESH FEED		418.6	76.5	2275608			OIL	7'2 3/4"	383.14	77	0.9915	379.88	47.5 6.582	2500.37	
CO_2 44.010	30.30	29.41	28.91	29.540	50.54	7.429	20.816	0.9845	1.5085	11,607	30.585		5'4 3/4"	286.02	61	0.9995	285.88	45.6 6.541	1869.94	
N_2 28.016	1.69	2.11	1.75	1.850	WET GAS		1.50	72.1	1234793				3'3"	174.73	66	0.9970	174.21	47.5	1146.65	
CH_4 16.042	11.15	8.71	7.73	9.197	79.31	9.289	4.025	0.9886	1.1112	3,257	8.582		0'9"	39.17	89	0.9856	38.61	6.582	254.13	
C_2H_6 30.068	2.24	2.26	2.14	2.214	RECYCLE		420.0	123.2									45.39		+35.50	64.94
C_3H_6 42.080	1.41	1.36	1.19	1.320	79.31	8.504	20.849	0.9442	1.1112	14,753	38.875						234.99		1558.45	9.791
C_3H_8 44.094	3.12	2.36	2.27	2.583	BLEED															
C_4H_8 56.104	0.55	0.39	0.33	0.423	5.02	8.067	20.849	1.0000	1.1112	938	2.472	WATER	7'3 3/4"	386.41	72	0.99872	385.92	10.3	3207.38	
C_4H_{10} 58.120	2.79	1.90	1.86	2.183	NATURAL GAS		437.9	193.0	1415057				5'5 3/4"	291.48	74	0.99846	291.03	8.311	2418.75	
C_4H_{10} 58.120	0.73	0.69	0.70	0.707	19.79	8.571	21.274	0.8924	1.1896	3,831	10.095		4'5"	235.83	78	0.99788	235.33		1955.83	
C_5H_{10} 70.130	1.16	0.92	0.77	0.950	OXYGEN		440.9	78.8					0'3"	13.29	84	0.99692	13.24		110.04	109.77
C_5H_{12} 72.146	0.25	0.21	0.21	0.223	18.82	7.333	21.345	0.9824		2,894	7.626						316.98		2634.42	13.208
C_6H_{12} 84.162	0.30	0.39	0.18	0.290	STEAM		35.3 4.7 40.0													
			M. W.	23.445218	215.7	4.462	0.3115		300#/hr.											

OPERATING CONDITIONS				PRODUCT TESTS			CATALYST DATA				
PRESSURES PSIG		RATES S.C.F.H.			OIL	WATER	INVENTORY DATA		PARTICLE SIZE		
Oxygen	441	Fresh Feed	11607	°API	47.5	10.3	In Reactor at Start of Period		Screen Analysis		Sedimentation
Natural Gas	438	Recycle	15691	Neut. No.	40.9	40.7	Fresh Catalyst Added		Mesh / Microns	%	Microns / %
Generator Outlet	426	Combined Feed	27298	Sap. No.	51.8	42.3	Total		On 40 / 419+	19.9	80+
Reactor Inlet	419	Wet Gas—Measured	3257	Hydrox. No.			Catalyst Recovered	27	100 / 150	24.7	40—80
Condenser Inlet		Adjusted	3470	Bromine No.	86		In Reactor at End of Period		150 / 105	12.3	20—40
Product Accumulator	383	Loss	213	Pour °F.	Below -40				200 / 74	10.2	10—20
				Chemicals, % by K_2CO_3		9.3	REACTOR d-p, Inches H_2O		250 / 62	5.3	0—20
							No. Height		325 / 44	12.3	
TEMPERATURES—°F.		Recycle/Fresh Feed	1.35				0 See Period A	35	<325	15.3	
Oxygen	510	Inlet Velocity—ft./sec.	0.83				1	45	CATALYST		
Natural Gas	753	Fresh Feed Rate = S.C.F.H. / H_2+CO	11285	HEMPEL, DIST. %		°API	2	58	Bulk Density, Lbs./Cu.Ft.		
Generator	2277	per Cu.Ft. Dense Bed	760	205 °F.			3	46	Aerated		117
Quench Accumulator	121	per Lb. Catalyst	7.76	400	72.0	54.0	4	240	Settled		117
Reactor Inlet	428	per Sq. Ft.	17098	400-550	18.8	33.0	Total	424	Compacted		154
Condenser Inlet	598			550+	9.2				Particle Density, gm./cc.		3.60
Product Accumulator	93	**Heat Transfer Calculations**					CALCULATED FROM dp		NH_3 Value, ml./gm.		
Catalyst No. Height		**Steam Rate = 300#/hr.**		A. S. T. M. DIST. ON			Density, Lbs./Cu.Ft.	98	N_2 Surface, m^2/gm.		
1 See Period A	557	**@ 706 psia & 505°F. =**		Naphtha °F.			Inventory, Lbs.	1455			
2	635	**1201 Btu/#**		IBP	106		Bed Depth, Ft.	22.49	CHEMICAL ANALYSIS		
3	642	**Water in @ 70°F. = 38 Btu/#**		10%	138		Vol., Cu. Ft.	14.84	Fe		
4	648	**Net Btu/# steam=**	1163	50%	234				C		14.8
5	650	**1163x300 =**	348,900	90%	366				O		
6	653	**Av. Bed Temp. = 649° F.**		EP	412				H		
7	654	**dT = 649 - 505 =**	144°F.	Rec.	96.5				K_2O, W+, % basis Fe		
8	653	**Tube Area = 38.0 sq.ft.**							X-Ray Analysis—		
9	654	**K = 348,900 / (38.0)(144) =**							$Fe_{25}C_2$		
10	656	**63.8 Btu/°F/sq.ft.**							Fe_2O_3		
11	654								Fe		103

RUN NO. 61-F
HOURS 113+135
CATALYST Fresh CM&S

THE TEXAS COMPANY — MONTEBELLO LABORATORY
YIELD CALCULATIONS

	FRESH FEED			WET GAS			RECYCLE	COMBINED FEED	EFFLUENT	NET CHANGE		YIELD BASIS H_2+CO FED				
					At Wt. Balance							CONDENSATE				
	%	m/hr	#/hr	%	m/hr	#/hr	m/hr	m/hr	m/hr	m/hr	#/hr	#/MCF	#/gal	gal/hr	gal/MCF	
CO 28.010	37.973	11.484	321.67	11.640	1.132	31.71	4.832	16.316	5.964	-10.352	-289.96					
H_2 2.016	59.410	17.967	36.22	39.936	3.883	7.83	16.578	34.545	20.461	-14.084	-28.39					
CO_2 44.010	2.077	0.628	27.64	29.120	2.832	124.67	12.098	12.716	14.920	2.204	97.03	8.681				
N_2 28.016	0.063	0.019	0.53	1.443	0.140	3.92	0.599	0.618	0.739							
CH_4 16.042	0.477	0.144	2.31	7.577	0.737	11.82	3.145	3.289	3.882	0.593	9.51	0.851				
C_2H_6 28.058				2.177	0.212	5.95	0.904	0.904	1.116	0.212	5.95	0.532				
C_3H_6 30.068				1.193	0.116	3.49	0.495	0.495	0.611	0.116	3.49	0.312				
C_1+C_2											18.95	1.695				
C_3H_8 42.078				2.413	0.235	9.89	1.002	1.002	1.237	0.235	9.89	0.885	4.32	2.289	0.205	
C_2H_8 44.094				0.417	0.041	1.81	0.173	0.173	0.214	0.041	1.81	0.162	4.24	0.427	0.038	
C_4H_8 56.104				2.027	0.197	11.05	0.841	0.841	1.038	0.197	11.05	0.989	5.00	2.210	0.198	
C_4H_{10} 58.120				0.640	0.062	3.60	0.266	0.266	0.328	0.062	3.60	0.322	4.86	0.741	0.066	
C_5H_{10} 70.130				0.917	0.089	6.24	0.381	0.381	0.470	0.089	6.24	0.558	5.45	1.145	0.102	
C_5H_{12} 72.146				0.190	0.018	1.30	0.079	0.079	0.097	0.018	1.30	0.116	5.25	0.248	0.022	
C_6H_{12} 84.156				0.310	0.030	2.52	0.129	0.129	0.159	0.030	2.52	0.225	5.54	0.455	0.041	
C_5-C_6											36.41	3.257		7.515	0.672	
TOTAL		30.242	388.37		9.724	225.80	41.512	71.754	57.281							
H_2+CO	97.383	29.451	1176.647	SCFH	5.015		21.410	50.861	26.425	-24.436						
H_2/CO		1.56	Factor	894722	3.43		3.43	2.12	3.43	1.36						

Weight Recovery, %	95.09	Catalyst Age, hrs.	135	Space Velocity, vhv	763	RECOVERED OIL	0.383**	53.74
Pressure, psig	416	Inlet Velocity, Ft/sec	0.83	Catalyst Vol., CF	14.65	TOTAL OIL		90.15
Temperature, °F	654	Bed Depth, Ft	22.20	Weight, #	1407	WATER SOLUBLE CHEMICALS	0.195**	10.34
Recycle Ratio	1.37	Bed Density, #/CF	96	Effluent Shift Ratio $\frac{(H_2)(CO_2)}{(H_2O)(CO)}$	= 9.36	TOTAL LIQUID PRODUCTS C_5+		100.49

FRESH FEED CONVERSION — %				TOTAL FEED CONVERSION — %			SELECTIVITY	NET WATER	5.467**	98.49
Contraction	CO	H_2	H_2+CO	CO	H_2	$CO+H_2$	C_3+/C_1+	GROSS WATER		108.83
67.85	90.14	78.39	82.97	63.45	40.77	48.04	84.14	HYDROCARBON TOTAL—C_1+		119.44

YIELDS BASIS BROWNSVILLE DESIGN FEED RATE*				
	CORRECTED HEMPEL, %	gal/hr	TREATING RECOVERY, %	gal/hr
400 EP	74.3	6.119	98.0	5.997
400-550	18.4	1.515	91.4	1.385
550 +	7.3	0.601	114.6	0.689
	RECOVERY %	#/hr	gal/hr	
PROPYLENE	44.2	4.37		
C_3 POLY GASO.	87.5	3.82	0.638	
C_3 POLY TAR	12.5	0.55	0.073	
	#/gal	#/hr	gal/hr	RVP
C_4H_8	5.00	0.50	0.100	68.0
C_4 POLY GASO.	5.98	9.23	1.544	1.5
C_4H_{10}	4.86	3.60	0.741	68.0
C_4 FREE GASO.			8.483	5.8
C_4 POLY TAR	7.53	1.32	0.175	
	gal/hr	gal/MCF	Bbl/Day	
10 # RVP 400 EP GASOLINE	10.868	0.9724	5272	
GAS OIL	1.385	0.1239	672	
FUEL OIL	0.689	0.0616	334	
POLY TAR	0.248	0.0222	120	
TOTAL	13.190	1.1801	6398	
W. S. CHEM.	1.270	0.1136	616	
TOTAL	14.460	1.2937	7014	

Form ML—11

**Included in Reactor Effluent Total

g/NCM = 16.91 X #/MCF *9488 MCFH H_2+CO, Bbl/Day = 5421.6 X gal/MCF

GAS ANALYSES					GENERATOR BALANCE										WEIGHT BALANCE		
HOUR	1400	2200	0600	AVERAGE	M/HR	C	H	O		Mol %	M/Hr	C	H	O		#/hr Measured	At Wt. Balance
FRESH FEED									O_2 32.000	0.21	7.715 0.021			15.472	WET GAS	206.75	225.80
CO 28.010	37.98	38.19	37.75	37.973	11.484	11.484		11.484	CO 28.010	1.21	0.121	0.121		0.242	OIL	53.74	53.74
H_2 2.016	59.22	59.28	59.73	59.410	17.967		35.934		N_2 28.016	0.32	0.082				WATER	108.83	108.83
CO_2 44.010	2.03	2.11	2.09	2.077	0.628	0.628		1.256	CH_4 16.042	81.70	8.181	8.181	32.724		TOTAL	369.32	388.37
N_2 28.016	0.04	0.02	0.13	0.063	0.019				C_2H_6 30.068	6.92	0.693	1.386	4.158		FRESH FEED	388.37	
CH_4 16.042	0.73	0.40	0.30	0.477	0.144	0.144	0.576		C_3H_8 44.094	6.53	0.654	1.962	5.232		WEIGHT BALANCE	95.09	
			M. W	12.842201					C_4H_{10} 58.120	1.82	0.182	0.728	1.820				
			H_2O 18.016				7.160	3.580	C_5H_{12} 72.146	0.79	0.079	0.395	0.948		WET GAS FACTOR	1092140	
						12.256	43.670	16.320	MW=	20.523547					INDICATED LOSS—S C F H	311	
			BALANCE			95.95	97.30	103.86	TOTAL			12.773	44.982	15.714			

WET GAS					GAS FLOW RATES								LIQUID PRODUCT RATES							
CO 28.010	9.86	12.29	12.77	11.640		$\sqrt{T/R}$	PRESSURE	TEMP.	M. W.	S. C. F. H.	M/HR.	HOUR	GAGE	GAL.	°F	FACTOR	GAL. AT 60	API° #/GAL.	#	# HR GAL HR
H_2 2.016	34.20	42.27	43.34	39.936	FRESH FEED		418.2	77.0	2254286			OIL	6'11½"	368.95	65	0.9975	368.03	48.3 6.552	2411.33	
CO_2 44.010	32.81	27.59	26.96	29.120	50.54	7.388	20.806	0.9840	1.5014	11,477	30.242		3'3"	174.73	66	0.9970	174.21	47.5 6.582	1146.65	
N_2 28.016	1.32	1.40	1.61	1.443	WET GAS		1.50	72.6	1246779								*3.82		*25.00	
CH_4 16.042	8.21	7.71	6.81	7.577	73.31	9.593	4.025	0.9883	1.1166	3,379	8.904						137.64		1289.68	53.74
C_2H_6 28.058	2.33	2.16	2.04	2.177	RECYCLE		418.0	123.0												8.235
C_3H_6 30.068	1.40	1.10	1.08	1.193	79.31	8.513	20.301	0.9444	1.1166	14,813	39.025									
C_3H_8 42.078	3.42	2.07	1.75	2.413	BLEED															
C_2H_8 44.094	0.70	0.32	0.23	0.417	5.02	8.096	20.801	1.0000	1.1166	944	2.487	WATER	7'3½"	385.32	86	0.99656	383.99	10.3 8.311	3191.34	
C_4H_8 56.104	3.03	1.59	1.46	2.027	NATURAL GAS		436.3	196.1	1410874				4'5"	235.85	78	0.99788	235.33		1955.83	
C_4H_{10} 58.120	0.80	0.51	0.61	0.640	19.79	8.550	21.237	0.8903	1.1877	3,800	10.013		3'5"	183.46	71	0.99883	183.25		1522.99	
C_5H_{10} 70.130	1.32	0.67	0.76	0.917	OXYGEN		439.3	78.9					0'4"	17.70	82	0.99726	17.65		146.69	
C_5H_{12} 72.146	0.21	0.13	0.23	0.190	18.82	7.433	21.307	0.9823		2,928	7.715						314.26		2611.81	108.83
C_6H_{12} 84.156	0.39	0.19	0.35	0.310	STEAM		34.5 4.7 39.2													13.094
			M. W.	23.219828	215.7	4.679	0.3086		311#/hr.											

OPERATING CONDITIONS				PRODUCT TESTS			CATALYST DATA				
PRESSURES PSIG		RATES S.C.F.H.			OIL	WATER	INVENTORY DATA		PARTICLE SIZE		
Oxygen	439	Fresh Feed	11477	°API	48.3	10.3	In Reactor at Start of Period		Screen Analysis		Sedimentation
Natural Gas	436	Recycle	15754	Neut. No.	41.7	40.7	Fresh Catalyst Added		Mesh / Microns	%	Microns / %
Generator Outlet	425	Combined Feed	27231	Sap. No.	52.2	44.4	Total		On 40 / 419+	20.9	80+
Reactor Inlet	418	Wet Gas—Measured	3379	Hydrox. No.			Catalyst Recovered	55	100 / 150	28.3	40—80
Condenser Inlet		Adjusted	3690	Bromine No.	86		In Reactor at End of Period		150 / 105	13.6	20—40
Product Accumulator	380	Loss	311	Pour °F.	Below -40				200 / 74	10.6	10—20
				Chemicals, % by K_2CO_3		9.7	REACTOR d-p, Inches H_2O		250 / 62	9.6	0—20
							No. Height		325 / 44	14.4	
TEMPERATURES—°F.		Recycle/Fresh Feed	1.37				0 See Period A	34	<325	2.6	
Oxygen	527	Inlet Velocity—ft./sec.	0.83	°			1	44	CATALYST		
Natural Gas	768	Fresh Feed Rate $\frac{S.C.F.H.}{H_2+CO}$	11177	HEMPEL, DIST. %		°API	2	57	Bulk Density, Lbs./Cu.Ft.		
Generator	2295	per Cu.Ft. Dense Bed	765	205 °F.			3	45	Aerated		104
Quench Accumulator	113	per Lb. Catalyst	7.94	400	73.3	53.6	4	230	Settled		105
Reactor Inlet	479	per Sq. Ft.	16935	400-550	18.4	32.0	Total	410	Compacted		139
Condenser Inlet	601			550+	8.3				Particle Density, gm./cc.		3.62
Product Accumulator	91	Heat Transfer Calculations					CALCULATED FROM dp		NH_3 Value, ml./gm.		
Catalyst No. Height		Steam Rate = 311#/hr.		A. S. T. M. DIST. ON			Density, Lbs./Cu.Ft.	96	N_2 Surface, m^2/gm.		
1 See Period A	565	@ 705 psia & 506° F. =		Naphtha °F.			Inventory, Lbs.	1407			
2	643	1201 Btu/#		IBP	106		Bed Depth, Ft.	22.20	CHEMICAL ANALYSIS		
3	651	Water in at 77°F.=	45°F.	10%	136		Vol., Cu. Ft.	14.65	Fe		
4	655	Net Btu/# Steam =	1156	50%	234				C		14.7
5	655	1156 x 311 =	359,516	90%	262				O		
6	657	Av. Bed Temp. =	654	EP	400				H		
7	658	dT = 654 - 506 =	148°F.	Rec.	96.5				K_2O, W+, % basis Fe		
8	657	Tube Area =	38.0 sq.ft.						X-Ray Analysis—		
9	659	K = 359516 / (38.0)(148) =							$Fe_{25}C_9$		
10	659	63.9 Btu/°F/sq.ft.							Fe_3O_4		
11	640								Fe		101

THE TEXAS COMPANY — MONTEBELLO LABORATORY

YIELD CALCULATIONS

RUN NO. 61-G
HOURS 135-159
CATALYST Fresh CM&S

	FRESH FEED			WET GAS			RECYCLE	COMBINED FEED	EFFLUENT	NET CHANGE		YIELD BASIS H_2+CO FED								
					At Wt. Balance							CONDENSATE				YIELDS BASIS BROWNSVILLE DESIGN FEED RATE*				
	%	m/hr	#/hr	%	m/hr	#/hr	m/hr	m/hr	m/hr	m/hr	#/hr	#/MCF	#/gal	gal/hr	gal/MCF		CORRECTED HEMPEL. %	gal/hr	TREATING RECOVERY, %	gal/hr
CO 28.010	37.853	11.453	320.79	12.620	1.368	38.32	5.484	16.937	6.852	-10.085	-282.47									
H_2 2.016	59.570	18.023	36.33	43.820	4.749	9.57	19.041	37.064	23.790	-13.274	-26.76					400 EP	74.0	5.720	98.0	5.606
CO_2 44.010	1.737	0.526	23.15	25.854	2.801	123.27	11.234	11.760	14.035	2.275	100.12	8.950				400-550	17.2	1.329	91.4	1.215
N_2 28.016	0.100	0.030	0.84	1.520	0.165	4.62	0.661	0.691	0.826							550 +	8.8	0.680	114.6	0.779
CH_4 16.042	0.740	0.224	3.59	7.943	0.861	13.81	3.452	3.676	4.313	0.637	10.22	0.914								
C_2H_4 28.052				1.903	0.206	5.78	0.827	0.827	1.033	0.206	5.78	0.517					RECOVERY %	#/hr	gal/hr	
C_2H_6 30.068				1.067	0.116	3.49	0.464	0.464	0.580	0.116	3.49	0.312				PROPYLENE	39.4	3.45		
C_1+C_2											19.49	1.743				C_3 POLY GASO.	87.5	3.02	0.505	
C_3H_6 42.078				1.917	0.208	8.75	0.833	0.833	1.041	0.208	8.75	0.782	4.32	2.025	0.181	C_3 POLY TAR	12.5	0.43	0.057	
C_3H_8 44.094				0.393	0.043	1.90	0.171	0.171	0.214	0.043	1.90	0.170	4.24	0.448	0.040					
C_4H_8 56.104				1.480	0.160	8.98	0.643	0.643	0.803	0.160	8.98	0.803	5.00	1.796	0.161		#/gal	#/hr	gal/hr	RVP
C_4H_{10} 58.120				0.480	0.052	3.02	0.209	0.209	0.261	0.052	3.02	0.270	4.86	0.621	0.056	C_4H_8	5.00	0.54	0.108	68.0
C_5H_{10} 70.130				0.660	0.072	5.05	0.287	0.287	0.359	0.072	5.05	0.451	5.45	0.927	0.083	C_4 POLY GASO.	5.98	7.39	1.235	1.5
C_5H_{12} 72.146				0.130	0.014	1.01	0.056	0.056	0.070	0.014	1.01	0.090	5.25	0.192	0.017	C_4H_{10}	4.86	3.02	0.621	68.0
C_6H_{12} 84.156				0.213	0.023	1.94	0.093	0.093	0.116	0.023	1.94	0.173	5.54	0.350	0.031	C_4-FREE GASO.			7.580	5.8
C_3-C_6											30.65	2.739		6.359	0.569	C_4 POLY TAR	7.53	1.05	0.139	
TOTAL		30.256	384.70		10.838	229.51	43.455	73.711	60.111											
H_2+CO	97.423	29.476	11186.1089 SCFH		6.117		24.525	54.001	30.642	-23.359							gal/hr	gal/MCF	Bbl/Day	
H_2/CO		1.57	Factor 893965		3.47		3.47	2.19	3.47	1.32						10 # RVP 400 EP GASOLINE	9.544	0.8532	4626	

							m/hr	#/hr	#/MCF	#/gal	gal/hr	gal/MCF		gal/hr	gal/MCF	Bbl/Day
Weight Recovery, %	95.11	Catalyst Age, hrs.	159	Space Velocity, vhv	738	RECOVERED OIL	0.364**	50.99	4.558		7.729	0.691	GAS OIL	1.215	0.1086	589
Pressure, psig	416	Inlet Velocity, Ft/sec	0.86	Catalyst Vol., CF	15.15	TOTAL OIL		81.64	7.297		14.088	1.260	FUEL OIL	0.779	0.0696	377
Temperature, °F	657	Bed Depth, Ft	22.95	Weight, #	1424	WATER SOLUBLE CHEMICALS	0.170**	9.01	0.805		1.270	0.114	POLY TAR	0.196	0.0175	95
Recycle Ratio	1.44	Bed Density, #/CF	94	Effluent Shift Ratio $\frac{(H_2)(CO_2)}{(H_2O)(CO)}$ =	9.22	TOTAL LIQUID PRODUCTS C_3+		90.65	8.102		15.358	1.374	TOTAL	11.734	1.0489	5687
						NET WATER	5.284**	95.19	8.510		11.427	1.022	W. S. CHEM.	1.270	0.1135	615
						GROSS WATER		104.20	9.315		12.697	1.136	TOTAL	13.004	1.1624	6302
						HYDROCARBON TOTAL—C_1+		110.14	9.845							

FRESH FEED CONVERSION — %				TOTAL FEED CONVERSION — %			SELECTIVITY
Contraction	CO	H_2	H_2+CO	CO	H_2	CO+H_2	C_3+/C_1+
64.18	88.06	73.65	79.25	59.54	35.81	43.26	82.30

Form ML—11

**Included in Reactor Effluent Total

g/NCM = 16.91×#/MCF

*9488 MCFH H_2 + CO, Bbl/Day = 5421.6 × gal/MCF

	GAS ANALYSES				GENERATOR BALANCE										WEIGHT BALANCE		
HOUR	1400	2200	0600	AVERAGE	M/HR	C	H	O		Mol %	M/Hr	C	H	O		#/hr Measured	At Wt. Balance
FRESH FEED									O_2 32.000	0.21	7.692 0.021			15.426	WET GAS	210.71	229.51
CO 28.010	37.87	37.75	37.94	37.853	11.453	11.453		11.453	CO_2 44.010	0.91	0.092	0.092		0.184	OIL	50.99	50.99
H_2 2.016	59.26	59.48	59.97	59.570	18.023		36.046		N_2 28.016	0.67	0.067				WATER	104.20	104.20
CO_2 44.010	1.76	1.92	1.53	1.737	0.526	0.526		1.052	CH_4 16.042	81.97	8.254	8.254	33.016		TOTAL	365.90	384.70
N_2 28.016	0.04	0.16	0.10	0.100	0.030				C_2H_6 30.068	6.90	0.695	1.390	4.170		FRESH FEED	384.70	
CH_4 16.042	1.07	0.69	0.46	0.740	0.224	0.224	0.896		C_3H_8 44.094	6.90	0.695	2.085	5.560		WEIGHT BALANCE	95.11	
			M. W	12.714737					C_4H_{10} 58.120	1.66	0.167	0.668	1.670				
			H_2O 18.016				7.316	3.658	C_5H_{12} 72.146	0.78	0.079	0.395	0.948		WET GAS FACTOR	1089222	
						12.203	44.258	16.163	MW = 20.449734						INDICATED LOSS—S C F H	337	
			BALANCE			94.71	97.56	103.54	TOTAL			12.884	45.364	15.610			

WET GAS					GAS FLOW RATES							LIQUID PRODUCT RATES								
CO 28.010	12.50	12.32	13.04	12.620		√H	PRESSURE	TEMP.	M. W.	S. C. F H	M/HR	HOUR	GAGE	GAL.	°F	FACTOR	GAL. AT 60	API° #/GAL.	#	# HR GAL HR
H_2 2.016	43.67	43.45	44.34	43.820	FRESH FEED		416.0	80.9	2276885			OIL	7'1"	375.50	66	0.9970	374.37	47.9 6.567	2458.49	
CO_2 44.010	25.16	26.55	25.85	25.854	50.54	7.400	20.753	0.9804	1.5089	11,482	30.256		6'11½"	368.95	65	0.9975	368.03	48.3 6.552	2411.33	
N_2 28.016	1.47	1.59	1.50	1.520	WET GAS		1.56	76.0	1367083				3'8"	196.55	65	0.9975	196.06	47.9	1287.53	
CH_4 16.042	8.88	7.71	7.24	7.943	115.14	7.062	4.032	0.9850	1.1692	3,776	9.950		0'5"	22.13	58	1.0010	22.15	6.567	145.46	
C_2H_4 28.052	1.85	2.07	1.79	1.903	RECYCLE		416.3	124.5									+5.25		+34.50	50.99
C_2H_6 30.068	1.14	1.02	1.04	1.067	79.31	8.529	20.761	0.9432	1.1692	15,487	40.809						185.50		1223.73	7.729
C_3H_6 42.078	1.93	1.95	1.37	1.917	BLEED															
C_3H_8 44.094	0.38	0.48	0.32	0.393	5.02	8.242	20.761	1.0000	1.1692	1,004	2.646	WATER	7'2½"	382.05	80	0.99759	381.13	11.4 8.246	3142.80	
C_4H_8 56.104	1.47	1.50	1.47	1.480	NATURAL GAS		434.6	193.6	1415666				3'5"	183.46	71	0.99883	183.25	10.3 8.311	1522.99	
C_4H_{10} 58.120	0.57	0.31	0.56	0.480	19.79	8.583	21.197	0.8920	1.1898	3,821	10.069		2'9½"	149.62	76	0.99819	149.35	11.4	1231.54	
C_5H_{10} 70.130	0.65	0.69	0.64	0.660	OXYGEN		438.8	82.4					0'11"	47.65	69	0.99907	47.61	8.246	392.59	
C_5H_{12} 72.146	0.14	0.12	0.13	0.130	18.82	7.438	21.296	0.9791		2,919	7.692		0'9½"	41.26	66	0.99942	41.24		340.07	
C_6H_{12} 84.156	0.19	0.24	0.21	0.213	STEAM		34.7 4.7						0'8¼"	36.16	66	0.99942	36.14		298.01	104.20
			M. W.	21.176473	215.7	4.671	39.4 0.3093		312 #/hr.								304.72		2500.82	12.697

OPERATING CONDITIONS				PRODUCT TESTS			CATALYST DATA						
PRESSURES PSIG		RATES S.C.F.H.			OIL	WATER	INVENTORY DATA		PARTICLE SIZE				
Oxygen	439	Fresh Feed	11,482	°API	47.9	11.4	In Reactor at Start of Period		Screen Analysis			Sedimentation	
Natural Gas	435	Recycle	16,491	Neut. No.	41.7	40.0	Fresh Catalyst Added		Mesh	Microns	%	Microns	%
Generator Outlet	423	Combined Feed	27,973	Sap. No.	47.3	41.5	Total		On 40	419+	19.4	80+	
Reactor Inlet	416	Wet Gas—Measured	3,776	Hydrox. No.			Catalyst Recovered	41	100	150	26.0	40—80	
Condenser Inlet		Adjusted	4,113	Bromine No.	86		In Reactor at End of Period		150	105	14.6	20—40	
Product Accumulator	378	Loss	337	Pour °F.	Below -40				200	74	13.2	10—20	
				Chemicals, % by K_2CO_3		10.0	REACTOR d-p, Inches H_2O		250	62	7.6	0—20	
							No. Height		325	44	13.2		
TEMPERATURES—°F.		Recycle/Fresh Feed	1.44				0 See Period A	33	<325		6.0		
Oxygen	520	Inlet Velocity—ft./sec.	0.86				1	42	CATALYST				
Natural Gas	767	Fresh Feed Rate—S.C.F.H. H_2 + CO	11186	HEMPEL. DIST. %		°API	2	56	Bulk Density, Lbs./Cu.Ft.				
Generator	2290	per Cu. Ft. Dense Bed	738	205 °F.			3	44	Aerated				126
Quench Accumulator	112	per Lb. Catalyst	7.86	400	73.0	53.4	4	240	Settled				127
Reactor Inlet	499	per Sq. Ft.	16948	400-550	17.2	33.3	Total	415	Compacted				163
Condenser Inlet	605			550+	9.8				Particle Density, gm./cc.				3.60
Product Accumulator	93	Heat Transfer Calculations					CALCULATED FROM dp		NH_3 Value, ml./gm.				
Catalyst No. Height		Steam Rate = 312 #/hr.		A. S. T. M. DIST. ON			Density, Lbs./Cu.Ft.	94	N_2 Surface, m²/gm.				
1 See Period A	562	@706 psia & 505°F =		Naphtha °F.			Inventory, Lbs.	1424					
2	648	1201 Btu/#		IBP	108		Bed Depth, Ft.	22.95	CHEMICAL ANALYSIS				
3	651	Water in @76°F = 44 Btu/#		10%	140		Vol., Cu. Ft.	15.15	Fe				
4	656	Net Btu/# steam = 1157 Btu		50%	238				C				18.3
5	658	(1157)(312) = 360,984 Btu/hr.		90%	366				O				
6	661	Ave. Bed Temp. = 657°F.		EP	408				H				
7	662	dT = 657-505 = 152°F.		Rec.	96.0				K_2O, W+, % basis Fe				
8	661	Tube Area = 38.3 sq. ft.							X-Ray Analysis—				
9	661	K = $\frac{360,984}{(152)(38.3)}$ =							$Fe_{20}C_9$				
10	661	68 Btu/°F/sq. ft.							Fe_3O_4				
11	646								Fe				

THE TEXAS COMPANY — MONTEBELLO LABORATORY

YIELD CALCULATIONS

RUN NO. 61-H
HOURS 159-183
CATALYST Fresh CM&S

FRESH FEED	%	m/hr	#/hr
CO 28.010	37.360	11.026	308.83
H_2 2.016	60.366	17.816	35.92
CO_2 44.010	1.500	0.443	19.50
N_2 28.016	0.187	0.055	1.54
CH_4 16.042	0.587	0.173	2.77
C_2H_4 28.058			
C_2H_6 30.069			
C_3-C_5			
C_3H_6 42.078			
C_3H_8 44.094			
C_4H_8 56.104			
C_4H_{10} 58.120			
C_5H_{12} 72.146			
C_6H_{12} 84.156			
C_5-C_6			
TOTAL		29.513	368.56
H_2+CO	97.726	28.842	10945.312 SCFH
H_2/CO		1.62	Factor 913633

WET GAS	%	At Wt. Balance m/hr	At Wt. Balance #/hr
	8.820	0.783	21.93
	40.177	3.568	7.19
	29.377	2.608	114.76
	2.473	0.220	6.16
	9.273	0.824	13.22
	2.130	0.189	5.30
	1.387	0.123	3.70
	2.147	0.191	8.04
	0.430	0.038	1.68
	1.893	0.168	9.43
	0.503	0.045	2.62
	0.373	0.078	5.47
	0.227	0.020	1.44
	0.290	0.026	2.19
TOTAL		8.881	203.13
H_2+CO		4.351	
H_2/CO		4.56	

RECYCLE m/hr	COMBINED FEED m/hr	EFFLUENT m/hr	NET CHANGE m/hr	NET CHANGE #/hr
3.667	14.693	4.450	-10.243	-286.90
16.706	34.522	20.274	-14.248	-28.73
12.215	12.658	14.823	2.165	95.26
1.028	1.083	1.248		
3.856	4.029	4.680	0.651	10.45
0.886	0.886	1.075	0.189	5.30
0.577	0.577	0.700	0.123	3.70
				19.45
0.893	0.893	1.094	0.191	8.04
0.179	0.179	0.217	0.038	1.68
0.787	0.787	0.955	0.168	9.43
0.209	0.209	0.254	0.045	2.62
0.363	0.363	0.441	0.078	5.47
0.094	0.094	0.114	0.020	1.44
0.121	0.121	0.147	0.026	2.19
				30.87
41.581	71.094	56.609		
20.373	49.215	24.724	-24.491	
4.56	2.35	4.56	1.39	

CONDENSATE #/MCF	#/gal	gal/hr	gal/MCF
8.703			
0.955			
0.484			
0.338			
1.777			
0.735	4.32	1.861	0.170
0.153	4.24	0.396	0.036
0.862	5.00	1.886	0.172
0.239	4.86	0.539	0.049
0.500	5.45	1.004	0.092
0.132	5.25	0.274	0.025
0.200	5.54	0.395	0.036
2.821		6.355	0.580

YIELDS BASIS BROWNSVILLE DESIGN FEED RATE*	CORRECTED HEMPEL. %	gal/hr	TREATING RECOVERY.%	gal/hr
400 EP	74.0	6.247	98.0	6.122
400-550	18.0	1.519	91.4	1.388
550 +	8.0	0.675	114.6	0.774

	RECOVERY %	#/hr	gal/hr
PROPYLENE	47.4	3.81	
C_3 POLY GASO.	87.5	3.33	0.557
C_3 POLY TAR	12.5	0.48	0.064

	#/gal	#/hr	gal/hr	RVP
C_4H_8	5.00	1.21	0.242	68.0
C_4 POLY GASO.	5.98	7.19	1.203	1.5
C_4H_{10}	4.86	2.62	0.539	68.0
C_4-FREE GASO.			8.352	5.8
C_4 POLY TAR	7.53	1.03	0.137	

	gal/hr	gal / MCF	Bbl/Day
10 # RVP 400 EP GASOLINE	10.336	0.9443	5120
GAS OIL	1.388	0.1268	687
FUEL OIL	0.774	0.0707	383
POLY TAR	0.201	0.0184	100
TOTAL	12.699	1.1602	6290
W.S.CHEM.	1.191	0.1088	590
TOTAL	13.890	1.2690	6880

Weight Recovery, %	97.16	Catalyst Age, hrs.	183
Pressure, psig	412	Inlet Velocity, Ft/sec	0.84
Temperature, °F	658	Bed Depth, Ft	25.74
Recycle Ratio	1.41	Bed Density, #/C.F	79

Space Velocity, vhv	644
Catalyst Vol., CF	16.99
Weight, #	1342
Effluent $(H_2)/(CO_2)$ / Shift Ratio $(H_2O)/(CO)$	12.13

RECOVERED OIL	0.393**	55.19	5.042
TOTAL OIL		86.06	7.863
WATER SOLUBLE CHEMICALS	0.1088**	9.96	0.910
TOTAL LIQUID PRODUCTS, C_5+		96.02	8.773
NET WATER	5.566**	100.28	9.162
GROSS WATER		110.24	10.072
HYDROCARBON TOTAL—C_4+		115.47	10.550

	3.441	0.771
	14.796	1.351
	1.191	0.109
	15.987	1.460
	13.038	1.100
	13.229	1.209

FRESH FEED CONVERSION — %			
Contraction	CO	H_2	H_2+CO
69.91	92.90	79.87	84.91

TOTAL FEED CONVERSION — %			SELECTIVITY
CO	H_2	CO+H_2	C_3+ C_4+
69.71	41.27	49.76	93.16

Form ML—11

**Included in Reactor Effluent Total

g/NCM = 16.91 × #/MCF

*0.488 MCFH H_2 + CO, Bbl/Day = 5421.6 × gal/MCF

GAS ANALYSES	1400	2200	0600	AVERAGE
HOUR				
FRESH FEED				
CO 28.010	37.49	33.92	37.67	37.360
H_2 2.016	59.99	61.00	60.11	60.365
CO_2 44.010	1.57	1.42	1.51	1.500
N_2 28.016	0.18	0.15	0.23	0.187
CH_4 16.042	0.77	0.51	0.48	0.587
			M. W	12.43822
			H_2O 18.016	
			BALANCE	
WET GAS				
CO 28.010	11.58	9.02	5.86	8.820
H_2 2.016	45.17	40.75	34.61	40.177
CO_2 44.010	24.44	22.36	34.33	29.377
N_2 28.016	2.34	2.37	2.21	2.473
CH_4 16.042	8.79	8.15	10.08	9.273
C_2H_4 28.052	1.32	2.39	2.69	2.130
C_2H_6 30.068	1.08	1.34	1.74	1.387
C_3H_6 42.078	1.39	2.34	2.71	2.147
C_3H_8 44.094	0.50	0.35	0.44	0.430
C_4H_8 56.104	1.86	1.61	2.21	1.893
C_4H_{10} 58.120	0.37	0.47	0.67	0.503
C_5H_{10} 70.130	0.70	0.81	1.11	0.873
C_5H_{12} 72.146	0.25	0.18	0.25	0.227
C_6H_{12} 84.156	0.21	0.37	0.29	0.290
			M. W.	29.271699

GENERATOR BALANCE	M/HR	C	H	O
FRESH FEED				
CO 28.010	11.026	11.026		11.026
H_2 2.016	17.816		35.632	
CO_2 44.010	0.443	0.443		0.886
N_2 28.016	0.055			
CH_4 16.042	0.173	0.173	0.692	
			6.904	3.452
		11.642	42.228	15.364
		94.12	93.57	102.09

	Mol %	M/Hr	C	H	O
O_2 32.000	0.22	7.452 / 0.022			14.948
CO_2 44.010	0.52	0.051	0.051		0.102
N_2 28.016	1.08	0.106			
CH_4 16.042	32.28	8.054	8.054	32.216	
C_2H_6 30.068	7.36	0.720	1.440	4.320	
C_3H_8 44.094	6.05	0.592	1.776	4.736	
C_4H_{10} 58.120	1.76	0.172	0.688	1.720	
C_5H_{12} 72.146	0.73	0.072	0.360	0.864	
TOTAL			12.369	43.856	15.050

WEIGHT BALANCE	#/hr Measured	At Wt. Balance
WET GAS	192.67	203.13
OIL	55.19	55.19
WATER	110.24	110.24
TOTAL	358.10	368.56
FRESH FEED	369.56	
WEIGHT BALANCE	97.16	
WET GAS FACTOR	1054289	
INDICATED LOSS—S C F H	174	

GAS FLOW RATES		√H	PRESSURE	TEMP.	M. W.	S. C. F. H	M/HR
FRESH FEED	50.54	7.136	412.4 / 20.666	73.9	2318134	11,200	28.513
WET GAS	115.14	6.196	1.52 / 4.087	71.4	1265756	3,197	8.424
RECYCLE	79.31	5.436	412.5 / 20.669	122.7 / 0.0446	1.1251	14,901	38.001
BLEED	5.02	0.338	20.669	1.0000	1.1251	973	2.580
NATURAL GAS	19.79	8.313	431.6 / 21.128	191.4 / 0.8935	1.1932	3,715	9.789
OXYGEN	18.82	7.179	436.4 / 21.833	75.5		2,938	7.452
STEAM	215.7	4.700	36.5 / 4.7 / 41.2 / 0.3160		320#/hr.		

LIQUID PRODUCT RATES	HOUR	GAGE	GAL.	°F	FACTOR	GAL. AT 60	API° / # GAL	#	# HR GAL HR
OIL	7'3⅛"	388.41	65	0.9975	388.44	45.5 / 6.552	2525.40		
	3'8"	196.55	65	0.9975	196.06	47.9 / 6.567	1287.53		
	1'9½"	93.76	65	0.9975	93.53	48.3	612.81		
	1'7½"	84.80	65	0.9975	84.59	6.552	554.23		
					+4.27		+23.00	55.19	
					202.59		1324.45	8.441	
WATER	7'6¾"	399.50	77	0.99804	398.72	10.4 / 8.305	3311.37		
	2'9¾"	149.62	76	0.99819	149.35	11.4 / 8.246	1231.54		
	2'0⅜"	107.43	72	0.99872	107.29	10.4	891.04		
	0'9"	39.17	64	0.99963	39.16	8.305	325.22		
					317.50		2645.65	110.24	

OPERATING CONDITIONS		RATES S.C.F.H.	
PRESSURES PSIG			
Oxygen	436	Fresh Feed	11,200
Natural Gas	432	Recycle	15,780
Generator Outlet	419	Combined Feed	26,980
Reactor Inlet	412	Wet Gas—Measured	3,197
Condenser Inlet		Adjusted	3,371
Product Accumulator	376	Loss	174
TEMPERATURES—°F.		Recycle/Fresh Feed	1.41
Oxygen	497	Inlet Velocity—ft./sec.	0.84
Natural Gas	801	Fresh Feed Rate—S.C.F.H. H_2 + CO	10945
Generator	2290	per Cu. Ft. Dense Bed	644
Quench Accumulator	115	per Lb. Catalyst	8.16
Reactor Inlet	508	per Sq. Ft.	16583
Condenser Inlet	605		
Product Accumulator	92	Heat Transfer Calculations	
Catalyst No. Height		Steam Rate = 320#/hr.	
1 See Period A	551	@706 psia & 505°F. =	
2	646	1201 Btu	
3	654	Water in @74°F. = 42°F.	
4	659	Net Btu/# steam = 1159 Btu	
5	658	(1159)(320) = 370,880 Btu/hr.	
6	659	Ave. Bed Temp. = 658°F.	
7	661	dT = 658-505 = 153°F.	
8	661	Tube Area = 40.0 sq. ft.	
9	662	K = 370,880 / (153)(40.0) =	
10	662	60.6 Btu/°F./sq. ft.	
11	641		

PRODUCT TESTS	OIL	WATER
°API	48.3	10.4
Neut. No.	39.9	37.6
Sap. No.	52.2	40.4
Hydrox. No.		
Bromine No.	86	
Pour °F.		
Chemicals, % by K_2CO_3		9.0
TEMPERATURES—°F.		
HEMPEL. DIST. %		°API
205 °F.		
400	73.0	53.9
400-580	18.0	33.7
550+	9.0	
A. S. T. M. DIST. ON		
Naphtha °F.		
IBP	106	
10%	136	
50%	234	
90%	362	
EP	406	
Rec.	97	

CATALYST DATA					
INVENTORY DATA		PARTICLE SIZE			
In Reactor at Start of Period		Screen Analysis		Sedimentation	
Fresh Catalyst Added		Mesh	Microns	%	Microns %
Total		On 40	419+	19.4	80+
Catalyst Recovered	50	100	150	31.4	40—80
In Reactor at End of Period		150	105	14.4	20—40
		200	74	12.1	10—20
REACTOR d-p, Inches H_2O		250	62	13.2	0—20
No. Height		325	44	8.5	
0 See Period A	31	<325		1.0	
1	37	CATALYST			
2	55	Bulk Density, Lbs./Cu.Ft.			
3	28	Aerated			116
4	240	Settled			117
Total	391	Compacted			163
		Particle Density, gm./cc.			3.5
CALCULATED FROM dp		NH_3 Value, ml./gm.			
Density, Lbs./Cu.Ft.	79	N_2 Surface, m^2/gm.			
Inventory, Lbs.	1348				
Bed Depth, Ft.	25.74	CHEMICAL ANALYSIS			
Vol., Cu. Ft.	16.99	Fe			
		C			13.4
		O			
		H			
		K_2O, W+, % basis Fe			
		X-Ray Analysis—			
		$Fe_{23}C_6$			
		Fe_3O_4			
		Fe			

THE TEXAS COMPANY — MONTEBELLO LABORATORY
YIELD CALCULATIONS

RUN NO. 61-I
HOURS 183-207
CATALYST Fresh CM&S

	FRESH FEED %	FRESH FEED m/hr	FRESH FEED #/hr	WET GAS %	WET GAS At Wt. Balance m/hr	WET GAS At Wt. Balance #/hr	RECYCLE m/hr	COMBINED FEED m/hr	EFFLUENT m/hr	NET CHANGE m/hr	NET CHANGE #/hr	CONDENSATE #/MCF	CONDENSATE #/gal	CONDENSATE gal/hr	CONDENSATE gal/MCF
CO 28.010	37.890	11.147	312.22	5.580	0.424	11.89	2.239	13.386	2.663	-10.723	-300.33				
H_2 2.016	59.817	17.598	35.48	34.480	2.619	5.28	13.838	31.426	16.457	-14.979	-30.20				
CO_2 44.010	1.430	0.421	18.53	33.940	2.578	113.50	13.621	14.042	16.199	2.157	94.97	8.706			
N_2 28.016	0.323	0.095	2.66	2.207	0.168	4.71	0.886	0.981	1.054						
CH_4 16.042	0.540	0.159	2.55	11.860	0.901	14.45	4.760	4.919	5.661	0.742	11.90	1.091			
C_2H_4 28.052				2.743	0.208	5.83	1.101	1.101	1.309	0.208	5.83	0.534			
C_2H_6 30.068				1.713	0.130	3.91	0.688	0.688	0.818	0.130	3.91	0.358			
C_1+C_2											21.64	1.983			
C_3H_6 42.078				2.870	0.218	9.17	1.152	1.152	1.370	0.218	9.17	0.841	4.32	2.123	0.195
C_3H_8 44.094				0.453	0.034	1.50	0.182	0.182	0.216	0.034	1.50	0.138	4.24	0.354	0.032
C_4H_8 56.104				1.987	0.151	8.47	0.797	0.797	0.948	0.151	8.47	0.776	5.00	1.694	0.155
C_4H_{10} 58.120				0.610	0.046	2.67	0.245	0.245	0.291	0.046	2.67	0.245	4.86	0.549	0.050
C_5H_{10} 70.130				0.927	0.070	4.91	0.372	0.372	0.442	0.070	4.91	0.450	5.45	0.901	0.083
C_5H_{12} 72.146				0.297	0.023	1.66	0.119	0.119	0.142	0.023	1.66	0.152	5.25	0.316	0.029
C_6H_{12} 84.156				0.333	0.025	2.10	0.134	0.134	0.159	0.025	2.10	0.193	5.54	0.379	0.035
C_3-C_6											30.48	2.795		6.316	0.579
TOTAL		29.420	371.44		7.595	190.05	40.134	69.554	54.410						
H_2+CO	97.707	28.745	10908.9866 SCFH		3.043		16.077	44.822	19.120	-25.702					
H_2/CO		1.58	Factor 916675		6.18		6.18	2.35	6.18	1.40					

Weight Recovery, %	96.05	Catalyst Age, hrs.	207	Space Velocity, vhv	668	RECOVERED OIL	0.441**	61.84	5.669	9.520	0.873
Pressure, psig	409	Inlet Velocity, Ft/sec	0.83	Catalyst Vol., CF	16.32	TOTAL OIL		92.32	8.464	15.836	1.452
Temperature, °F	659	Bed Depth, Ft	24.72	Weight, #	1191	WATER SOLUBLE CHEMICALS	0.203**	10.79	0.989	1.339	0.123
Recycle Ratio	1.36	Bed Density, #/CF	73	Effluent Shift Ratio $\frac{(H_2)(CO_2)}{(H_2O)(CO)}$	= 16.58	TOTAL LIQUID PRODUCTS C_3+		103.11	9.453	17.175	1.575

FRESH FEED CONVERSION — %				TOTAL FEED CONVERSION — %			SELECTIVITY						
Contraction	CO	H_2	H_2+CO	CO	H_2	CO+H_2	C_3+/C_1+	NET WATER	6.037**	108.76	9.970	13.056	1.197
								GROSS WATER		119.55	10.959	14.395	1.320
74.18	96.20	85.12	89.41	80.11	47.65	57.34	82.65	HYDROCARBON TOTAL—C_1+		124.75	11.436		

YIELD BASIS H_2+CO FED — YIELDS BASIS BROWNSVILLE DESIGN FEED RATE*

	CORRECTED HEMPEL %	gal/hr	TREATING RECOVERY %	gal/hr
400 EP	72.4	6.892	98.0	6.754
400-550	19.6	1.866	91.4	1.706
550 +	8.0	0.762	114.6	0.873

	RECOVERY %	#/hr	gal/hr
PROPYLENE	57.0	5.23	
C_3 POLY GASO.	87.5	4.58	0.766
C_3 POLY TAR	12.5	0.65	0.086

	#/gal	#/hr	gal/hr	RVP
C_4H_8	5.00	1.32	0.264	68.0
C_4 POLY GASO.	5.98	6.26	1.046	1.5
C_4H_{10}	4.86	2.67	0.549	68.0
C_4-FREE GASO.			9.116	5.8
C_4 POLY TAR	7.53	0.39	0.118	

	gal/hr	gal MCF	Bbl/Day
10 # RVP 400 EP GASOLINE	10.975	1.0061	5455
GAS OIL	1.706	0.1564	848
FUEL OIL	0.873	0.0800	434
POLY TAR	0.204	0.0187	101
TOTAL	13.758	1.2612	6838
W. S CHEM.	1.339	0.1227	665
TOTAL	15.097	1.3839	7503

Form ML—11 **Included in Reactor Effluent Total g/NCM = 16.91 × #/MCF *9488 MCFH H_2 + CO, Bbl/Day = 5421.6 × gal/MCF

GAS ANALYSES

HOUR	1400	2200	0600	AVERAGE
FRESH FEED				
CO 28.010	37.57	38.34	37.76	37.890
H_2 2.016	60.01	59.64	59.80	59.817
CO_2 44.010	1.63	1.16	1.50	1.430
N_2 28.016	0.29	0.28	0.40	0.323
CH_4 16.042	0.50	0.58	0.54	0.540
			M. W.	12.62536
			H_2O 18.016	
			BALANCE	
WET GAS				
CO 28.010	5.13	5.53	6.08	5.580
H_2 2.016	34.54	33.46	35.44	34.480
CO_2 44.010	34.21	34.29	33.32	33.940
N_2 28.016	2.22	2.32	2.08	2.207
CH_4 16.042	12.21	12.58	10.79	11.860
C_2H_4 28.052	2.78	2.82	2.63	2.743
C_2H_6 30.068	1.83	1.75	1.56	1.713
C_3H_6 42.078	2.74	2.89	2.98	2.870
C_3H_8 44.094	0.37	0.50	0.49	0.453
C_4H_8 56.104	1.87	1.91	2.18	1.987
C_4H_{10} 58.120	0.58	0.52	0.73	0.610
C_5H_{10} 70.130	0.86	0.91	1.01	0.927
C_5H_{12} 72.146	0.37	0.20	0.32	0.297
C_6H_{12} 84.156	0.29	0.32	0.39	0.333
			M. W.	25.021815

GENERATOR BALANCE

M/HR	C	H	O		Mol %	M/Hr	C	H	O
				O_2 32.000	0.19	7.397 0.018			14.830
11.147	11.147		11.147	CO_2 44.010	0.58	0.056	0.056		0.112
17.598		35.196		N_2 28.016	0.84	0.081			
0.421	0.421		0.842	CH_4 16.042	81.84	7.936	7.936	31.744	
0.095				C_2H_6 30.068	7.69	0.746	1.492	4.476	
0.159	0.159	0.636		C_3H_8 44.094	6.09	0.591	1.773	4.728	
				C_4H_{10} 58.120	1.97	0.191	0.764	1.910	
		6.934	3.467	C_5H_{12} 72.146	0.80	0.078	0.390	0.936	
	11.727	42.766	15.456	MW=	20.399851				
	94.49	97.65	103.44	TOTAL			12.411	43.794	14.942

WEIGHT BALANCE

	#/hr Measured	At Wt. Balance
WET GAS	175.38	190.05
OIL	61.84	61.84
WATER	119.55	119.55
TOTAL	356.77	371.44
FRESH FEED	371.44	
WEIGHT BALANCE	96.05	
WET GAS FACTOR	10836469	
INDICATED LOSS—S C F H	223	

GAS FLOW RATES

		√H	PRESSURE	TEMP.	M. W.	S. C. F. H	M/HR
FRESH FEED	50.54	7.154	409.4 / 20.594	70.3 / 0.9902	2293003 / 1.5143	11,165	29.420
WET GAS	115.14	5.363	1.51 / 4.026	65.5 / 0.9948	1156990 / 1.0756	2,660	7.009
RECYCLE	79.31	8.596	410.7 / 20.625	122.6 / 0.9448	1.0756	14,289	37.652
BLEED	5.02	8.459	20.625	1.0000	1.0756	942	2.482
NATURAL GAS	19.79	8.308	428.8 / 21.059	193.4 / 0.8921	1419128 / 1.1913	3,680	9.697
OXYGEN	18.82	7.125	432.8 / 21.154	71.1 / 0.9895		2,807	7.397
STEAM	215.7	4.517	43.7 + 4.7 = 48.4 / 0.3407		332 #/hr.		

LIQUID PRODUCT RATES

HOUR	GAGE	GAL.	°F	FACTOR	GAL. AT 60	API° #/GAL.	#	# HR GAL HR
OIL	6'0½"	320.94	62	0.9990	320.62	49.4 6.512	2087.88	
	1'9½"	93.76	65	0.9975	93.53	48.3 6.552	612.81	
					+1.38		+9.00	
					228.47		1484.07	61.84
								9.520
WATER	7'6½"	399.50	72	0.99872	398.99	10.4 8.305	3313.61	
	2'0½"	107.43	72	0.99872	107.29	10.4 8.305	891.04	
	1'3½"	67.20	78	0.99788	67.06		556.93	
	0'3"	13.28	66	0.99942	13.27		110.21	
					345.49		2869.29	119.55
								14.395

OPERATING CONDITIONS

PRESSURES PSIG		RATES S.C.F.H.	
Oxygen	433	Fresh Feed	11,165
Natural Gas	429	Recycle	15,231
Generator Outlet	417	Combined Feed	26,396
Reactor Inlet	409	Wet Gas—Measured	2,660
Condenser Inlet		Adjusted	2,883
Product Accumulator	375	Loss	223
TEMPERATURES—°F.		Recycle/Fresh Feed	1.36
Oxygen	478	Inlet Velocity—ft./sec.	0.83
Natural Gas	790	Fresh Feed Rate—S.C.F.H. H_2 + CO	10909
Generator	2288	per Cu. Ft. Dense Bed	668
Quench Accumulator	120	per Lb. Catalyst	9.16
Reactor Inlet	473	per Sq. Ft.	16529
Condenser Inlet	606		
Product Accumulator	92	Heat Transfer Calculations	
Catalyst No. Height		Steam Rate = 332 #/hr.	
1 See Period A	519	@706 psia & 505°F.=	
2	641	1200 Btu/#	
3	657	Water in @70°F. = 38 Btu/#	
4	663	Net Btu/# steam = 1162 Btu	
5	659	(1162)(332) = 385,784 Btu/hr.	
6	661	Ave. Bed Temp. = 659°F	
7	662	dT = 659-505 = 154°F.	
8	662	Tube Area = 39.4 sq. ft.	
9	663	$K = \frac{385,784}{(39.4)(154)} =$	
10	662	63.6 Btu/°F./sq. ft.	
11	642		

PRODUCT TESTS

	OIL	WATER
°API	49.4	10.4
Neut. No.	32.6	33.3
Sap. No.	40.7	36.8
Hydrox. No.		
Bromine No.	86	
Pour °F.		
Chemicals, % by K_2CO_3		9.3
HEMPEL. DIST. %		°API
205 °F.		
400	71.4	55.3
400-550	19.6	35.2
550+	9.0	
A. S. T. M. DIST. ON		
Naphtha °F.		
IBP	100	
10%	136	
50%	232	
90%	366	
EP	408	
Rec.	96.5	

CATALYST DATA

INVENTORY DATA	
In Reactor at Start of Period	
Fresh Catalyst Added	0
Total	
Catalyst Recovered	129
In Reactor at End of Period	
REACTOR d-p, Inches H_2O	
No. Height	
0 See Period A	25
1	34
2	39
3	37
4	212
Total	347
CALCULATED FROM dp	
Density, Lbs./Cu.Ft.	73
Inventory, Lbs.	1191
Bed Depth, Ft.	24.72
Vol., Cu. Ft.	16.32

PARTICLE SIZE

Screen Analysis Mesh	Microns	%	Sedimentation Microns	%
On 40	419+	24.0	80+	
100	150	35.4	40—80	
150	105	6.4	20—40	
200	74	6.2	10—20	
250	62	1.0	0—20	
325	44	13.4		
<325		13.6		

CATALYST	
Bulk Density, Lbs./Cu.Ft.	
Aerated	106
Settled	107
Compacted	153
Particle Density, gm./cc.	3.42
NH_3 Value, ml./gm.	
N_2 Surface, m²/gm.	
CHEMICAL ANALYSIS	
Fe	
C	18.1
O	
H	
K_2O, W+, % basis Fe	
X-Ray Analysis—	
$Fe_{20}C_9$	
Fe_3O_4	
Fe	

THE TEXAS COMPANY — MONTEBELLO LABORATORY

YIELD CALCULATIONS

RUN NO. 61-J
HOURS 207-231
CATALYST Fresh CM&S

	FRESH FEED			WET GAS			RECYCLE	COMBINED FEED	EFFLUENT	NET CHANGE		YIELD BASIS H_2+CO FED			
	%	m/hr	#/hr	%	At Wt. Balance m/hr	At Wt. Balance #/hr	m/hr	m/hr	m/hr	m/hr	#/hr	CONDENSATE #/MCF	CONDENSATE #/gal	CONDENSATE gal/hr	CONDENSATE gal/MCF
CO 28.010	37.217	10.893	305.13	6.010	0.449	12.58	2.382	13.275	2.831	-10.444	-292.55				
H_2 2.016	59.856	17.520	35.32	35.020	2.615	5.27	13.879	31.399	16.494	-14.905	-30.05				
CO_2 44.010	2.177	0.637	28.03	33.494	2.502	110.10	13.273	13.910	15.775	1.865	82.07	7.611			
N_2 28.016	0.217	0.064	1.79	1.983	0.148	4.15	0.786	0.850	0.934						
CH_4 16.042	0.533	0.156	2.50	11.933	0.884	14.18	4.689	4.845	5.573	0.728	11.68	1.083			
C_2H_4 28.052				2.860	0.214	6.00	1.133	1.133	1.347	0.214	6.00	0.556			
C_2H_6 30.068				1.677	0.125	3.76	0.665	0.665	0.790	0.125	3.76	0.349			
C_3+C_4											21.44	1.988			
C_3H_6 42.078				2.393	0.179	7.53	0.948	0.948	1.127	0.179	7.53	0.698	4.32	1.743	0.162
C_4H_8 44.094				0.550	0.041	1.81	0.218	0.218	0.259	0.041	1.91	0.168	4.24	0.427	0.040
C_4H_{10} 58.104				2.007	0.150	8.42	0.795	0.795	0.945	0.150	8.42	0.781	5.00	1.684	0.156
C_4H_{12} 58.120				0.630	0.047	2.73	0.250	0.250	0.297	0.047	2.73	0.253	4.86	0.562	0.052
C_5H_{10} 70.130				1.003	0.075	5.26	0.397	0.397	0.472	0.075	5.26	0.488	5.45	0.965	0.089
C_5H_{12} 72.146				0.193	0.014	1.01	0.076	0.076	0.090	0.014	1.01	0.094	5.23	0.192	0.018
C_6H_{12} 84.162				0.347	0.026	2.19	0.138	0.138	0.164	0.026	2.19	0.203	5.54	0.379	0.035
C_5-C_6											28.95	2.685		5.952	0.552
TOTAL		29.270	372.77		7.469	184.99	39.629	68.899	53.994						
H_2+CO	97.073	28.413	10782.869 SCFH		3.064		16.261	44.674	19.325	-25.349					
H_2/CO		1.61	Factor 927396		5.83		5.83	2.37	5.83	1.43					

Weight Recovery, %	96.82	Catalyst Age, hrs.	231	Space Velocity, v/hr/v	584	RECOVERED OIL	0.454**	65.09	6.036	9.632	0.893
Pressure, psig	406	Inlet Velocity, Ft/sec	0.84	Catalyst Vol., CF.	18.46	TOTAL OIL		94.04	8.721	15.584	1.445
Temperature, °F	678	Bed Depth, Ft	27.97	Weight, #	1126	WATER SOLUBLE CHEMICALS	0.195**	10.33	0.958	1.285	0.119
Recycle Ratio	1.35	Bed Density, #/CF	61	Effluent $(H_2)(CO_2)$ / Shift Ratio $(H_2O)(CO)$ =	14.74	TOTAL LIQUID PRODUCTS C_3+		104.37	9.679	16.869	1.564
						WET WATER	6.237**	112.36	10.420	13.488	1.251
						GROSS WATER		122.69	11.378	14.773	1.370
						HYDROCARBON TOTAL—C_1+		125.81	11.667		

FRESH FEED CONVERSION — %				TOTAL FEED CONVERSION — %			SELECTIVITY
Contraction	CO	H_2	H_2+CO	CO	H_2	$CO+H_2$	$C_3+ \cdot C_3+$
74.43	95.88	85.07	89.22	78.67	47.47	56.74	82.96

Form ML—11

**Included in Reactor Effluent Total

g/NCM = 16.91 × #/MCF

***488 MCFH H_2+CO, Bbl/Day = 5421.6 × gal/MCF

	GAS ANALYSES				GENERATOR BALANCE									WEIGHT BALANCE		
HOUR	1400	2200	0600	AVERAGE	M/HR	C	H	O		Mol %	M/Hr	C	H	O		#/hr Measured	#/hr At Wt. Balance
FRESH FEED									O_2 32.000	0.19	7.404 0.018			14.844	WET GAS	173.14	184.99
CO 28.010	37.14	37.25	37.26	37.217	10.893	10.893		10.893	CO_2 44.010	1.38	0.133	0.133		0.266	OIL	65.09	65.09
H_2 2.016	59.32	59.74	60.01	59.856	17.520		35.040		N_2 28.016	1.32	0.128				WATER	122.69	122.69
CO_2 44.010	2.07	2.33	2.13	2.177	0.637	0.637		1.274	CH_4 16.042	82.13	7.943	7.943	31.772		TOTAL	360.92	372.77
N_2 28.016	0.18	0.17	0.30	0.217	0.064				C_2H_6 30.068	6.81	0.659	1.318	3.954		FRESH FEED	372.77	
CH_4 16.042	0.79	0.51	0.30	0.533	0.156	0.156	0.624		C_3H_8 44.094	5.78	0.559	1.677	4.472		WEIGHT BALANCE	96.82	
			M. W	12.735575					C_4H_{10} 58.120	1.79	0.173	0.692	1.730				
			H_2O 18.016				6.423	3.212	C_5H_{12} 72.146	0.60	0.058	0.290	0.696		WET GAS FACTOR	1068441	
						11.686	42.087	15.379	MW = 20.28273						INDICATED LOSS—S C F H	182	
			BALANCE			96.96	98.74	101.78	TOTAL			12.053	42.624	15.110			

WET GAS					GAS FLOW RATES							LIQUID PRODUCT RATES						
						V/R	PRESSURE	TEMP.	M. W.	S. C. F. H	M/HR	HOUR	GAGE	GAL.	°F	FACTOR	GAL. AT 60	API° # GAL.	#	# HR GAL HR
CO 28.010	6.21	5.54	6.28	6.010			405.9	71.8	2273160			OIL	7'4½"	389.69	68	0.9961	388.17	45.5 6.615	2567.74	
H_2 2.016	35.02	34.78	35.26	35.020	FRESH FEED															
CO_2 44.010	33.58	33.86	33.04	33.494	50.54	7.188	20.509	0.9889	1.5077	11,108	29.270		6'0½"	320.94	62	0.9990	320.62	49.4 6.512	2087.86	
N_2 28.016	2.02	1.98	1.95	1.983	WET GAS		1.50	68.4	11689078				4'2"	222.74	61	0.9995	222.63	46.6	1472.70	
CH_4 16.042	12.42	11.51	11.57	11.833	115.14	5.338	4.025	0.9920	1.0612	2,653	6.991		1'2⅜"	62.73	70	0.9951	62.42	6.615	412.91	
C_2H_4 28.052	2.77	2.82	2.99	2.860	RECYCLE		407.4	125.1									*3.40		*22.50	65.09
C_3H_6 42.078	1.74	1.64	1.65	1.677	79.31	8.513	20.545	0.9428	1.0612	14.140	37.260						231.16		1562.15	9.632
C_4H_8 44.094	1.35	2.36	2.97	2.393	BLEED															
C_4H_{10} 58.104	0.54	0.50	0.61	0.550	5.02	9.063	20.545	1.0000	1.0612	899	2.389	WATER	1'1⅛"	377.68	78	0.99788	376.88	10.4	3129.99	
C_5H_{12} 72.146	2.11	2.07	1.84	2.007	NATURAL GAS		424.4	190.9	14273225				1'3⅜"	67.20	78	0.99788	67.06	8.305	556.93	
C_5H_{10} 70.130	0.64	0.77	0.48	0.630	19.79	8.288	20.955	0.9938	1.1947	3,670	9.671		1'8¾"	89.24	70	0.99896	89.15		740.39	
C_5H_{12} 72.146	1.07	1.06	0.88	1.003	OXYGEN		427.6	72.9					0'10½"	44.45	62	0.99982	44.42		368.91	
C_6H_{12} 84.156	0.19	0.20	0.19	0.193	18.82	7.188	21.031	0.9878		2,810	7.404						354.55		2944.54	122.69
C_6H_{14} 86.172	0.34	0.41	0.29	0.347	STEAM		33.8 4.7													14.773
			M. W.	24.766732	215.7	3.679	0.3062		243 #/hr.											

OPERATING CONDITIONS				PRODUCT TESTS			CATALYST DATA				
PRESSURES PSIG		RATES S.C.F.H.			OIL	WATER	INVENTORY DATA		PARTICLE SIZE		
Oxygen	428	Fresh Feed	11,108	°API	46.6	10.4	In Reactor at Start of Period		Screen Analysis		Sedimentation
Natural Gas	424	Recycle	15,039	Neut. No.	36.4	33.1	Fresh Catalyst Added		Mesh	Microns	%	Microns	%
Generator Outlet	413	Combined Feed	26,147	Sap. No.	42.7	36.5	- Total		On 40	419+	26.6	80+	
Reactor Inlet	406	Wet Gas—Measured	2,653	Hydrox. No.			Catalyst Recovered	126	100	150	31.8	40—80	
Condenser Inlet		Adjusted	2,635	Bromine No.	82		In Reactor at End of Period		150	105	8.9	20—40	
Product Accumulator	375	Loss	182	Pour °F.					200	74	4.7	10—20	
				Chemicals, % by K_2CO_3		8.7	REACTOR d-p, Inches H_2O		250	62	1.6	0—20	
							No. Height		325	44	9.6		
TEMPERATURES—°F.		Recycle/Fresh Feed	1.35				0 See Period A	21	<325		16.8		
Oxygen	470	Inlet Velocity—ft./sec.	0.84				1	28	CATALYST				
Natural Gas	799	Fresh Feed Rate—$\frac{H_2}{CO}$ S.C.F.H.	10783	HEMPEL. DIST. %		°API	2	33	Bulk Density, Lbs./Cu.Ft.		
Generator	2300	per Cu.Ft. Dense Bed	584	205 °F.			3	31	Aerated		87
Quench Accumulator	113	per Lb. Catalyst	9.58	400	71.6	54.5	4	215	Settled		87
Reactor Inlet	334	per Sq. Ft.	16338	400-550	19.8	31.7	Total	328	Compacted		130
Condenser Inlet	634			550+	8.8				Particle Density, grm./cc.		3.38
Product Accumulator	93	Heat Transfer Calculations					CALCULATED FROM dp		NH_3 Value, ml./gm.		
Catalyst No. Height		Steam Rate = 243#/hr.		A. S. T. M. DIST. ON			Density, Lbs./Cu.Ft.	61	N_2 Surface, m^2/gm.		
1 See Period A	451	@707 psia & 505°F.		Naphtha °F.			Inventory, Lbs.	1126			
2	638	= 1201 Btu/#		IBP	106		Bed Depth, Ft.	27.97	CHEMICAL ANALYSIS		
3	661	Water in @65°F. = 33Btu/#		10%	132		Vol., Cu. Ft.	18.46	Fe		
4	672	Net Btu/# steam = 1168 Btu		50%	234				C		22.8
5	679	(1168)(243) = 283,824 Btu/hr.		90%	360				O		
6	687	Ave. Bed Temp. = 678°F.		EP	406				H		
7	691	dT = 678-505 = 173°F.		Rec.	96.5				K_2O, W+, % basis Fe		
8	691	Tube Area = 41.0 sq. ft.							X-Ray Analysis—		
9	693	$K = \frac{283,824}{(41.0)(173)} =$							$Fe_{20}C_9$		
10	692	40 Btu/°F./sq. ft.							Fe_3O_4		
11	669								Fe		

THE TEXAS COMPANY — MONTEBELLO LABORATORY

YIELD CALCULATIONS

RUN NO. 61-K
HOURS 231-239
CATALYST Fresh CM&S

	FRESH FEED %	FRESH FEED m/hr	FRESH FEED #/hr	WET GAS %	WET GAS At Wt. Balance m/hr	WET GAS At Wt. Balance #/hr	RECYCLE m/hr	COMBINED FEED m/hr	EFFLUENT m/hr	NET CHANGE m/hr	NET CHANGE #/hr	CONDENSATE #/MCF	CONDENSATE #/gal	CONDENSATE gal/hr	CONDENSATE gal/MCF
CO 28.010	37.863	10.846	303.80	8.805	0.686	19.21	3.689	14.535	4.375	-10.160	-284.59				
H_2 2.016	59.077	16.923	34.12	32.905	2.562	5.16	13.787	30.710	16.349	-14.361	-28.96				
CO_2 44.010	2.067	0.592	26.05	27.980	2.179	95.80	11.723	12.315	13.902	1.587	69.75	6.619			
N_2 28.016	0.230	0.066	1.85	1.780	0.139	3.89	0.746	0.812	0.885						
CH_4 16.042	0.763	0.219	3.51	18.055	1.406	22.56	7.565	7.784	8.971	1.187	19.05	1.808			
C_2H_4 28.052				2.095	0.163	4.57	0.878	0.878	1.041	0.163	4.57	0.434			
C_2H_6 30.068				2.225	0.173	5.20	0.932	0.932	1.105	0.173	5.20	0.493			
C_1+C_2											28.82	2.735			
C_3H_6 42.078				1.970	0.153	6.44	0.925	0.825	0.978	0.153	6.44	0.611	4.32	1.491	0.141
C_3H_8 44.094				0.925	0.072	3.17	0.388	0.388	0.460	0.072	3.17	0.301	4.24	0.748	0.071
C_4H_8 56.104				1.655	0.129	7.24	0.693	0.693	0.822	0.129	7.24	0.687	5.00	1.448	0.137
C_4H_{10} 58.120				0.740	0.058	3.37	0.310	0.310	0.368	0.058	3.37	0.320	4.86	0.693	0.066
C_5H_{10} 70.130				0.575	0.045	3.16	0.241	0.241	0.286	0.045	3.16	0.300	5.45	0.580	0.055
C_5H_{12} 72.146				0.165	0.013	0.94	0.069	0.069	0.082	0.013	0.94	0.089	5.25	0.179	0.017
C_6H_{12} 84.156				0.125	0.010	0.84	0.052	0.052	0.062	0.010	0.84	0.080	5.54	0.152	0.014
C_3-C_6											25.16	2.388		5.291	0.501
TOTAL		23.646	369.33		7.786	181.55	41.899	70.545	56.941						
H_2+CO	96.940	27.769	10538.3474SCFH	3.243			17.476	45.245	20.724	-24.521					
H_2/CO		1.56	Factor 948915	3.73			3.74	2.11	3.74	1.41					

							m/hr	#/hr	#/MCF	#/gal	gal/hr	gal/MCF
Weight Recovery, %	98.29	Catalyst Age, hrs. 239	Space Velocity, vhv 690			RECOVERED OIL	0.433**	60.77	5.767		7.987	0.758
Pressure, psig	402	Inlet Velocity, Ft/sec 0.91	Catalyst Vol., CF 15.28			TOTAL OIL		85.93	8.155		13.278	1.259
Temperature, °F	730	Bed Depth, Ft 23.15	Weight, # 810			WATER SOLUBLE CHEMICALS	0.116**	6.18	0.586		0.715	0.068
Recycle Ratio	1.46	Bed Density, #/CF 53	Effluent Shift Ratio $\frac{(H_2)(CO_2)}{(H_2O)(CO)}$ = 7.75			TOTAL LIQUID PRODUCTS C_3+		92.11	8.741		13.993	1.327
FRESH FEED CONVERSION — %			TOTAL FEED CONVERSION — %		SELECTIVITY	NET WATER	6.707**	120.83	11.466		14.506	1.376
Contraction / CO	H_2	H_2+CO	CO / H_2	$CO+H_2$	C_3+ / C_1+	GROSS WATER		127.01	12.052		15.221	1.444
72.82 / 93.68	84.86	88.30	69.90 / 46.76	54.20	76.17	HYDROCARBON TOTAL—C_1+		120.93	11.476			

YIELD BASIS H_2+CO FED — YIELDS BASIS BROWNSVILLE DESIGN FEED RATE*

	CORRECTED HEMPEL %	gal/hr	TREATING RECOVERY %	gal/hr
400 EP	62.6	5.000	98.0	4.900
400-550	18.4	1.470	91.4	1.344
550 +	19.0	1.517	114.6	1.738

	RECOVERY %	#/hr	gal/hr
PROPYLENE	53.4	3.44	
C_3 POLY GASO.	87.5	3.01	0.503
C_3 POLY TAR	12.5	0.43	0.057

	#/gal	#/hr	gal/hr	RVP
C_4H_8	5.00	-	-	68.0
C_4 POLY GASO	5.98	6.34	1.059	6.5
C_4H_{10}	4.86	(3.37) 2.97	(0.693) 0.612	68.0
C_4-FREE GASO.			6.314	5.8
C_4 POLY TAR	7.53	0.90	0.120	

	gal/hr	gal/MCF	Bbl/Day
10 # RVP 400 EP GASOLINE	7.985	0.7577	4108
GAS OIL	1.344	0.1275	691
FUEL OIL	1.738	0.1649	894
POLY TAR	0.177	0.0168	91
TOTAL	11.244	1.0669	5784
W S CHEM	0.715	0.0678	368
TOTAL	11.959	1.1347	6152

Form ML--11

**Included in Reactor Effluent Total

g/NCM = 16.01 × #/MCF

*9488 MCFH H_2 + CO, Bbl/Day = 5421.6 × gal/MCF

GAS ANALYSES / GENERATOR BALANCE

HOUR	1000	1400	1410	AVERAGE	M/HR	C	H	O
FRESH FEED								
CO 28.010	37.82	38.11	37.66	37.863	10.846	10.846		10.846
H_2 2.016	59.33	58.54	59.36	59.077	16.923		33.846	
CO_2 44.010	1.98	2.28	1.94	2.067	0.592	0.592		1.184
N_2 28.016	0.24	0.32	0.13	0.230	0.066			
CH_4 16.042	0.63	0.75	0.91	0.763	0.219	0.219	0.876	
			M. W.	12.892943				
			H_2O 18.016				6.432	3.216
						11.657	41.154	15.246
			BALANCE			98.00	97.84	103.07

	Mol %	M/Hr	C	H	O
O_2 32.000	0.19	7.246 0.018			14.528
CO_2 44.010	1.38	0.132	0.132		0.264
N_2 28.016	1.32	0.126			
CH_4 16.042	82.13	7.838	7.838	31.352	
C_2H_6 30.068	6.81	0.650	1.300	3.900	
C_3H_8 44.094	5.78	0.552	1.656	4.416	
C_4H_{10} 58.120	1.79	0.171	0.684	1.710	
C_5H_{12} 72.146	0.60	0.057	0.285	0.684	
MW = 20.28273					
TOTAL			11.895	42.062	14.792

WEIGHT BALANCE

	#/hr Measured	At Wt. Balance
WET GAS	175.24	181.55
OIL	60.77	60.77
WATER	127.01	127.01
TOTAL	363.02	369.33
FRESH FEED	369.33	
WEIGHT BALANCE	98.29	
WET GAS FACTOR	1036007	
INDICATED LOSS—S C F H	103	

WET GAS	1000	1400	1410	AVERAGE
CO 28.010	6.91	10.70		8.805
H_2 2.016	30.81	35.00		32.905
CO_2 44.010	30.63	25.33		27.980
N_2 28.016	2.13	1.43		1.780
CH_4 16.042	17.66	18.45		18.055
C_2H_4 28.052	2.60	1.59		2.095
C_2H_6 30.068	2.30	2.15		2.225
C_3H_6 42.078	2.43	1.51		1.970
C_3H_8 44.094	0.89	0.96		0.925
C_4H_8 56.104	1.99	1.32		1.655
C_4H_{10} 58.120	0.74	0.74		0.740
C_5H_{10} 70.130	0.63	0.52		0.575
C_5H_{12} 72.146	0.17	0.16		0.165
C_6H_{12} 84.156	0.11	0.14		0.125
			M. W.	23.31831

GAS FLOW RATES

	$\sqrt{H}$	PRESSURE	TEMP.	M. W.	S. C. F. H.	M/HR
FRESH FEED 50.54	7.188	402.0 20.413	83.3 0.9783	2245414 1.4985	10,871	28.646
WET GAS 115.14	5.614	1.50 4.025	77.0 0.9840	1241513 1.1142	2,852	7.515
RECYCLE 79.31	8.763	404.0 20.462	128.7 0.9398	1.1142	14,891	39.238
BLEED 5.02	8.822	20.462	1.0000	1.1142	1,010	2.661
NATURAL GAS 19.79	8.263	420.6 20.864	198.6 0.8886	14273226 1.1947	3,622	9.544
OXYGEN 18.82	7.163	423.1 20.924	86.9 0.9751	-	2.750	7.246
STEAM 215.7	1.725	31.1 4.7 35.8 0.2958		110#/hr.		

LIQUID PRODUCT RATES — Basis 8 1/6 hours

HOUR	GAGE	GAL.	°F	FACTOR	GAL. AT 60	API° #/GAL	#	# HR GAL HR
OIL	5'5¼"	289.30	73	0.9935	287.42	40.1 6.666	1966.01	
	4'2"	222.74	61	0.9995	222.63	46.5 6.615	1472.70	
					+0.44		+3.00	60.77
					65.23		496.31	7.987
WATER	4'0"	214.01	81	0.99743	213.46	10.0 8.328	1777.69	
	1'8½"	89.24	70	0.99896	89.15	10.4 8.305	740.39	
					124.31		1037.30	127.01
								15.221

OPERATING CONDITIONS

PRESSURES PSIG		RATES S.C.F.H.	
Oxygen	423	Fresh Feed	10,871
Natural Gas	421	Recycle	15,901
Generator Outlet	410	Combined Feed	26,772
Reactor Inlet	402	Wet Gas—Measured	2,852
Condenser Inlet		Adjusted	2,955
Product Accumulator	375	Loss	103
TEMPERATURES—°F.		Recycle/Fresh Feed	1.46
Oxygen	508	Inlet Velocity—ft./sec.	0.91
Natural Gas	807	Fresh Feed Rate—S.C.F.H. H_2 + CO	10538
Generator	2275	per Cu. Ft. Dense Bed	690
Quench Accumulator	113	per Lb. Catalyst	13.01
Reactor Inlet	220	per Sq. Ft.	15967
Condenser Inlet	738		
Product Accumulator	98	Heat Transfer Calculations	
Catalyst No. Height		Steam Rate = 110#/hr.	
1 See Period A	364	@719 psia & 496°F =	
2	595	1202 Btu/#	
3	626	Water in @62°F = 30 Btu/#	
4	656	Net Btu/# steam = 1172 Btu/#	
5	700	(1172)(110) = 128,920 Btu/hr.	
6	735	Ave. Bed Temp. = 730°F.	
7	765	dT = 730-496 = 234°F.	
8	798	Tube Area = 38.4 sq. ft.	
9	807	$K = \frac{128,920}{(38.4)(234)} =$	
10	805	14.3 Btu/°F/sq. ft.	
11	783		

PRODUCT TESTS

	OIL	WATER
°API	40.1	10.0
Neut. No.	19.6	12.8
Sap. No.	22.7	13.4
Hydrox. No.		
Bromine No.	68	
Pour °F.		
Chemicals, % by K_2CO_3		4.7
HEMPEL DIST. %		°API
205 °F.		
400	61.6	49.7
400-550	18.4	28.8
550+	20.0	
A. S. T. M. DIST. ON		
Naphtha °F.		
IBP	110	
10%	150	
50%	250	
90%	376	
EP	416	
Rec.	97.0	

CATALYST DATA

INVENTORY DATA	
In Reactor at Start of Period	
Fresh Catalyst Added	
Total	
Catalyst Recovered	125.5
In Reactor at End of Period	
REACTOR d-p, Inches H_2O	
No. Height	
0 See Period A	21
1	32
2	30
3	18
4	135
Total	236
CALCULATED FROM dp	
Density, Lbs./Cu.Ft.	53
Inventory, Lbs.	810
Bed Depth, Ft.	23.15
Vol., Cu. Ft.	15.28

PARTICLE SIZE

Screen Analysis Mesh	Microns	%	Sedimentation Microns	%
On 40	419+	28.3	80+	
100	150	36.3	40--80	
150	105	11.0	20--40	
200	74	4.4	10--20	
250	62	0.8	0--20	
325	44	9.8		
<325		9.4		

CATALYST	
Bulk Density, Lbs./Cu.Ft.	
Aerated	93
Settled	93
Compacted	136
Particle Density, gm./cc.	3.58
NH_3 Value, ml./gm.	
N_2 Surface, m²/gm.	
CHEMICAL ANALYSIS	
Fe	
C	15.6
O	
H	
K_2O, W+, % basis Fe	2.28
X-Ray Analysis—	
$Fe_{20}C_9$	
Fe_3O_4	
Fe	

THE TEXAS COMPANY — MONTEBELLO LABORATORY
YIELD CALCULATIONS

RUN NO. 62-0 (A-D)
HOURS 0-94
CATALYST Fresh CM&S

	FRESH FEED %	FRESH FEED m/hr	FRESH FEED #/hr	WET GAS %	WET GAS At Wt. Balance m/hr	WET GAS At Wt. Balance #/hr	RECYCLE m/hr	COMBINED FEED m/hr	EFFLUENT m/hr	NET CHANGE m/hr	NET CHANGE #/hr	CONDENSATE #/MCF	CONDENSATE #/gal	CONDENSATE gal/hr	CONDENSATE gal/MCF
CO 28.010		16.342						22.319		-14.026	-392.87				
H_2 2.016		26.222						45.324		-18.887	-38.07				
CO_2 44.010										3.191	140.44	8.694			
N_2 28.016															
CH_4 16.042										0.968	15.53	0.961			
C_2H_4 28.052										0.275	7.71	0.477			
C_2H_6 30.068										0.161	4.84	0.300			
C_1+C_2											28.08	1.738			
C_3H_6 42.078										0.295	12.41	0.768	4.32	2.873	0.178
C_3H_8 44.094										0.043	1.90	0.118	4.24	0.448	0.028
C_4H_8 56.104										0.254	14.25	0.882	5.00	2.850	0.176
C_4H_{10} 58.120										0.094	5.46	0.338	4.86	1.123	0.070
C_5H_{10} 70.130										0.113	7.92	0.490	5.45	1.453	0.090
C_6H_{12} 72.146										0.028	2.02	0.125	5.25	0.385	0.024
C_6H_{12} 84.156										0.042	3.53	0.219	5.54	0.637	0.039
C_3-C_6											47.49	2.940		9.769	0.605
TOTAL															
H_2+CO		42.564	16153.2 SCFH					67.643		-32.912					
H_2/CO			Factor 619072												

Weight Recovery, %	93.62	Catalyst Age, hrs. Ave.,	44	Space Velocity, vhv	1385	RECOVERED OIL
Pressure, psig	375	Inlet Velocity, Ft/sec	1.02	Catalyst Vol., CF	11.74	TOTAL OIL
Temperature, °F	658	Bed Depth, Ft	17.8	Weight, #	1733	WATER SOLUBLE CHEMICALS
Recycle Ratio	1.00	Bed Density, #/CF	148	Effluent $(H_2)(CO_2)$ / Shift Ratio $(H_2O)(CO)$	7.22	TOTAL LIQUID PRODUCTS C_3+

FRESH FEED CONVERSION — %				TOTAL FEED CONVERSION — %				SELECTIVITY
Contraction	CO	H_2	H_2+CO	CO	H_2	CO+H_2	C_3+ /C_1+	HYDROCARBON TOTAL—C_1+
62.11	85.83	72.02	77.32	62.84	41.67	48.66	83.27	

RECOVERED OIL		74.33	4.602		11.382	0.705			
TOTAL OIL		121.82	7.542		21.151	1.309			
WATER SOLUBLE CHEMICALS		6.03 11.96	0.373 0.740		0.749 1.486	0.046 0.092			
TOTAL LIQUID PRODUCTS C_3+		139.81	8.655		23.386	1.448			
NET WATER		121.00	7.491		14.508	0.898			
GROSS WATER		137.35	8.503		16.539	1.024			
HYDROCARBON TOTAL—C_1+		167.89	10.394						

YIELDS BASIS BROWNSVILLE DESIGN FEED RATE*

	CORRECTED HEMPEL, %	gal/hr	TREATING RECOVERY,%	gal/hr
400 EP	72.6	8.263	98.0	8.098
400-550	19.5	2.220	91.4	2.029
550 +	7.9	0.899	114.6	1.030

	RECOVERY %	#/hr	gal/hr
PROPYLENE	37.75	4.685	
C_3 POLY GASO.	87.5	4.099	0.685
C_3 POLY TAR	12.5	0.586	0.078

	#/gal	#/hr	gal/hr	RVP
C_4H_8	5.00	–	–	68.0
C_4 POLY GASO.	5.98	12.47	2.085	1.5
C_4H_{10}	4.86	5.46	1.123	68.0
C_4-FREE GASO.			11.258	5.8
C_4 POLY TAR	7.53	1.78	0.236	

	gal/hr	gal/MCF	Bbl/Day
10 # RVP 400 EP GASOLINE	14.466	0.8955	4855
GAS OIL	2.029	0.1256	681
FUEL OIL	1.030	0.0638	346
POLY TAR	0.314	0.0194	105
TOTAL	17.839	1.1044	5988
W. S. CHEM.	0.749 1.486	0.0464 0.0920	252 499
TOTAL	20.074	1.2427	6739

Form ML—11 AI= (37.22)(0.6443)=23.98 Acids=(0.117)(37.5)=4.39 g/NCM = 16.91×#/MCF *9488 MCFH H_2 + CO, Bbl/Day = 5421.6×gal/MCF

THE TEXAS COMPANY — MONTEBELLO LABORATORY
YIELD CALCULATIONS

RUN NO. 62-1 (E-I)
HOURS 94-206
CATALYST

	FRESH FEED %	FRESH FEED m/hr	FRESH FEED #/hr	WET GAS %	WET GAS At Wt. Balance m/hr	WET GAS At Wt. Balance #/hr	RECYCLE m/hr	COMBINED FEED m/hr	EFFLUENT m/hr	NET CHANGE m/hr	NET CHANGE #/hr	CONDENSATE #/MCF	CONDENSATE #/gal	CONDENSATE gal/hr	CONDENSATE gal/MCF
CO 28.010		15.331						21.865		-12.909	-361.58				
H_2 2.016		24.584						44.459		-17.217	-34.71				
CO_2 44.010										3.041	133.83	8.835			
N_2 28.016															
CH_4 16.042										0.843	13.52	0.893			
C_2H_4 28.052										0.282	7.91	0.522			
C_2H_6 30.068										0.163	4.90	0.323			
C_1+C_2											26.33	1.738			
C_3H_6 42.078										0.304	12.79	0.844	4.32	2.961	0.195
C_3H_8 44.094										0.047	2.07	0.137	4.24	0.488	0.032
C_4H_8 56.104										0.255	14.31	0.945	5.00	2.862	0.189
C_4H_{10} 58.120										0.076	4.42	0.292	4.86	0.909	0.060
C_5H_{10} 70.130										0.115	8.06	0.532	5.45	1.479	0.098
C_6H_{12} 72.146										0.024	1.73	0.114	5.25	0.330	0.022
C_6H_{12} 84.156										0.046	3.87	0.255	5.54	0.699	0.046
C_3-C_6											47.25	3.119		9.728	0.642
TOTAL															
H_2+CO		39.915	15147.653 SCFH					66.324		-30.126					
H_2/CO			Factor 660168												

Weight Recovery, %	93.66	Catalyst Age, hrs. Ave.	138	Space Velocity, vhv	1192	RECOVERED OIL
Pressure, psig	373	Inlet Velocity, Ft/sec	0.98	Catalyst Vol, CF	12.71	TOTAL OIL
Temperature, °F	658	Bed Depth, Ft	19.2	Weight, #	1716	WATER SOLUBLE CHEMICALS
Recycle Ratio		Bed Density, #/CF	135	Effluent $(H_2)(CO_2)$ / Shift Ratio $(H_2O)(CO)$	6.98	TOTAL LIQUID PRODUCTS C_3+

FRESH FEED CONVERSION — %				TOTAL FEED CONVERSION — %				SELECTIVITY
Contraction	CO	H_2	H_2+CO	CO	H_2	CO+H_2	C_3+ /C_1+	HYDROCARBON TOTAL—C_1+
60.59	84.20	70.03	75.48	59.04	38.73	45.42	83.15	

RECOVERED OIL		64.99	4.290		9.970	0.658			
TOTAL OIL		112.24	7.410		19.698	1.300			
WATER SOLUBLE CHEMICALS		5.53 12.18	0.365 0.804		0.689 1.518	0.045 0.100			
TOTAL LIQUID PRODUCTS C_3+		129.95	8.579		21.905	1.446			
NET WATER		108.50	7.163		13.002	0.858			
GROSS WATER		126.21	8.332		15.209	1.004			
HYDROCARBON TOTAL—C_1+		156.28	10.317						

YIELDS BASIS BROWNSVILLE DESIGN FEED RATE*

	CORRECTED HEMPEL, %	gal/hr	TREATING RECOVERY,%	gal/hr
400 EP	71.94	7.172	98.0	7.029
400-550	18.56	1.851	91.4	1.692
550 +	9.50	0.947	114.6	1.085

	RECOVERY %	#/hr	gal/hr
PROPYLENE	35.64	4.558	
C_3 POLY GASO.	87.5	3.988	0.667
C_3 POLY TAR	12.5	0.570	0.076

	#/gal	#/hr	gal/hr	RVP
C_4H_8	5.00	0.62	0.124	68.0
C_4 POLY GASO.	5.98	11.98	2.003	1.5
C_4H_{10}	4.86	4.42	0.909	68.0
C_4-FREE GASO.			10.204	5.8
C_4 POLY TAR	7.53	1.71	0.227	

	gal/hr	gal/MCF	Bbl/Day
10 # RVP 400 EP GASOLINE	13.240	0.8741	4739
GAS OIL	1.692	0.1117	606
FUEL OIL	1.085	0.0716	388
POLY TAR	0.303	0.0200	108
TOTAL	16.320	1.0774	5842
W. S. CHEM.	0.889 1.518	0.0455 0.1002	247 543
TOTAL	18.527	1.2231	6632

Form ML—11 AI=(34.53)(0.6105)=21.08 Acids=(0.117)(37.4)=4.38% g/NCM = 16.91×#/MCF *9488 MCFH H_2 + CO, Bbl/Day = 5421.6×gal/MCF

RUN NO. 62-2 (J-M)
HOURS 206-303
CATALYST Fresh CM&S

THE TEXAS COMPANY — MONTEBELLO LABORATORY
YIELD CALCULATIONS

	FRESH FEED %	FRESH FEED m/hr	FRESH FEED #/hr	WET GAS %	WET GAS At Wt. Balance m/hr	WET GAS At Wt. Balance #/hr	RECYCLE m/hr	COMBINED FEED m/hr	EFFLUENT m/hr	NET CHANGE m/hr	NET CHANGE #/hr	YIELD BASIS H_2+CO FED #/MCF	CONDENSATE #/gal	CONDENSATE gal/hr	CONDENSATE gal/MCF
CO 28.010		15.423						22.433		-12.772	-357.74				
H_2 2.016		24.899						46.277		-16.819	-33.91				
CO_2 44.010										3.037	133.66	8.735			
N_2 28.016															
CH_4 16.042										0.859	13.78	0.901			
C_2H_4 28.052										0.250	7.01	0.458			
C_2H_6 30.068										0.147	4.42	0.289			
C_1+C_2											25.21	1.647			
C_3H_6 42.078										0.215	9.05	0.591	4.32	2.095	0.137
C_3H_8 44.094										0.029	1.28	0.084	4.24	0.302	0.020
C_4H_8 56.104										0.220	12.34	0.806	5.00	2.468	0.161
C_4H_{10} 58.120										0.085	4.94	0.323	4.86	1.016	0.066
C_5H_{10} 70.130										0.121	8.49	0.555	5.45	1.558	0.102
C_5H_{12} 72.146										0.032	2.31	0.151	5.25	0.440	0.029
C_6H_{12} 84.156										0.050	4.21	0.275	5.54	0.760	0.050
C_3-C_6											42.62	2.785		8.639	0.565
TOTAL															
H_2+CO		40.322	15302	SCFH				68.710		-29.591					
H_2/CO			Factor 653509												

YIELDS BASIS BROWNSVILLE DESIGN FEED RATE*	CORRECTED HEMPEL, %	gal/hr	TREATING RECOVERY, %	gal/hr
400 EP	70.8	6.886	98.0	6.748
400-550	18.0	1.751	91.4	1.600
550 +	11.2	1.089	114.6	1.248

	RECOVERY %	#/hr	gal/hr
PROPYLENE	34.38	3.111	
C_3 POLY GASO.	87.5	2.722	0.455
C_3 POLY TAR	12.5	0.389	0.052

	#/gal	#/hr	gal/hr	RVP
C_4H_8	5.00	-	-	68.0
C_4 POLY GASO.	5.98	10.80	1.806	1.5
C_4H_{10}	4.86	4.81	0.990	68.0
C_4-FREE GASO.			9.961	5.8
C_4 POLY TAR	7.53	1.54	0.205	

	gal/hr	gal/MCF	Bbl/Day
10 # RVP 400 EP GASOLINE	12.757	0.8337	4520
GAS OIL	1.600	0.1046	567
FUEL OIL	1.248	0.0816	442
POLY TAR	0.257	0.0168	91
TOTAL	15.862	1.0366	5620
W. S. CHEM.	0.673 1.516	0.0440 0.0991	239 537
TOTAL	18.051	1.1796	6395

Weight Recovery, % 94.80	Catalyst Age, hrs. Ave. = 243	Space Velocity, vhv 1226			
Pressure, psig 372	Inlet Velocity, Ft/sec 1.01	Catalyst Vol., CF 12.49			
Temperature, °F 659	Bed Depth, Ft 18.9	Weight, # 1549			
Recycle Ratio 1.08	Bed Density, #/CF 124	Effluent Shift Ratio $\frac{(H_2)(CO_2)}{(H_2O)(CO)}$ =			

	m/hr	#/hr	#/MCF	gal/hr	gal/MCF
RECOVERED OIL		63.41	4.144	9.726	0.636
TOTAL OIL		106.03	6.929	18.365	1.200
WATER SOLUBLE CHEMICALS		5.40 12.17	0.353 0.795	0.673 1.516	0.044 0.099
TOTAL LIQUID PRODUCTS C_3+		123.60	8.077	20.554	1.343
NET WATER		106.37	6.951	12.746	0.833
GROSS WATER		123.94	8.100	14.935	0.976
HYDROCARBON TOTAL—C_1+		148.81	9.725		

FRESH FEED CONVERSION — % Contraction	CO	H_2	H_2+CO	TOTAL FEED CONVERSION — % CO	H_2	$CO+H_2$	SELECTIVITY C_3+/C_1+
59.09	82.81	67.55	73.39	56.93	36.34	43.07	83.06

Form ML—11 AI = (35.01)(0.5750)=20.13 Acids= (0.117)(37.28)=4.36% g/NCM = 16.91×#/MCF *9488 MCFH H_2 + CO, Bbl/Day=5421.6×gal/MCF

RUN NO. 62-3 (N-Q)
HOURS 303-399
CATALYST Fresh CM&S

THE TEXAS COMPANY — MONTEBELLO LABORATORY
YIELD CALCULATIONS

	FRESH FEED %	FRESH FEED m/hr	FRESH FEED #/hr	WET GAS %	WET GAS At Wt. Balance m/hr	WET GAS At Wt. Balance #/hr	RECYCLE m/hr	COMBINED FEED m/hr	EFFLUENT m/hr	NET CHANGE m/hr	NET CHANGE #/hr	YIELD BASIS H_2+CO FED #/MCF	CONDENSATE #/gal	CONDENSATE gal/hr	CONDENSATE gal/MCF
CO 28.010		15.361						23.166		-12.131	-339.79				
H_2 2.016		24.598						46.956		-15.347	-30.94				
CO_2 44.010										3.096	136.25	8.985			
N_2 28.016															
CH_4 16.042										0.894	14.34	0.946			
C_2H_4 28.052										0.237	6.65	0.439			
C_2H_6 30.068										0.143	4.30	0.284			
C_1+C_2											25.29	1.668			
C_3H_6 42.078										0.210	8.84	0.583	4.32	2.046	0.135
C_3H_8 44.094										0.032	1.41	0.093	4.24	0.333	0.022
C_4H_8 56.104										0.207	11.61	0.766	5.00	2.322	0.153
C_4H_{10} 58.120										0.086	5.00	0.330	4.86	1.029	0.068
C_5H_{10} 70.130										0.123	8.63	0.569	5.45	1.583	0.104
C_5H_{12} 72.146										0.031	2.24	0.148	5.25	0.427	0.028
C_6H_{12} 84.156										0.053	4.46	0.294	5.54	0.805	0.053
C_3-C_6											42.19	2.782		8.545	0.564
TOTAL															
H_2+CO		39.959	15164	SCFH				70.122		-27.478					
H_2/CO			Factor 659456												

YIELDS BASIS BROWNSVILLE DESIGN FEED RATE*	CORRECTED HEMPEL, %	gal/hr	TREATING RECOVERY, %	gal/hr
400 EP	70.1	5.885	98.0	5.767
400-550	18.8	1.578	91.4	1.442
550 +	11.1	0.932	114.6	1.068

	RECOVERY %	#/hr	gal/hr
PROPYLENE	30.9	2.732	
C_3 POLY GASO.	87.5	2.390	0.400
C_3 POLY TAR	12.5	0.342	0.045

	#/gal	#/hr	gal/hr	RVP
C_4H_8	5.00	-	-	68.0
C_4 POLY GASO.	5.98	10.16	1.699	1.5
C_4H_{10}	4.86	4.37	0.900	68.0
C_4-FREE GASO.			8.982	5.8
C_4 POLY TAR	7.53	1.45	0.193	

	gal/hr	gal/MCF	Bbl/Day
10 # RVP 400 EP GASOLINE	11.581	0.7637	4140
GAS OIL	1.442	0.0951	516
FUEL OIL	1.068	0.0704	382
POLY TAR	0.238	0.0157	85
TOTAL	14.329	0.9449	5123
W. S. CHEM.	0.636 1.299	0.0419 0.0857	227 465
TOTAL	16.264	1.0725	5815

Weight Recovery, % 92.58	Catalyst Age, hrs. Ave. 339	Space Velocity, vhv 1309
Pressure, psig 371	Inlet Velocity, Ft/sec 1.02	Catalyst Vol., CF 11.59
Temperature, °F 658	Bed Depth, Ft 17.6	Weight, # 1402
Recycle Ratio 1.11	Bed Density, #/CF 121	Effluent Shift Ratio $\frac{(H_2)(CO_2)}{(H_2O)(CO)}$ =

	m/hr	#/hr	#/MCF	gal/hr	gal/MCF
RECOVERED OIL		54.84	3.616	8.395	0.554
TOTAL OIL		97.03	6.399	16.940	1.117
WATER SOLUBLE CHEMICALS		5.12 10.45	0.338 0.689	0.636 1.299	0.042 0.086
TOTAL LIQUID PRODUCTS C_3+		112.60	7.425	18.875	1.245
NET WATER		93.43	6.161	11.194	0.738
GROSS WATER		109.00	7.188	13.129	0.866
HYDROCARBON TOTAL—C_1+		137.89	9.093		

FRESH FEED CONVERSION — % Contraction	CO	H_2	H_2+CO	TOTAL FEED CONVERSION — % CO	H_2	$CO+H_2$	SELECTIVITY C_3+/C_1+
54.08	78.97	62.39	68.77	52.37	32.68	39.19	81.66

Form ML—11 Activity Index = (36.18)(0.5054)=18.29 Acids=(0.117)(40.2)=4.70% g/NCM = 16.91×#/MCF *9488 MCFH H_2 + CO, Bbl/Day=5421.6×gal/MCF

RUN NO. 62-4 (R-W)
HOURS 399-543
CATALYST Fresh CM&S

THE TEXAS COMPANY — MONTEBELLO LABORATORY
YIELD CALCULATIONS

	FRESH FEED %	FRESH FEED m/hr	FRESH FEED #/hr	WET GAS %	WET GAS At Wt. Balance m/hr	WET GAS At Wt. Balance #/hr	RECYCLE m/hr	COMBINED FEED m/hr	EFFLUENT m/hr	NET CHANGE m/hr	NET CHANGE #/hr	CONDENSATE #/MCF	CONDENSATE #/gal	CONDENSATE gal/hr	CONDENSATE gal/MCF
CO 28.010		15.234						21.858		-12.567	-352.00				
H_2 2.016		24.429						46.027		-15.720	-31.69				
CO_2 44.010										3.263	143.60	9.543			
N_2 28.016															
CH_4 16.042										0.866	13.89	0.923			
C_2H_4 28.052										0.251	7.04	0.468			
C_2H_6 30.068										0.128	3.85	0.256			
C_1+C_2											24.78	1.647			
C_3H_6 42.078										0.189	7.95	0.528	4.32	1.840	0.122
C_3H_8 44.094										0.026	1.15	0.076	4.24	0.271	0.018
C_4H_8 56.104										0.201	11.28	0.750	5.00	2.256	0.150
C_4H_{10} 58.120										0.084	4.88	0.324	4.86	1.004	0.067
C_5H_{10} 70.130										0.126	8.84	0.587	5.45	1.622	0.108
C_5H_{12} 72.146										0.033	2.38	0.158	5.25	0.453	0.030
C_6H_{12} 84.156										0.052	4.38	0.291	5.54	0.791	0.053
C_3-C_6											40.86	2.715		8.237	0.547
TOTAL															
H_2+CO		39.663	15047 SCFH					67.885		-28.287					
H_2/CO			Factor 664584												

YIELD BASIS H_2+CO FED				
RECOVERED OIL		59.93	3.983	9.193	0.611
TOTAL OIL		100.79	6.698	17.430	1.158
WATER SOLUBLE CHEMICALS		5.07 10.53	0.337 0.700	0.625 1.298	0.042 0.086
TOTAL LIQUID PRODUCTS C_3+		116.39	7.735	19.353	1.286
NET WATER		95.17	6.325	11.408	0.758
GROSS WATER		110.77	7.362	13.331	0.886
HYDROCARBON TOTAL—C_1+		141.17	9.382		

YIELDS BASIS BROWNSVILLE DESIGN FEED RATE*	CORRECTED HEMPEL, %	gal/hr	TREATING RECOVERY, %	gal/hr
400 EP	69.95	6.431	98.0	6.302
400-550	18.78	1.726	91.4	1.578
550 +	11.27	1.036	114.6	1.187

	RECOVERY %	#/hr	gal/hr
PROPYLENE	32.23	2,562	
C_3 POLY GASO.	87.5	2.242	0.375
C_3 POLY TAR	12.5	0.320	0.042

	#/gal	#/hr	gal/hr	RVP
C_4H_8	5.00	-	-	68.0
C_4 POLY GASO.	5.98	9.87	1.651	1.5
C_4H_{10}	4.86	4.53	0.933	68.0
C_4-FREE GASO.			9.543	5.8
C_4 POLY TAR	7.53	1.41	0.187	

	gal/hr	gal/MCF	Bbl/Day
10 # RVP 400 EP GASOLINE	12.127	0.8059	4369
GAS OIL	1.578	0.1049	569
FUEL OIL	1.187	0.0789	428
POLY TAR	0.229	0.0152	82
TOTAL	15.121	1.0049	5448
W. S. CHEM.	0.625 1.298	0.0415 0.0863	225 468
TOTAL	17.044	1.1327	6141

Weight Recovery, %	92.68	Catalyst Age, hrs. Ave.	416	Space Velocity, vhv	1513
Pressure, psig	370	Inlet Velocity, Ft/sec	1.01	Catalyst Vol., CF	9.98
Temperature, °F	659	Bed Depth, Ft	15.1	Weight, #	1213
Recycle Ratio	1.10	Bed Density, #/CF	122	Effluent $(H_2)(CO_2)$ / Shift Ratio $(H_2O)(CO)$ =	

FRESH FEED CONVERSION — %				TOTAL FEED CONVERSION — %			SELECTIVITY
Contraction	CO	H_2	H_2+CO	CO	H_2	CO+H_2	C_3 + /C_1 +
55.92	82.49	64.35	71.32	57.49	34.15	41.67	82.45

Form ML—11 Activity Index = (38.90)(0.5425)=21.10 Acids=(0.117)(39.18)=4.58%

g/NCM = 16.91 × #/MCF *9488 MCFH H_2 + CO, Bbl/Day = 5421.6 × gal/MCF

RUN NO. 62-A
HOURS 0-22
CATALYST Fresh CM&S

THE TEXAS COMPANY — MONTEBELLO LABORATORY
YIELD CALCULATIONS

	FRESH FEED %	FRESH FEED m/hr	FRESH FEED #/hr	WET GAS %	WET GAS At Wt. Balance m/hr	WET GAS At Wt. Balance #/hr	RECYCLE m/hr	COMBINED FEED m/hr	EFFLUENT m/hr	NET CHANGE m/hr	NET CHANGE #/hr
CO 28.010	36.990	16.765	469.57	8.357	1.160	32.49	3.446	20.211	4.606	-15.605	-437.08
H_2 2.016	59.400	26.921	54.27	37.760	5.243	10.57	15.568	42.489	20.811	-21.678	-43.70
CO_2 44.010	1.910	0.866	38.11	29.430	4.086	179.84	12.134	13.000	16.220	3.220	141.73
N_2 28.016	0.200	0.091	2.55	1.590	0.221	6.19	0.656	0.747	0.877		
CH_4 16.042	1.500	0.680	10.91	12.947	1.798	28.84	5.338	6.018	7.136	1.118	17.93
C_2H_4 28.052				1.894	0.263	7.38	0.781	0.781	1.044	0.263	7.38
C_2H_6 30.068				1.143	0.159	4.78	0.471	0.471	0.630	0.159	4.78
C_1+C_2											30.09
C_3H_6 42.078				2.413	0.335	14.10	0.995	0.995	1.330	0.335	14.10
C_3H_8 44.094				0.377	0.052	2.29	0.155	0.155	0.207	0.052	2.29
C_4H_8 56.104				2.087	0.290	16.27	0.860	0.860	1.150	0.290	16.27
C_4H_{10} 58.120				0.733	0.102	5.93	0.302	0.302	0.404	0.102	5.93
C_5H_{10} 70.130				0.843	0.117	8.21	0.348	0.348	0.465	0.117	8.21
C_5H_{12} 72.146				0.193	0.027	1.95	0.080	0.080	0.107	0.027	1.95
C_6H_{12} 84.156				0.233	0.032	2.69	0.096	0.096	0.128	0.032	2.69
C_3-C_6											51.44
TOTAL		45.323	575.41		13.885	321.53	41.230	86.553	64.274		
H_2+CO	96.390	43.686	1657908 SCFH	6.403			19.014	62.700	25.417	-37.283	
H_2/CO		1.61	Factor 603169	4.52			4.52	2.10	4.52	1.39	

CONDENSATE #/MCF	CONDENSATE #/gal	CONDENSATE gal/hr	CONDENSATE gal/MCF
1.081			
0.445			
0.288			
1.814			
0.950	4.32	3.264	0.197
0.138	4.24	0.540	0.033
0.981	5.00	3.254	0.196
0.358	4.86	1.220	0.074
0.495	5.45	1.506	0.091
0.118	5.25	0.371	0.022
0.162	5.54	0.486	0.029
3.102		10.641	0.642
11.250			

YIELD BASIS H_2+CO FED

YIELDS BASIS BROWNSVILLE DESIGN FEED RATE*

	CORRECTED HEMPEL. %	gal/hr	TREATING RECOVERY.%	gal/hr
400 EP	71.0	9.935	98.0	9.736
400-550	20.4	2.855	91.4	2.609
550 +	8.6	1.203	114.6	1.379

	RECOVERY %	#/hr	gal/hr	
PROPYLENE	46.4	6.54		
C_3 POLY GASO.	87.5	5.72	0.957	
C_3 POLY TAR	12.5	0.82	0.109	

	#/gal	#/hr	gal/hr	RVP
C_4H_8	5.00	0.33	0.066	68.0
C_4 POLY GASO.	5.98	13.95	2.332	1.5
C_4H_{10}	4.86	5.93	1.220	68.0
C_4-FREE GASO.			13.056	5.8
C_4 POLY TAR	7.53	1.99	0.264	

	gal/hr	gal/MCF	Bbl/Day
10 # RVP 400 EP GASOLINE	16.674	1.0057	5453
GAS OIL	2.609	0.1574	853
FUEL OIL	1.379	0.0832	451
POLY TAR	0.373	0.0225	122
TOTAL	21.035	1.2688	6879
W. S. CHEM.	1.554	0.0937	508
TOTAL	22.589	1.3625	7387

Weight Recovery, % 94.83	Catalyst Age, hrs.	Space Velocity, vhv 1524	RECOVERED OIL 0.659 92.45 5.576 13.993 0.844
Pressure, psig 415	Inlet Velocity, Ft/sec 1.03	Catalyst, vol CF 10.88	TOTAL OIL 143.89 143.89 8.678 24.634 1.486
Temperature, °F 669	Bed Depth, Ft 16.48	Weight, # 1534	WATER SOLUBLE CHEMICALS 0.237 12.57 0.758 1.554 0.094
Recycle Ratio 0.91	Bed Density, #/CF 141	Effluent $\frac{(H_2)(CO_2)}{(H_2O)(CO)}$ = 8.87 Shift Ratio	TOTAL LIQUID PRODUCTS C_3+ 156.46 9.436 26.188 1.580

FRESH FEED CONVERSION — %				TOTAL FEED CONVERSION — %			SELECTIVITY	
Contraction	CO	H_2	H_2+CO	CO	H_2	CO+H_2	C_3 + /C_1 +	NET WATER 8.263 148.86 8.979 17.870 1.078
69.36	93.08	80.52	85.34	77.21	51.02	59.46	83.87	GROSS WATER 161.43 9.737 19.424 1.172
								HYDROCARBON TOTAL—C_1+ 186.55 11.250 .

Form ML—11

g/NCM = 16.91 × #/MCF *9488 MCFH H_2 + CO, Bbl/Day = 5421.6 × gal/MCF

THE TEXAS COMPANY — MONTEBELLO LABORATORY
DATA SUMMARY

RUN NO. 62-A
HOURS 0-22

OPERATING CONDITIONS			
PRESSURES PSIG		RATES S.C.F.H.	
Oxygen	441	Fresh Feed	17200
Natural Gas	439	Recycle	15647
Generator Outlet	421	Combined Feed	32847
Reactor Inlet	415	Wet Gas—Measured	4782
Condenser Inlet		Adjusted	5269
Product Accumulator	377	Loss	487
TEMPERATURES—°F.		Recycle/Fresh Feed	0.91
Oxygen	432	Inlet Velocity—ft./sec.	1.03
Natural Gas	776	Fresh Feed Rate—S.C.F.H.	16579
Generator	2260	per Cu. Ft. Dense Bed	1524
Quench Accumulator	158	per Lb. Catalyst	10.81
Reactor Inlet	225	per Sq. Ft.	25120
Condenser Inlet	619		
Product Accumulator	103	Heat Transfer Calculations	
Catalyst No. Height		Steam Rate=409#/hr	
1 0'0"	627	@ 706 psia & 506°F=	
2 0'9"	669	1201 BTU/#	
3 1'8"	658	Water in @ 79°F=47 BTU/#	
4 4'5"	668	Heat Trans/#steam=1154 BTU	
5 7'0"	676	(1154)(409)=471986	
6 12'3"	675	Ave. Bed Temp=669°F	
7 17'5"	661	dT=669-506°F=163°F	
8 20'0"	704	Tube Area=30.0 sq ft	
9 22'7"	734	K= $\frac{471986}{(30.0)(163)}$ = 98.5 BTU/°F/sq ft	
10 25'2"	722		
11 26'11"	651		

PRODUCT TESTS	OIL	WATER
° API	46.8	10.3
Neut. No.	36.2	35.3
Sap. No.	39.3	38.0
Hydrox. No.		
Bromine No.	82	
Pour °F. below	-35	
Chemicals, % by K_2CO_3		8.0
HEMPEL, DIST. %		°API
205 °F.		
400	70.0	53.6
400-550	20.4	35.3
550+	9.6	
A. S. T. M. DIST. ON		
Naphtha °F.		
IBP	110	
10%	144	
50%	240	
90%	374	
EP	400	
Rec.	95.0	

CATALYST DATA						
INVENTORY DATA		PARTICLE SIZE				
		Screen Analysis			Sedimentation	
In Reactor at Start of Period		Mesh	Microns	%	Microns	%
Fresh Catalyst Added	0	On 40	419+	53.8	80+	
Total		100	150	29.3	40—80	
Catalyst Recovered	137	150	105	6.7	20—40	
In Reactor at End of Period		200	74	5.0	10—20	
		250	62	0.8	0—20	
REACTOR d-p, Inches H_2O		325	44	2.0		
No. Height		<325		2.4		
0 0-21-3/8	48					
1 21-3/8-52-3/4	70	CATALYST				
2 52-3/4-84	71	Bulk Density, Lbs./Cu.Ft.				
3 84-115-3/8	73	Aerated			148	
4 115-3/8-353-1/8	185	Settled			150	
Total	447	Compacted			193	
		Particle Density, gm./cc.			4.30	
CALCULATED FROM dp		NH_3 Value, ml./gm.				
Density, Lbs./Cu.Ft.	141	N_2 Surface, m^2/gm.				
Inventory, Lbs.	1534					
Bed Depth, Ft.	16.48	CHEMICAL ANALYSIS				
Vol., Cu. Ft.	10.88	Fe				
		C			5.78	
		O				
		H				
		K_2O, W+, % basis Fe				
		X-Ray Analysis—				
		$Fe_{20}C_9$				
		Fe_3O_4				
		Fe				

RUN NO. 62-B
HOURS 22-46
CATALYST Fresh CM&S

THE TEXAS COMPANY — MONTEBELLO LABORATORY
YIELD CALCULATIONS

	FRESH FEED			WET GAS			RECYCLE	COMBINED FEED	EFFLUENT	NET CHANGE		YIELD BASIS H_2+CO FED								
					At Wt. Balance							CONDENSATE								
	%	m/hr	#/hr	%	m/hr	#/hr	m/hr	m/hr	m/hr	m/hr	#/hr	#/MCF	#/gal	gal/hr	gal/MCF	YIELDS BASIS BROWNSVILLE DESIGN FEED RATE*				
CO 28.010	36.846	16.955	474.91	16.140	3.159	88.48	7.339	24.294	10.498	-13.796	-386.43						CORRECTED HEMPEL. %	gal/hr	TREATING RECOVERY %	gal/hr
H_2 2.016	59.853	27.542	55.52	47.514	9.299	18.34	21.603	49.145	30.902	-182.43	-37.18					400 EP	71.9	7.732	98.0	7.577
CO_2 44.010	1.957	0.901	39.65	21.667	4.240	186.60	9.852	10.753	14.092	3.339	146.95	8.702				400-550	20.4	2.194	91.4	2.005
N_2 28.016	0.357	0.164	4.59	1.453	0.284	7.96	0.661	0.825	0.945							550 +	7.7	0.828	114.6	0.949
CH_4 16.042	0.987	0.454	7.28	6.923	1.355	21.74	3.148	3.602	4.503	0.901	14.46	0.856								
C_2H_4 28.052				1.307	0.256	7.18	0.594	0.594	0.850	0.256	7.18	0.425					RECOVERY %	#/hr	gal/hr	
C_2H_6 30.068				0.790	0.155	4.66	0.359	0.359	0.514	0.155	4.66	0.276				PROPYLENE	33.0	3.706		
C_1+C_2											26.30	1.557				C_3 POLY GASO.	87.5	3.243	0.542	
C_3H_6 42.078				1.363	0.267	11.23	0.620	0.620	0.887	0.267	11.23	0.665	4.32	2.600	0.154	C_3 POLY TAR	12.5	0.463	0.061	
C_3H_8 44.094				0.170	0.033	1.46	0.077	0.077	0.110	0.033	1.46	0.086	4.24	0.344	0.020					
C_4H_8 56.104				1.177	0.230	12.90	0.535	0.535	0.765	0.230	12.90	0.764	5.00	2.580	0.153		#/gal	#/hr	gal/hr	RVP
C_4H_{10} 58.120				0.590	0.115	6.68	0.268	0.268	0.383	0.115	6.68	0.396	4.86	1.374	0.081	C_4H_8	5.00	5.01	1.002	68.0
C_5H_{10} 70.130				0.533	0.104	7.29	0.242	0.242	0.346	0.104	7.29	0.432	5.45	1.338	0.079	C_4 POLY GASO.	5.98	9.83	1.643	1.5
C_5H_{12} 72.146				0.153	0.030	2.16	0.070	0.070	0.100	0.030	2.16	0.128	5.25	0.411	0.024	C_4H_{10}	4.86	6.68	1.374	68.0
C_6H_{12} 84.156				0.220	0.043	3.62	0.100	0.100	0.143	0.043	3.62	0.214	5.54	0.653	0.039	C_4-FREE GASO.			10.521	5.8
C_3-C_6											45.34	2.685		9.300	0.550	C_4 POLY TAR	7.53	1.40	0.186	
TOTAL		46.016	581.95		19.571	380.30	45.468	91.484	72.437											
H_2+CO	96.699	44.497	16886.6 SCFH		12.458		28.942	73.439	41.400	32.039							gal/hr	gal/MCF	Bbl/Day	
H_2/CO		1.62	Factor 592185		2.94		2.94	2.02	2.94	1.32						10 # RVP 400 EP GASOLINE	14.540	0.8610	4668	
Weight Recovery, % 93.29			Catalyst Age, hrs.			Space Velocity, vhv 1525			RECOVERED OIL	0.494	69.27	4.102		10.754	0.637	GAS OIL	2.005	0.1187	644	
Pressure, psig 419			Inlet Velocity, Ft/sec 1.06			Catalyst, Vol CF 11.07			TOTAL OIL		114.61	6.787		20.054	1.187	FUEL OIL	0.949	0.0562	305	
Temperature, °F 654			Bed Depth, Ft 16.78			Weight, # 1661			WATER SOLUBLE CHEMICALS	0.214	11.36	0.673		1.396	0.083	POLY TAR	0.247	0.0146	79	
Recycle Ratio 0.99			Bed Density, #/CF 150			Effluent $\frac{(H_2)(CO_2)}{(H_2O)(CO)}$ Shift Ratio =6.20			TOTAL LIQUID PRODUCTS C_3+		125.97	7.460		21.450	1.270	TOTAL	17.741	1.0506	5696	
FRESH FEED CONVERSION — %				TOTAL FEED CONVERSION — %			SELECTIVITY		NET WATER	6.690	120.53	7.138		14.473	0.857	W. S. CHEM.	0.673	0.0399	216	
Contraction	CO	H_2	H_2+CO	CO	H_2	$CO+H_2$	C_3+/C_1+		GROSS WATER		131.89	7.810		15.869	0.940	TOTAL	18.414	1.0904	5912	
57.47	81.31	66.24	72.00	56.79	37.12	43.63	82.72		HYDROCARBON TOTAL—C_1+		152.27	9.017								

Form ML—11

g/NCM = 16.91 × #/MCF *9488 MCFH H_2+CO, Bbl/Day = 5421.6 × gal/MCF

THE TEXAS COMPANY — MONTEBELLO LABORATORY
DATA SUMMARY

RUN NO. 62-B
HOURS 22-46

OPERATING CONDITIONS				PRODUCT TESTS			CATALYST DATA				
PRESSURES PSIG		RATES S.C.F.H.			OIL	WATER	INVENTORY DATA		PARTICLE SIZE		
Oxygen	449	Fresh Feed	17463	° API	48.7	10.3	In Reactor at Start of Period		Screen Analysis		Sedimentation
Natural Gas	445	Recycle	17255	Neut. No.	40.8	40.5	Fresh Catalyst Added	--	Mesh / Microns / %		Microns / %
Generator Outlet	425	Combined Feed	34718	Sap. No.	51.1	44.2	Total		On 40 / 419+ / 42.6		80+
Reactor Inlet	419	Wet Gas—Measured	6666	Hydrox. No.			Catalyst Recovered	88	100 / 150 / 38.6		40—80
Condenser Inlet		Adjusted	7427	Bromine No.	86		In Reactor at End of Period		150 / 105 / 9.0		20—40
Product Accumulator	375	Loss	761	Pour °F. Below	-35				200 / 74 / 5.2		10—20
				Chemicals, % by K_2CO_3		8.8	REACTOR d-p, Inches H_2O		250 / 62 / 0.6		0—20
							No. Height		325 / 44 / 2.0		
TEMPERATURES—°F.		Recycle/Fresh Feed	0.99				0 See Per. A	51	<325 / / 2.0		
Oxygen	455	Inlet Velocity—ft./sec.	1.06				1	74	CATALYST		
Natural Gas	825	Fresh Feed Rate—S.C.F.H.	16887	HEMPEL. DIST. %		°API	2	76	Bulk Density, Lbs./Cu.Ft.		
Generator	2296	per Cu.Ft. Dense Bed	1525	205 °F.			3	78	Aerated		158
Quench Accumulator	160	per Lb. Catalyst	10.17	400	70.9	54.6	4	205	Settled		160
Reactor Inlet	372	per Sq. Ft.	25586	400-550	20.4	37.5	Total	484	Compacted		189
Condenser Inlet	589			550+	8.7				Particle Density, gm./cc.		4.25
Product Accumulator	95	Heat Transfer Calculations					CALCULATED FROM dp		NH_3 Value, ml./gm.		
Catalyst No. Height		Steam Rate=439#/hr		A. S. T. M. DIST. ON			Density, Lbs./Cu.Ft.	150	N_2 Surface, m^2/gm.		
1 See Per. A	597	@ 707 psia & 505°F=		Naphtha °F.			Inventory, Lbs.	1661			
2	649	1201 BTU/#		IBP	112		Bed Depth, Ft.	16.78	CHEMICAL ANALYSIS		
3	646	Water in @ 78°F=46 BTU/#		10%	142		Vol., Cu. Ft.	11.07	Fe		
4	655	Heat Trans/# steam=1155 BTU		50%	242				C		4.97
5	661	(1155)(439)=507045		90%	370				O		
6	661	Ave Bed Temp=654°F		EP	420				H		
7	647	dT=654-505=149°F		Rec.	97.0				K_2O, W+, % basis Fe		
8	659	Tube Area=30.4 sq ft							X-Ray Analysis—		
9	672	$K=\frac{507045}{(30.4)(149)}=111.9$ BTU/°F/sq ft							$Fe_{20}C_9$		
10	659								Fe_3O_4		
11	613								Fe		

RUN NO. 62-C
HOURS 46-70
CATALYST Fresh CM&S

THE TEXAS COMPANY — MONTEBELLO LABORATORY
YIELD CALCULATIONS

	FRESH FEED			WET GAS			RECYCLE	COMBINED FEED	EFFLUENT	NET CHANGE		YIELD BASIS H_2+CO FEED			
					At Wt. Balance							CONDENSATE			
	%	m/hr	#/hr	%	m/hr	#/hr	m/hr	m/hr	m/hr	m/hr	#/hr	#/MCF	#/gal	gal/hr	gal/MCF
CO 28.010	37.217	16.019	448.69	14.543	2.458	68.85	6.375	22.394	8.833	-13.561	-379.84				
H_2 2.016	59.486	25.605	51.62	44.077	7.450	15.02	19.320	44.925	26.770	-18.155	-36.60				
CO_2 44.010	2.360	1.016	44.72	24.850	4.200	184.84	10.893	11.909	15.093	3.184	140.12	8.870			
N_2 28.016	0.207	0.089	2.49	1.137	0.192	5.38	0.499	0.588	0.691						
CH_4 16.032	0.730	0.314	5.04	7.523	1.271	20.39	3.297	3.611	4.568	0.957	15.35	0.972			
C_2H_4 28.052				1.707	0.288	8.08	0.748	0.748	1.036	0.288	8.08	0.512			
C_2H_6 30.068				0.967	0.163	4.90	0.424	0.424	0.587	0.163	4.90	0.310			
C_1+C_2											28.33	1.794			
C_3H_6 42.078				1.787	0.302	12.71	0.783	0.783	1.085	0.302	12.71	0.805	4.32	2.942	0.187
C_3H_8 44.094				0.263	0.044	1.94	0.115	0.115	0.159	0.044	1.94	0.123	4.24	0.458	0.029
C_4H_8 56.104				1.527	0.258	14.47	0.669	0.669	0.927	0.258	14.47	0.916	5.00	2.894	0.183
C_4H_{10} 58.120				0.480	0.081	4.71	0.210	0.210	0.291	0.081	4.71	0.298	4.86	0.969	0.061
C_5H_{10} 70.130				0.693	0.117	8.21	0.304	0.304	0.421	0.117	8.21	0.520	5.45	1.506	0.095
C_5H_{12} 72.146				0.163	0.028	2.02	0.071	0.071	0.099	0.028	2.02	0.128	5.25	0.385	0.024
C_6H_{12} 84.156				0.283	0.048	4.04	0.124	0.124	0.172	0.048	4.04	0.256	5.54	0.729	0.046
C_5-C_6											48.10	3.046		9.883	0.625
TOTAL		43.043	552.56		16.900	355.56	43.832	86.875	67.894						
H_2+CO	96.703	41.624	15796435 SCFH		9.908		25.695	67.319	35.603	-31.716					
H_2/CO		1.60	Factor 633054		3.03		3.03	2.01	3.03	1.34					
									RECOVERED OIL	0.492	68.94	4.364		10.603	0.671
									TOTAL OIL		117.04	7.410		20.486	1.296
									WATER SOLUBLE CHEMICALS	0.225	11.94	0.756		1.497	0.095
									TOTAL LIQUID PRODUCTS C_5+		128.98	8.166		21.983	1.391
									NET WATER	6.441	116.12	7.351		13.940	0.883
									GROSS WATER		128.06	6.107		15.437	0.998
									HYDROCARBON TOTAL—C_1+		157.31	9.959			

Weight Recovery, %	93.32
Pressure, psig	421
Temperature, °F	653
Recycle Ratio	1.02
Catalyst Age, hrs.	
Inlet Velocity, Ft/sec	1.00
Bed Depth, Ft	18.94
Bed Density, #/CF	151
Space Velocity, vhv	1264
Catalyst	Vol CF 12.50
Weight, #	1888
Effluent Shift Ratio $\frac{(H_2)(CO_2)}{(H_2O)(CO)}$	= 7.10

FRESH FEED CONVERSION — %				TOTAL FEED CONVERSION — %			SELECTIVITY
Contraction	CO	H_2	H_2+CO	CO	H_2	$CO+H_2$	C_3+/C_1+
60.74	84.66	70.90	76.20	60.56	40.41	47.11	81.99

YIELDS BASIS BROWNSVILLE DESIGN FEED RATE*	CORRECTED HEMPEL. %	gal/hr	TREATING RECOVERY, %	gal/hr
400 EP	73.1	7.751	98.0	7.596
400-550	18.8	1.993	91.4	1.822
550 +	8.1	0.859	114.6	0.984

	RECOVERY %	#/hr	gal/hr
PROPYLENE	35.7	4.54	
C_3 POLY GASO.	87.5	3.97	0.664
C_3 POLY TAR	12.5	0.57	0.076

	#/gal	#/hr	gal/hr	RVP
C_4H_8	5.00	0.58	0.116	68.0
C_4 POLY GASO.	5.98	12.15	2.032	1.5
C_4H_{10}	4.86	4.71	0.969	68.0
C_4-FREE GASO.			10.980	5.8
C_4 POLY TAR	7.53	1.74	0.231	

	gal/hr	gal/MCF	Bbl/Day
10 # RVP 400 EP GASOLINE	13.997	0.8861	4804
GAS OIL	1.922	0.1153	625
FUEL OIL	0.984	0.0623	338
POLY TAR	0.307	0.0194	105
TOTAL	17.110	1.0331	5872
W.S CHEM.	1.497	0.0948	514
TOTAL	18.607	1.1779	6386

Form ML—11

g/NCM = 16.91 × #/MCF *9488 MCFH H_2 + CO, Bbl/Day = 5421.6 × gal/MCF

THE TEXAS COMPANY — MONTEBELLO LABORATORY
DATA SUMMARY

RUN NO. 62-C
HOURS 46-70

OPERATING CONDITIONS			
PRESSURES PSIG		RATES S.C.F.H.	
Oxygen	449	Fresh Feed	16335
Natural Gas	443	Recycle	16634
Generator Outlet	426	Combined Feed	32969
Reactor Inlet	421	Wet Gas—Measured	5748
Condenser Inlet		Adjusted	6414
Product Accumulator	375	Loss	666
TEMPERATURES—°F.		Recycle/Fresh Feed	1.02
Oxygen	467	Inlet Velocity—ft./sec.	1.00
Natural Gas	802	Fresh Feed Rate—S.C.F.H.	15796
Generator	2322	per Cu. Ft. Dense Bed	1264
Quench Accumulator	160	per Lb. Catalyst	8.37
Reactor Inlet	421	per Sq. Ft.	23933
Condenser Inlet	578		
Product Accumulator	97	Heat Trans. Calculations	
Catalyst No. Height		Steam Rate=455#/hr	
1 See Per. A	590	@ 706 psia & 505°F=	
2	653	1201 BTU/#	
3	647	Water in @ 81°F=49 BTU/#	
4	654	Heat Trans/# steam=1152 BTU	
5	659	(1152)(455)=524160	
6	658	Ave. Bed Temp=653°F	
7	648	dT=653-505=148°F	
8	637	Tube Area=34.3 sq ft	
9	632	K= $\frac{524160}{(34.3)(148)}$ = 103.25 BTU/°F/sq ft	
10	637		
11	628		

PRODUCT TESTS	OIL	WATER
°API	49.2	10.5
Neut. No.	37.4	34.9
Sap. No.	51.0	42.2
Hydrox. No.		
Bromine No.	86	
Pour °F. Below	-35	
Chemicals, % by K_2CO_3		9.7
HEMPEL DIST. %		°API
205 °F.		
400	72.1	55.3
400-550	18.8	37.1
550+	9.1	
A. S. T. M. DIST. ON		
Naphtha °F.		
IBP	110	
10%	142	
50%	246	
90%	370	
EP	414	
Rec.	96.0	

CATALYST DATA						
INVENTORY DATA		PARTICLE SIZE				
		Screen Analysis			Sedimentation	
In Reactor at Start of Period		Mesh	Microns	%	Microns	%
Fresh Catalyst Added	175	On 40	419+	29.6	80+	
Total		100	150	40.4	40—80	
Catalyst Recovered	75	150	105	14.3	20—40	
In Reactor at End of Period		200	74	8.5	10—20	
		250	62	1.4	0—20	
REACTOR d-p, Inches H_2O		325	44	3.8		
No. Height		<325		2.0		
0 See Per. A	51					
1	68	CATALYST				
2	82	Bulk Density, Lbs./Cu.Ft.				
3	79	Aerated			158	
4	270	Settled			159	
Total	550	Compacted			185	
		Particle Density, gm. cc.			4.48	
CALCULATED FROM dp		NH_3 Value, ml./gm.				
Density, Lbs./Cu.Ft.	151	N_2 Surface, m^2/gm.				
Inventory, Lbs.	1888					
Bed Depth, Ft.	18.94	CHEMICAL ANALYSIS				
Vol., Cu Ft.	12.50	Fe				
		C			6.21	
		O				
		H				
		K_2O, W+, % basis Fe				
		X-Ray Analysis—				
		$Fe_{20}C_9$				
		Fe_3O_4				
		Fe				

RUN NO. 62-D
HOURS 70-94
CATALYST Fresh CM&S

THE TEXAS COMPANY — MONTEBELLO LABORATORY
YIELD CALCULATIONS

	FRESH FEED			WET GAS			RECYCLE	COMBINED FEED	EFFLUENT	NET CHANGE		CONDENSATE				YIELD BASIS H_2+CO FED				
	%	m/hr	#/hr	%	At Wt. Balance m/hr	At Wt. Balance #/hr	m/hr	m/hr	m/hr	m/hr	#/hr	#/MCF	#/gal	gal/hr	gal/MCF	YIELDS BASIS BROWNSVILLE DESIGN FEED RATE*				
CO 28.010	37.610	15.630	437.78	15.317	2.490	69.74	6.745	22.375	9.235	-13.140	-368.04						CORRECTED HEMPEL, %	gal/hr	TREATING RECOVERY,%	gal/hr
H_2 2.016	59.725	24.819	50.03	45.230	7.350	14.82	19.918	44.737	27.268	-17.469	35.21					400 EP	74.6	7.593	98.0	7.441
CO_2 44.010	2.225	0.925	40.70	24.277	3.947	173.68	10.691	11.616	14.638	3.022	132.98	8.663				400-550	18.4	1.873	91.4	1.712
N_2 28.016	0.165	0.069	1.93	1.144	0.186	5.21	0.504	0.573	0.690							550 +	7.0	0.712	114.6	0.816
CH_4 16.042	0.275	0.114	1.83	6.197	1.008	16.17	2.729	2.843	3.737	0.894	14.34	0.934								
C_2H_4 28.052				1.793	0.292	8.19	0.790	0.790	1.082	0.292	8.19	0.534					RECOVERY %	#/hr	gal/hr	
C_3H_6 30.068				1.023	0.166	4.99	0.451	0.451	0.617	0.166	4.99	0.325				PROPYLENE	35.9	4.17		
C_1+C_2											27.52	1.793				C_3 POLY GASO.	87.5	3.65	0.610	
C_3H_8 42.078				1.700	0.276	11.61	0.749	0.749	1.025	0.276	11.61	0.756	4.32	2.688	0.175	C_3 POLY TAR	12.5	0.52	0.069	
C_3H_8 44.094				0.263	0.043	1.90	0.116	0.116	0.159	0.043	1.90	0.124	4.24	0.448	0.029					
C_4H_8 56.104				1.450	0.236	13.24	0.639	0.639	0.875	0.236	13.24	0.862	5.00	2.648	0.172			#/gal	#/hr	gal/hr	RVP
C_4H_{10} 58.120				0.483	0.079	4.59	0.213	0.213	0.292	0.079	4.59	0.299	4.86	0.944	0.061	C_4H_8		5.00	0.46	0.092	68.0
C_5H_{10} 70.130				0.700	0.114	7.99	0.308	0.308	0.422	0.114	7.99	0.520	5.45	1.466	0.096	C_4 POLY GASO.		5.98	11.18	1.870	1.5
C_5H_{12} 72.146				0.153	0.025	1.80	0.067	0.067	0.092	0.025	1.80	0.117	5.25	0.343	0.022	C_4H_{10}		4.86	4.59	0.944	68.0
C_6H_{12} 84.156				0.270	0.044	3.70	0.119	0.119	0.163	0.044	3.70	0.241	5.54	0.668	0.044	C_4 FREE GASO.				10.528	5.8
C_3-C_6											44.83	2.919		9.205	0.599	C_4 POLY TAR		7.53	1.60	0.212	
TOTAL		41.557	532.27		16.259	337.63	44.039	85.596	67.439											
H_2+CO	97.335	40.449	15350703 SCFH		9.840		26.663	67.112	36.503	-30.609								gal/hr	gal / MCF	Bbl/Day
H_2/CO		1.59	Factor 651435		2.95		2.95	2.00	2.95	1.33						10 # RVP 400 EP GASOLINE		13.434	0.8751	4744
									RECOVERED OIL	0.475	66.64	4.341		10.178	0.663	GAS OIL		1.712	0.1115	605
									TOTAL OIL		111.47	7.260		19.383	1.262	FUEL OIL		0.816	0.0532	288
									WATER SOLUBLE CHEMICALS	0.226	11.98	0.780		1.496	0.097	POLY TAR		0.281	0.0183	99
									TOTAL LIQUID PRODUCTS C_3+		123.45	8.040		20.879	1.359	TOTAL		16.243	1.0581	5736
									NET WATER	6.440	116.02	7.558		13.928	0.907	W. S. CHEM.		1.496	0.0975	529
									GROSS WATER		128.00	8.338		15.424	1.004	TOTAL		17.739	1.1556	6265
									HYDROCARBON TOTAL—C_1+		150.97	9.833								

Weight Recovery, % 93.05 | Catalyst Age, hrs. | Space Velocity, vhv 1228
Pressure, psig 420 | Inlet Velocity, Ft/sec 0.99 | Catalyst Vol CF 12.50
Temperature, °F 657 | Bed Depth, Ft 18.94 | Weight, # 1850
Recycle Ratio 1.06 | Bed Density, #/CF 148 | Effluent $(H_2)(CO_2)$ / Shift Ratio $(H_2O)(CO)$ = 6.71

FRESH FEED CONVERSION — %				TOTAL FEED CONVERSION — %			SELECTIVITY
Contraction	CO	H_2	H_2+CO	CO	H_2	$CO+H_2$	C_3+/C_1+
60.88	84.07	70.39	75.67	58.73	39.05	45.61	81.77

Form ML—11

g/NCM = 16.91 × #/MCF *9488 MCFH H_2 + CO, Bbl/Day = 5421.6 × gal/MCF

THE TEXAS COMPANY — MONTEBELLO LABORATORY
DATA SUMMARY

RUN NO. 62-D
HOURS 70-94

OPERATING CONDITIONS				PRODUCT TESTS			CATALYST DATA				
PRESSURES PSIG		RATES S.C.F.H.			OIL	WATER	INVENTORY DATA		PARTICLE SIZE		
Oxygen	449	Fresh Feed	15771	° API	48.8	10.5	In Reactor at Start of Period		Screen Analysis		Sedimentation
Natural Gas	442	Recycle	16713	Neut. No.	40.6	39.4	Fresh Catalyst Added	26	Mesh / Microns / %		Microns / %
Generator Outlet	425	Combined Feed	32484	Sap. No.	51.2	42.5	Total		On 40	419+	80+
Reactor Inlet	420	Wet Gas—Measured	5494	Hydrox. No.			Catalyst Recovered	78	100	150	40—80
Condenser Inlet		Adjusted	6170	Bromine No.	86		In Reactor at End of Period		150	105	20—40
Product Accumulator	375	Loss	676	Pour °F. Below	-35				200	74	10—20
				Chemicals, % by K_2CO_3		9.7	REACTOR d-p, Inches H_2O		250	62	0—20
							No. Height		325	44	M
TEMPERATURES—°F.		Recycle/Fresh Feed	1.06				0 See Per. A	50	<325		0
Oxygen	465	Inlet Velocity—ft./sec.	0.99				1	70	CATALYST		
Natural Gas	790	Fresh Feed Rate—S.C.F.H.	15351	HEMPEL. DIST. %		°API	2	78	Bulk Density, Lbs./Cu.Ft.		S
Generator	2391	per Cu.Ft. Dense Bed	1228	205 °F.			3	76	Aerated		A
Quench Accumulator	163	per Lb. Catalyst	8.30	400	73.6	53.8	4	265	Settled		M
Reactor Inlet	442	per Sq. Ft.	23259	400-550	18.4	36.8	Total	539	Compacted		P
Condenser Inlet	581			550+	8.0				Particle Density, gm./cc.		L
Product Accumulator	95	Heat Transfer Calculations					CALCULATED FROM dp		NH_3 Value, ml./gm.		E
Catalyst No. Height		Steam Rate=446#/hr		A. S. T. M. DIST. ON			Density, Lbs./Cu.Ft.	148	N_2 Surface, m^2/gm.		
1 See Per. A	592	@ 706 psia & 505°F=		Naphtha °F.			Inventory, Lbs.	1850			
2	660	1201 BTU/#		IBP	112		Bed Depth, Ft.	18.94	CHEMICAL ANALYSIS		
3	650	Water in @ 75°F=43 BTU/#		10%	144		Vol., Cu. Ft.	12.50	Fe		
4	657	Heat Trans/# steam=1158 BTU		50%	246				C		
5	663	(1158)(446)=516468 BTU/hr		90%	380				O		
6	661	Ave. Bed Temp=657°F		EP	420				H		
7	650	dT=657-505=152°F		Rec.	96.0				K_2O, W+, % basis Fe		
8	637	Tube Area=34.3 sq ft							X-Ray Analysis—		
9	633	K= 516468 / (34.3)(152) = 99.1 BTU/°F/sq ft							$Fe_{20}C_9$		
10	634								Fe_3O_4		
11	639								Fe		

RUN NO. 62-E
HOURS 94-110
CATALYST Fresh CM&S

THE TEXAS COMPANY — MONTEBELLO LABORATORY
YIELD CALCULATIONS

	FRESH FEED			WET GAS			RECYCLE	COMBINED FEED	EFFLUENT	NET CHANGE		YIELD BASIS H_2+CO FED								
					At Wt. Balance							CONDENSATE								
	%	m/hr	#/hr	%	m/hr	#/hr	m/hr	m/hr	m/hr	m/hr	#/hr	#/MCF	#/gal	gal/hr	gal/MCF	YIELDS BASIS BROWNSVILLE DESIGN FEED RATE*	CORRECTED HEMPEL, %	gal/hr	TREATING RECOVERY,%	gal/hr
CO 28.010	37.525	15.517	434.63	15.405	2.582	72.32	6.771	22.288	9.353	-12.935	-362.31									
H_2 2.016	59.575	24.636	49.67	45.590	7.643	15.41	20.038	44.674	27.681	-16.993	-34.26					400 EP	73.0	7.057	98.0	6.916
CO_2 44.010	2.480	1.026	45.15	24.290	4.072	179.18	10.677	11.703	14.749	3.046	134.038.796					400-550	18.8	1.818	91.4	1.662
N_2 28.016	0.240	0.099	2.77	1.280	0.215	6.02	0.563	0.662	0.778							550 +	8.2	0.793	114.6	0.909
CH_4 16.042	0.180	0.074	1.19	5.680	0.952	15.27	2.497	2.571	3.449	0.878	14.08	0.924								
C_2H_6 28.052				1.700	0.285	7.99	0.747	0.747	1.032	0.285	7.99	0.524					RECOVERY %	#/hr	gal/hr	
C_2H_4 30.068				0.985	0.165	4.96	0.433	0.433	0.598	0.165	4.96	0.326				PROPYLENE	34.6	4.05		
C_1+C_2											27.03	1.774				C_3 POLY GASO.	87.5	3.54	0.592	
C_3H_6 42.078				1.660	0.278	11.70	0.730	0.730	1.008	0.278	11.70	0.768	4.32	2.708	0.178	C_3 POLY TAR	12.5	0.51	0.068	
C_3H_8 44.094				0.275	0.046	2.03	0.121	0.121	0.167	0.046	2.03	0.133	4.24	0.479	0.031					
C_4H_8 56.104				1.460	0.245	13.75	0.642	0.642	0.887	0.245	13.75	0.902	5.00	2.750	0.180		#/gal	#/hr	gal/hr	RVP
C_4H_{10} 58.120				0.450	0.075	4.36	0.198	0.198	0.273	0.075	4.36	0.286	4.86	0.897	0.059	C_4H_8	5.00	0.66	0.132	68.0
C_5H_{10} 70.130				0.715	0.120	8.42	0.314	0.314	0.434	0.120	8.42	0.553	5.45	1.545	0.101	C_4 POLY GASO.	5.98	11.45	1.915	1.5
C_5H_{12} 72.146				0.160	0.027	1.95	0.070	0.070	0.097	0.027	1.95	0.128	5.25	0.371	0.024	C_4H_{10}	4.86	4.36	0.897	68.0
C_6H_{12} 84.156				0.350	0.059	4.97	0.154	0.154	0.213	0.059	4.97	0.326	5.54	0.897	0.059	C_4-FREE GASO.			10.321	5.8
C_3-C_6											47.18	3.096		9.647	0.632	C_4 POLY TAR	7.53	1.64	0.218	
TOTAL		41.352	533.41		16.764	348.33	43.955	85.307	67.477											
H_2+CO	97.100	40.153	15237903 SCFH		10.225		26.809	66.962	37.034	-29.928							gal/hr	gal/MCF	Bbl/Day	
H_2/CO		1.59	Factor 656258		2.96		2.96	2.00	2.96	1.31						10 # RVP 400 EP GASOLINE	13.265	0.8705	4720	
Weight Recovery, %	92.38	Catalyst Age, hrs.		Space Velocity, vhv	1190	RECOVERED OIL		0.450	63.07	4.139		9.668	0.634	GAS OIL	1.662	0.1091	591	
Pressure, psig	417	Inlet Velocity, Ft/sec	0.99	Catalyst, Vol CF	12.80	TOTAL OIL			110.25	7.235		19.315	1.266	FUEL OIL	0.909	0.0597	324	
Temperature, °F	655	Bed Depth, Ft	19.39	Weight, #	1792	WATER SOLUBLE CHEMICALS		0.238	12.65	0.830		1.573	0.103	POLY TAR	0.286	0.0188	102	
Recycle Ratio	0.94	Bed Density, #/CF	140	Effluent $\frac{(H_2)(CO_2)}{(H_2O)(CO)}$ Shift Ratio	7.19	TOTAL LIQUID PRODUCTS C_3+			122.90	8.065		20.888	1.369	TOTAL	16.122	1.0581	5737	
FRESH FEED CONVERSION — %				TOTAL FEED CONVERSION — %			SELECTIVITY	NET WATER		6.070	109.36	7.177		13.129	0.862	W. S CHEM.	1.573	0.1032	560	
Contraction	CO	H_2	H_2+CO	CO	H_2	$CO+H_2$	C_3 + /C_1 +	GROSS WATER			122.01	8.007		14.702	0.965	TOTAL	17.695	1.1613	6297	
59.46	83.36	68.98	74.53	58.04	38.04	44.69	81.97	HYDROCARBON TOTAL—C_1 +			149.93	9.839								

Form ML—11

g/NCM = 16.91 × #/MCF *9488 MCFH H_2 + CO, Bbl/Day = 5421.6 × gal/MCF

THE TEXAS COMPANY — MONTEBELLO LABORATORY
DATA SUMMARY

RUN NO. 62-E
HOURS 94-110

OPERATING CONDITIONS				PRODUCT TESTS			CATALYST DATA			
PRESSURES PSIG		RATES S.C.F.H.			OIL	WATER	INVENTORY DATA		PARTICLE SIZE	
Oxygen	444	Fresh Feed	15693	°API	49.1	10.5	In Reactor at Start of Period		Screen Analysis	Sedimentation
Natural Gas	440	Recycle	16681	Neut. No.	39.8	39.5	Fresh Catalyst Added		Mesh / Microns / %	Microns / %
Generator Outlet	423	Combined Feed	32374	Sap. No.	51.3	42.3	Total		On 40 / 419+ / N	80+
Reactor Inlet	417	Wet Gas—Measured	5620	Hydrox. No.			Catalyst Recovered	39	100 / 150 / O	40—80
Condenser Inlet		Adjusted	6362	Bromine No.	82		In Reactor at End of Period		150 / 105 / S A M P L E	20—40
Product Accumulator	372	Loss	742	Pour °F.	-30				200 / 74	10—20
				Chemicals, % by K_2CO_3		10.7	REACTOR d-p, Inches H_2O		250 / 62	0—20
							No. Height		325 / 44	
TEMPERATURES—°F.		Recycle/Fresh Feed	0.94				0 See Per. A	50	<325	
Oxygen	456	Inlet Velocity—ft./sec.	0.99				1	70	CATALYST	
Natural Gas	787	Fresh Feed Rate—S.C.F.H.	15238	HEMPEL. DIST. %		°API	2	78	Bulk Density, Lbs./Cu.Ft.	
Generator	2354	per Cu.Ft. Dense Bed	1190	205 °F.			3	64	Aerated	
Quench Accumulator	166	per Lb. Catalyst	850	400	72.0	55.1	4	260	Settled	
Reactor Inlet	448	per Sq. Ft.	23088	400-550	18.8	36.4	Total	522	Compacted	
Condenser Iniet	580			550+	9.2				Particle Density, gm./cc.	
Product Accumulator	94	Heat Transfer Calculations					CALCULATED FROM dp		NH_3 Value, ml./gm.	
Catalyst No. Height		Steam Rate=433#/hr		A. S. T. M. DIST. ON			Density, Lbs./Cu.Ft.	140	N_2 Surface, m^2/gm.	
1 See Per. A	626	@ 706 psia & 505°F=		Naphtha °F.			Inventory, Lbs.	1792		
2	658	1201 BTU/#		IBP	112		Bed Depth, Ft.	19.39	CHEMICAL ANALYSIS	
3	647	Water in @ 73°F=41 BTU/#		10%	140		Vol., Cu. Ft.	12.80	Fe	
4	651	Heat Trans/# steam=1160 BTU		50%	240				C	
5	663	(1160)(433)=502280 BTU/hr		90%	360				O	
6	661	Ave. Bed Temp=655°F		EP	404				H	
7	651	dT=655-505=150°F		Rec.	97.0				K_2O, W+, % basis Fe	
8	639	Tube Area=35.1 sq ft							X-Ray Analysis—	
9	634	$K=\frac{502280}{(35.1)(150)}=95.4$ BTU/°F/sq ft							$Fe_{20}C_9$	
10	634								Fe_3O_4	
11	624								Fe	

RUN NO. 62-F
HOURS 110-134
CATALYST Fresh CM&S

THE TEXAS COMPANY — MONTEBELLO LABORATORY
YIELD CALCULATIONS

	FRESH FEED			WET GAS			RECYCLE	COMBINED FEED	EFFLUENT	NET CHANGE		YIELD BASIS H_2+CO FED								
					At Wt. Balance							CONDENSATE								
	%	m/hr	#/hr	%	m/hr	#/hr	m/hr	m/hr	m/hr	m/hr	#/hr	#/MCF	#/gal	gal/hr	gal/MCF	YIELDS BASIS BROWNSVILLE DESIGN FEED RATE*				
CO 28.010	37.310	15.099	422.92	14.946	2.443	68.43	65535	21.634	8.978	-12.656	-354.49						CORRECTED HEMPEL. %	gal/hr	TREATING RECOVERY.%	gal/hr
H_2 2.016	59.217	23.964	48.31	44.810	7.325	14.77	19.592	43.556	26.917	-16.639	-33.54					400 EP	74.6	7.041	98.0	6.900
CO_2 44.010	2.343	0.948	41.72	23.673	3.868	170.20	10.350	11.298	14.218	2.920	128.48	8.667				400-550	16.0	1.510	91.4	1.380
N_2 28.016	0.933	0.378	10.59	3.123	0.511	14.31	1.366	1.744	1.877							550 +	9.4	0.887	114.6	1.017
CH_4 16.042	0.197	0.080	1.28	5.607	0.917	14.71	2.452	2.532	3.369	0.837	13.43	0.906								
C_2H_4 28.052				1.617	0.264	7.41	0.707	0.707	0.971	0.264	7.41	0.500					RECOVERY %	#/hr	gal/hr	
C_2H_6 30.068				0.990	0.162	4.87	0.433	0.433	0.595	0.162	4.87	0.329				PROPYLENE	34.7	4.41		
C_1+C_2											25.71	1.735				C_3 POLY GASO.	87.5	3.86	0.645	
C_3H_6 42.078				1.847	0.302	12.71	0.808	0.808	1.110	0.302	12.71	0.857	4.32	2.942	0.198	C_3 POLY TAR	12.5	0.55	0.066	
C_3H_8 44.094				0.297	0.049	2.16	0.130	0.130	0.179	0.049	2.16	0.146	4.24	0.509	0.034					
C_4H_8 56.104				1.537	0.251	14.08	0.672	0.672	0.923	0.251	14.08	0.950	5.00	2.816	0.190		#/gal	#/hr	gal/hr	RVP
C_4H_{10} 58.120				0.490	0.080	4.65	0.214	0.214	0.294	0.080	4.65	0.314	4.86	0.957	0.065	C_4H_8	5.00	0.28	0.056	68.0
C_5H_{10} 70.130				0.670	0.110	7.71	0.293	0.293	0.403	0.110	7.71	0.520	5.45	1.415	0.095	C_4 POLY GASO.	5.98	12.08	2.019	1.5
C_6H_{12} 72.146				0.150	0.025	1.80	0.066	0.066	0.091	0.025	1.80	0.121	5.25	0.343	0.023	C_4H_{10}	4.86	4.65	0.957	68.0
C_6H_{12} 84.156				0.243	0.040	3.37	0.106	0.106	0.146	0.040	3.37	0.227	5.54	0.608	0.041	C_4-FREE GASO.			9.911	5.8
C_3-C_6											46.48	3.135		9.590	0.646	C_4 POLY TAR	7.53	1.72	0.228	
TOTAL		40.469	524.32		16.347	341.28	43.724	84.193	66.815											
H_2+CO	96.527	39.063	14824617 SCFH		9.768		26.127	65.190	-35.895	-29.295							gal/hr	gal/MCF	Bbl/Day	
H_2/CO		1.59	Factor 674553		3.00		3.00	2.01	3.00	1.31						10 # RVP 400 EP GASOLINE	12.943	0.8731	4734	
Weight Recovery, % 93.06			Catalyst Age, hrs.			Space Velocity, vhv 1179			RECOVERED OIL	0.439	61.63	4.157		9.438	0.637	GAS OIL	1.380	0.0931	505	
Pressure, psig 418			Inlet Velocity, Ft/sec 0.98			Catalyst Vol CF 12.57			TOTAL OIL		108.11	7.292		19.028	1.283	FUEL OIL	1.017	0.0686	372	
Temperature, °F 654			Bed Depth, Ft 19.05			Weight, # 1723			WATER SOLUBLE CHEMICALS	0.240	12.73	0.859		1.572	0.106	POLY TAR	0.294	0.0198	107	
Recycle Ratio 1.08			Bed Density, #/CF 137			Effluent $(H_2)(CO_2)$ / Shift Ratio $(H_2O)(CO)$ = 7.03			TOTAL LIQUID PRODUCTS C_3+		120.84	8.151		20.600	1.389	TOTAL	15.634	1.0546	5718	
FRESH FEED CONVERSION — %				TOTAL FEED CONVERSION — %			SELECTIVITY		NET WATER	6.065	109.27	7.371		13.118	0.885	W. S. CHEM.	1.572	0.1060	575	
Contraction	CO	H_2	H_2+CO	CO	H_2	$CO+H_2$	C_3+/C_1+		GROSS WATER		122.00	8.230		14.690	0.991	TOTAL	17.206	1.1606	6293	
59.61	83.82	69.43	74.99	58.50	38.20	44.94	82.46		HYDROCARBON TOTAL—C_1+		146.55	9.886								

Form ML—11

g/NCM = 16.91 × #/MCF *9488 MCFH H_2+CO, Bbl/Day = 5421.6 × gal/MCF

THE TEXAS COMPANY — MONTEBELLO LABORATORY
DATA SUMMARY

RUN NO. 62-F
HOURS 110-134

OPERATING CONDITIONS				PRODUCT TESTS			CATALYST DATA						
PRESSURES PSIG		RATES S.C.F.H.			OIL	WATER	INVENTORY DATA.		PARTICLE SIZE				
Oxygen	444	Fresh Feed	15358						Screen Analysis			Sedimentation	
Natural Gas	442	Recycle	16593	°API	49.0	10.4	In Reactor at Start of Period		Mesh	Microns	%	Microns	%
Generator Outlet	423	Combined Feed	31951	Neut. No.	39.8	38.8	Fresh Catalyst Added	20	On 40	419+		80+	
Reactor Inlet	418	Wet Gas—Measured	5542	Sap. No.	52.1	42.2	Total		100	150		40—80	
Condenser Inlet		Adjusted	6204	Hydrox. No.			Catalyst Recovered	54	150	105		20—40	
Product Accumulator	373	Loss	662	Bromine No.	82		In Reactor at End of Period		200	74		10—20	
				Pour °F.					250	62		0—20	
				Chemicals, % by K_2CO_3		10.7	REACTOR d-p, Inches H_2O		325	44			
							No. Height		<325				
TEMPERATURES—°F.		Recycle/Fresh Feed	1.08				0 See Per. A.	50	CATALYST				
Oxygen	448	Inlet Velocity—ft./sec.	0.98				1	70	Bulk Density, Lbs./Cu.Ft.				
Natural Gas	807	Fresh Feed Rate—S.C.F.H.	14825	HEMPEL, DIST. %		°API	2	76	Aerated				
Generator	2375	per Cu.Ft. Dense Bed	1179	205 °F.			3	61	Settled				
Quench Accumulator	183	per Lb. Catalyst	8.60	400	73.6	54.5	4	245	Compacted				
Reactor Inlet	443	per Sq. Ft.	2246212	400-550	16.0	36.5	Total	502	Particle Density, gm./cc.				
Condenser Inlet	579			550+	10.4				NH_3 Value, ml./gm.				
Product Accumulator	95	Heat Transfer Calculations					CALCULATED FROM dp		N_2 Surface, m^2/gm.				
Catalyst No. Height		Steam Rate=426#/hr		A. S. T. M. DIST. ON			Density, Lbs./Cu.Ft.	137					
1 See Per. A	624	@ 706 psia & 506°F=		Naphtha °F.			Inventory, Lbs.	1723					
2	655	1201 BTU/#		IBP	112		Bed Depth, Ft.	19.05	CHEMICAL ANALYSIS				
3	649	Water in @ 73°F=41 BTU/#		10%	144		Vol., Cu. Ft.	12.57	Fe				
4	655	Heat Trans/#steam=1160 BTU		50%	244				C				
5	658	(1160)(426)=494160		90%	262				O				
6	657	Ave Bed Temp=654		EP	416				H				
7	647	dT=654-506=148°F		Rec.	97.0				K_2O, W+, % basis Fe				
8	633	Tube Area=34.6 sq ft							X-Ray Analysis—				
9	630	$K=\frac{494160}{(34.6)(148)}=96.5$ BTU/°F/sq ft							$Fe_{20}C_9$				
10	630								Fe_3O_4				
11	620								Fe				

RUN NO. 62-G
HOURS 134-158
CATALYST Fresh CM&S

THE TEXAS COMPANY — MONTEBELLO LABORATORY
YIELD CALCULATIONS

	FRESH FEED			WET GAS			RECYCLE	COMBINED FEED	EFFLUENT	NET CHANGE		YIELD BASIS H_2+CO FED								
	%	m/hr	#/hr	%	At Wt. Balance m/hr	#/hr	m/hr	m/hr	m/hr	m/hr	#/hr	CONDENSATE #/MCF	#/gal	gal/hr	gal/MCF	YIELDS BASIS BROWNSVILLE DESIGN FEED RATE*	CORRECTED HEMPEL, %	gal/hr	TREATING RECOVERY,%	gal/hr
CO 28.010	36.993	15.327	429.30	14.640	2.314	64.82	6.374	21.701	8.688	-13.013	-364.48									
H_2 2.016	59.717	24.741	49.88	44.760	7.074	14.26	19.486	44.227	26.560	-17.667	-35.62					400 EP	71.5	7.419	98.0	7.271
CO_2 44.010	2.313	0.958	42.16	24.346	3.848	169.35	10.598	11.556	14.446	2.890	127.19	8.365				400-550	18.0	1.868	91.4	1.707
N_2 28.016	0.610	0.253	7.09	1.267	0.200	5.60	0.552	0.805	0.752							550 +	10.5	1.089	114.6	1.248
CH_4 16.042	0.367	0.152	2.44	6.336	1.001	16.06	2.758	2.910	3.759	0.849	13.62	0.896								
C_2H_4 28.052				1.867	0.295	8.28	0.813	0.813	1.108	0.295	8.28	0.545					RECOVERY %	#/hr	gal/hr	
C_2H_6 30.068				1.067	0.169	5.08	0.465	0.465	0.634	0.169	5.08	0.334				PROPYLENE	36.8	4.94		
C_1+C_2											26.98	1.775				C_3 POLY GASO.	87.5	4.32	0.722	
C_3H_6 42.078				2.020	0.319	13.42	0.879	0.879	1.198	0.319	13.42	0.883	4.32	3.106	0.204	C_3 POLY TAR	12.5	0.62	0.082	
C_3H_8 44.094				0.293	0.046	2.03	0.128	0.128	0.174	0.046	2.03	0.134	4.24	0.479	0.032					
C_4H_8 56.104				1.760	0.278	15.60	0.766	0.766	1.044	0.278	15.60	1.026	5.00	3.120	0.205		#/gal	#/hr	gal/hr	RVP
C_4H_{10} 58.120				0.487	0.077	4.48	0.212	0.212	0.289	0.077	4.48	0.295	4.86	0.922	0.061	C_4H_8	5.00	0.77	0.154	68.0
C_5H_{10} 70.130				0.750	0.119	8.35	0.327	0.327	0.446	0.119	8.35	0.549	5.45	1.532	0.101	C_4 POLY GASO.	5.98	12.98	2.170	1.5
C_6H_{12} 72.146				0.160	0.025	1.80	0.070	0.070	0.095	0.025	1.80	0.118	5.25	0.343	0.023	C_4H_{10}	4.86	4.48	0.922	68.0
C_6H_{12} 84.156				0.247	0.039	3.28	0.108	0.108	0.147	0.039	3.28	0.216	5.54	0.592	0.039	C_4-FREE GASO.			10.460	5.8
C_3-C_6											48.96	3.221		10.094	0.665	C_4 POLY TAR	7.53	1.85	0.246	
TOTAL		41.431	530.87		15.804	332.41	43.536	84.967	66.655											
H_2+CO	96.710	40.068	152057133 SCFH		9.388		25.860	65.928	35.248	-30.680							gal/hr	gal/MCF	Bbl/Day	
H_2/CO		1.61	Factor 657647		3.06		3.06	2.04	3.06	1.36						10 # RVP 400 EP GASOLINE	13.706	0.9014	4887	
Weight Recovery, % 94.54			Catalyst Age, hrs.			Space Velocity, vhv 1201			RECOVERED OIL	0.482	67.66	4.450		10.376	0.682	GAS OIL	1.707	0.1123	609	
Pressure, psig 418			Inlet Velocity, Ft/sec 1.00			Catalyst Vol CF 12.66			TOTAL OIL		116.62	7.671		20.470	1.347	FUEL OIL	1.248	0.0821	445	
Temperature, °F 666			Bed Depth, Ft 19.18			Weight, # 1709			WATER SOLUBLE CHEMICALS	0.219	11.64	0.766		1.467	0.096	POLY TAR	0.328	0.0216	117	
Recycle Ratio 1.05			Bed Density, #/CF 135			Effluent $(H_2)(CO_2)$ / Shift Ratio $(H_2O)(CO)$ = 6.68			TOTAL LIQUID PRODUCTS C_5+		128.26	8.437		21.937	1.443	TOTAL	16.989	1.1174	6058	
FRESH FEED CONVERSION — %				TOTAL FEED CONVERSION — %			SELECTIVITY		NET WATER	6.614	119.16	7.837		14.305	0.941	W. S. CHEM.	1.467	0.0965	523	
Contraction	CO	H_2	H_2+CO	CO	H_2	$CO+H_2$	C_3+/C_1+		GROSS WATER		130.80	8.602		15.772	1.037	TOTAL	18.456	1.2139	6581	
61.85	84.90	71.41	76.57	59.96	39.95	46.54	82.62		HYDROCARBON TOTAL—C_1+		155.24	10.209								

Form ML—11

g/NCM = 16.91 × #/MCF *9488 MCFH H_2+CO, Bbl/Day = 5421.6 × gal/MCF

THE TEXAS COMPANY — MONTEBELLO LABORATORY
DATA SUMMARY

RUN NO. 62-G
HOURS 134-158

OPERATING CONDITIONS				PRODUCT TESTS			CATALYST DATA				
PRESSURES PSIG		RATES S.C.F.H.			OIL	WATER	INVENTORY DATA		PARTICLE SIZE		
Oxygen	444	Fresh Feed	15723	°API	49.1	10.5	In Reactor at Start of Period		Screen Analysis		Sedimentation
Natural Gas	441	Recycle	16522	Neut. No.	38.2	37.4	Fresh Catalyst Added	20	Mesh	Microns %	Microns %
Generator Outlet	423	Combined Feed	32245	Sap. No.	50.8	41.0	Total		On 40	419+	80+
Reactor Inlet	418	Wet Gas—Measured	5475	Hydrox. No.			Catalyst Recovered	62	100	150	40—80
Condenser Inlet		Adjusted	5998	Bromine No.	89		In Reactor at End of Period		150	105	20—40
Product Accumulator	373	Loss	523	Pour °F.					200	74	10—20
				Chemicals, % by K_2CO_3		9.3	REACTOR d-p, Inches H_2O		250	62	0—20
							No. Height		325	44	
TEMPERATURES—°F.		Recycle/Fresh Feed	1.05				0 See Per. A.	49	<325		
Oxygen	462	Inlet Velocity—ft./sec.	1.00				1	69	CATALYST		
Natural Gas	760	Fresh Feed Rate—S.C.F.H.	15206	HEMPEL, DIST. %		°API	2	74	Bulk Density, Lbs./Cu.Ft.		
Generator	2349	per Cu.Ft. Dense Bed	1201	205 °F.			3	61	Aerated		
Quench Accumulator	173	per Lb. Catalyst	8.90	400	70.5	54.4	4	245	Settled		
Reactor Inlet	450	per Sq. Ft.	23039	400-550	18.0	36.4	Total	498	Compacted		
Condenser Inlet	588			550+	11.5				Particle Density, gm./cc.		
Product Accumulator	93	Heat Transfer Calculations					CALCULATED FROM dp		NH_3 Value, ml./gm.		
Catalyst No. Height		Steam Rate=451#/hr		A. S. T. M. DIST. ON			Density, Lbs./Cu.Ft.	135	N_2 Surface, m^2/gm.		
1 See Per. A	633	@ 706 psia & 505°F		Naphtha °F.			Inventory, Lbs.	1709			
2	666	1201 BTU/#		IBP	112		Bed Depth, Ft.	19.18	CHEMICAL ANALYSIS		
3	663	Water in @ 65°F=33 BTU/#		10%	144		Vol., Cu. Ft.	12.66	Fe		
4	670	Heat Trans/# steam=1168 BTU		50%	242				C		
5	671	(1168)(451)=526768		90%	358				O		
6	668	Ave Bed Temp=666°F		EP	404				H		
7	657	dT=666-505=161°F		Rec.	97.5				K_2O, W+, % basis Fe		
8	642	Tube Area=34.8 sq ft							X-Ray Analysis—		
9	639	$K = \frac{526768}{(34.8)(161)} = 94.0$ BTU/°F/sq ft							$Fe_{20}C_9$		
10	638								Fe_3O_4		
11	627								Fe		

RUN NO. 62-H
HOURS 158-182
CATALYST Fresh CM&S

THE TEXAS COMPANY — MONTEBELLO LABORATORY
YIELD CALCULATIONS

	FRESH FEED			WET GAS	At Wt. Balance		RECYCLE	COMBINED FEED	EFFLUENT	NET CHANGE		YIELD BASIS H_2+CO FED				
												CONDENSATE				
	%	m/hr	#/hr	%	m/hr	#/hr	m/hr	m/hr	m/hr	m/hr	#/hr	#/MCF	#/gal	gal/hr	gal/MCF	
CO 28.010	37.063	15.317	429.05	14.467	2.334	65.38	6.301	21.618	8.635	-12.983	-363.67					
H_2 2.016	59.810	24.719	49.83	45.536	7.346	14.81	19.835	44.554	27.181	-17.373	-35.02					
CO_2 44.010	2.540	1.050	46.21	24.310	3.921	172.59	10.589	11.639	14.510	2.871	126.38	8.318				
N_2 28.016	0.277	0.114	3.19	1.220	0.197	5.52	0.531	0.645	0.728							
CH_4 16.042	0.310	0.128	2.05	5.853	0.944	15.14	2.549	2.677	3.493	0.816	13.09	0.862				
C_2H_4 28.052				1.837	0.296	8.30	0.800	0.800	1.096	0.296	8.30	0.546				
C_2H_6 30.068				1.047	0.169	5.08	0.456	0.456	0.625	0.169	5.08	0.334				
C_1+C_2											26.47	1.742				
C_3H_6 42.078				2.123	0.342	14.39	0.925	0.925	1.267	0.342	14.39	0.947	4.32	3.331	0.219	
C_3H_8 44.094				0.317	0.051	2.25	0.138	0.138	0.189	0.051	2.25	0.148	4.24	0.531	0.035	
C_4H_8 56.104				1.670	0.269	15.09	0.727	0.727	0.996	0.269	15.09	0.993	5.00	3.018	0.199	
C_4H_{10} 58.120				0.500	0.081	4.71	0.218	0.218	0.299	0.081	4.71	0.310	4.86	0.969	0.064	
C_5H_{10} 70.130				0.693	0.112	7.85	0.302	0.302	0.414	0.112	7.85	0.517	5.45	1.440	0.095	
C_5H_{12} 72.146				0.157	0.025	1.80	0.068	0.068	0.093	0.025	1.80	0.118	5.25	0.343	0.023	
C_6H_{12} 84.156				0.270	0.044	3.70	0.118	0.118	0.162	0.044	3.70	0.244	5.54	0.668	0.044	
C_5-C_6											49.79	3.277		10.300	0.679	
TOTAL		41.328	530.33		16.131	336.61	43.557	84.885	66.795							
H_2+CO	96.873	40.036	151935613 SCFH		9.680		26.136	66.172	35.816	-30.356						
H_2/CO		1.61	Factor 658173		3.15		3.15	2.06	3.15	1.34						

Weight Recovery, % 93.40	Catalyst Age, hrs.	Space Velocity, vhv 1180	RECOVERED OIL	0.471	66.03	4.346	10.149	0.668
Pressure, psig 417	Inlet Velocity, Ft/sec 0.99	Catalyst Vol CF 12.88	TOTAL OIL		115.82	7.623	20.449	1.347
Temperature, °F 658	Bed Depth, Ft 19.51	Weight, # 1713	WATER SOLUBLE CHEMICALS	0.233	12.34	0.812	1.539	0.101
Recycle Ratio 1.05	Bed Density, #/CF 133	Effluent $(H_2)(CO_2)$ / Shift Ratio $(H_2O)(CO)$ = 7.13	TOTAL LIQUID PRODUCTS C_3+		128.16	8.435	21.988	1.448

FRESH FEED CONVERSION — %				TOTAL FEED CONVERSION — %			SELECTIVITY	NET WATER	6.403	115.35	7.592	13.848	0.911
Contraction	CO	H_2	H_2+CO	CO	H_2	$CO+H_2$	C_3+/C_1+	GROSS WATER		127.69	8.404	15.387	1.012
60.97	84.76	70.28	75.82	60.06	38.99	45.87	82.88	HYDROCARBON TOTAL—C_1+		154.63	10.177		

YIELDS BASIS BROWNSVILLE DESIGN FEED RATE*	CORRECTED HEMPEL, %	gal/hr	TREATING RECOVERY, %	gal/hr
400 EP	70.0	7.105	98.0	6.963
400-550	20.4	2.070	91.4	1.892
550 +	9.6	0.974	114.6	1.116

	RECOVERY %	#/hr	gal/hr	
PROPYLENE	36.0	5.18		
C_3 POLY GASO.	87.5	4.53	0.758	
C_3 POLY TAR	12.5	0.65	0.086	

	#/gal	#/hr	gal/hr	RVP
C_4H_8	5.00	0.41	0.028	68.0
C_4 POLY GASO.	5.98	12.85	2.148	1.5
C_4H_{10}	4.86	4.71	0.969	68.0
C_4-FREE GASO.			10.172	5.8
C_4 POLY TAR	7.53	1.83	0.243	

	gal/hr	gal/MCF	Bbl/Day
10 # RVP 400 EP GASOLINE	13.371	0.8800	4771
GAS OIL	1.892	0.1245	675
FUEL OIL	1.116	0.0735	398
POLY TAR	0.329	0.0217	118
TOTAL	16.708	1.0997	5962
W. S CHEM.	1.539	0.1013	549
TOTAL	18.247	1.2010	6511

Form ML—11

g/NCM = 16.91 × #/MCF *9488 MCFH H_2 + CO, Bbl/Day = 5421.6 × gal/MCF

THE TEXAS COMPANY — MONTEBELLO LABORATORY
DATA SUMMARY

RUN NO. 62-H
HOURS 158-182

OPERATING CONDITIONS				PRODUCT TESTS		
PRESSURES PSIG		RATES S.C.F.H.			OIL	WATER
Oxygen	444	Fresh Feed	15684	°API	49.4	10.5
Natural Gas	439	Recycle	16530	Neut. No.	32.1	34.0
Generator Outlet	422	Combined Feed	32214	Sap. No.	49.3	41.0
Reactor Inlet	417	Wet Gas—Measured	5485	Hydrox. No.		
Condenser Inlet		Adjusted	6122	Bromine No.	89	
Product Accumulator	373	Loss	637	Pour °F.		
				Chemicals, % by K_2CO_3		10.0
TEMPERATURES—°F.		Recycle/Fresh Feed	1.05			
Oxygen	470	Inlet Velocity—ft./sec.	0.99			
Natural Gas	815	Fresh Feed Rate—S.C.F.H.	15194	HEMPEL. DIST. %		°API
Generator	2380	per Cu. Ft. Dense Bed	1180	205 °F.		
Quench Accumulator	179	per Lb. Catalyst	8.87	400	69.0	53.0
Reactor Inlet	411	per Sq. Ft.	23021	400-550	20.4	37.0
Condenser Inlet	586	Heat Transfer Calculations		550+	10.6	
Product Accumulator	93	Steam Rate=423#/hr				
Catalyst No. Height		@705 psia & 506°F		A. S. T. M. DIST. ON		
1 See Per. A	623	=1201 BTU/#		Naphtha °F.		
2	658	Water in @ 65°F=33 BTU/#		IBP	114	
3	651	Net Heat Trans/# steam		10%	146	
4	659	=1168 BTU		50%	240	
5	664	(1168)(423)=494064		90%	358	
6	664	Ave. Bed Temp=658°F		EP	406	
7	654	dT=658-506=152°F		Rec.	97.0	
8	641	Tube Area=35.4 sq ft				
9	637	$K = \frac{494064}{(35.4)(152)}$ = 91.8 BTU/°F/sq ft				
10	636					
11	622					

CATALYST DATA								
INVENTORY DATA		PARTICLE SIZE						
		Screen Analysis			Sedimentation	
In Reactor at Start of Period		Mesh	Microns	%	Microns	%
Fresh Catalyst Added	24	On 40	419+		80+	
Total		100	150		40—80	
Catalyst Recovered	70	150	105		20—40	
In Reactor at End of Period		200	74		10—20	
		250	62		0—20	
REACTOR d-p, Inches H_2O		325	44			
No. Height		<325				
0 See Per. A	48					
1	68	CATALYST				
2	74	Bulk Density, Lbs./Cu.Ft.				
3	59	Aerated				
4	250	Settled				
Total	499	Compacted				
		Particle Density, gm./cc.				
CALCULATED FROM dp		NH_3 Value, ml./gm.				
Density, Lbs./Cu.Ft.	133	N_2 Surface, m^2/gm.				
Inventory, Lbs.	1713					
Bed Depth, Ft.	19.51	CHEMICAL ANALYSIS				
Vol., Cu. Ft.	12.88	Fe				
		C				
		O				
		H				
		K_2O, W+, % basis Fe				
		X-Ray Analysis—				
		$Fe_{20}C_9$				
		Fe_3O_4				
		Fe				

RUN NO. 62-I
HOURS 182-206
CATALYST Fresh CM&S

THE TEXAS COMPANY — MONTEBELLO LABORATORY
YIELD CALCULATIONS

	FRESH FEED			WET GAS			RECYCLE	COMBINED FEED	EFFLUENT	NET CHANGE		YIELD BASIS H_2+CO FED								
					At Wt. Balance							CONDENSATE								
	%	m/hr	#/hr	%	m/hr	#/hr	m/hr	m/hr	m/hr	m/hr	#/hr	#/MCF	#/gal	gal/hr	gal/MCF	YIELDS BASIS BROWNSVILLE DESIGN FEED RATE*				
CO 28.010	37.247	15.396	431.26	15.147	2.438	68.29	6.687	22.083	9.125	-12.958	-362.97						CORRECTED HEMPEL, %	gal/hr	TREATING RECOVERY, %	gal/hr
H_2 2.016	60.136	24.858	50.11	46.266	7.446	15.01	20.424	45.282	27.870	-17.412	-35.10					400 EP	70.6	7.214	98.0	7.070
CO_2 44.010	1.987	0.921	36.13	23.610	3.800	167.29	10.423	11.244	14.223	2.979	131.16	8.586				400-550	19.6	2.003	91.4	1.831
N_2 28.016	0.360	0.149	4.17	1.530	0.246	6.89	0.675	0.824	0.921							550 +	9.8	1.001	114.6	1.147
CH_4 16.042	0.270	0.112	1.80	5.893	0.948	15.21	2.601	2.713	3.549	0.836	13.41	0.878								
C_2H_4 28.052				1.677	0.270	7.57	0.740	0.740	1.010	0.270	7.57	0.496					RECOVERY %	#/hr	gal/hr	
C_2H_6 30.068				0.923	0.149	4.48	0.407	0.407	0.556	0.149	4.48	0.293				PROPYLENE	36.1	4.22		
C_1+C_2											25.46	1.667				C_3 POLY GASO.	87.5	3.69	0.617	
C_3H_6 42.078				1.730	0.278	11.70	0.764	0.764	1.042	0.278	11.70	0.766	4.32	2.708	0.177	C_3 POLY TAR	12.5	0.53	0.070	
C_3H_8 44.094				0.267	0.043	1.90	0.118	0.118	0.161	0.043	1.90	0.124	4.24	0.448	0.029					
C_4H_8 56.104				1.430	0.230	12.90	0.631	0.631	0.861	0.230	12.90	0.844	5.00	2.580	0.169		#/gal	#/hr	gal/hr	RVP
C_4H_{10} 58.120				0.407	0.065	3.78	0.180	0.180	0.245	0.065	3.78	0.247	4.86	0.778	0.051	C_4H_8	5.00	1.05	0.210	68.0
C_5H_{10} 72.130				0.713	0.115	8.06	0.315	0.315	0.430	0.115	8.06	0.528	5.45	1.479	0.097	C_4 POLY GASO.	5.98	10.37	1.734	1.5
C_5H_{12} 72.146				0.120	0.019	1.37	0.053	0.053	0.072	0.019	1.37	0.090	5.25	0.261	0.017	C_4H_{10}	4.86	3.78	0.778	68.0
C_4H_{12} 84.156				0.287	0.046	3.87	0.127	0.127	0.173	0.046	3.87	0.253	5.54	0.699	0.046	C_4-FREE GASO.			10.126	5.8
C_3-C_6											43.58	2.852		8.953	0.586	C_4 POLY TAR	7.53	1.48	0.197	
TOTAL		41.336	523.47		16.093	328.32	44.145	85.481	67.426											
H_2+CO	97.383	40.254	15276.471 SCFH		9884		27.111	67.365	36.995	30.370							gal/hr	gal/MCF	Bbl/Day	
H_2/CO		1.61	Factor 654601		3.05		3.05	2.05	3.05	1.34						10 # RVP 400 EP GASOLINE	12.848	0.8410	4560	
																GAS OIL	1.831	0.1199	650	
																FUEL OIL	1.147	0.0751	407	
																POLY TAR	0.267	0.0175	95	
																TOTAL	16.093	1.0535	5712	
																W. S. CHEM.	1.441	0.0943	511	
																TOTAL	17.534	1.1478	6223	

Weight Recovery, % 94.93 | Catalyst Age, hrs. | Space Velocity, vhv 1208 | RECOVERED OIL 0.475 66.58 4.358 10.218 0.669

Pressure, psig 417 | Inlet Velocity, Ft/sec 1.00 | Catalyst Vol CF 12.65 | TOTAL OIL 110.16 7.210 19.171 1.255

Temperature, °F 659 | Bed Depth, Ft 19.16 | Weight, # 1644 | WATER SOLUBLE CHEMICALS 0.217 11.53 0.755 1.441 0.094

Recycle Ratio 1.07 | Bed Density, #/CF 130 | Effluent $(H_2)(CO_2)$ / Shift Ratio $(H_2O)(CO)$ = | TOTAL LIQUID PRODUCTS C_5+ 121.69 7;965 20.612 1.349

FRESH FEED CONVERSION — %				TOTAL FEED CONVERSION — %			SELECTIVITY	NET WATER 6.496 117.04 7.661 14.051 0.920
Contraction	CO	H_2	H_2+CO	CO	H_2	$CO+H_2$	C_3+/C_1+	GROSS WATER 128.57 8.416 15.492 1.014
61.07	84.16	70.05	75.45	58.68	38.45	45.08	82.70	HYDROCARBON TOTAL—C_1+ 147.15

Form ML—11

g/NCM = 16.91 × #/MCF *9488 MCFH H_2+CO, Bbl/Day = 5421.6 × gal/MCF

THE TEXAS COMPANY — MONTEBELLO LABORATORY
DATA SUMMARY

RUN NO. 62-I
HOURS 182-206

OPERATING CONDITIONS				PRODUCT TESTS			CATALYST DATA					
PRESSURES PSIG		RATES S.C.F.H.			OIL	WATER	INVENTORY DATA		PARTICLE SIZE			
Oxygen	444	Fresh Feed	15687	°API	49.3	10.5	In Reactor at Start of Period		Screen Analysis			Sedimentation
Natural Gas	439	Recycle	16753	Neut. No.	37.7	37.3	Fresh Catalyst Added		Mesh	Microns	%	Microns %
Generator Outlet	405	Combined Feed	32440	Sap. No.	48.5	41.0	Total		On 40	419+		80+
Reactor Inlet	417	Wet Gas—Measured	5614	Hydrox. No.			Catalyst Recovered	66	100	150		40—80
Condenser Inlet		Adjusted	6108	Bromine No.	86		In Reactor at End of Period		150	105		20—40
Product Accumulator	373	Loss	494	Pour °F.					200	74		10—20
				Chemicals, % by K_2CO_3		9.3	REACTOR d-p, Inches H_2O		250	62		0—20
							No. Height		325	44		
TEMPERATURES—°F.		Recycle/Fresh Feed	1.07				0 See Per. A	47	<325			
Oxygen	481	Inlet Velocity—ft./sec.	1.00				1	67	CATALYST			
Natural Gas	812	Fresh Feed Rate—S.C.F.H.	15276	HEMPEL, DIST. %		°API	2	72	Bulk Density, Lbs./Cu.Ft.			
Generator	2373	per Cu. Ft. Dense Bed	1208	205 °F.			3	58	Aerated			
Quench Accumulator	158	per Lb. Catalyst	9.29	400	69.6	53.7	4	235	Settled			
Reactor Inlet	401	per Sq. Ft.	23145	400-550	19.6	37.3	Total	479	Compacted			
Condenser Inlet	586			550+	10.8				Particle Density, gm./cc.			
Product Accumulator	93						CALCULATED FROM dp		NH_3 Value, ml./gm.			
Catalyst No. Height				A. S. T. M. DIST. ON			Density, Lbs./Cu.Ft.	130	N_2 Surface, m^2/gm.			
1 See Per. A	629			Naphtha °F.			Inventory, Lbs.	1644				
2	660			IBP	114		Bed Depth, Ft.	19.16	CHEMICAL ANALYSIS			
3	651			10%	146		Vol., Cu. Ft.	12.65	Fe			
4	660			50%	242				C			
5	665			90%	358				O			
6	664			EP	402				H			
7	654			Rec.	97.0				K_2O, W+, % basis Fe			
8	641								X-Ray Analysis—			
9	636								$Fe_{20}C_9$			
10	636								Fe_3O_4			
11	622								Fe			

RUN NO. 62-J
HOURS 206-230
CATALYST Fresh CM&S

THE TEXAS COMPANY — MONTEBELLO LABORATORY
YIELD CALCULATIONS

	FRESH FEED			WET GAS			RECYCLE	COMBINED FEED	EFFLUENT	NET CHANGE		YIELD BASIS H_2+CO FED								
	%	m/hr	#/hr	%	At Wt. Balance m/hr	At Wt. Balance #/hr	m/hr	m/hr	m/hr	m/hr	#/hr	CONDENSATE #/MCF	#/gal	gal/hr	gal/MCF	YIELDS BASIS BROWNSVILLE DESIGN FEED RATE*	CORRECTED HEMPEL. %	gal/hr	TREATING RECOVERY.%	gal/hr
CO 28.010	37.244	15.408	431.57	15.037	2.435	68.20	6.711	22.119	9.146	-12.973	-363.37									
H_2 2.016	60.270	24.933	50.26	46.990	7.609	15.35	20.969	45.902	28.578	-17.324	-34.91					400 EP	72.2	7.311	98.0	7.165
CO_2 44.010	1.953	0.808	35.56	23.190	3.757	165.37	10.348	11.156	14.105	2.949	129.81	8.479				400-550	16.0	1.620	91.4	1.481
N_2 28.016	0.210	0.087	2.44	1.233	0.200	5.60	0.550	0.637	0.750							550 +	11.8	1.195	114.6	1.369
CH_4 16.042	0.323	0.134	2.15	6.094	0.987	15.83	2.720	2.854	3.707	0.853	13.68	0.894								
C_2H_4 28.052				1.573	0.255	7.15	0.702	0.702	0.957	0.255	7.15	0.467					RECOVERY %	#/hr	gal/hr	
C_2H_6 30.068				0.907	0.147	4.42	0.405	0.405	0.552	0.147	4.42	0.289				PROPYLENE	35.9	4.02		
C_1+C_2											25.25	1.650				C_3 POLY GASO.	87.5	3.52	0.467	
C_3H_6 42.078				1.643	0.266	11.19	0.733	0.733	0.999	0.266	11.19	0.731	4.32	2.590	0.169	C_3 POLY TAR	12.5	0.50	0.060	
C_3H_8 44.094				0.237	0.038	1.68	0.106	0.106	0.144	0.038	1.68	0.110	4.24	0.396	0.026					
C_4H_8 56.104				1.483	0.240	13.46	0.662	0.662	0.902	0.240	13.46	0.879	5.00	2.692	0.176		#/gal	#/hr	gal/hr	RVP
C_4H_{10} 58.120				0.497	0.080	4.65	0.222	0.222	0.302	0.080	4.65	0.304	4.86	0.957	0.063	C_4H_8	5.00	0.27	0.054	68.0
C_5H_{10} 70.130				0.723	0.117	8.21	0.323	0.323	0.440	0.117	8.21	0.536	5.45	1.506	0.098	C_5 POLY GASO.	5.98	11.54	1.930	1.5
C_5H_{12} 72.146				0.120	0.019	1.37	0.054	0.054	0.073	0.019	1.37	0.089	5.25	0.261	0.017	C_4H_{10}	4.86	4.65	0.957	68.0
C_6H_{12} 84.156				0.273	0.044	3.70	0.122	0.122	0.166	0.044	3.70	0.242	5.54	0.668	0.044	C_4-FREE GASO.			10.067	5.8
C_3-C_6											44.26	2.891		9.070	0.593	C_4 POLY TAR	7.53	1.65	0.219	
TOTAL		41.370	521.98		16.194	326.18	44.627	85.997	68.028											
H_2+CO	97.514	40.341	15309.698 SCFH		10.044		27.680	68.021	37.724	-30.297							gal/hr	gal/MCF	Bbl/Day	
H_2/CO		1.62	Factor 653180		3.12		3.12	2.08	3.12	1.34						10 # RVP 400 EP GASOLINE	13.008	0.8497	4607	
Weight Recovery, % 95.23			Catalyst Age, hrs.			Space Velocity, vhv 1228			RECOVERED OIL	0.470	65.89	4.304		10.126	0.661	GAS OIL	1.481	0.0967	524	
Pressure, psig 417			Inlet Velocity, Ft/sec 1.01			Catalyst Vol CF 12.47			TOTAL OIL		110.15	7.195		19.196	1.254	FUEL OIL	1.369	0.0894	485	
Temperature, °F 660			Bed Depth, Ft 18.89			Weight, # 1596			WATER SOLUBLE CHEMICALS	0.244	12.94	0.845		1.612	0.105	POLY TAR	0.285	0.0186	101	
Recycle Ratio 1.08			Bed Density, #/CF 128			Effluent $\frac{(H_2)(CO_2)}{(H_2O)(CO)}$ = Shift Ratio			TOTAL LIQUID PRODUCTS C_3+		123.09	8.040		20.808	1.359	TOTAL	16.143	1.0544	5717	
FRESH FEED CONVERSION — %				TOTAL FEED CONVERSION — %		SELECTIVITY			NET WATER	6.493	116.97	7.640		14.042	0.917	W. S. CHEM.	1.612	0.1053	571	
Contraction	CO	H_2	H_2+CO	CO	H_2	$CO+H_2$	C_3+/C_1+		GROSS WATER		129.91	8.485		15.654	1.022	TOTAL	17.755	1.1597	6288	
60.86	84.20	69.48	75.10	58.65	37.74	44.54	82.98		HYDROCARBON TOTAL—C_1+		148.34	9.690								

Form ML—11

g/NCM = 16.91 × #/MCF *9488 MCFH H_2+CO, Bbl/Day = 5421.6 × gal/MCF

THE TEXAS COMPANY — MONTEBELLO LABORATORY
DATA SUMMARY

RUN NO. 62-J
HOURS 206-230

OPERATING CONDITIONS				PRODUCT TESTS			CATALYST DATA				
PRESSURES PSIG		RATES S.C.F.H.			OIL	WATER	INVENTORY DATA		PARTICLE SIZE		
Oxygen	444	Fresh Feed	15700	° API	49.4	10.5	In Reactor at Start of Period		Screen Analysis		Sedimentation
Natural Gas	440	Recycle	16936	Neut. No.	38.6	38.1	Fresh Catalyst Added	0	Mesh / Microns / %		Microns / %
Generator Outlet	422	Combined Feed	32636	Sap. No.	48.4	40.5	Total		On 40 / 419+		80+
Reactor Inlet	417	Wet Gas—Measured	5676	Hydrox. No.			Catalyst Recovered	63.5	100 / 150		40—80
Condenser Inlet		Adjusted	6145	Bromine No.	86		In Reactor at End of Period		150 / 105		20—40
Product Accumulator	373	Loss	469	Pour °F.					200 / 74		10—20
				Chemicals, % by K_2CO_3		10.3	REACTOR d-p, Inches H_2O		250 / 62		0—20
							No. Height		325 / 44		
TEMPERATURES—°F.		Recycle/Fresh Feed	1.08				0 See Per. A	46	<325		
Oxygen	465	Inlet Velocity—ft./sec.	1.01				1	66	CATALYST		
Natural Gas	815	Fresh Feed Rate—S.C.F.H.	15310	HEMPEL. DIST. %		°API	2	70	Bulk Density, Lbs./Cu.Ft.		
Generator	2377	per Cu.Ft. Dense Bed	1228	205 °F.			3	58	Aerated		
Quench Accumulator	144	per Lb. Catalyst	9.59	400	71.2	55.3	4	225	Settled		
Reactor Inlet	400	per Sq. Ft.	23197	400-550	16.0	37.3	Total	465	Compacted		
Condenser Inlet	589			550+	12.8				Particle Density, gm./cc.		
Product Accumulator	91						CALCULATED FROM dp		NH_3 Value, ml./gm.		
Catalyst No. Height				A. S. T. M. DIST. ON			Density, Lbs./Cu.Ft.	128	N_2 Surface, $m^2/gm.$		
1 See Per. A	643			Naphtha °F.			Inventory, Lbs.	1596			
2	661			IBP	116		Bed Depth, Ft.	18.89	CHEMICAL ANALYSIS		
3	652			10%	146		Vol., Cu. Ft.	12.47	Fe		
4	660			50%	244				C		
5	665			90%	360				O		
6	665			EP	406				H		
7	655			Rec.	97.0				K_2O, W+, % basis Fe		
8	641								X-Ray Analysis—		
9	637								$Fe_{20}C_9$		
10	638								Fe_3O_4		
11	625								Fe		

RUN NO. 62-K
HOURS 230-254
CATALYST

THE TEXAS COMPANY – MONTEBELLO LABORATORY
YIELD CALCULATIONS

	FRESH FEED			WET GAS			RECYCLE	COMBINED FEED	EFFLUENT	NET CHANGE		YIELD BASIS H_2+CO FED							
					At Wt. Balance							CONDENSATE							
	%	m/hr	#/hr	%	m/hr	#/hr	m/hr	m/hr	m/hr	m/hr	#/hr	#/MCF	#/gal	gal/hr	gal/MCF	YIELDS BASIS BROWNSVILLE DESIGN FEED RATE*				
CO 28.010	37.260	15.411	431.66	15.197	2.518	70.52	6.756	22.167	9.274	-12.893	-361.14						CORRECTED HEMPEL, %	gal/hr	TREATING RECOVERY, %	gal/hr
H_2 2.016	60.114	24.863	50.12	47.000	7.788	15.69	20.894	45.757	28.682	-17.075	-34.43					400 EP	71.0	6.988	98.0	6.848
CO_2 44.010	2.033	0.841	37.01	23.826	3.947	173.69	10.592	11.433	14.539	3.106	136.68	8.943				400-550	16.8	1.654	91.4	1.512
N_2 28.016	0.320	0.132	3.70	1.083	0.179	5.01	0.481	0.613	0.660							550 +	12.2	1.201	114.6	1.376
CH_4 16.042	0.273	0.113	1.81	5.990	0.993	15.93	2.663	2.776	3.656	0.880	14.12	0.924								
C_2H_4 28.052				1.467	0.243	6.82	0.652	0.652	0.895	0.243	6.82	0.446					RECOVERY %	#/hr	gal/hr	
C_2H_6 30.068				0.920	0.152	4.57	0.409	0.409	0.561	0.152	4.57	0.299				PROPYLENE	35.0	3.11		
C_1+C_2											25.51	1.669				C_3 POLY GASO.	87.5	2.72	0.455	
C_3H_6 42.078				1.273	0.211	8.88	0.566	0.566	0.777	0.211	8.88	0.581	4.32	2.056	0.135	C_3 POLY TAR	12.5	0.39	0.052	
C_3H_8 44.094				0.167	0.028	1.23	0.074	0.074	0.102	0.028	1.23	0.080	4.24	0.290	0.019					
C_4H_8 56.104				1.333	0.221	12.40	0.593	0.593	0.814	0.221	12.40	0.811	5.00	2.480	0.162		#/gal	#/hr	gal/hr	RVP
C_4H_{10} 58.120				0.487	0.081	4.71	0.217	0.217	0.298	0.081	4.71	0.308	4.86	0.969	0.063	C_4H_8	5.00	0.14	0.028	68.0
C_5H_{10} 70.130				0.753	0.125	8.77	0.335	0.335	0.460	0.125	8.77	0.574	5.45	1.609	0.105	C_4 POLY GASO.	5.98	10.73	1.794	1.5
C_5H_{12} 72.146				0.217	0.036	2.60	0.096	0.096	0.132	0.036	2.60	0.170	5.25	0.495	0.032	C_4H_{10}	4.86	4.71	0.969	68.0
C_6H_{12} 84.156				0.287	0.048	4.04	0.128	0.128	0.176	0.048	4.04	0.264	5.54	0.729	0.048	C_4-FREE GASO.			10.136	5.8
C_3-C_4											42.63	2.788		8.628	0.564	C_4 POLY TAR	7.53	1.53	0.203	
TOTAL		41.360	524.30		16.570	334.86	44.456	85.816	67.987											
H_2+CO	97.374	40.274	15283.823 SCFH		10.306		27.650	67.924	37.956	-29.968							gal/hr	gal/MCF	Bbl/Day	
H_2/CO		1.61	Factor 654286		3.09		3.09	2.06	3.09	1.32						10 # RVP 400 EP GASOLINE	12.927	0.8458	4586	
									RECOVERED OIL	0.459	64.31	4.208		9.843	0.644	GAS OIL	1.512	0.0989	536	
									TOTAL OIL		106.94	6.996		18.471	1.208	FUEL OIL	1.376	0.0900	488	
									WATER SOLUBLE CHEMICALS	0.228	12.09	0.791		1.508	0.099	POLY TAR	0.255	0.0167	91	
									TOTAL LIQUID PRODUCTS C_3+		119.03	7.787		19.979	1.307	TOTAL	16.070	1.0514	5701	
									NET WATER	6.274	113.04	7.396		13.570	0.888	W. S CHEM.	1.508	0.0987	535	
									GROSS WATER		125.13	8.187		15.078	0.987	TOTAL	17.578	1.1501	6236	
									HYDROCARBON TOTAL—C_1+		144.54	9.456							

Weight Recovery, % 95.25	Catalyst Age, hrs.	Space Velocity, vhv 1230
Pressure, psig 417	Inlet Velocity, Ft/sec 1.00	Catalyst Vol CF 12.43
Temperature, °F 659	Bed Depth, Ft 18.84	Weight, # 15.79
Recycle Ratio 1.07	Bed Density, #/CF 127	Effluent $\frac{(H_2)(CO_2)}{(H_2O)(CO)}$ = Shift Ratio

FRESH FEED CONVERSION — %				TOTAL FEED CONVERSION — %			SELECTIVITY
Contraction	CO	H_2	H_2+CO	CO	H_2	$CO+H_2$	C_3+/C_1+
59.94	83.66	68.69	74.41	58.16	37.32	44.12	82.35

Form ML—11

g/NCM = 16.91 × #/MCF *9488 MCFH H_2 + CO, Bbl/Day = 5421.6 × gal/MCF

THE TEXAS COMPANY — MONTEBELLO LABORATORY
DATA SUMMARY

RUN NO. 62-K
HOURS 230-254

OPERATING CONDITIONS				PRODUCT TESTS			CATALYST DATA					
PRESSURES PSIG		RATES S.C.F.H.			OIL	WATER	INVENTORY DATA		PARTICLE SIZE			
Oxygen	445	Fresh Feed	15696	°API	49.1	10.5	In Reactor at Start of Period		Screen Analysis			Sedimentation
Natural Gas	440	Recycle	16871	Neut. No.	38.0	36.4	Fresh Catalyst Added	0	Mesh	Microns	%	Microns %
Generator Outlet	422	Combined Feed	32567	Sap. No.	48.4	41.7	Total		On 40	419+		80+
Reactor Inlet	417	Wet Gas—Measured	5821	Hydrox. No.			Catalyst Recovered	68	100	150		40—80
Condenser Inlet		Adjusted	6288	Bromine No.	86		In Reactor at End of Period		150	105		20—40
Product Accumulator	373	Loss	467	Pour °F.					200	74		10—20
				Chemicals, % by K_2CO_3		10.0	REACTOR d-p, Inches H_2O		250	62		0—20
							No. Height		325	44		
TEMPERATURES—°F.		Recycle/Fresh Feed	1.07				0 See Period A	47	<325			
Oxygen	496	Inlet Velocity—ft./sec.	1.00				1	68	CATALYST			
Natural Gas	801	Fresh Feed Rate—S.C.F.H.	15284	HEMPEL. DIST. %		°API	2	70	Bulk Density, Lbs./Cu.Ft.			
Generator	2379	per Cu. Ft. Dense Bed	1230	205 °F.			3	55	Aerated			
Quench Accumulator	150	per Lb. Catalyst	9.68	400	70.0	54.0	4	220	Settled			
Reactor Inlet	390	per Sq. Ft.	23158	400-550	16.8	37.6	Total	460	Compacted			
Condenser Inlet	590			550+	13.2				Particle Density, gm./cc.			
Product Accumulator	91						CALCULATED FROM dp		NH_3 Value, ml./gm.			
Catalyst No. Height				A. S. T. M. DIST. ON			Density, Lbs./Cu.Ft.	127	N_2 Surface, m^2/gm.			
1 See Per. A	663			Naphtha °F.			Inventory, Lbs.	1579				
2	663			IBP	120		Bed Depth, Ft.	18.84	CHEMICAL ANALYSIS			
3	652			10%	150		Vol., Cu. Ft.	12.43	Fe			
4	658			50%	244				C			
5	664			90%	364				O			
6	663			EP	414				H			
7	655			Rec.	97.0				K_2O, W+, % basis Fe			
8	642								X-Ray Analysis—			
9	637								$Fe_{20}C_9$			
10	638								Fe_3O_4			
11	623								Fe			

THE TEXAS COMPANY — MONTEBELLO LABORATORY
YIELD CALCULATIONS

RUN NO. 62-L
HOURS 254-279
CATALYST Fresh CM&S

	FRESH FEED			WET GAS			RECYCLE	COMBINED FEED	EFFLUENT	NET CHANGE		YIELD BASIS H_2+CO FED								
					At Wt. Balance							CONDENSATE								
	%	m/hr	#/hr	%	m/hr	#/hr	m/hr	m/hr	m/hr	m/hr	#/hr	#/MCF	#/gal	gal/hr	gal/MCF	YIELDS BASIS BROWNSVILLE DESIGN FEED RATE*				
CO 28.010	37.277	15.416	431.77	15.995	2.744	76.85	7.176	22.592	9.920	-12.672	-354.92						CORRECTED HEMPEL. %	gal/hr	TREATING RECOVERY.%	gal/hr
H_2 2.016	60.267	24.922	50.24	48.235	8.274	16.68	21.640	46.562	29.914	-16.648	-33.56					400 EP	70.0	6.666	98.0	6.533
CO_2 44.010	2.023	0.837	36.84	22.590	3.875	170.50	10.135	10.972	14.010	3.038	133.66	8.731				400-550	19.2	1.829	91.4	1.672
N_2 28.016	0.150	0.062	1.74	1.005	0.172	4.82	0.451	0.513	0.623							550 +	10.8	1.029	114.6	1.179
CH_4 16.042	0.283	0.117	1.88	5.610	0.962	15.43	2.517	2.634	3.479	0.845	13.55	0.885								
C_2H_4 28.052				1.570	0.269	7.55	0.704	0.704	0.973	0.269	7.55	0.493					RECOVERY %	#/hr	gal/hr	
C_2H_6 30.068				0.885	0.152	4.57	0.397	0.397	0.549	0.152	4.57	0.299				PROPYLENE	33.9	1.93		
C_1+C_2											25.67	1.677				C_3 POLY GASO.	87.5	1.69	0.283	
C_3H_6 42.078				0.785	0.135	5.68	0.352	0.352	0.487	0.135	5.68	0.371	4.32	1.315	0.086	C_3 POLY TAR	12.5	0.24	0.32	
C_3H_8 44.094				0.080	0.014	0.62	0.036	0.036	0.050	0.014	0.62	0.041	4.24	0.146	0.010					
C_4H_8 56.104				1.210	0.208	11.67	0.543	0.543	0.751	0.208	11.67	0.762	5.00	2.334	0.152		#/gal	#/hr	gal/hr	RVP
C_4H_{10} 58.120				0.585	0.100	5.81	0.262	0.262	0.362	0.100	5.81	0.380	4.86	1.195	0.078	C_4H_8	5.00	--	--	68.0
C_5H_{10} 70.130				0.795	0.136	9.54	0.357	0.357	0.493	0.136	9.54	0.623	5.45	1.750	0.114	C_4 POLY GASO.	5.98	10.21	1.708	1.5
C_5H_{12} 72.146				0.290	0.050	3.61	0.130	0.130	0.180	0.050	3.61	0.236	5.25	0.688	0.045	C_4H_{10}	4.86	(5.81) 4.81	(1.195) 0.990	68.0
C_6H_{12} 84.156				0.365	0.063	5.30	0.164	0.164	0.227	0.063	5.30	0.346	5.54	0.957	0.063	C_4 FREE GASO.			10.211	5.8
C_3-C_6											42.23	2.759		8.385	0.548	C_4 POLY TAR	7.53	1.46	0.194	
TOTAL		41.354	522.47		17.154	338.63	44.864	86.218	68.770											
H_2+CO	97.544	40.338	15308.5554 SCFH		11.018		28.816	69.154	39.834	-29.320							gal/hr	gal/MCF	Bbl/Day	
H_2/CO		1.62	Factor 653229		3.02		3.02	2.06	3.02	1.31						10 # RVP 400 EP GASOLINE	12.909	0.8433	4572	
Weight Recovery, % 94.64			Catalyst Age, hrs.			Space Velocity, vhv 1204			RECOVERED OIL	0.443	62.17	4.061		9.524	0.622	GAS OIL	1.672	0.1092	592	
Pressure, psig 417			Inlet Velocity, Ft/sec 1.01			Catalyst Vol CF 12.71			TOTAL OIL		104.40	6.820		17.909	1.170	FUEL OIL	1.179	0.0770	417	
Temperature, °F 659			Bed Depth, Ft 19.26			Weight, # 1551			WATER SOLUBLE CHEMICALS	0.228	12.12	0.792		1.510	0.099	POLY TAR	0.226	0.0148	80	
Recycle Ratio 1.08			Bed Density, #/CF 122			Effluent $\frac{(H_2)(CO_2)}{(H_2O)(CO)}$ = Shift Ratio			TOTAL LIQUID PRODUCTS C_3+		116.52	7.612		19.419	1.269	TOTAL	15.986	1.0443	5661	
FRESH FEED CONVERSION — %				TOTAL FEED CONVERSION — %			SELECTIVITY		NET WATER	6.081	109.55	7.156		13.151	0.859	W.S.CHEM.	1.510	0.0986	535	
Contraction	CO	H_2	H_2+CO	CO	H_2	$CO+H_2$	C_3+/C_1+		GROSS WATER		121.67	7.948		14.661	0.958	TOTAL	17.496	1.1429	6196	
58.52	82.20	66.80	72.69	56.09	35.75	42.40	81.95		HYDROCARBON TOTAL—C_1+		142.19	9.289								

Form ML—11

g/NCM = 16.91 × #/MCF *9488 MCFH H_2+CO, Bbl/Day = 5421.6 × gal/MCF

THE TEXAS COMPANY — MONTEBELLO LABORATORY
DATA SUMMARY

RUN NO. 62-L
HOURS 254-279

OPERATING CONDITIONS				PRODUCT TESTS			CATALYST DATA			
PRESSURES PSIG		RATES S.C.F.H.			OIL	WATER	INVENTORY DATA		PARTICLE SIZE	
Oxygen	444	Fresh Feed	15694	° API	49.0	10.5	In Reactor at Start of Period		Screen Analysis	Sedimentation
Natural Gas	440	Recycle	17026	Neut. No.	38.9	37.3	Fresh Catalyst Added		Mesh / Microns / %	Microns / %
Generator Outlet	422	Combined Feed	32720	Sap. No.	49.0	42.3	Total		On 40 / 419+	80+
Reactor Inlet	417	Wet Gas—Measured	5972	Hydrox. No.			Catalyst Recovered	55	100 / 150	40—80
Condenser Inlet		Adjusted	6510	Bromine No.	86		In Reactor at End of Period		150 / 105	20—40
Product Accumulator	372	Loss	538	Pour °F.					200 / 74	10—20
				Chemicals, % by K_2CO_3		10.3	REACTOR d-p, Inches H_2O		250 / 62	0—20
							No. Height		325 / 44	
TEMPERATURES—°F.		Recycle/Fresh Feed	1.08				0 See Per. A	45	<325	
Oxygen	464	Inlet Velocity—ft./sec.	1.01				1	64	CATALYST	
Natural Gas	796	Fresh Feed Rate—S.C.F.H.	15309	HEMPEL. DIST. %		°API	2	68	Bulk Density, Lbs./Cu.Ft.	
Generator	2383	per Cu. Ft. Dense Bed	1204	205 °F.			3	53	Aerated	
Quench Accumulator	154	per Lb. Catalyst	9.87	400	69.0	53.8	4	222	Settled	
Reactor Inlet	387	per Sq. Ft.	23195	400-550	19.2	37.9	Total	452	Compacted	
Condenser Inlet	588			550+	11.8				Particle Density, gm./cc.	
Product Accumulator	91						CALCULATED FROM dp		NH_3 Value, ml./gm.	
Catalyst No. Height				A. S. T. M. DIST. ON			Density, Lbs./Cu.Ft.	122	N_2 Surface, m^2/gm.	
1 See Per. A	662			Naphtha °F.			Inventory, Lbs.	1551		
2	669			IBP	118		Bed Depth, Ft.	19.26	CHEMICAL ANALYSIS	
3	649			10%	152		Vol., Cu. Ft.	12.71	Fe	
4	656			50%	244				C	
5	662			90%	362				O	
6	663			EP	410				H	
7	654			Rec.	97.0				K_2O, W+, % basis Fe	
8	640								X-Ray Analysis—	
9	637								$Fe_{20}C_9$	
10	637								Fe_3O_4	
11	618								Fe	

RUN NO. 62-M
HOURS 279-303
CATALYST Fresh CM&S

THE TEXAS COMPANY — MONTEBELLO LABORATORY
YIELD CALCULATIONS

	FRESH FEED			WET GAS			RECYCLE	COMBINED FEED	EFFLUENT	NET CHANGE		YIELD BASIS H_2+CO FED								
					At Wt. Balance							CONDENSATE				YIELDS BASIS BROWNSVILLE DESIGN FEED RATE*				
	%	m/hr	#/hr	%	m/hr	#/hr	m/hr	m/hr	m/hr	m/hr	#/hr	#/MCF	#/gal	gal/hr	gal/MCF		CORRECTED HEMPEL. %	gal/hr	TREATING RECOVERY,%	gal/hr
CO 28.010	37.330	15.456	432.93	16.337	2.907	81.44	7.396	22.852	10.303	-12.549	-351.49									
H_2 2.016	60.086	24.877	50.15	48.614	8.650	17.44	22.008	46.885	30.658	-16.227	-32.71					400 EP	70.0	6.588	98.0	6.456
CO_2 44.010	2.177	0.901	39.65	22.213	3.955	174.06	10.056	10.957	14.011	3.054	134.41	8.782				400-550	20.0	1.883	91.4	1.721
N_2 28.016	0.167	0.069	1.93	1.197	0.213	5.97	0.542	0.611	0.755							550 +	10.0	0.941	114.6	1.078
CH_4 16.042	0.240	0.099	1.59	5.383	0.958	15.37	2.437	2.536	3.395	0.859	13.78	0.900								
C_2H_4 28.052				1.313	0.234	6.56	0.594	0.594	0.828	0.234	6.56	0.429					RECOVERY %	#/hr	gal/hr	
C_2H_6 30.068				0.763	0.136	4.09	0.345	0.345	0.481	0.136	4.09	0.267				PROPYLENE	32.7	3.40		
C_1+C_2											24.43	1.596				C_3 POLY GASO.	87.5	2.97	0.497	
C_3H_6 42.078				1.390	0.247	10.39	0.629	0.629	0.876	0.247	10.39	0.679	4.32	2.405	0.157	C_3 POLY TAR	12.5	0.43	0.057	
C_3H_8 44.094				0.193	0.034	1.50	0.087	0.087	0.121	0.034	1.50	0.098	4.24	0.354	0.023					
C_4H_8 56.104				1.190	0.212	11.89	0.539	0.539	0.751	0.212	11.89	0.777	5.00	2.378	0.155		#/gal	#/hr	gal/hr	RVP
C_4H_{10} 58.120				0.440	0.078	4.53	0.199	0.199	0.277	0.078	4.53	0.296	4.86	0.932	0.061	C_4H_8	5.00	--	--	68.0
C_5H_{10} 70.130				0.587	0.104	7.29	0.266	0.266	0.370	0.104	7.29	0.476	5.45	1.338	0.087	C_5 POLY GASO.	5.98	10.40	1.740	1.5
C_5H_{12} 72.146				0.120	0.021	1.52	0.054	0.054	0.075	0.021	1.52	0.099	5.25	0.290	0.019	C_4H_{10}	4.86	(4.53) 4.51	(0.932) 0.927	68.0
C_6H_{12} 84.156				0.260	0.046	3.87	0.118	0.118	0.164	0.046	3.87	0.253	5.54	0.699	0.046	C_4-FREE GASO.			9.280	5.8
C_3-C_6											40.99	2.678		8.396	0.548	C_4 POLY TAR	7.53	1.49	0.198	
TOTAL		41.402	526.25		17.795	345.92	45.270	86.672	69.688											
H_2+CO	97.416	40.333	1530600192 SCFH	11.557			29.404	69.737	40.961	-28.776							gal/hr	gal/MCF	Bbl/Day	
H_2/CO		1.61	Factor 653338	2.98			2.98	2.05	2.98	1.29						10 # RVP 400 EP GASOLINE	11.947	0.7805	4232	
									RECOVERED OIL	0.437	61.28	4.004		9.412	0.615	GAS OIL	1.721	0.1124	609	
									TOTAL OIL		102.27	6.682		17.808	1.163	FUEL OIL	1.078	0.0704	382	
									WATER SOLUBLE CHEMICALS	0.217	11.51	0.752		1.435	0.094	POLY TAR	0.255	0.0167	91	
									TOTAL LIQUID PRODUCTS C_3+		113.78	7.434		19.243	1.257	TOTAL	15.001	0.9800	5314	
									NET WATER	5.969	107.54	7.026		12.910	0.843	W. S. CHEM.	1.435	0.0938	508	
									GROSS WATER		119.05	7.778		14.345	0.937	TOTAL	16.436	1.0738	5822	
									HYDROCARBON TOTAL—C_1+		138.21	9.030								

Weight Recovery, % 94.07 | Catalyst Age, hrs. | Space Velocity, vhv 1240
Pressure, psig 418 | Inlet Velocity, Ft/sec 1.01 | Catalyst Vol CF 12.34
Temperature, °F 658 | Bed Depth, Ft 18.70 | Weight, # 1469
Recycle Ratio 1.09 | Bed Density, #/CF 119 | Effluent $\frac{(H_2)(CO_2)}{(H_2O)(CO)}$ Shift Ratio =

FRESH FEED CONVERSION — %				TOTAL FEED CONVERSION — %			SELECTIVITY
Contraction	CO	H_2	H_2+CO	CO	H_2	$CO+H_2$	C_3+/C_1+
57.02	81.19	65.23	71.35	54.91	34.61	41.26	82.32

Form ML—11

g/NCM = 16.91 × #/MCF *9488 MCFH H_2+CO, Bbl/Day = 5421.6 × gal/MCF

THE TEXAS COMPANY — MONTEBELLO LABORATORY
DATA SUMMARY

RUN NO. 62-M
HOURS 279-303

OPERATING CONDITIONS				PRODUCT TESTS			CATALYST DATA					
PRESSURES PSIG		RATES S.C.F.H.			OIL	WATER	INVENTORY DATA		PARTICLE SIZE			
Oxygen	446	Fresh Feed	15712	° API	49.2	10.5			Screen Analysis			Sedimentation
Natural Gas	441	Recycle	17180	Neut. No.	37.0	37.3	In Reactor at Start of Period		Mesh	Microns	%	Microns %
Generator Outlet	423	Combined Feed	32892	Sap. No.	49.0	41.9	Fresh Catalyst Added		On 40	419+		80+
Reactor Inlet	418	Wet Gas—Measured	6144	Hydrox. No.			Total		100	150		40—80
Condenser Inlet		Adjusted	6753	Bromine No.	86		Catalyst Recovered	50	150	105		20—40
Product Accumulator	372	Loss	609	Pour °F.			In Reactor at End of Period		200	74		10—20
				Chemicals, % by K_2CO_3		10.0	REACTOR d-p, Inches H_2O		250	62		0—20
							No. Height		325	44		
TEMPERATURES—°F.		Recycle/Fresh Feed	1.09				0 See Per. A	45	<325			
Oxygen	488	Inlet Velocity—ft./sec.	1.01				1	63	CATALYST			
Natural Gas	803	Fresh Feed Rate—S.C.F.H.	15306	HEMPEL. DIST. %		°API	2	68	Bulk Density, Lbs./Cu.Ft.			
Generator	2383	per Cu. Ft. Dense Bed	1240	205 °F.			3	50	Aerated			
Quench Accumulator	152	per Lb. Catalyst	10.42	400	69.0	54.0	4	202	Settled			
Reactor Inlet	405	per Sq. Ft.	23191	400-550	20.0	37.9	Total	428	Compacted			
Condenser Inlet	589			550+	11.0				Particle Density, gm./cc.			
Product Accumulator	85						CALCULATED FROM dp		NH_3 Value, ml./gm.			
Catalyst No. Height				A. S. T. M. DIST. ON			Density, Lbs./Cu.Ft.	119	N_2 Surface, m^2/gm.			
1 See Per. A	654			Naphtha °F.			Inventory, Lbs.	1469				
2	664			IBP	116		Bed Depth, Ft.	18.70	CHEMICAL ANALYSIS			
3	649			10%	150		Vol., Cu. Ft.	12.34	Fe			
4	654			50%	244				C			
5	663			90%	352				O			
6	662			EP	402				H			
7	656			Rec.	97.0				K_2O, W+, % basis Fe			
8	640								X-Ray Analysis—			
9	637								$Fe_{20}C_9$			
10	638								Fe_3O_4			
11	621								Fe			

RUN NO. 62-N
HOURS 303-327
CATALYST Fresh CM&S

THE TEXAS COMPANY — MONTEBELLO LABORATORY
YIELD CALCULATIONS

	FRESH FEED			WET GAS			RECYCLE	COMBINED FEED	EFFLUENT	NET CHANGE		YIELD BASIS H_2+CO FED			
					At Wt. Balance							CONDENSATE			
	%	m/hr	#/hr	%	m/hr	#/hr	m/hr	m/hr	m/hr	m/hr	#/hr	#/MCF	#/gal	gal/hr.	gal/MCF
CO 28.010	36.783	15.369	430.47	16.790	3.122	87.45	7.680	23.049	10.802	-12.247	-343.02				
H_2 2.016	60.477	25.269	50.94	49.206	9.150	18.45	22.506	47.775	31.656	-16.119	-32.49				
CO_2 44.010	2.093	0.875	38.51	21.266	3.956	174.10	9.727	10.602	13.683	3.081	135.59	8.792			
N_2 28.016	0.320	0.134	3.75	1.260	0.234	6.56	0.576	0.710	0.810						
CH_4 16.042	0.327	0.137	2.20	5.470	1.017	16.31	2.502	2.639	3.519	0.880	14.11	0.915			
C_2H_4 28.052				1.217	0.226	6.34	0.557	0.557	0.783	0.226	6.34	0.411			
C_2H_6 30.068				0.787	0.146	4.39	0.360	0.360	0.506	0.146	4.39	0.285			
C_1+C_2											24.84	1.611			
C_3H_6 42.078				1.277	0.237	9.97	0.584	0.584	0.821	0.237	9.97	0.646	4.32	2.308	0.150
C_3H_8 44.094				0.203	0.038	1.68	0.093	0.093	0.131	0.038	1.68	0.109	4.24	0.396	0.026
C_4H_8 56.104				1.167	0.217	12.17	0.534	0.534	0.751	0.217	12.17	0.789	5.00	2.434	0.158
C_4H_{10} 58.120				0.427	0.079	4.59	0.195	0.195	0.274	0.079	4.59	0.298	4.86	0.944	0.061
C_5H_{10} 70.130				0.580	0.108	7.57	0.265	0.265	0.373	0.108	7.57	0.491	5.45	1.389	0.090
C_5H_{12} 72.146				0.123	0.023	1.66	0.056	0.056	0.079	0.023	1.66	0.108	5.25	0.316	0.020
C_6H_{12} 84.156				0.227	0.042	3.53	0.104	0.104	0.146	0.042	3.53	0.229	5.54	0.637	0.041
C_3-C_6											41.17	2.670		8.424	0.546
TOTAL		41.784	525.87		18.595	354.77	45.739	87.523	70.720						
H_2+CO	97.260	40.638	15422.5182 SCFH		12.272		30.186	70.824	42.458	-28.366					
H_2/CO		1.64	Factor 648402		2.93		2.93	2.07	2.93	1.32					

Weight Recovery, % 93.26	Catalyst Age, hrs.	Space Velocity, vhv 1266	RECOVERED OIL	0.403	56.54	3.666		8.663	0.562
Pressure, psig 416	Inlet Velocity, Ft/sec 1.02	Catalyst Vol CF 12.18	TOTAL OIL		97.71	6.336		17.087	1.108
Temperature, °F 657	Bed Depth, Ft 18.46	Weight, # 1438	WATER SOLUBLE CHEMICALS	0.194	10.27	0.666		1.284	0.083
Recycle Ratio 1.09	Bed Density, #/CF 118	Effluent $\frac{(H_2)(CO_2)}{(H_2O)(CO)}$ = Shift Ratio	TOTAL LIQUID PRODUCTS C_3+		107.98	7.002		18.371	1.191

FRESH FEED CONVERSION — %				TOTAL FEED CONVERSION — %			SELECTIVITY			
Contraction	CO	H_2	H_2+CO	CO	H_2	$CO+H_2$	C_3+/C_1+	NET WATER	5.789	104.29	6.762		12.520	0.812
55.50	79.69	63.79	69.80	53.13	33.74	40.05	81.30	GROSS WATER		114.56	7.428		13.804	0.895
								HYDROCARBON TOTAL—C_1+		132.82	8.613			

YIELDS BASIS BROWNSVILLE DESIGN FEED RATE*	CORRECTED HEMPEL. %	gal/hr	TREATING RECOVERY,%	gal/hr
400 EP	70.0	6.064	98.0	5.943
400-550	18.8	1.629	91.4	1.489
550 +	11.2	0.970	114.6	1.112

	RECOVERY %	#/hr	gal/hr
PROPYLENE	31.7	3.16	
C_3 POLY GASO.	87.5	2.76	0.462
C_3 POLY TAR	12.5	0.40	0.053

	#/gal	#/hr	gal/hr	RVP
C_4H_8	5.00	--	--	68.0
C_4 POLY GASO.	5.98	10.65	1.781	1.5
C_4H_{10}	4.86	(4.59) 4.35	(0.944) 0.895	68.0
C_4-FREE GASO.			8.747	5.8
C_4 POLY TAR	7.53	1.52	0.202	

	gal/hr	gal/MCF	Bbl/Day
10 # RVP 400 EP GASOLINE	11.423	0.7407	4016
GAS OIL	1.489	0.0965	523
FUEL OIL	1.112	0.0721	391
POLY TAR	0.255	0.0165	89
TOTAL	14.279	0.9258	5019
W. S. CHEM.	1.284	0.833	452
TOTAL	15.563	1.0091	5471

Form ML—11

g/NCM = 16.91 × #/MCF *9488 MCFH H_2 + CO, Bbl/Day = 5421.6 × gal/MCF

RUN NO. 62-N
HOURS 303-327

THE TEXAS COMPANY — MONTEBELLO LABORATORY
DATA SUMMARY

OPERATING CONDITIONS				PRODUCT TESTS			CATALYST DATA			
PRESSURES PSIG		RATES S.C.F.H.			OIL	WATER	INVENTORY DATA		PARTICLE SIZE	
Oxygen	444	Fresh Feed	15857	°API	49.1	10.5	In Reactor at Start of Period		Screen Analysis	Sedimentation
Natural Gas	439	Recycle	17358	Neut. No.	37.3	39.6	Fresh Catalyst Added		Mesh / Microns / %	Microns / %
Generator Outlet	421	Combined Feed	33215	Sap. No.	48.6	42.5	Total		On 40 / 419+	80+
Reactor Inlet	416	Wet Gas—Measured	6352	Hydrox. No.			Catalyst Recovered	39	100 / 150	40—80
Condenser Inlet		Adjusted	7057	Bromine No.			In Reactor at End of Period		150 / 105	20—40
Product Accumulator	371	Loss	705	Pour °F.					200 / 74	10—20
				Chemicals, % by K_2CO_3		9.3	REACTOR d-p, Inches H_2O		250 / 62	0—20
							No. Height		325 / 44	
TEMPERATURES—°F.		Recycle/Fresh Feed	1.09				0 See Per. A	44	<325	
Oxygen	526	Inlet Velocity—ft./sec.	1.02				1	62	CATALYST	
Natural Gas	799	Fresh Feed Rate—S.C.F.H.	15423	HEMPEL. DIST. %		°API	2	67	Bulk Density, Lbs./Cu.Ft.	
Generator	2374	per Cu. Ft. Dense Bed	1266	205 °F.			3	50	Aerated	
Quench Accumulator	152	per Lb. Catalyst	10.73	400	69.0	53.0	4	196	Settled	
Reactor Inlet	411	per Sq. Ft.	23368	400-550	18.8	37.2	Total	419	Compacted	
Condenser Inlet	588			550+	12.2				Particle Density, gm./cc.	
Product Accumulator	79						CALCULATED FROM dp		NH_3 Value, ml./gm.	
Catalyst No. Height				A. S. T. M. DIST. ON			Density, Lbs./Cu.Ft.	118	N_2 Surface, m^2/gm.	
1 See Per. A	661			Naphtha °F.			Inventory, Lbs.	1438		
2	661			IBP	120		Bed Depth, Ft.	18.46	CHEMICAL ANALYSIS	
3	650			10%	158		Vol., Cu. Ft.	12.18	Fe	
4	654			50%	250				C	
5	662			90%	364				O	
6	662			EP	408				H	
7	653			Rec.	96.5				K_2O, W+, % basis Fe	
8	339								X-Ray Analysis—	
9	635								$Fe_{20}C_9$	
10	638								Fe_3O_4	
11	621								Fe	

RUN NO. 62-0
HOURS 327-351
CATALYST

THE TEXAS COMPANY — MONTEBELLO LABORATORY
YIELD CALCULATIONS

	FRESH FEED			WET GAS			RECYCLE	COMBINED FEED	EFFLUENT	NET CHANGE		YIELD BASIS H_2+CO FED								
					At Wt. Balance							CONDENSATE				YIELDS BASIS BROWNSVILLE DESIGN FEED RATE*				
	%	m/hr	#/hr	%	m/hr	#/hr	m/hr	m/hr	m/hr	m/hr	#/hr	#/MCF	#/gal	gal/hr	gal/MCF		CORRECTED HEMPEL. %	gal/hr	TREATING RECOVERY.%	gal/hr
CO 28.010	37.553	15.445	432.61	17.660	3.317	92.91	8.005	23.450	11.322	-12.128	+339.70									
H_2 2.016	59.833	24.609	49.61	48.367	9.084	18.31	21.923	46.532	31.007	-15.525	31.30					400 EP	69.0	5.631	98.0	5.518
CO_2 44.010	2.160	0.888	39.08	21.123	3.967	174.54	9.574	10.462	13.541	3.079	135.46	8.912				400-550	17.2	1.404	91.4	1.283
N_2 28.016	0.147	0.060	1.68	1.237	0.232	6.50	0.561	0.621	0.793							550 +	13.8	1.126	114.6	1.290
CH_4 16.042	0.307	0.126	2.02	5.167	0.970	15.56	2.342	2.468	3.312	0.844	13.54	0.891								
C_2H_4 28.052				1.427	0.268	7.52	0.647	0.647	0.915	0.268	7.52	0.495					RECOVERY %	#/hr	gal/hr	
C_2H_6 30.068				0.787	0.148	4.45	0.357	0.357	0.505	0.148	4.45	0.293				PROPYLENE	31.0	3.18		
C_1+C_2											25.51	1.679				C_3 POLY GASO.	87.5	2.78	0.465	
C_3H_4 42.078				1.300	0.244	10.27	0.589	0.589	0.833	0.244	10.27	0.676	4.32	2.377	0.156	C_3 POLY TAR	12.5	0.40	0.053	
C_3H_8 44.094				0.243	0.046	2.03	0.110	0.110	0.156	0.046	2.03	0.134	4.24	0.479	0.032					
C_4H_8 56.104				1.123	0.211	11.84	0.509	0.509	0.720	0.211	11.84	0.779	5.00	2.368	0.156		#/gal	#/hr	gal/hr	RVP
C_4H_{10} 58.120				0.413	0.078	4.53	0.187	0.187	0.265	0.078	4.53	0.298	4.86	0.932	0.061	C_4H_8	5.00	--	--	68.0
C_5H_{10} 70.130				0.717	0.135	9.47	0.325	0.325	0.460	0.135	9.47	0.623	5.45	1.738	0.114	C_4 POLY GASO.	5.98	10.36	1.732	1.5
C_6H_{12} 72.146				0.133	0.025	1.80	0.060	0.060	0.085	0.025	1.80	0.118	5.25	0.343	0.023	C_4H_{10}	4.86	(4.53) 4.38	(0.952) 0.901	68.0
C_6H_{12} 84.156				0.303	0.057	4.90	0.137	0.137	0.194	0.057	4.90	0.316	5.54	0.866	0.057	C_4 FREE GASO.			8.930	5.8
C_3-C_6											44.74	2.944		9.103	0.599	C_4 POLY TAR	7.53	1.48	0.197	
TOTAL		41.128			18.782	364.58	45.326	86.454	70.055											
H_2+CO	97.386	40.054	15200.00 688 SCFH		12.401		29.928	69.982	42.329	-27.653							gal/hr	gal/MCF	Bbl/Day	
H_2/CO		1.59	Factor 657894		2.74		2.74	1.98	2.74	1.28						10 # RVP 400 EP GASOLINE	11.563	0.7607	4124	
Weight Recovery, % 92.75			Catalyst Age, hrs.			Space Velocity, vhv 1333			RECOVERED OIL	0.381	53.38	3.512		8.161	0.537	GAS OIL	1.283	0.0844	458	
Pressure, psig 415			Inlet Velocity, Ft/sec 1.01			Catalyst Vol CF 11.40			TOTAL OIL		98.12	6.456		17.264	1.136	FUEL OIL	1.290	0.0849	460	
Temperature, °F 654			Bed Depth, Ft 17.27			Weight, # 1448			WATER SOLUBLE CHEMICALS	0.195	10.35	0.681		1.291	0.085	POLY TAR	0.250	0.0164	89	
Recycle Ratio 1.10			Bed Density, #/CF 127			Effluent $\frac{(H_2)(CO_2)}{(H_2O)(CO)}$ = Shift Ratio			TOTAL LIQUID PRODUCTS C_5+		108.47	7.137		18.555	1.221	TOTAL	14.386	0.9464	5131	
FRESH FEED CONVERSION — %				TOTAL FEED CONVERSION — %			SELECTIVITY		NET WATER	5.371	96.77	6.366		11.617	0.764	W. S. CHEM.	1.291	0.0849	460	
Contraction	CO	H_2	H_2+CO	CO	H_2	$CO+H_2$	C_3 + /C_1 +		GROSS WATER		107.12	7.047		12.908	0.949	TOTAL	15.677	1.0313	5591	
5433	78.52	63.09	69.04	51.72	33.36	39.51	80.96		HYDROCARBON TOTAL—C_1+		133.98	8.816								

Form ML—11

g/NCM = 16.91 × #/MCF *9488 MCFH H_2 + CO, Bbl/Day = 5421.6 × gal/MCF

THE TEXAS COMPANY — MONTEBELLO LABORATORY
DATA SUMMARY

RUN NO. 62-0
HOURS 327-351

OPERATING CONDITIONS				PRODUCT TESTS			CATALYST DATA				
PRESSURES PSIG		RATES S.C.F.H.			OIL	WATER	INVENTORY DATA		PARTICLE SIZE		
Oxygen	443	Fresh Feed	15608	°API	48.8	10.5	In Reactor at Start of Period		Screen Analysis		Sedimentation
Natural Gas	439	Recycle	17201	Neut. No.	38.2	39.9	Fresh Catalyst Added	0	Mesh	Microns %	Microns %
Generator Outlet	421	Combined Feed	32809	Sap. No.	49.7	42.5	Total		On 40	419+	80+
Reactor Inlet	415	Wet Gas—Measured	6384	Hydrox. No.			Catalyst Recovered	43.5	100	150	40—80
Condenser Inlet		Adjusted	7128	Bromine No.	86		In Reactor at End of Period		150	105	20—40
Product Accumulator	370	Loss	744	Pour °F.					200	74	10—20
				Chemicals, % by K_2CO_3		10.0	REACTOR d-p, Inches H_2O		250	62	0—20
							No. Height		325	44	
TEMPERATURES—°F.		Recycle/Fresh Feed	1.10				0 See Per. A	44	<325		
Oxygen	515	Inlet Velocity—ft./sec.	1.01				1	59	CATALYST		
Natural Gas	799	Fresh Feed Rate—S.C.F.H.	15200	HEMPEL. DIST. %		°API	2	70	Bulk Density. Lbs./Cu.Ft.		
Generator	2377	per Cu.Ft. Dense Bed	1333	205 °F.			3	64	Aerated		
Quench Accumulator	145	per Lb. Catalyst	10.50	400	68.0	54.9	4	185	Settled		
Reactor Inlet	417	per Sq. Ft.	23030	400-550	17.2	38.1	Total	422	Compacted		
Condenser Inlet	585			550+	14.8				Particle Density, gm./cc.		
Product Accumulator	79						CALCULATED FROM dp		NH_3 Value, ml./gm.		
Catalyst No. Height				A. S. T. M. DIST. ON			Density, Lbs./Cu.Ft.	127	N_2 Surface, m^2/gm.		
1 See Per. A	658			Naphtha °F.			Inventory, Lbs.	1448			
2	658			IBP	116		Bed Depth, Ft.	17.27	CHEMICAL ANALYSIS		
3	648			10%	150		Vol., Cu. Ft.	11.40	Fe		
4	652			50%	246				C		
5	657			90%	350				O		
6	657			EP	417				H		
7	648			Rec.	98.0				K_2O, W+, % basis Fe		
8	633								X-Ray Analysis—		
9	630								$Fe_{20}C_9$		
10	640								Fe_3O_4		
11	624								Fe		

RUN NO. 62-P
HOURS 351-375
CATALYST Fresh CM&S

THE TEXAS COMPANY — MONTEBELLO LABORATORY
YIELD CALCULATIONS

	FRESH FEED			WET GAS			RECYCLE	COMBINED FEED	EFFLUENT	NET CHANGE		YIELD BASIS H_2+CO FED — CONDENSATE			
	%	m/hr	#/hr	%	At Wt. Balance m/hr	At Wt. Balance #/hr	m/hr	m/hr	m/hr	m/hr	#/hr	#/MCF	#/gal	gal/hr	gal/MCF
CO 28.010	37.607	15.332	429.46	17.647	3.459	96.89	8.146	23.478	11.605	-11.873	-332.57				
H_2 2.016	59.376	24.207	48.80	49.904	9.781	19.72	23.037	47.244	32.818	-14.426	-29.08				
CO_2 44.010	2.147	0.875	38.51	19.900	3.900	171.65	9.186	10.061	13.086	3.025	133.14	8.873			
N_2 28.016	0.257	0.105	2.94	1.107	0.217	6.08	0.511	0.616	0.728						
CH_4 16.042	0.613	0.250	4.01	5.917	1.160	18.61	2.731	2.981	3.891	0.910	14.60	0.973			
C_2H_4 28.052				1.160	0.227	6.37	0.535	0.535	0.762	0.227	6.37	0.425			
C_2H_6 30.068				0.683	0.134	4.03	0.315	0.315	0.449	0.134	4.03	0.269			
C_1+C_2											25.00	1.667			
C_3H_6 42.078				0.973	0.191	8.04	0.449	0.449	0.640	0.191	8.04	0.536	4.32	1.861	0.124
C_3H_8 44.094				0.110	0.022	0.97	0.051	0.051	0.073	0.022	0.97	0.065	4.24	0.229	0.015
C_4H_8 56.104				1.023	0.201	11.28	0.472	0.472	0.673	0.201	11.28	0.752	5.00	2.256	0.150
C_4H_{10} 58.120				0.483	0.095	5.52	0.223	0.223	0.318	0.095	5.52	0.368	4.86	1.136	0.076
C_5H_{10} 70.130				0.630	0.123	8.63	0.291	0.291	0.414	0.123	8.63	0.575	5.45	1.583	0.105
C_5H_{12} 72.146				0.180	0.035	2.53	0.083	0.083	0.118	0.035	2.53	0.169	5.25	0.482	0.032
C_6H_{12} 84.156				0.283	0.055	4.63	0.131	0.131	0.186	0.055	4.63	0.309	5.54	0.836	0.056
C_3-C_6											41.60	2.774		8.383	0.558
TOTAL		40.769	523.72		19.600	364.95	46.161	86.930	71.591						
H_2+CO	96.983	39.539	15005 SCFH		13.240		31.183	70.722	44.423	-26.299					
H_2/CO		1.58	Factor 666444		2.83		2.83	2.01	2.83	1.22					
RECOVERED OIL										0.383	53.71	3.579		8.246	0.550
TOTAL OIL											95.31	6.353		16.629	1.108
WATER SOLUBLE CHEMICALS										0.197	10.47	0.698		1.304	0.087
TOTAL LIQUID PRODUCTS C_3+											105.78	7.051		17.933	1.195
NET WATER										5.250	94.59	6.304		11.355	0.757
GROSS WATER											105.06	7.002		12.659	0.844
HYDROCARBON TOTAL—C_1+											130.78	8.718			

Weight Recovery, % 91.89	Catalyst Age, hrs.	Space Velocity, vhv 1312	
Pressure, psig 415	Inlet Velocity, Ft/sec 1.02	Catalyst Vol CF 11.44	
Temperature, °F 659	Bed Depth, Ft 17.33	Weight, # 1407	
Recycle Ratio 1.13	Bed Density, #/CF 123	Effluent Shift Ratio $\frac{(H_2)(CO_2)}{(H_2O)(CO)}$ =	

FRESH FEED CONVERSION — %				TOTAL FEED CONVERSION — %			SELECTIVITY
Contraction	CO	H_2	H_2+CO	CO	H_2	$CO+H_2$	C_3+/C_1+
51.92	77.44	59.59	66.51	50.57	30.54	37.19	80.88

YIELDS BASIS BROWNSVILLE DESIGN FEED RATE*

	CORRECTED HEMPEL, %	gal/hr	TREATING RECOVERY, %	gal/hr
400 EP	71.5	5.896	98.0	5.778
400-550	19.6	1.616	91.4	1.477
550 +	8.9	0.734	114.6	0.841

	RECOVERY %	#/hr	gal/hr
PROPYLENE	29.8	2.40	
C_3 POLY GASO.	87.5	2.10	0.351
C_3 POLY TAR	12.5	0.30	0.040

	#/gal	#/hr	gal/hr	RVP
C_4H_8	5.00	--	--	68.0
C_4 POLY GASO.	5.98	9.87	1.651	1.5
C_4H_{10}	4.86	(5.52) 4.35	(1.136) 0.896	68.0
C_4-FREE GASO.			9.030	5.8
C_4 POLY TAR	7.53	1.41	0.187	

	gal/hr	gal/MCF	Bbl/Day
10 # RVP 400 EP GASOLINE	11.577	0.7715	4183
GAS OIL	1.477	0.0984	533
FUEL OIL	0.841	0.0560	304
POLY TAR	0.227	0.0151	82
TOTAL	14.122	0.9410	5102
W. S. CHEM.	1.304	0.0869	471
TOTAL	15.426	1.0279	5573

Form ML—11

g/NCM = 16.91 × #/MCF

*9488 MCFH H_2+CO, Bbl/Day = 5421.6 × gal/MCF

THE TEXAS COMPANY — MONTEBELLO LABORATORY
DATA SUMMARY

RUN NO. 62-P
HOURS 351-375

OPERATING CONDITIONS

PRESSURES PSIG		RATES S.C.F.H.	
Oxygen	442	Fresh Feed	15472
Natural Gas	439	Recycle	17518
Generator Outlet	421	Combined Feed	32990
Reactor Inlet	415	Wet Gas—Measured	6573
Condenser Inlet		Adjusted	7438
Product Accumulator	370	Loss	865
TEMPERATURES—°F.		Recycle/Fresh Feed	1.13
Oxygen	528	Inlet Velocity—ft./sec.	1.02
Natural Gas	768	Fresh Feed Rate—S.C.F.H.	15005
Generator	2345	per Cu.Ft. Dense Bed	1312
Quench Accumulator	147	per Lb. Catalyst	10.66
Reactor Inlet	430	per Sq. Ft.	22735
Condenser Inlet	590		
Product Accumulator	80		
Catalyst No. Height			
1 See Per. A	667		
2	670		
3	650		
4	654		
5	661		
6	660		
7	649		
8	633		
9	632		
10	646		
11	626		

PRODUCT TESTS

	OIL	WATER
°API	49.0	10.5
Neut. No.	38.3	40.5
Sap. No.	48.6	42.5
Hydrox. No.		
Bromine No.		
Pour °F.		
Chemicals, % by K_2CO_3		10.3
HEMPEL. DIST. %		°API
205 °F.		
400	70.5	53.5
400-550	19.6	37.9
550+	9.9	
A. S. T. M. DIST. ON		
Naphtha °F.		
IBP	116	
10%	150	
50%	246	
90%	362	
EP	418	
Rec.	98.0	

CATALYST DATA

INVENTORY DATA*	
In Reactor at Start of Period	
Fresh Catalyst Added	
Total	
Catalyst Recovered	43
In Reactor at End of Period	
REACTOR d-p, Inches H_2O	
No. Height	
0 See Per. A	43
1	57
2	70
3	60
4	180
Total	410
CALCULATED FROM dp	
Density, Lbs./Cu.Ft.	123
Inventory, Lbs.	1407
Bed Depth, Ft.	17.33
Vol., Cu. Ft.	11.44

PARTICLE SIZE

Screen Analysis Mesh	Microns	%	Sedimentation Microns	%
On 40	419+		80+	
100	150		40—80	
150	105		20—40	
200	74		10—20	
250	62		0—20	
325	44			
<325				

CATALYST

Bulk Density, Lbs./Cu.Ft.	
Aerated	
Settled	
Compacted	
Particle Density, gm./cc.	
NH_3 Value, ml./gm.	
N_2 Surface, m²/gm.	
CHEMICAL ANALYSIS	
Fe	
C	
O	
H	
K_2O, W+, % basis Fe	
X-Ray Analysis—	
$Fe_{20}C_9$	
Fe_3O_4	
Fe	

RUN NO. 62-Q
HOURS 375-399
CATALYST Fresh CM&S

THE TEXAS COMPANY — MONTEBELLO LABORATORY
YIELD CALCULATIONS

	FRESH FEED			WET GAS	At Wt. Balance		RECYCLE	COMBINED FEED	EFFLUENT	NET CHANGE		YIELD BASIS H_2+CO FED								
	%	m/hr	#/hr	%	m/hr	#/hr	m/hr	m/hr	m/hr	m/hr	#/hr	CONDENSATE #/MCF	#/gal	gal/hr	gal/MCF	YIELDS BASIS BROWNSVILLE DESIGN FEED RATE*				
CO 28.010	37.420	15.297	428.47	16.275	3.023	84.67	7.389	22.686	10.412	-12.274	-343.80						CORRECTED HEMPEL. %	gal/hr	TREATING RECOVERY.%	gal/hr
H_2 2.016	59.456	24.306	49.00	48.380	8.987	18.12	21.965	46.271	30.952	15.319	-30.88					400 EP	70.0	5.956	98.0	5.837
CO_2 44.010	2.110	0.863	37.98	21.865	4.061	178.72	9.926	10.789	13.987	3.198	140.74	9.365				400-550	19.5	1.659	91.4	1.516
N_2 28.016	0.367	0.150	4.20	1.220	0.227	6.36	0.554	0.704	0.781							550 +	10.5	0.894	114.6	1.025
CH_4 16.042	0.647	0.264	4.24	6.490	1.206	19.35	2.946	3.210	4.152	0.942	15.11	1.005								
C_2H_4 28.052				1.210	0.225	6.31	0.549	0.549	0.774	0.225	6.31	0.420					RECOVERY %	#/hr	gal/hr	
C_2H_6 30.068				0.775	0.144	4.33	0.352	0.352	0.496	0.144	4.33	0.288				PROPYLENE	31.2	2.18		
C_1+C_2											25.75	1.713				C_3 POLY GASO.	87.5	1.91	0.319	
C_3H_6 42.078				0.895	0.166	6;98	0.406	0.406	0.572	0.166	6.98	0.464	4.32	1.616	0.108	C_3 POLY TAR	12.5	0.27	0.036	
C_3H_8 44.094				0.125	0.023	1.01	0.057	0.057	0.080	0.023	1.01	0.067	4.24	0.238	0.016					
C_4H_8 56.104				1.060	0.197	11.05	0.481	0.481	0.678	0.197	11.05	0.735	5.00	2.210	0.147		#/gal	#/hr	gal/hr	RVP
C_4H_{10} 58.120				0.500	0.093	5.41	0.227	0.227	0.320	0.093	5.41	0.360	4.86	1.113	0.074	C_4H_8	5.00	--	--	68.0
C_5H_{10} 70.130				0.680	0.126	8.84	0.309	0.309	0.435	0.126	8.84	0.588	5.45	1.622	0.108	C_4 POLY GASO.	5.98	9.67	1.617	1.5
C_5H_{12} 72.146				0.220	0.041	2.96	0.100	0.100	0.141	0.041	2.96	0.197	5.25	0.564	0.038	C_4H_{10}	4.86	(5.41) 4.39	(1.113) 0.204	68.0
C_6H_{12} 84.156				0.305	0.057	4.80	0.138	0.138	0.195	0.057	4.80	0.319	5.54	0.866	0.058	C_4-FREE GASO.			9.208	5.8
C_3-C_6											41.05	2.730		8.229	0.549	C_4 POLY TAR	7.53	1.38	0.183	
TOTAL		40.380	523.89		18.576	358.91	45.399	86.279	70.043											
H_2+CO	96.876	39.603	15029 SCFH		12.010		29.354	68.957	41.364	-27.593							gal/hr	gal/MCF	Bbl/Day	
H_2/CO		1.59	Factor 665380		2.97		2.97	2.04	2.97	1.25						10 # RVP 400 EP GASOLINE	11.729	0.7804	4231	
																GAS OIL	1.516	0.1009	547	
																FUEL OIL	1.025	0.0682	370	
																POLY TAR	0.219	0.0146	79	
																TOTAL	14.489	0.9641	5227	
																W. S. CHEM.	1.315	0.0875	474	
																TOTAL	15.804	1.0516	5701	

Weight Recovery, % 92.43 | Catalyst Age, hrs. | Space Velocity, vhv 1326 | RECOVERED OIL 0.397 55.74
Pressure, psig 415 | Inlet Velocity, Ft/sec 1.02 | Catalyst Vol CF 11.33 | TOTAL OIL 96.79
Temperature, °F 661 | Bed Depth, Ft 17.16 | Weight, # 1314 | WATER SOLUBLE CHEMICALS 0.201 10.69
Recycle Ratio 1.11 | Bed Density, #/CF 116 | Effluent $(H_2)(CO_2)$ / Shift Ratio $(H_2O)(CO)$ = | TOTAL LIQUID PRODUCTS C_5+ 107.48

FRESH FEED CONVERSION — %				TOTAL FEED CONVERSION — %			SELECTIVITY	
Contraction	CO	H_2	H_2+CO	CO	H_2	$CO+H_2$	C_3+/C_1+	
54.56	80.24	63.03	69.67	54.10	33.11	40.01	80.67	

NET WATER 5.470 98.55
GROSS WATER 109.24
HYDROCARBON TOTAL—C_1+ 133.23

6.557		11.831	0.787	W. S. CHEM.	1.315	0.0875	474	
7.268		13.146	0.975	TOTAL	15.804	1.0516	5701	
8.863								

Form ML—11

g/NCM = 16.91 × #/MCF *9488 MCFH H_2+CO, Bbl/Day = 5421.6 × gal/MCF

THE TEXAS COMPANY — MONTEBELLO LABORATORY
DATA SUMMARY

RUN NO. 62-Q
HOURS 375-399

OPERATING CONDITIONS				PRODUCT TESTS			CATALYST DATA				
PRESSURES PSIG		RATES S.C.F.H.			OIL	WATER	INVENTORY DATA		PARTICLE SIZE		
Oxygen	442	Fresh Feed	15514	°API	48.6	10.4			Screen Analysis		Sedimentation	
Natural Gas	438	Recycle	17229	Neut. No.	37.0	40.6	In Reactor at Start of Period		Mesh	Microns %	Microns	%
Generator Outlet	421	Combined Feed	32743	Sap. No.	48.8	43.3	Fresh Catalyst Added		On 40	419+	80+	
Reactor Inlet	415	Wet Gas—Measured	6271	Hydrox. No.			Total		100	150	40—80	
Condenser Inlet		Adjusted	7050	Bromine No.			Catalyst Recovered	47	150	105	20—40	
Product Accumulator	371	Loss	779	Pour °F.			In Reactor at End of Period		200	74	10—20	
				Chemicals, % by K_2CO_3		10.0	REACTOR d-p, Inches H_2O		250	62	0—20	
							No. Height		325	44		
TEMPERATURES—°F.		Recycle/Fresh Feed	1.11				0 See Per. A	40	<325			
Oxygen	518	Inlet Velocity—ft./sec.	1.02				1	55	CATALYST			
Natural Gas	775	Fresh Feed Rate—S.C.F.H.	15029	HEMPEL. DIST. %		°API	2	64	Bulk Density, Lbs./Cu.Ft.			
Generator	2349	per Cu.Ft. Dense Bed	1326	205 °F.			3	57	Aerated			
Quench Accumulator	150	per Lb. Catalyst	11.44	400	69.0	53.4	4	167	Settled			
Reactor Inlet	427	per Sq. Ft.	22771	400-550	19.5	38.2	Total	383	Compacted			
Condenser Inlet	598			550+	11.5				Particle Density, gm./cc.			
Product Accumulator	86	Heat Transfer Calculations					CALCULATED FROM dp		NH_3 Value, ml./gm.			
Catalyst No. Height		Steam Rate=370#/hr		A. S. T. M. DIST. ON			Density, Lbs./Cu.Ft.	116	N_2 Surface, m^2/gm.			
1 See Per. A	630	@ 705 psia & 506°F=		Naphtha °F.			Inventory, Lbs.	1314				
2	672	1201 BTU/#		IBP	120		Bed Depth, Ft.	17.16	CHEMICAL ANALYSIS			
3	653	Water in @ 66°F=34 BTU/#		10%	152		Vol., Cu. Ft.	11.33	Fe			
4	658	Net Heat Trans/# steam		50%	258				C			
5	662	=1167 BTU		90%	384				O			
6	662	(1167)(370)=431790		EP	426				H			
7	649	Ave Bed Temp=661°F		Rec.	96.5				K_2O. W+. % basis Fe			
8	635	dT=661-506=155°F							X-Ray Analysis—			
9	638	Tube Area=31.2 sq ft							$Fe_{20}C_9$			
10	646	K= 431790 / (31.2)(155) = 89.3 BTU/°F/sq ft							Fe_3O_4			
11	623								Fe			

RUN NO. 62-R
HOURS 399-423
CATALYST Fresh CM&S

THE TEXAS COMPANY — MONTEBELLO LABORATORY
YIELD CALCULATIONS

	FRESH FEED			WET GAS			RECYCLE	COMBINED FEED	EFFLUENT	NET CHANGE		YIELD BASIS H_2+CO FED								
					At Wt. Balance							CONDENSATE								
	%	m/hr	#/hr	%	m/hr	#/hr	m/hr	m/hr	m/hr	m/hr	#/hr	#/MCF	#/gal	gal/hr	gal/MCF	YIELDS BASIS BROWNSVILLE DESIGN FEED RATE*				
CO 28.010	36.755	15.059	421.81	15.10	2.766	77.49	6.857	21.916	9.623	-12.293	-344.32						CORRECTED HEMPEL. %	gal/hr	TREATING RECOVERY.%	gal/hr
H_2 2.016	59.715	24.465	49.32	49.15	9.003	18.15	22.320	46.785	31.323	-15.462	-31.17					400 EP	70.6	6.663	98.0	6.530
CO_2 44.010	2.600	1.065	46.87	22.29	4.083	179.71	10.122	11.187	14.205	3.018	132.84	8.857				400-550	18.0	1.699	91.4	1.553
N_2 28.016	0.440	0.180	5.04	1.13	0.207	5.80	0.513	0.693	0.720							550 +	11.4	1.076	114.6	1.233
CH_4 16.042	0.490	0.201	3.22	6.36	1.165	18.69	2.888	3.089	4.053	0.964	15.47	1.031								
C_2H_4 28.052				1.67	0.306	8.58	0.758	0.758	1.064	0.306	8.58	0.572					RECOVERY %	#/hr	gal/hr	
C_2H_6 30.068				0.74	0.136	4.09	0.336	0.336	0.472	0.136	4.09	0.273				PROPYLENE	31.6	1.41		
C_1+C_2											28.14	1.876				C_3 POLY GASO.	87.5	1.23	0.206	
C_3H_4 42.078				0.58	0.106	4.46	0.263	0.263	0.369	0.106	4.46	0.297	4.32	1.032	0.069	C_3 POLY TAR	12.5	0.18	0.024	
C_3H_8 44.094				0.15	0.027	1.19	0.068	0.068	0.095	0.027	1.19	0.079	4.24	0.281	0.019					
C_4H_8 56.104				1.10	0.201	11.28	0.500	0.500	0.701	0.201	11.28	0.752	5.00	2.256	0.150		#/gal	#/hr	gal/hr	RVP
C_4H_{10} 58.120				0.48	0.088	5.11	0.218	0.218	0.306	0.088	5.11	0.341	4.86	1.051	0.070	C_4H_8	5.00	--	--	68.0
C_5H_{10} 70.130				0.70	0.128	8.98	0.318	0.318	0.496	0.128	8.98	0.599	5.45	1.648	0.110	C_4 POLY GASO.	5.98	9.87	1.651	1.5
C_5H_{12} 72.146				0.19	0.035	2.53	0.086	0.086	0.121	0.035	2.53	0.169	5.25	0.482	0.032	C_4H_{10}	4.86	(5.11) 4.65	(1.051) 0.956	68.0
C_6H_{12} 84.156				0.36	0.066	5.55	0.163	0.163	0.229	0.066	5.55	0.370	5.54	1.002	0.067	C_4 FREE GASO.			9.868	5.8
C_7-C_8											39.10	2.607		7.752	0.517	C_4 POLY TAR	7.53	1.41	0.187	
TOTAL		40.970	526.26		18.317	351.61	45.410	86.380	70.062											
H_2+CO	96.470	39.524	14999 SCFH		11.769		29.177	68.701	40.946	-27.755							gal/hr	gal/MCF	Bbl/Day	
H_2/CO		1.62	Factor 666711		3.25		3.26	2.13	3.26	1.26						10 # RVP 400 EP GASOLINE	12.475	0.8317	4509	
Weight Recovery, % 91.31			Catalyst Age, hrs.			Space Velocity, vhv 1367		RECOVERED OIL		0.435	61.05	4.070		9.438	0.629	GAS OIL	1.553	0.1035	561	
Pressure, psig 416			Inlet Velocity, Ft/sec 1.02			Catalyst Vol CF 10.27		TOTAL OIL			100.15	6.677		17.190	1.146	FUEL OIL	1.233	0.0822	446	
Temperature, °F 663			Bed Depth, Ft 16.62			Weight, # 1229		WATER SOLUBLE CHEMICALS		0.208	11.05	0.737		1.368	0.091	POLY TAR	0.211	0.0141	76	
Recycle Ratio 1.11			Bed Density, #/CF 112			Effluent $(H_2)(CO_2)$ / Shift Ratio $(H_2O)(CO)$ =		TOTAL LIQUID PRODUCTS C_4+			111.20	7.414		18.558	1.237	TOTAL	15.472	1.0315	5592	
FRESH FEED CONVERSION — %				TOTAL FEED CONVERSION — %			SELECTIVITY	NET WATER		5.692	102.55	6.837		12.311	0.821	W. S. CHEM.	1.368	0.0912	494	
Contraction	CO	H_2	H_2+CO	CO	H_2	$CO+H_2$	C_3+/C_1+	GROSS WATER			113.60	7.574		13.679	0.912	TOTAL	16.840	1.1227	6086	
55.29	81.63	63.20	70.22	56.09	33.05	40.40	79.80	HYDROCARBON TOTAL—C_1+			139.34	9.290								

Form ML—11

g/NCM = 16.91 × #/MCF *9488 MCFH H_2+CO, Bbl/Day = 5421.6 × gal/MCF

THE TEXAS COMPANY — MONTEBELLO LABORATORY
DATA SUMMARY

RUN NO. 62-R
HOURS 399-423

OPERATING CONDITIONS				PRODUCT TESTS			CATALYST DATA						
PRESSURES PSIG		RATES S.C.F.H.			OIL	WATER	INVENTORY DATA		PARTICLE SIZE				
Oxygen	442	Fresh Feed	15548	° API	49.4	10.4	In Reactor at Start of Period		Screen Analysis			Sedimentation	
Natural Gas	438	Recycle	17233	Neut. No.	35.7	36.4	Fresh Catalyst Added		Mesh	Microns	%	Microns	%
Generator Outlet	420	Combined Feed	32781	Sap. No.	46.4	43.3	Total		On 40	419+		80+	
Reactor Inlet	416	Wet Gas—Measured	6047	Hydrox. No.			Catalyst Recovered	55	100	150		40—80	
Condenser Inlet		Adjusted	6951	Bromine No.			In Reactor at End of Period		150	105		20—40	
Product Accumulator	370	Loss	904	Pour °F.					200	74		10—20	
				Chemicals, % by K_2CO_3		10.0	REACTOR d-p, Inches H_2O		250	62		0—20	
							No. Height		325	44			
TEMPERATURES—°F.		Recycle/Fresh Feed	1.11				0 See Per. A	39	<325				
Oxygen	491	Inlet Velocity—ft./sec.	1.02				1	55	CATALYST				
Natural Gas	800	Fresh Feed Rate—S.C.F.H.	14999	HEMPEL. DIST. %		°API	2	60	Bulk Density, Lbs./Cu.Ft.				
Generator	2365	per Cu. Ft. Dense Bed	1367	205 °F.			3	54	Aerated				
Quench Accumulator	160	per Lb. Catalyst	12.20	400	69.6	53.0	4	150	Settled				
Reactor Inlet	425	per Sq. Ft.	22726	400-550	18.0	38.0	Total	358	Compacted				
Condenser Inlet	617			550+	12.4				Particle Density, gm./cc.				
Product Accumulator	87						CALCULATED FROM dp		NH_3 Value, ml./gm.				
Catalyst No. Height				A. S. T. M. DIST. ON			Density, Lbs./Cu.Ft.	112	N_2 Surface, m^2/gm.				
1 See Per. A	600			Naphtha °F.			Inventory, Lbs.	1229					
2	665			IBP	118		Bed Depth, Ft.	16.62	CHEMICAL ANALYSIS				
3	658			10%	148		Vol., Cu. Ft.	10.97	Fe				
4	662			50%	250				C				
5	665			90%	380				O				
6	665			EP	424				H				
7	650			Rec.	96.5				K_2O, W+, % basis Fe				
8	642								X-Ray Analysis—				
9	647								$Fe_{20}C_9$				
10	650								Fe_3O_4				
11	626								Fe				

RUN NO. 62-S
HOURS 423-447
CATALYST Fresh CM&S

THE TEXAS COMPANY — MONTEBELLO LABORATORY
YIELD CALCULATIONS

	FRESH FEED			WET GAS			RECYCLE	COMBINED FEED	EFFLUENT	NET CHANGE		YIELD BASIS H_2+CO FED							
					At Wt. Balance							CONDENSATE							
	%	m/hr	#/hr	%	m/hr	#/hr	m/hr	m/hr	m/hr	m/hr	#/hr	#/MCF	#/gal	gal/hr	gal/MCF	YIELDS BASIS BROWNSVILLE DESIGN FEED RATE*			
CO 28.010	37.604	15.435	432.32	14.340	2.530	70.87	6.366	21.801	8.896	-12.905	-361.45						CORRECTED HEMPEL, %	gal/hr	TREATING RECOVERY,%	gal/hr
H_2 2.016	59.310	24.344	49.08	46.960	8.285	16.70	20.848	45.192	29.133	-16.059	-32.38					400 EP	70.0	6.334	98.0	6.207
CO_2 44.010	2.090	0.858	37.76	24.757	4.367	192.16	10.991	11.849	15.358	3.509	154.40	10.228				400-550	16.8	1.520	91.4	1.389
N_2 28.016	0.243	0.100	2.80	1.320	0.233	6.53	0.586	0.686	0.819							550 +	13.2	1.195	114.6	1.369
CH_4 16.042	0.753	0.309	4.96	6.457	1.139	18.27	2.867	3.176	4.006	0.830	18.27	1.210								
C_2H_4 28.052				1.447	0.255	7.15	0.642	0.642	0.897	0.255	7.15	0.474					RECOVERY %	#/hr	gal/hr	
C_2H_6 30.068				0.613	0.108	3.25	0.272	0.272	0.380	0.108	3.25	0.215				PROPYLENE	32.7	3.01		
C_1+C_2											28.67	1.899				C_3 POLY GASO.	87.5	2.63	0.440	
C_3H_4 42.078				1.240	0.219	9.22	0.550	0.550	0.769	0.219	9.22	0.611	4.32	2.134	0.141	C_3 POLY TAR	12.5	0.38	0.050	
C_3H_6 44.094				0.193	0.034	1.50	0.086	0.086	0.120	0.034	1.50	0.099	4.24	0.354	0.023					
C_4H_8 56.104				1.157	0.204	11.45	0.514	0.514	0.718	0.204	11.45	0.758	5.00	2.290	0.152		#/gal	#/hr	gal/hr	RVP
C_4H_{10} 58.120				0.393	0.069	4.01	0.174	0.174	0.243	0.069	4.01	0.266	4.86	0.825	0.055	C_4H_8	5.00	0.44	0.088	68.0
C_5H_{10} 70.130				0.673	0.119	8.35	0.299	0.299	0.418	0.119	8.35	0.553	5.45	1.532	0.101	C_5 POLY GASO.	5.98	9.63	1.611	1.5
C_5H_{12} 72.146				0.173	0.031	2.24	0.077	0.077	0.108	0.031	2.24	0.148	5.25	0.427	0.028	C_4H_{10}	4.86	4.01	0.825	68.0
C_6H_{12} 84.156				0.277	0.049	4.12	0.123	0.123	0.172	0.049	4.12	0.273	5.84	0.744	0.049	C_4-FREE GASO.			9.350	5.8
C_3-C_6											40.89	2.708		8.306	0.549	C_4 POLY TAR	7.53	1.38	0.183	
TOTAL		41.046	526.92		17.642	355.82	44.395	85.441	68.270											
H_2+CO	96.914	39.779	15096 SCFH	109815			27.214	66.993	38.029	-28.964							gal/hr	gal/MCF	Bbl/Day	
H_2/CO		1.58	Factor 662427	3.27			3.27	2.07	3.27	1.24						10 # RVP-400 EP GASOLINE	11.874	0.7866	4265	
Weight Recovery, % 91.73			Catalyst Age, hrs.			Space Velocity, vhv 1463			RECOVERED OIL	0.423	59.34	3.931		9.049	0.599	GAS OIL	1.389	0.0920	499	
Pressure, psig 416			Inlet Velocity, Ft/sec 1.01			Catalyst Vol CF 10.32			TOTAL OIL		100.23	6.639		17.355	1.148	FUEL OIL	1.369	0.0907	492	
Temperature, °F 663			Bed Depth, Ft 15.64			Weight, # 1115			WATER SOLUBLE CHEMICALS	0.202	10.73	0.711		1.348	0.089	POLY TAR	0.233	0.0154	83	
Recycle Ratio 1.08			Bed Density, #/CF 108			Effluent $(H_2)(CO_2)$ / Shift Ratio $(H_2O)(CO)$ =			TOTAL LIQUID PRODUCTS C_3+		110.96	7.350		18.703	1.237	TOTAL	14.865	0.9847	5339	
FRESH FEED CONVERSION — %				TOTAL FEED CONVERSION — %			SELECTIVITY		NET WATER	5.608	101.03	6.692	8.33	12.129	0.863	W. S. CHEM.	1.348	0.0893	484	
Contraction	CO	H_2	H_2+CO	CO	H_2	$CO+H_2$	C_3+/C_1+		GROSS WATER		111.76	7.403		13.477	0.892	TOTAL	16.213	1.0740	5823	
57.02	83.61	65.97	72.81	59.19	35.54	43.23	79.47		HYDROCARBON TOTAL—C_1+		139.63	9.249								

Form ML—11

g/NCM = 16.91 × #/MCF *9488 MCFH H_2 + CO, Bbl/Day = 5421.6 × gal/MCF

THE TEXAS COMPANY — MONTEBELLO LABORATORY
DATA SUMMARY

RUN NO. 62-S
HOURS 423-447

OPERATING CONDITIONS				PRODUCT TESTS			CATALYST DATA			
PRESSURES PSIG		RATES S.C.F.H.			OIL	WATER	INVENTORY DATA		PARTICLE SIZE	
Oxygen	442	Fresh Feed	15577	°API	48.9	10.5	In Reactor at Start of Period		Screen Analysis	Sedimentation
Natural Gas	439	Recycle	16848	Neut. No.	37.2	39.8	Fresh Catalyst Added		Mesh / Microns / %	Microns / %
Generator Outlet	421	Combined Feed	32425	Sap. No.	47.5	43.4	Total		On 40 / 419+	80+
Reactor Inlet	416	Wet Gas—Measured	5875	Hydrox. No.			Catalyst Recovered	94	100 / 150	40—80
Condenser Inlet		Adjusted	6695	Bromine No.			In Reactor at End of Period		150 / 105	20—40
Product Accumulator	370	Loss	820	Pour °F.					200 / 74	10—20
				Chemicals, % by K_2CO_3			REACTOR d-p, Inches H_2O		250 / 62	0—20
							No. Height		325 / 44	
TEMPERATURES—°F.		Recycle/Fresh Feed	1.08				0 See Period A	36	<325	
Oxygen	483	Inlet Velocity—ft./sec.	1.01				1	55	CATALYST	
Natural Gas	798	Fresh Feed Rate—S.C.F.H.	15096	HEMPEL, DIST. %		°API	2	59	Bulk Density, Lbs./Cu.Ft.	
Generator	2341	per Cu. Ft. Dense Bed	1463	205 °F.			3	50	Aerated	
Quench Accumulator	168	per Lb. Catalyst	13.54	400	69.0	52.4	4	125	Settled	
Reactor Inlet	417	per Sq. Ft.	22873	400-550	16.8	37.8	Total	325	Compacted	
Condenser Inlet	638			550+	14.2				Particle Density, gm./cc.	
Product Accumulator	85						CALCULATED FROM dp		NH_3 Value, ml./gm.	
Catalyst No. Height				A. S. T. M. DIST. ON			Density, Lbs./Cu.Ft.	108	N_2 Surface, m^2/gm.	
1 See Per. A	568			Naphtha °F.			Inventory, Lbs.	1115		
2	666			IBP	126		Bed Depth, Ft.	15.64	CHEMICAL ANALYSIS	
3	659			10%	160		Vol., Cu. Ft.	10.32	Fe	
4	661			50%	254				C	
5	666			90%	380				O	
6	666			EP	436				H	
7	655			Rec.	97.0				K_2O, W+, % basis Fe	
8	650								X-Ray Analysis—	
9	655								$Fe_{20}C_9$	
10	656								Fe_3O_4	
11	633								Fe	

RUN NO. 62-T
HOURS 447-471
CATALYST Fresh CM&S

THE TEXAS COMPANY — MONTEBELLO LABORATORY
YIELD CALCULATIONS

	FRESH FEED			WET GAS			RECYCLE	COMBINED FEED	EFFLUENT	NET CHANGE		YIELD BASIS H_2+CO FED								
					At Wt. Balance							CONDENSATE								
	%	m/hr	#/hr	%	m/hr	#/hr	m/hr	m/hr	m/hr	m/hr	#/hr	#/MCF	#/gal	gal/hr	gal/MCF	YIELDS BASIS BROWNSVILLE DESIGN FEED RATE*				
CO 28.010	36.885	15.147	424.25	14.650	2.818	78.93	6.735	21.882	9.553	-12.329	-345.32						CORRECTED HEMPEL, %	gal/hr	TREATING RECOVERY,%	gal/hr
H_2 2.016	60.025	24.649	49.69	50.706	9.754	19.66	23.310	47.959	33.064	-14.895	-30.03					400 EP	68.4	6.058	98.0	5.937
CO_2 44.010	2.420	0.994	43.75	21.446	4.126	181.61	9.859	10.853	13.985	3.132	137.96	9.129				400-550	18.2	1.612	91.4	1.473
N_2 28.016	0.370	0.152	4.26	1.380	0.265	7.42	0.634	0.786	0.899							550 +	13.4	1.187	114.6	1.360
CH_4 16.042	0.300	0.123	1.97	6.007	1.156	18.54	2.762	2.885	3.918	1.033	16.57	1.097								
C_2H_4 28.052				1.287	0.248	6.96	0.592	0.592	0.840	0.248	6.96	0.461					RECOVERY %	#/hr	gal/hr	
C_2H_6 30.068				0.800	0.154	4.63	0.368	0.368	0.522	0.154	4.63	0.307				PROPYLENE	30.4	2.85		
C_1+C_2											28.16	1.865				C_3 POLY GASO.	87.5	2.49	0.416	
C_3H_6 42.078				1.160	0.223	9.38	0.533	0.533	0.756	0.223	9.38	0.621	4.32	2.171	0.144	C_3 POLY TAR	12.5	0.36	0.048	
C_3H_8 44.094				0.130	0.025	1.10	0.060	0.060	0.085	0.025	1.10	0.073	4.24	0.259	0.017					
C_4H_8 56.104				0.873	0.168	9.43	0.401	0.401	0.569	0.168	9.43	0.624	5.00	1.886	0.125		#/gal	#/hr	gal/hr	RVP
C_4H_{10} 58.120				0.417	0.080	4.65	0.192	0.192	0.272	0.080	4.65	0.308	4.86	0.957	0.063	C_4H_8	5.00	--	--	68.0
C_5H_{10} 70.130				0.680	0.131	9.19	0.313	0.313	0.444	0.131	9.19	0.609	5.45	1.686	0.112	C_4 POLY GASO.	5.98	8.25	1.380	1.5
C_5H_{12} 72.146				0.197	0.038	2.74	0.091	0.091	0.129	0.038	2.74	0.181	5.25	0.522	0.035	C_4H_{10}	4.86	(4.65) 4.27	(0.957) 0.978	68.0
C_6H_{12} 84.156				0.267	0.051	4.29	0.123	0.123	0.174	0.051	4.29	0.284	5.54	0.774	0.051	C_4-FREE GASO.			9.335	5.8
C_3-C_6											40.78	2.700		8.255	0.547	C_4 POLY TAR	7.53	1.18	0.157	
TOTAL		41.065	523.92		19.237	358.53	45.973	87.038	71.223											
H_2+CO	96.910	39.796	15102 SCFH		12.572		30.045	69.841	42.617	-27.224							gal/hr	gal/MCF	Bbl/Day	
H_2/CO		1.63	Factor 662163		3.46		3.46	2.19	3.46	1.21						10 # RVP 400 EP GASOLINE	11.593	0.7676	4162	
Weight Recovery, % 90.83			Catalyst Age, hrs.			Space Velocity, vhv 1575			RECOVERED OIL	0.409	57.43	3.803		8.857	0.586	GAS OIL	1.473	0.0975	529	
Pressure, psig 415			Inlet Velocity, Ft/sec 1.03			Catalyst Vol CF 9.59			TOTAL OIL		98.21	6.503		17.112	1.133	FUEL OIL	1.360	0.0901	488	
Temperature, °F 661			Bed Depth, Ft 14.53			Weight, # 1122			WATER SOLUBLE CHEMICALS	0.199	10.58	0.701		1.299	0.086	POLY TAR	0.205	0.0136	74	
Recycle Ratio 1.12			Bed Density, #/CF 117			Effluent $\frac{(H_2)(CO_2)}{(H_2O)(CO)}$ = Shift Ratio			TOTAL LIQUID PRODUCTS C_5+		108.79	7.204		18.411	1.219	TOTAL	14.631	0.9688	5253	
FRESH FEED CONVERSION — %				TOTAL FEED CONVERSION — %			SELECTIVITY		NET WATER	5.405	97.38	6.448	8.33	11.690	0.774	W. S. CHEM.	1.299	0.0860	466	
Contraction	CO	H_2	H_2+CO	CO	H_2	$CO+H_2$	C_3+/C_1+		GROSS WATER		107.96	7.149		12.989	0.860	TOTAL	15.930	1.0548	5719	
53.15	31.40	60.43	68.41	56.34	31.06	38.98	79.44		HYDROCARBON TOTAL—C_1+		136.95	9.069								

Form ML—11

g/NCM = 16.91 × #/MCF *9488 MCFH H_2+CO, Bbl/Day = 5421.6 × gal/MCF

THE TEXAS COMPANY — MONTEBELLO LABORATORY
DATA SUMMARY

RUN NO. 62-T
HOURS 447-471

OPERATING CONDITIONS				PRODUCT TESTS			CATALYST DATA				
PRESSURES PSIG		RATES S.C.F.H.			OIL	WATER	INVENTORY DATA		PARTICLE SIZE		
Oxygen	441	Fresh Feed	15584	°API	49.6	10.4	In Reactor at Start of Period		Screen Analysis		Sedimentation
Natural Gas	438	Recycle	17447	Neut. No.	46.5	44.4	Fresh Catalyst Added		Mesh	Microns %	Microns %
Generator Outlet	420	Combined Feed	33031	Sap. No.	47.5	45.2	Total		On 40	419+	80+
Reactor Inlet	415	Wet Gas—Measured	6322	Hydrox. No.			Catalyst Recovered	120.5	100	150	40—80
Condenser Inlet		Adjusted	7300	Bromine No.			In Reactor at End of Period		150	105	20—40
Product Accumulator	370	Loss	978	Pour °F.					200	74	10—20
				Chemicals, % by K_2CO_3		10.0	REACTOR d-p, Inches H_2O		250	62	0—20
							No. Height		325	44	
TEMPERATURES—°F.		Recycle/Fresh Feed	1.12				0 See Per. A	40	<325		
Oxygen	447	Inlet Velocity—ft./sec.	1.03				1	59	CATALYST		
Natural Gas	801	Fresh Feed Rate—S.C.F.H.	15102	HEMPEL. DIST. %		°API	2	63	Bulk Density, Lbs./Cu.Ft.		
Generator	2340	per Cu. Ft. Dense Bed	1575	205 °F.			3	55	Aerated		
Quench Accumulator	170	per Lb. Catalyst	13.46	400	67.4	54.6	4	110	Settled		
Reactor Inlet	395	per Sq. Ft.	22882	400-550	18.2	38.8	Total	327	Compacted		
Condenser Inlet	645			550+	14.4				Particle Density, gm./cc.		
Product Accumulator	81						CALCULATED FROM dp		NH_3 Value, ml./gm.		
Catalyst No. Height				A. S. T. M. DIST. ON			Density, Lbs./Cu.Ft.	117	N_2 Surface, m^2/gm.		
1 See Per. A	607			Naphtha °F.			Inventory, Lbs.	1122			
2	666			IBP	126		Bed Depth, Ft.	14.53	CHEMICAL ANALYSIS		
3	655			10%	158		Vol., Cu. Ft.	9.59	Fe		
4	657			50%	248				C		
5	662			90%	368				O		
6	663			EP	410				H		
7	652			Rec.	97.0				K_2O, W+, % basis Fe		
8	658								X-Ray Analysis—		
9	664								$Fe_{20}C_9$		
10	663								Fe_3O_4		
11	639								Fe		

RUN NO. 62-U
HOURS 471-495
CATALYST Fresh CM&S

THE TEXAS COMPANY — MONTEBELLO LABORATORY
YIELD CALCULATIONS

	FRESH FEED			WET GAS			RECYCLE	COMBINED FEED	EFFLUENT	NET CHANGE		YIELD BASIS H_2+CO FED							
					At Wt. Balance							CONDENSATE							
	%	m/hr	#/hr	%	m/hr	#/hr	m/hr	m/hr	m/hr	m/hr	#/hr	#/MCF	#/gal	gal/hr	gal/MCF	YIELDS BASIS BROWNSVILLE DESIGN FEED RATE*			
CO 28.010	38.267	15.394	431.18	15.815	3.089	86.52	7.238	22.632	10.327	-12.305	344.66						CORRECTED HEMPEL, %	gal/hr	TREATING RECOVERY,%	gal/hr
H_2 2.016	58.150	23.393	47.16	50.335	9.832	19.82	23.036	46.429	32.868	-13.561	27.34					400 EP	67.9	5.893	98.0	5.775
CO_2 44.010	2.553	1.027	45.20	22.240	4.345	191.22	10.178	11.205	14.522	3.318	146.02	9.939				400-550	22.4	1.944	91.4	1.777
N_2 28.016	0.317	0.128	3.59	1.145	0.224	6.28	0.524	0.652	0.748							550 +	9.7	0.842	114.6	0.965
CH_4 16.042	0.713	0.287	4.60	5.160	1.008	16.17	2.361	2.648	3.369	0.721	11.57	0.788								
C_2H_4 28.052				1.125	0.220	6.17	0.515	0.515	0.735	0.220	6.17	0.420					RECOVERY %	#/hr	gal/hr	
C_2H_6 30.068				0.630	0.123	3.70	0.288	0.288	0.411	0.123	3.70	0.252				PROPYLENE	29.5	2.46		
C_1+C_2											21.44	1.460				C_3 POLY GASO.	87.5	2.15	0.360	
C_3H_6 42.078				1.015	0.198	8.33	0.465	0.465	0.663	0.198	8.33	0.567	4.32	1.928	0.131	C_3 POLY TAR	12.5	0.31	0.041	
C_3H_8 44.094				0.150	0.029	1.28	0.069	0.069	0.098	0.029	1.28	0.087	4.24	0.302	0.021					
C_4H_8 56.104				1.010	0.197	11.05	0.462	0.462	0.659	0.197	11.05	0.752	5.00	2.210	0.150		#/gal	#/hr	gal/hr	RVP
C_4H_{10} 58.120				0.420	0.082	4.77	0.192	0.192	0.274	0.082	4.77	0.325	4.86	0.981	0.067	C_4H_8	5.00	--	--	68.0
C_5H_{10} 70.130				0.580	0.113	7.92	0.265	0.265	0.378	0.113	7.92	0.539	5.45	1.453	0.099	C_4 POLY GASO.	5.98	9.67	1.617	1.5
$C_{12}H_{12}$ 72.146				0.160	0.031	2.24	0.073	0.073	0.104	0.031	2.24	0.152	5.25	0.427	0.029	C_4H_{10}	4.86	(4.77) 4.20	(0.981) 0.864	68.0
C_6H_{12} 84.156				0.215	0.042	3.53	0.098	0.098	0.140	0.042	5.53	0.240	5.54	0.637	0.043	C_4 FREE GASO.			8.652	5.8
C_3-C_6											39.12	2.662		7.938	0.540	C_4 POLY TAR	7.53	1.38	0.183	
TOTAL		40.229	531.73		19.532	369.03	45.765	85.994	71.236											
H_2+CO	96.417	38.787	14691 SCFH		12.921		30.274	69.061	43.195	-25.866							gal/hr	gal / MCF	Bbl/Day	
H_2/CO		1.52	Factor 680688		3.18		3.18	2.05	3.18	1.10						10 # RVP 400 EP GASOLINE	11.133	0.7578	4108	
Weight Recovery, % 90.53			Catalyst Age, hrs.			Space Velocity, vhv 1482			RECOVERED OIL	0.404	56.61	3.853		8.679	0.591	GAS OIL	1.777	0.1210	656	
Pressure, psig 415			Inlet Velocity, Ft/sec 1.00			Catalyst Vol CF 9.91			TOTAL OIL		95.73	6.515		16.617	1.131	FUEL OIL	0.965	0.0657	356	
Temperature, °F 652			Bed Depth, Ft 15.02			Weight, # 1249			WATER SOLUBLE CHEMICALS	0.182	9.65	0.657		1.187	0.081	POLY TAR	0.224	0.0152	82	
Recycle Ratio 1.14			Bed Density, #/CF 126			Effluent $(H_2)(CO_2)$ / Shift Ratio $(H_2O)(CO)$ =			TOTAL LIQUID PRODUCTS C_3+		105.38	7.172		17.804	1.212	TOTAL	14.099	0.9597	5202	
FRESH FEED CONVERSION — %				TOTAL FEED CONVERSION — %			SELECTIVITY		NET WATER	5.353	96.44	6.565	8.33	11.578	0.788	W. S. CHEM.	1.187	0.0808	438	
Contraction	CO	H_2	H_2+CO	CO	H_2	$CO+H_2$	C_3+/C_1+		GROSS WATER		106.09	7.222		12.765	0.869	TOTAL	15.286	1.0405	5640	
51.45	79.93	57.97	66.69	54.37	29.21	37.45	83.09		HYDROCARBON TOTAL—C_1+		126.82	8.632								

Form ML—11

g/NCM = 16.91 × #/MCF *9488 MCFH H_2+CO, Bbl/Day = 5421.6 × gal/MCF

THE TEXAS COMPANY — MONTEBELLO LABORATORY
DATA SUMMARY

RUN NO. 62-U
HOURS 471-495

OPERATING CONDITIONS				PRODUCT TESTS			CATALYST DATA				
PRESSURES PSIG		RATES S.C.F.H.			OIL	WATER	INVENTORY DATA		PARTICLE SIZE		
Oxygen	441	Fresh Feed	15267	° API	49.1	10.3	In Reactor at Start of Period		Screen Analysis		Sedimentation
Natural Gas	438	Recycle	17368	Neut. No.	37.2	37.2	Fresh Catalyst Added	154	Mesh	Microns %	Microns %
Generator Outlet	421	Combined Feed	32635	Sap. No.	46.5	42.5	Total		On 40	419+	80+
Reactor Inlet	415	Wet Gas—Measured	6401	Hydrox. No.			Catalyst Recovered	119	100	150	40—80
Condenser Inlet		Adjusted	7413	Bromine No.	73		In Reactor at End of Period		150	105	20—40
Product Accumulator	369	Loss	1012	Pour °F.					200	74	10—20
				Chemicals, % by K_2CO_3		9.3	REACTOR d-p, Inches H_2O		250	62	0—20
							No. Height		325	44	
TEMPERATURES—°F.		Recycle/Fresh Feed	1.14				0 See Per. A	43	<325		
Oxygen	453	Inlet Velocity—ft./sec.	1.00				1	63	CATALYST		
Natural Gas	799	Fresh Feed Rate—S.C.F.H.	14691	HEMPEL. DIST. %		°API	2	68	Bulk Density, Lbs./Cu.Ft.		
Generator	2346	per Cu. Ft. Dense Bed	1482	205 °F.			3	60	Aerated		
Quench Accumulator	150	per Lb. Catalyst	11.76	400	66.9	53.6	4	130	Settled		
Reactor Inlet	370	per Sq. Ft.	22259	400-550	22.4	34.1	Total	364	Compacted		
Condenser Inlet	630			550+	10.7				Particle Density, gm./cc.		
Product Accumulator	89						CALCULATED FROM dp		NH_3 Value, ml./gm.		
Catalyst No. Height				A. S. T. M. DIST. ON			Density, Lbs./Cu.Ft.	126	N_2 Surface, m^2/gm.		
1 See Per. A	576			Naphtha °F.			Inventory, Lbs.	1249			
2	655			IBP	126		Bed Depth, Ft.	15.02	CHEMICAL ANALYSIS		
3	645			10%	150		Vol., Cu. Ft.	9.91	Fe		
4	648			50%	260				C		
5	654			90%	382				O		
6	656			EP	430				H		
7	641			Rec.	97.0				K_2O, W+, % basis Fe		
8	661								X-Ray Analysis—		
9	667								$Fe_{20}C_9$		
10	661								Fe_3O_4		
11	631								Fe		

RUN NO. 62-V
HOURS 495-519
CATALYST Fresh CM&S

THE TEXAS COMPANY — MONTEBELLO LABORATORY
YIELD CALCULATIONS

	FRESH FEED			WET GAS			RECYCLE	COMBINED FEED	EFFLUENT	NET CHANGE		YIELD BASIS H_2+CO FED				
					At Wt. Balance							CONDENSATE				
	%	m/hr	#/hr	%	m/hr	#/hr	m/hr	m/hr	m/hr	m/hr	#/hr	#/MCF	#/gal	gal/hr	gal/MCF	YIELDS BASIS BROWNSVILLE DESIGN FEED RATE*
CO 28.010	36.756	15.208	425.96	13.216	2.315	64.84	5.923	21.131	8.238	-12.893	-361.12					
H_2 2.016	60.080	24.857	50.11	48.363	8.473	17.08	21.676	46.533	30.149	-16.384	-33.03					400 EP
CO_2 44.010	2.250	0.931	40.97	24.290	4.256	187.33	10.887	11.818	15.143	3.325	146.36	9.626				400-550
N_2 28.016	0.197	0.082	2.30	1.267	0.222	6.22	0.568	0.650	0.790							550 +
CH_4 16.042	0.717	0.297	4.76	6.600	1.156	18.54	2.958	3.255	4.114	0.859	13.78	0.906				
C_2H_4 28.052				1.377	0.241	6.76	0.617	0.617	0.858	0.241	6.76	0.445				
C_2H_6 30.068				0.723	0.127	3.82	0.324	0.324	0.451	0.127	3.82	0.251				PROPYLENE
C_1+C_2											24.36	1.602				C_3 POLY GASO.
C_3H_6 42.078				1.023	0.179	7.53	0.458	0.458	0.637	0.179	7.53	0.495	4.32	1.743	0.115	C_3 POLY TAR
C_3H_8 44.094				0.100	0.018	0.79	0.045	0.045	0.063	0.018	0.79	0.052	4.24	0.186	0.012	
C_4H_8 56.104				1.217	0.213	11.95	0.545	0.545	0.758	0.213	11.95	0.786	5.00	2.390	0.157	
C_4H_{10} 58.120				0.517	0.091	5.29	0.232	0.232	0.323	0.091	5.29	0.348	4.86	1.088	0.072	C_4H_8
C_5H_{10} 70.130				0.767	0.134	9.40	0.344	0.344	0.478	0.134	9.40	0.618	5.45	1.725	0.113	C_4 POLY GASO.
C_5H_{12} 72.146				0.213	0.037	2.67	0.095	0.095	0.132	0.037	2.67	0.176	5.25	0.509	0.033	C_4H_{10}
C_6H_{12} 84.156				0.327	0.057	4.80	0.147	0.147	0.204	0.057	4.80	0.316	5.54	0.866	0.057	C_4 FREE GASO.
C_3-C_6											42.43	2.791		8.507	0.559	C_4 POLY TAR
TOTAL		41.375	524.10		17.519	347.02	44.819	86.194	68.689							
H_2+CO	96.836	40.065	15205 SCFH		10.788		27.599	67.664	38.387	-29.277						
H_2/CO		1.63	Factor 657678		3.66		3.66	2.20	3.66	1.27						10 # RVP 400 EP GASOLINE
									RECOVERED OIL	0.452	63.46	4.174		9.739	0.641	GAS OIL
									TOTAL OIL		105.89	6.965		18.246	1.200	FUEL OIL
									WATER SOLUBLE CHEMICALS	0.210	11.13	0.732		1.367	0.090	POLY TAR
									TOTAL LIQUID PRODUCTS C_3+		117.02	7.697		19.633	1.290	TOTAL
									NET WATER	5.689	102.49	6.741		12.304	0.809	W. S CHEM.
									GROSS WATER		113.62	7.473		13.671	0.899	TOTAL
									HYDROCARBON TOTAL—C_1+		141.38	9.299				

Weight Recovery, % 94.05	Catalyst Age, hrs.	Space Velocity, vhv 1536
Pressure, psig 419	Inlet Velocity, Ft/sec 1.00	Catalyst Vol CF 9.90
Temperature, °F 657	Bed Depth, Ft 15.0	Weight, # 1342
Recycle Ratio 1.08	Bed Density, #/CF 134	Effluent $(H_2)(CO_2)$ / Shift Ratio $(H_2O)(CO)$ =

FRESH FEED CONVERSION — %				TOTAL FEED CONVERSION — %			SELECTIVITY
Contraction	CO	H_2	H_2+CO	CO	H_2	$CO+H_2$	C_3+/C_1+
57.66	84.78	65.91	73.07	61.01	35.21	43.27	82.77

Form ML—11

g/NCM = 16.91 × #/MCF *9488 MCFH H_2+CO, Bbl/Day = 5421.6 × gal/MCF

YIELDS BASIS BROWNSVILLE DESIGN FEED RATE*	CORRECTED HEMPEL. %	gal/hr	TREATING RECOVERY. %	gal/hr
400 EP	72.0	7.012	98.0	6.872
400-550	16.8	1.636	91.4	1.495
550 +	11.2	1.091	114.6	1.250

	RECOVERY %	#/hr	gal/hr
PROPYLENE	33.2	2.50	
C_3 POLY GASO.	87.5	2.19	0.366
C_3 POLY TAR	12.5	0.31	0.041

	#/gal	#/hr	gal/hr	RVP
C_4H_8	5.00	--	--	68.0
C_4 POLY GASO.	5.98	10.46	1.749	1.5
C_4H_{10}	4.86	(5.29) 4.88	(1.088) 1.005	68.0
C_4 FREE GASO.			10.338	5.8
C_4 POLY TAR	7.53	1.49	0.198	

	gal/hr	gal/MCF	Bbl/Day
10 # RVP 400 EP GASOLINE	13.092	0.8610	4668
GAS OIL	1.495	0.0983	533
FUEL OIL	1.250	0.0822	446
POLY TAR	0.239	0.0157	85
TOTAL	16.076	1.0572	5732
W. S CHEM.	1.367	0.0899	487
TOTAL	17.443	1.1471	6219

RUN NO. 62-V
HOURS 495-519

THE TEXAS COMPANY — MONTEBELLO LABORATORY
DATA SUMMARY

OPERATING CONDITIONS			
PRESSURES PSIG		RATES S.C.F.H.	
Oxygen	445	Fresh Feed	15702
Natural Gas	442	Recycle	17009
Generator Outlet	424	Combined Feed	32711
Reactor Inlet	419	Wet Gas—Measured	6051
Condenser Inlet		Adjusted	6648
Product Accumulator	370	Loss	597
TEMPERATURES—°F.		Recycle/Fresh Feed	1.08
Oxygen	469	Inlet Velocity—ft./sec.	1.00
Natural Gas	790	Fresh Feed Rate—S.C.F.H.	15205
Generator	2349	per Cu. Ft. Dense Bed	1536
Quench Accumulator	156	per Lb. Catalyst	11.33
Reactor Inlet	380	per Sq. Ft.	23038
Condenser Inlet	644		
Product Accumulator	85		
Catalyst No. Height			
1 See Per. A	527		
2	663		
3	652		
4	653		
5	658		
6	659		
7	646		
8	662		
9	674		
10	671		
11	642		

PRODUCT TESTS		
	OIL	WATER
°API	49.2	10.3
Neut. No.	37.2	37;3
Sap. No.	46.2	40.6
Hydrox. No.		
Bromine No.		
Pour °F.		
Chemicals, % by K_2CO_3		10.0
HEMPEL. DIST. %		°API
205 °F.		
400	71.0	54.4
400-550	16.8	39.6
550+	13.2	
A. S. T. M. DIST. ON		
Naphtha °F.		
IBP		
10%	155	
50%	262	
90%	390	
EP	228	
Rec.	95	

CATALYST DATA								
INVENTORY DATA		PARTICLE SIZE						
		Screen Analysis			Sedimentation			
In Reactor at Start of Period		Mesh	Microns	%	Microns	%		
Fresh Catalyst Added		On 40	419+		80+			
Total		100	150		40—80			
Catalyst Recovered	163	150	105		20—40			
In Reactor at End of Period		200	74		10—20			
		250	62		0—20			
REACTOR d-p, Inches H_2O		325	44					
No. Height								
0 See Per. A	45	<325						
1	67	CATALYST						
2	71	Bulk Density, Lbs./Cu.Ft.						
3	63	Aerated						
4	145	Settled						
Total	391	Compacted						
		Particle Density, gm./cc.						
CALCULATED FROM dp		NH_3 Value, ml./gm.						
Density, Lbs./Cu.Ft.	134	N_2 Surface, m^2/gm.						
Inventory, Lbs.	1342							
Bed Depth, Ft.	15.0	CHEMICAL ANALYSIS						
Vol., Cu. Ft.	9.90	Fe						
		C						
		O						
		H						
		K_2O, W+, % basis Fe						
		X-Ray Analysis—						
		$Fe_{20}C_9$						
		Fe_3O_4						
		Fe						

RUN NO. 62-W
HOURS 519-543
CATALYST Fresh CM&S

THE TEXAS COMPANY — MONTEBELLO LABORATORY
YIELD CALCULATIONS

	FRESH FEED			WET GAS			RECYCLE	COMBINED FEED	EFFLUENT	NET CHANGE		YIELD BASIS H_2+CO FED								
					At Wt. Balance							CONDENSATE								
	%	m/hr	#/hr	%	m/hr	#/hr	m/hr	m/hr	m/hr	m/hr	#/hr	#/MCF	#/gal	gal/hr	gal/MCF	YIELDS BASIS BROWNSVILLE DESIGN FEED RATE*				
CO 28.010	36.727	15.160	424.64	15.430	2.486	69.63	6.623	21.783	9.109	-12.674							CORRECTED HEMPEL. %	gal/hr	TREATING RECOVERY,%	gal/hr
H_2 2.016	60.236	24.865	50.13	42.868	6.907	13.92	18.399	43.264	25.306	-17.958						400 EP	70.8	6.653	98.0	6.520
CO_2 44.010	2.300	0.949	41.77	26.203	4.222	185.81	11.246	12.195	15.468	3.273	144.04	9.483				400-550	20.5	1.927	91.4	1.761
N_2 28.016	0.177	0.073	2.05	2.273	0.366	10.25	0.976	1.049	1.342							550 +	8.7	0.818	114.6	0.937
CH_4 16.042	0.560	0.231	3.71	6.323	1.019	16.35	2.714	2.945	3.733	0.788	12.74									
C_2H_4 28.052				1.477	0.238	6.68	0.634	0.634	0.872	0.238	6.68						RECOVERY %	#/hr	gal/hr	
C_2H_6 30.068				0.757	0.122	3.67	0.325	0.325	0.447	0.122	3.67					PROPYLENE	36.0	3.16		
C_1+C_2											23.09	1.520				C_3 POLY GASO.	87.5	2.76	0.462	
C_3H_6 42.078				1.300	0.209	8.79	0.558	0.558	0.767	0.209	8.79	0.579	4.32	2.035	0.134	C_3 POLY TAR	12.5	0.40	0.053	
C_3H_8 44.094				0.140	0.023	1.01	0.060	0.060	0.083	0.023	1.01	0.066	4.24	0.238	0.016					
C_4H_8 56.104				1.390	0.224	12.57	0.597	0.597	0.821	0.224	12.57	0.828	5.00	2.514	0.166		#/gal	#/hr	gal/hr	RVP
C_4H_{10} 58.120				0.573	0.092	5.35	0.246	0.246	0.338	0.092	5.35	0.352	4.86	1.101	0.072	C_4H_8	5.00	--	--	68.0
C_5H_{10} 70.130				0.810	0.131	9.19	0.348	0.348	0.479	0.131	9.19	0.605	5.45	1.686	0.111	C_4 POLY GASO.	5.98	11.00	1.839	1.5
C_5H_{12} 72.146				0.153	0.025	1.80	0.066	0.066	0.091	0.025	1.80	0.119	5.25	0.343	0.023	C_4H_{10}	4.86	5.35	1.101	68.0
C_6H_{12} 84.156				0.303	0.049	4.12	0.130	0.130	0.179	0.049	4.12	0.271	5.54	0.744	0.049	C_4-FREE GASO.			9.755	5.8
C_7-C_8											42.83	2.820		8.661	0.570	C_4 POLY TAR	7.53	1.57	0.208	
TOTAL		41.278	522.30		16.112	394.08	42.920	84.198	65.296											
H_2+CO	96.963	40.025	15189 SCFH		9.393		25.022	65.047	34.415	30.632							gal/hr	gal / MCF	Bbl/Day	
H_2/CO		1.64	Factor 658371		2.78		2.78	1.99	2.78	1.42						10 # RVP 400 EP GASOLINE	12.569	0.8275	4486	
																GAS OIL	1.761	0.1159	628	
																FUEL OIL	0.937	0.0617	335	
																POLY TAR	0.261	0.0172	93	
																TOTAL	15.528	1.0223	5542	
																W. S. CHEM.	1.220	0.0803	435	
																TOTAL	16.748	1.1026	5977	

Weight Recovery, % 97.65	Catalyst Age, hrs.		Space Velocity, vhv 1653	RECOVERED OIL	0.440	61.66	4.060	9.398	0.619
Pressure, psig 419	Inlet Velocity, Ft/sec 0.98		Catalyst Vol CF 9.19	TOTAL OIL		104.49	6.880	18.059	1.189
Temperature, °F 659	Bed Depth, Ft 13.92		Weight, # 1222	WATER SOLUBLE CHEMICALS	0.190	10.06	0.662	1.220	0.080
Recycle Ratio 1.04	Bed Density, #/CF 133		Effluent $(H_2)(CO_2)$ / Shift Ratio $(H_2O)(CO)$ =	TOTAL LIQUID PRODUCTS C_5+		114.55	7.542	19.279	1.269
				NET WATER	5.634	101.50	6.682	12.185	
				GROSS WATER		111.56	7.345	13.405	
				HYDROCARBON TOTAL—C_1+		137.64	9.062		

FRESH FEED CONVERSION — %				TOTAL FEED CONVERSION — %			SELECTIVITY
Contraction	CO	H_2	H_2+CO	CO	H_2	$CO+H_2$	C_3+/C_1+
60.97	83.60	72.22	76.53	58.18	41.51	47.09	83.22

Form ML—11

g/NCM = 16.91 × #/MCF *9488 MCFH H_2+CO, Bbl/Day = 5421.6 × gal/MCF

THE TEXAS COMPANY — MONTEBELLO LABORATORY
DATA SUMMARY

RUN NO. 62-W
HOURS 519-543

OPERATING CONDITIONS				PRODUCT TESTS			CATALYST DATA			
PRESSURES PSIG		RATES S.C.F.H.			OIL	WATER	INVENTORY DATA		PARTICLE SIZE	
Oxygen	444	Fresh Feed	15665	°API	48.6	10.2	In Reactor at Start of Period		Screen Analysis	Sedimentation
Natural Gas	442	Recycle	16288	Neut. No.	39.0	40.0	Fresh Catalyst Added		Mesh / Microns / %	Microns / %
Generator Outlet	424	Combined Feed	31953	Sap. No.	48.5	45.3	Total		On 40 / 419+	80+
Reactor Inlet	419	Wet Gas—Measured	5899	Hydrox. No.			Catalyst Recovered	133.5	100 / 150	40—80
Condenser Inlet		Adjusted	6114	Bromine No.			In Reactor at End of Period		150 / 105	20—40
Product Accumulator	370	Loss	215	Pour °F.					200 / 74	10—20
				Chemicals, % by K_2CO_3		9.1	REACTOR d-p, Inches H_2O		250 / 62	0—20
							No. Height		325 / 44	
TEMPERATURES—°F.		Recycle/Fresh Feed	1.04				0 See Per. A	48	<325	
Oxygen	492	Inlet Velocity—ft./sec.	0.98				1	66	CATALYST	
Natural Gas	809	Fresh Feed Rate—S.C.F.H.	15189	HEMPEL. DIST. %		°API	2	75	Bulk Density, Lbs./Cu.Ft.	
Generator	2359	per Cu. Ft. Dense Bed	1653	205 °F.			3	61	Aerated	
Quench Accumulator	160	per Lb. Catalyst	12.43	400	69.8	53.0	4	106	Settled	
Reactor Inlet	378	per Sq. Ft.	23014	400-550	20.5	37.4	Total	356	Compacted	
Condenser Inlet	638			550+	9.7				Particle Density, gm./cc.	
Product Accumulator	89						CALCULATED FROM dp		NH_3 Value, ml. gm.	
Catalyst No. Height				A. S. T. M. DIST. ON			Density, Lbs./Cu.Ft.	133	N_2 Surface, m^2/gm.	
1 See Per. A	506			Naphtha °F.			Inventory, Lbs.	1222		
2	669			IBP			Bed Depth, Ft.	13.92	CHEMICAL ANALYSIS	
3	652			10%	178		Vol., Cu. Ft.	9.19	Fe	
4	655			50%	260				C	
5	660			90%	390				O	
6	661			EP	440				H	
7	640			Rec.	95				K_2O, W+, % basis Fe	
8	653								X-Ray Analysis—	
9	671								$Fe_{20}C_9$	
10	665								Fe_3O_4	
11	632								Fe	

THE TEXAS COMPANY — MONTEBELLO LABORATORY

RATE CALCULATIONS

RUN NO. 62-A
HOURS 0-22

	GAS ANALYSES			
HOUR	1400	2200	0600	AVERAGE
FRESH FEED				
CO 28.010	36.98	36.85	37.14	36.990
H_2 2.016	59.21	59.54	59.45	59.400
CO_2 44.010	1.83	1.90	2.00	1.910
N_2 28.016	0.39	0.06	0.15	0.200
CH_4 16.042	1.59	1.65	1.26	1.500
			M. W.	12.695656
			H_2O 18.016	
			BALANCE	

GENERATOR BALANCE									
M/HR	C	H	O		Mol %	M/Hr	C	H	O
				O_2 32.000	0.23	10.972 0.033			22.010
16.765	16.765		16.765	CO_2 44.010	1.02	0.147	0.147		0.294
26.921		53.842		N_2 28.016	1.52	0.219			
0.866	0.866		1.732	CH_4 16.042	81.08	11.663	11.663	46.652	
0.091				C_2H_6 30.068	7.14	1.027	2.054	6.162	
0.680	0.680	2.720		C_3H_8 44.094	6.53	0.939	2.817	7.512	
		7.556	3.807	C_4H_{10} 58.120	1.71	0.246	0.984	2.460	
		7.585	3.793	C_5H_{12} 72.146	0.77	0.111	0.555	1.332	
	18.311	64.147	22.290	MW	20.530768				
	100.50	100.05	99.94	TOTAL			18.220	64.118	22.304

WEIGHT BALANCE		
	#/hr Measured	At Wt. Balance
WET GAS	291.80	321.53
OIL	92.45	92.45
WATER	161.43	161.43
TOTAL	545.68	575.41
FRESH FEED	575.41	
WEIGHT BALANCE	94.83	
WET GAS FACTOR	1101884	
INDICATED LOSS—S C F H	487	
	5269	

WET GAS				
CO 28.010	4.04	8.22	12.81	8.357
H_2 2.016	28.38	38.96	45.94	37.760
CO_2 44.010	33.11	30.09	25.09	29.430
N_2 28.016	2.06	1.52	1.19	1.590
CH_4 16.042	19.74	11.65	7.45	12.947
C_2H_4 28.052	2.45	1.89	1.34	1.894
C_2H_6 30.068	1.37	1.10	0.96	1.143
C_3H_6 42.078	3.13	2.33	1.78	2.413
C_3H_8 44.094	0.46	0.27	0.40	0.377
C_4H_8 56.104	2.78	1.91	1.57	2.087
C_4H_{10} 58.120	0.85	0.83	0.52	0.733
C_5H_{10} 70.130	1.11	0.79	0.63	0.843
C_5H_{12} 72.146	0.24	0.17	0.17	0.193
C_6H_{12} 84.156	0.28	0.27	0.15	0.233
			M. W.	23.156532

GAS FLOW RATES							
	$\sqrt{h}$	PRESSURE	TEMP.	M. W.	S. C. F. H.	M/HR
FRESH FEED		415.0	81.7	2280307		
79.31	7.071	20.729	0.9798	1.5101	17200	45.323
WET GAS		1.57	79.0	1250184		
115.14	9.374	4.034	0.9822	1.1181	4782	12.601
RECYCLE		416.5	134.0			
79.31	8.496	20.765	0.9356	1.1181	14637	38.569
BLEED						
5.02	8.667	20.765	1.0000	1.1181	1010	2.661
NATURAL GAS		439.2	205.2	1410078		
28.43	8.583	21.305	0.8842	1.1875	5459	14.385
OXYGEN		441.4	84.5			
27.07	7.371	21.357	0.9772	--	4164	10.972
STEAM		49.6				
32 215.7	5.275	0.3597		409#/hr		

HOUR	GAGE	GAL.	°F	FACTOR	GAL. AT 60
OIL	6'8½"	355.86	69	0.9956	354.29
	0'10-3/4	46.58	66	0.9970	46.44
					307.85
WATER	7'7"	401.69	89	0.99600	400.08
	0'7½"	33.06	68	0.99920	33.03
	1'6½"	80.37	83	0.99759	80.18
	0'4½"	19.92	69	0.99907	19.90
					427.33

LIQUID PRODUCT RATES Basis 22 hours

API°	#/GAL.	#	# HR GAL HR
	46.8	2340.79	
	6.607	306.83	92.45
		2033.96	13.993
10.3	8.311	3325.06	
"		274.51	
"		666.38	
"		165.39	
		3551.54	161.43
			19.424

THE TEXAS COMPANY — MONTEBELLO LABORATORY

RATE CALCULATIONS

RUN NO. 62-B
HOURS 22-46

	GAS ANALYSES			
HOUR	1400	2200	0600	AVERAGE
FRESH FEED				
CO 28.010	37.04	37.11	36.39	36.846
H_2 2.016	59.03	59.68	60.85	59.853
CO_2 44.010	1.91	2.00	1.96	1.957
N_2 28.016	0.41	0.40	0.26	0.357
CH_4 16.042	1.61	0.81	0.54	0.987
			M. W.	12.646828
			H_2O 18.016	
			BALANCE	

GENERATOR BALANCE									
M/HR	C	H	O		Mol %	M/Hr	C	H	O
				O_2 32.000	0.21	11.186 0.031			22.434
16.955	16.955		16.955	CO_2 44.010	1.13	0.165	0.165		0.330
27.542		55.084		N_2 28.016	0.68	0.099			
0.901	0.901		1.802	CH_4 16.042	82.25	12.015	12.015	48.060	
0.164				C_2H_6 30.068	7.28	1.064	2.128	6.384	
0.454	0.454	1.816		C_3H_8 44.094	6.25	0.913	2.739	7.304	
				C_4H_{10} 58.120	1.69	0.247	0.988	2.470	
		8.116	4.058	C_5H_{12} 72.146	0.51	0.075	0.375	0.900	
	18.310	65.016	22.815	MW	20.244565				
	99.46	99.84	100.22	TOTAL			18.410	65.118	22.764

WEIGHT BALANCE		
	#/hr Measured	At Wt. Balance
WET GAS	341.77	380.80
OIL	69.27	69.27
WATER	131.89	131.89
TOTAL	542.93	581.96
FRESH FEED	581.96	
WEIGHT BALANCE	93.29	
WET GAS FACTOR	1114199	
INDICATED LOSS—S C F H	761	
	7427	

WET GAS				
CO 28.010	15.24	16.26	16.92	16.140
H_2 2.016	47.05	47.52	47.97	47.514
CO_2 44.010	21.83	21.72	21.45	21.667
N_2 28.016	1.47	1.40	1.49	1.453
CH_4 16.042	8.14	6.69	5.94	6.923
C_2H_4 28.052	1.37	1.31	1.24	1.307
C_2H_6 30.068	0.84	0.77	0.76	0.790
C_3H_6 42.078	1.71	1.23	1.15	1.363
C_3H_8 44.094	0.32	0.13	0.06	0.170
C_4H_8 56.104	1.13	1.27	1.13	1.177
C_4H_{10} 58.120	0.30	0.63	0.84	0.590
C_5H_{10} 70.130	0.38	0.63	0.59	0.533
C_5H_{12} 72.146	0.12	0.17	0.17	0.153
C_6H_{12} 84.156	0.10	0.27	0.29	0.220
			M. W.	19.457234

GAS FLOW RATES							
	$\sqrt{h}$	PRESSURE	TEMP.	M. W.	S. C. F. H.	M/HR
FRESH FEED		419.3	80.9	2289111		
79.31	7.125	20.833	0.9804	1.5130	17463	46.016
WET GAS		1.89	78.5	1487878		
158.44	8.617	4.073	0.9827	1.2198	6666	17.565
RECYCLE		420.4	129.7			
79.31	8.488	20.859	0.9390	1.2198	16084	42382
BLEED						
5.02	9.170	20.859	1.0000	1.2198	1171	3.086
NATURAL GAS		445.0	205.5	1430013		
28.43	8.604	21.441	0.8840	1.1958	5544	14.609
OXYGEN		448.5	84.3			
27.07	7.454	21.522	0.9775	--	4245	11.186
STEAM		55.3				
215.7	5.400	0.3769		439#/hr		

HOUR	GAGE	GAL.	°F	FACTOR	GAL. AT 60
OIL	7'1¼"	376.59	68	0.9961	375.12
	6'8½"	355.86	69	0.9956	354.29
	5'3½"	280.57	70	0.9951	279.20
	0'10½"	45.50	64	0.9980	45.41
					43.48
					258.10
WATER	7'2 3/4	383.14	85	0.99674	381.89
	1'6½"	80.37	83	0.99759	80.18
	1'9½"	92.62	79	0.99775	92.41
	0'3"	13.28	68	0.99920	13.27
					380.85

LIQUID PRODUCT RATES

API°	#/GAL.	#	# HR GAL HR
48.7	6.537	2452.16	
46.8	6.807	2340.79	
	48.7	1825.13	
	6.537	296.85	
		422.75	69.27
		1662.40	10.754
10.3		3173.89	
10.3	8.311	666.38	
"		768.02	
"		110.29	
		3165.24	131.89
			15.869

THE TEXAS COMPANY — MONTEBELLO LABORATORY

RATE CALCULATIONS

RUN NO. 62-C
HOURS 46-70

	GAS ANALYSES			
HOUR	1400	2200	0600	AVERAGE
FRESH FEED				
CO 28.010	37.09	37.12	37.44	37.217
H_2 2.016	59.13	59.71	59.62	59.486
CO_2 44.010	2.14	2.31	2.63	2.360
N_2 28.016	0.21	0.14	0.27	0.207
CH_4 16.042	1.43	0.72	0.04	0.730
			M. W.	12.837455
			H_2O 18.016	
			BALANCE	
WET GAS				
CO 28.010	14.61	14.52	14.50	14.543
H_2 2.016	45.39	43.84	43.00	44.077
CO_2 44.010	22.84	24.99	26.72	24.850
N_2 28.016	0.92	1.27	1.22	1.137
CH_4 16.042	9.12	7.43	6.02	7.523
C_2H_4 28.052	1.54	1.68	1.90	1.707
C_2H_6 30.068	0.86	0.99	1.05	0.967
C_3H_6 42.078	1.54	1.88	1.94	1.787
C_3H_8 44.094	0.18	0.38	0.23	0.263
C_4H_8 56.104	1.38	1.53	1.67	1.527
C_4H_{10} 58.120	0.55	0.38	0.51	0.480
C_5H_{10} 70.130	0.64	0.67	0.77	0.693
C_5H_{12} 72.146	0.16	0.16	0.17	0.163
C_6H_{12} 84.156	0.27	0.28	0.30	0.283
			M. W.	21.038904

	GENERATOR BALANCE									
M/HR	C	H	O		Mol %	M/Hr	C	H	Q
				O_2 32.000	0.21	10.646 0.028			21.348
16.019	16.019		16.019	CO_2 44.010	1.20	0.161	0.161		0.322
25.605		51.210		N_2 28.016	1.01	0.136			
1.016	1.016		2.032	CH_4 16.042	81.08	10.907	10.907	43.628	
0.089				C_2H_4 30.068	7.15	0.962	1.924	5.772	
0.314	0.314	1.256		C_2H_6 44.094	6.42	0.864	2.592	6.912	
				C_4H_{10} 58.120	1.94	0.261	1.044	2.610	
		7.645	3.823	C_5H_{12} 72.146	0.99	0.133	0.665	1.596	
	17.349	60.111	21.874	MW	20.707605				
	100.32	99.33	100.94	TOTAL			17.293	60.518	21.670

	WEIGHT BALANCE	
	#/hr Measured	At Wt. Balance
WET GAS	318.66	355.56
OIL	68.94	68.94
WATER	128.06	128.06
TOTAL	515.66	552.56
FRESH FEED	552.56	
WEIGHT BALANCE	93.32	
WET GAS FACTOR	1115797	
INDICATED LOSS—S C F H	666	
	6414	

	GAS FLOW RATES						
	√P	PRESSURE	TEMP.	M. W.	S. C. F. H.	M/HR
FRESH FEED	79.31	6.708	420.5 20.861	81.3 0.9801	2255119 1.5017	16335	43.043
WET GAS	158.44	7.765	1.71 4.051	77.8 0.9833	1376022 1.1730	5748	15.146
RECYCLE	79.31	8.513	421.1 20.876	130.6 0.9384	1.1730	15515	40.883
BLEED	5.02	9.104	20.876	1.0000	1.1730	1119	2.949
NATURAL GAS	28.43	8.025	442.8 21.389	204.5 0.8847	1398037 1.1824	5105	13.452
OXYGEN	27.07	7.096	448.6 21.524	84.5 0.9772	—	4040	10.646
STEAM	215.7	5.692	52.5 0.3703		455#/hr		

	LIQUID PRODUCT RATES						
HOUR	GAGE	GAL.	°F	FACTOR	GAL. AT 60	API° #/GAL.	#	#/HR GAL/HR
OIL	7'1½"	377.68	85	0.9876	373.00	49.2 6.520	2431.96	
	5'3½"	280.57	70	0.9951	279.20	48.7 6.537	1825.13	
	4'6"	240.20	66	0.9970	239.48	49.2	1561.41	
	1'8"	87.01	85	0.9876	85.93	6.520	560.26	
					*7.13		*46.50	68.94
					254.48		1654.48	10.603
WATER	7'3-¾	387.50	85	0.99674	386.24	10.5 8.299	3205.41	
	1'9½"	92.62	79	0.99775	92.41	10.3 8.311	768.02	
	2'5"	128.89	79	0.99775	128.60	10.5	1067.25	
	1'0"	52.00	69	0.99907	51.95	8.299	431.13	128.06
					370.48		3073.51	15.437

THE TEXAS COMPANY — MONTEBELLO LABORATORY

RATE CALCULATIONS

RUN NO. 62-D
HOURS 70-94

	GAS ANALYSES			
HOUR	1400	2200		AVERAGE
FRESH FEED				
CO 28.010	37.64	37.58		37.610
H_2 2.016	59.79	59.66		59.725
CO_2 44.010	2.09	2.36		2.225
N_2 28.016	0.12	0.21		0.165
CH_4 16.042	0.36	0.19		0.275
			M. W.	12.808181
			H_2O 18.016	
			BALANCE	
WET GAS	1400	2200	0600	
CO 28.010	15.61	15.06	15.28	15.317
H_2 2.016	46.16	44.44	45.09	45.230
CO_2 44.010	22.91	25.20	24.72	24.277
N_2 28.016	1.00	1.28	1.15	1.144
CH_4 16.042	6.49	6.14	5.96	6.197
C_2H_4 28.052	1.71	1.85	1.82	1.793
C_2H_6 30.068	1.02	1.00	1.05	1.023
C_3H_6 42.078	1.67	1.78	1.65	1.700
C_3H_8 44.094	0.28	0.26	0.25	0.263
C_4H_8 56.104	1.53	1.44	1.38	1.450
C_4H_{10} 58.120	0.47	0.48	0.50	0.483
C_5H_{10} 70.130	0.71	0.70	0.69	0.700
C_5H_{12} 72.146	0.16	0.13	0.17	0.153
C_6H_{12} 84.156	0.28	0.24	0.29	0.270
			M. W.	20.765665

	GENERATOR BALANCE									
M/HR	C	H	O		Mol %	M/Hr	C	H	O
				O_2 32.000	0.25	10.643 0.032			21.350
15.630	15.630		15.630	CO_2 44.010	1.28	0.166	0.166		0.332
24.819		49.638		N_2 28.016	1.21	0.157			
0.925	0.925		1.850	CH_4 16.042	80.63	10.440	10.440	41.760	
0.069				C_2H_4 30.068	7.64	0.989	1.978	5.934	
0.114	0.114	0.456		C_3H_8 44.094	6.36	0.824	2.472	6.592	
				C_4H_{10} 58.120	1.90	0.246	0.984	2.460	
		8.098	4.049	C_5H_{12} 72.146	0.73	0.095	0.475	1.140	
	16.669	58.192	21.529	MW	20.649506				
	100.93	100.53	99.29	TOTAL			16.515	57.886	21.682

	WEIGHT BALANCE	
	#/hr Measured	At Wt. Balance
WET GAS	300.62	337.63
OIL	66.64	66.64
WATER	128.00	128.00
TOTAL	495.26	532.27
FRESH FEED	532.27	
WEIGHT BALANCE	93.05	
WET GAS FACTOR	1123112	
INDICATED LOSS—S C F H	676	
	6170	

	GAS FLOW RATES						
	√P	PRESSURE	TEMP.	M. W.	S. C. F. H.	M/HR
FRESH FEED	79.31	6.450	420.0 20.849	77.5 0.9836	2260274 1.5034	15771	41.557
WET GAS	158.44	7.371	1.65 4.044	75.8 0.9852	1394128 1.1807	5494	14.477
RECYCLE	79.31	8.500	420.9 20.871	127.4 0.9408	1.1807	15629	41.183
BLEED	5.02	8.763	20.871	1.0000	1.1807	1084	2.856
NATURAL GAS	28.43	7.700	441.7 21.364	200.3 0.8874	1401970 1.1840	4914	12.949
OXYGEN	27.07	7.067	448.5 21.522	80.2 0.9811	—	4039	10.643
STEAM	215.7	5.775	49.2 0.3584		446#/hr		

	LIQUID PRODUCT RATES						
HOUR	GAGE	GAL.	°F	FACTOR	GAL. AT 60	API° #/GAL.	#	#/HR GAL/HR
OIL	7'2½"	382.05	76	0.9920	378.99	48.8 6.534	2476.32	
	4'6"	240.20	66	0.9970	239.48	49.2 6.520	1561.41	
	3'5½"	185.64	68	0.9961	184.92	48.8	1208.27	
	1'8"	87.01	78	0.9911	86.24	6.534	563.49	
					*6.08		*39.75	66.64
					244.27		1599.44	10.178
WATER	7'1½"	377.68	83	0.99709	376.58	10.5 8.299	3125.24	
	2'5"	128.89	79	0.99775	128.60	10.5 8.299	1067.25	
	2'6½"	135.80	80	0.99759	135.47	"	1124.27	
	0'3"	13.28	64	0.99963	13.28	"	110.21	128.00
					370.17		3072.05	15.424

THE TEXAS COMPANY — MONTEBELLO LABORATORY

RATE CALCULATIONS

RUN NO. 62-E
HOURS 94-110

	GAS ANALYSES			
HOUR	2200	0600		AVERAGE
FRESH FEED				
CO 28.010	37.51	37.54		37.525
H_2 2.016	59.45	59.70		59.575
CO_2 44.010	2.56	2.40		2.480
N_2 28.016	0.30	0.18		0.240
CH_4 16.042	0.18	0.18		0.180
			M. W	12.899347
			H_2O 18.016	
			BALANCE	
WET GAS				
CO 28.010	15.56	15.25		15.405
H_2 2.016	45.54	45.64		45.590
CO_2 44.010	24.35	24.23		24.290
N_2 28.016	1.26	1.30		1.280
CH_4 16.042	5.70	5.66		5.680
C_2H_6 28.052	1.67	1.73		1.700
C_2H_6 30.068	0.98	0.99		0.985
C_3H_6 42.078	1.55	1.77		1.660
C_3H_8 44.094	0.26	0.29		0.275
C_4H_8 56.104	1.36	1.56		1.460
C_4H_{10} 58.120	0.47	0.43		0.450
C_5H_{10} 70.130	0.71	0.72		0.715
C_6H_{12} 72.146	0.16	0.16		0.160
C_6H_{12} 84.156	0.43	0.27		0.350
			M. W.	20.778729

GENERATOR BALANCE

M/HR	C	H	O
24.636		49.272	
1.026	1.026		2.052
0.099			
0.074	0.074	0.296	
		7.481	3.741
	16.617	57.049	21.310
	100.81	98.86	101.57

	Mol %	M/Hr	C	H	O
O_2 32.000	0.25	10.285 0.032			20.634
CO_2 44.010	1.34	0.173	0.173		0.346
N_2 28.016	1.06	0.137			
CH_4 16.042	80.99	10.435	10.435	41.740	
C_2H_6 30.068	7.22	0.930	1.860	5.580	
C_3H_8 44.094	6.33	0.816	2.448	6.528	
C_4H_{10} 58.120	1.88	0.242	0.968	2.420	
C_5H_{12} 72.146	0.93	0.120	0.600	1.440	
MW	20.684793				
TOTAL			16.484	57.708	20.980

GAS FLOW RATES

	$\sqrt{H}$	PRESSURE	TEMP.	M. W.	S. C. F. H.	M/HR
FRESH FEED 79.31	6.429	417.3 20.785	72.3 0.9884	2244299 1.4981	15693	41.352
WET GAS 158.44	7.514	1.67 4.046	72.2 0.9885	1393251 1.1804	5620	14.809
RECYCLE 79.31	8.507	419.1 20.828	124.9 0.9428	1.1804	15639	41.209
BLEED 5.02	8.440	20.828	1.0000	1.1804	1042	2.746
NATURAL GAS 28.43	7.683	439.9 21.321	200.1 0.8876	1399578 1.1830	4890	12.885
OXYGEN 27.07	6.936	443.5 21.059	73.7 0.9871	--	3903	10.285
STEAM 215.7	6.100	40.3 0.3291		433#/hr		

HOUR	GAGE	GAL.
OIL	6'4½"	338.40
	4'0-3/4	217.28
WATER	7'1½"	377.68
	3'5-5/8	186.18

WEIGHT BALANCE

	#/hr Measured	At Wt. Balance
WET GAS	307.71	348.33
OIL	63.07	63.07
WATER	122.01	122.01
TOTAL	492.79	533.41
FRESH FEED	533.41	
WEIGHT BALANCE	92.38	
WET GAS FACTOR	1132007	
INDICATED LOSS—S C F H	742	
	6362	

LIQUID PRODUCT RATES — Basis 13 hours

°F	FACTOR	GAL. AT 60	API° #/GAL.	#	# HR GAL HR
70	0.9951	336.74	49.1	2196.56	
75	0.9925	215.65	6.523	1406.68	
		4.60		30.00	63.07
		125.69		819.88	9.668
78	0.99788	376.88	10.5	3127.73	
79	0.99775	185.76	8.299	1541.62	
		191.12		1586.11	122.01
					14.702

THE TEXAS COMPANY — MONTEBELLO LABORATORY

RATE CALCULATIONS

RUN NO. 62-F
HOURS 110-134

	GAS ANALYSES			
HOUR	1400	2200	0600	AVERAGE
FRESH FEED				
CO 28.010	37.58	37.42	36.93	37.310
H_2 2.016	59.80	58.81	59.04	59.217
CO_2 44.010	2.15	2.40	2.48	2.343
N_2 28.016	0.17	1.24	1.39	0.933
CH_4 16.042	0.30	0.13	0.16	0.197
			M. W	12.968492
			H_2O 18.016	
			BALANCE	
WET GAS				
CO 28.010	15.00	15.04	14.80	14.946
H_2 2.016	45.62	44.51	44.30	44.810
CO_2 44.010	24.26	23.56	23.20	23.673
N_2 28.016	1.23	3.97	4.17	3.123
CH_4 16.042	5.65	5.21	5.96	5.607
C_2H_6 28.052	1.55	1.66	1.64	1.617
C_2H_6 30.068	1.05	0.96	0.96	0.990
C_3H_6 42.078	2.01	1.74	1.79	1.847
C_3H_8 44.094	0.29	0.32	0.28	0.297
C_4H_8 56.104	1.72	1.47	1.42	1.537
C_4H_{10} 58.120	0.57	0.45	0.45	0.490
C_5H_{10} 70.130	0.69	0.70	0.62	0.670
C_6H_{12} 72.146	0.15	0.15	0.15	0.150
C_6H_{12} 84.156	0.21	0.26	0.26	0.243
			M. W.	20.871756

GENERATOR BALANCE

M/HR	C	H	O
23.964		47.928	
0.948	0.948		1.896
0.378			
0.080	0.080	0.320	
		10.004	3.707
		8.709	4.355
	16.127	56.957	21.350
	96.62	97.78	103.13

	Mol %	M/Hr	C	H	O
O_2 32.000	0.22	10.163 0.028			20.382
CO_2 44.010	1.24	0.160	0.160		0.320
N_2 28.016	1.06	0.137			
CH_4 16.042	80.14	10.354	10.354	41.416	
C_2H_6 30.068	7.94	1.026	2.052	6.156	
C_3H_8 44.094	6.54	0.845	2.535	6.760	
C_4H_{10} 58.120	2.01	0.260	1.040	2.600	
C_5H_{12} 72.146	0.85	0.110	0.550	1.320	
MW	20.821752				
TOTAL			16.691	58.252	20.702

GAS FLOW RATES

	$\sqrt{H}$	PRESSURE	TEMP.	M. W.	S. C. F. H.	M/HR
FRESH FEED 79.31	6.325	417.6 20.792	75.5 0.9855	2232333 1.4941	15358	40.469
WET GAS 158.44	7.433	1.70 4.050	74.1 0.9867	1387041 1.1777	5542	14.603
RECYCLE 79.31	8.496	418.7 20.819	127.5 0.9408	1.1777	15543	40.957
BLEED 5.02	8.527	20.819	1.0000	1.1777	1050	2.767
NATURAL GAS 28.43	7.704	441.6 21.361	198.5 0.8887	1390372 1.1791	4903	12.920
OXYGEN 27.07	6.788	444.1 21.349	77.8 0.9833		3857	10.163
STEAM 215.7	6.025	39.9 0.3278		426#/hr		

HOUR	GAGE	GAL.
OIL	7'2½"	382.05
	6'4½"	338.40
	4'0½"	216.19
	0'7"	30.98
WATER	7'0"	371.14
	0'4"	17.70

WEIGHT BALANCE

	#/hr Measured	At Wt. Balance
WET GAS	304.79	341.19
OIL	61.63	61.63
WATER	122.00	122.00
TOTAL	488.42	524.82
FRESH FEED	524.82	
WEIGHT BALANCE	93.06	
WET GAS FACTOR	1119426	
INDICATED LOSS—S C F H	662	
	6204	

LIQUID PRODUCT RATES

°F	FACTOR	GAL. AT 60	API° #/GAL.	#	# HR GAL HR
88	0.9861	376.74	49.0 6.526	2458.61	
70	0.9951	336.74	49.1 6.523	2196.56	
66	0.9970	215.54	49.0	1406.61	
67	0.9965	30.87	6.526	201.46	
		1.84		12.00	61.63
		226.51		1479.20	9.438
80	0.99759	370.25	10.4	3074.93	
68	0.99920	17.69	8.305	146.92	
		352.56		2928.01	122.00
					14.690

THE TEXAS COMPANY — MONTEBELLO LABORATORY

RATE CALCULATIONS

RUN NO. 62-G
HOURS 134-158

	GAS ANALYSES			
HOUR	1400	2200	0600	AVERAGE
FRESH FEED				
CO 28.010	37.22	36.50	37.26	36.993
H_2 2.016	59.86	59.28	60.01	59.717
CO_2 44.010	2.27	2.31	2.36	2.313
N_2 28.016	0.18	1.51	0.14	0.610
CH_4 16.042	0.47	0.40	0.23	0.367
			M. W	12.813357
			H_2O 18.016	
			BALANCE	
WET GAS				
CO 28.010	14.87	14.19	14.86	14.640
H_2 2.016	44.72	44.06	45.50	44.760
CO_2 44.010	24.11	24.73	24.20	24.346
N_2 28.016	1.27	1.17	1.36	1.267
CH_4 16.042	6.77	6.48	5.76	6.336
C_2H_4 28.052	1.71	2.01	1.88	1.867
C_2H_6 30.068	1.09	1.11	1.00	1.067
C_3H_6 42.078	2.01	2.19	1.86	2.020
C_3H_8 44.094	0.30	0.26	0.32	0.293
C_4H_8 56.104	1.63	1.97	1.68	1.760
C_4H_{10} 58.120	0.48	0.54	0.44	0.487
C_5H_{10} 70.130	0.66	0.87	0.72	0.750
C_5H_{12} 72.146	0.16	0.16	0.16	0.160
C_6H_{12} 84.156	0.22	0.26	0.26	0.247
			M. W.	21.03256

GENERATOR BALANCE

M/HR	C	H	O		Mol %	M/Hr	C	H	O
				O_2 32.000	0.26	10.406 0.031			20.874
15.327	15.327		15.327	CO_2 44.010	1.17	0.141	0.141		0.282
24.741		49.482		N_2 28.016	0.71	0.085			
0.958	0.958		1.916	CH_4 16.042	79.44	9.560	9.560	38.240	
0.253				C_2H_6 30.068	7.99	0.962	1.924	5.772	
0.152	0.152	0.608		C_3H_8 44.094	7.08	0.852	2.556	6.816	
				C_4H_{10} 58.120	2.22	0.267	1.068	2.670	
		6.433	3.217	C_5H_{12} 72.146	1.13	0.136	0.680	1.632	
	16.437	56.523	20.460	MW	21.170598				
	103.19	97.54	96.71	TOTAL			15.929	55.130	21.156

GAS FLOW RATES

	$\sqrt{H}$	PRESSURE	TEMP.	M. W.	S. C. F. H.	M/HR
FRESH FEED		417.9	71.9	2259361		
79.31	6.413	20.799	0.9888	1.5031	15723	41.431
WET GAS		1.60	71.3	1376437		
158.44	7.375	4.037	0.9893	1.1732	5475	14.427
RECYCLE		418.2	125.6			
79.31	8.496	20.806	0.9424	1.1732	15500	40.843
BLEED						
5.02	8.342	20.806	1.0000	1.1732	1022	2.693
NATURAL GAS		441.0	199.4	1367462		
28.43	7.246	21.347	0.8880	1.1694	4567	12.034
OXYGEN		444.4	73.6			
27.07	6.896	21.427	0.9872	--	3949	10.406
STEAM		44.4				
215.7	6.092	0.3430		451#/hr		

	HOUR	GAGE	GAL.	°F	FACTOR	GAL. AT 60	API° #/GAL.	#	# HR GAL HR
	OIL	7'3½"	386.41	67	0.9965	385.06	49.1 6.523	2511.75	
		4'0½"	216.19	66	0.9970	215.54	49.0 6.526	1406.61	
		2'9½"	149.62	64	0.9980	149.32	49.1	974.01	
		1'6"	78.16	68	0.9961	77.86	6.523	507.88	
						*8.05		*52.50	67.66
						249.03		1623.77	10.376
	WATER	7'3"	384.23	79	0.99775	383.37	10.5 8.299	3181.59	
		7'0"	371.14	80	0.99759	370.25	10.4 8.305	3074.93	
		7'4"	388.59	77	0.99804	387.83	10.5	3218.60	
		0'10"	43.36	73	0.99858	43.30	8.299	359.35	
		2'2"	114.67	72	0.99872	114.52	"	950.40	
		1'9½"	93.76	72	0.99872	93.64	"	777.12	130.80
						378.53		3139.19	15.772

WEIGHT BALANCE

	# /hr Measured	At Wt. Balance
WET GAS	303.44	332.41
OIL	67.66	67.66
WATER	130.80	130.80
TOTAL	501.90	530.87
FRESH FEED	530.87	
WEIGHT BALANCE	94.54	
WET GAS FACTOR	1095471	
INDICATED LOSS—S C F H	523	
	5998	

THE TEXAS COMPANY — MONTEBELLO LABORATORY

RATE CALCULATIONS

RUN NO. 62-H
HOURS 158-182

	GAS ANALYSES			
HOUR	1000	2200	0600	AVERAGE
FRESH FEED				
CO 28.010	37.17	37.02	37.00	37.063
H_2 2.016	59.16	60.23	60.04	59.810
CO_2 44.010	2.97	2.29	2.36	2.540
N_2 28.016	0.35	0.13	0.35	0.277
CH_4 16.042	0.35	0.33	0.25	0.310
			M. W	12.83230
			H_2O 18.016	
			BALANCE	
WET GAS	1400	2200	0600	
CO 28.010	14.79	14.13	14.48	14.467
H_2 2.016	45.96	44.81	45.84	45.536
CO_2 44.010	23.78	24.82	24.33	24.310
N_2 28.016	1.10	1.28	1.28	1.220
CH_4 16.042	5.90	5.77	5.89	5.853
C_2H_4 28.052	1.76	1.90	1.85	1.837
C_2H_6 30.068	1.02	1.06	1.06	1.047
C_3H_6 42.078	2.04	2.42	1.91	2.123
C_3H_8 44.094	0.33	0.32	0.30	0.317
C_4H_8 56.104	1.70	1.79	1.52	1.670
C_4H_{10} 58.120	0.47	0.56	0.47	0.500
C_5H_{10} 70.130	0.74	0.69	0.65	0.693
C_5H_{12} 72.146	0.16	0.15	0.16	0.157
C_6H_{12} 84.156	0.25	0.30	0.26	0.270
			M. W.	20.867026

GENERATOR BALANCE

M/HR	C	H	O		Mol %	M/Hr	C	H	O
				O_2 32.000	0.26	10.387 0.034			20.842
15.317	15.317		15.317	CO_2 44.010	1.51	0.195	0.195		0.390
24.719		49.438		N_2 28.016	0.57	0.074			
1.050	1.050		2.100	CH_4 16.042	80.89	10.441	10.441	41.764	
0.114				C_2H_6 30.068	7.79	1.006	2.012	6.036	
0.128	0.128	0.512		C_3H_8 44.094	6.40	0.826	2.478	6.608	
				C_4H_{10} 58.120	1.79	0.231	0.924	2.310	
		7.811	3.906	C_5H_{12} 72.146	0.79	0.102	0.510	1.224	
	16.495	57.761	21.323	MW	20.658431				
	99.61	99.59	100.43	TOTAL			16.560	57.942	21.232

GAS FLOW RATES

	$\sqrt{H}$	PRESSURE	TEMP.	M. W.	S. C. F. H.	M/HR
FRESH FEED		417.3	72.2	2256025		
79.31	6.408	20.785	0.9885	1.5020	15684	41.328
WET GAS		1.60	71.1	1387356		
158.44	7.358	4.037	0.9895	1.1779	5485	14.453
RECYCLE		417.0	125.5			
79.31	8.504	20.777	0.9424	1.1779	15555	40.988
BLEED						
5.02	7.933	20.777	1.0000	1.1779	975	2.569
NATURAL GAS		438.8	198.5	1401364		
28.43	7.692	21.296	0.8887	1.1838	4899	12.909
OXYGEN		444.3	74.7			
27.07	6.892	21.424	0.9862	--	3942	10.387
STEAM		46.1				
215.7	5.620	0.3486		423#/hr		

	HOUR	GAGE	GAL.	°F	FACTOR	GAL. AT 60	API° #/GAL.	#	# HR GAL HR
	OIL	7'4"	388.59	66	0.9970	387.42	49.4 6.512	2522.88	
		2'9½"	149.82	64	0.9980	149.32	49.1 6.523	974.01	
						*5.49		*35.75	66.03
						243.59		1584.62	10.149
	WATER	7'5"	392.96	79	0.99775	392.08	10.5	3253.87	
		2'2"	114.67	72	0.99872	114.52	8.299	950.40	
		2'0"	105.19	76	0.99819	105.00	"	871.40	
		0'3"	13.28	62	0.99982	13.28	"	110.21	127.69
						369.28		3064.66	15.387

WEIGHT BALANCE

	# hr Measured	At Wt. Balance
WET GAS	301.59	336.61
OIL	66.03	66.03
WATER	127.69	127.69
TOTAL	495.31	530.33
FRESH FEED	530.33	
WEIGHT BALANCE	93.40	
WET GAS FACTOR	1116117	
INDICATED LOSS—S C F H	637	
	6122	

THE TEXAS COMPANY — MONTEBELLO LABORATORY

RATE CALCULATIONS

RUN NO. 62-I
HOURS 182-206

	GAS ANALYSES				GENERATOR BALANCE										WEIGHT BALANCE		
HOUR	1400	2200	0600	AVERAGE	M/HR	C	H	O		Mol %	M/Hr	C	H	O		#/hr Measured	At Wt. Balance
FRESH FEED									O_2 32.000	0.28	10.353 0.036			20.778	WET GAS	301.79	328.32
CO 28.010	37.26	37.23	37.25	37.247	15.396	15.396		15.396	CO_2 44.010	1.42	0.185	0.185		0.370	OIL	66.58	66.58
H_2 2.016	60.14	59.98	60.29	60.136	24.858		49.716		N_2 28.016	1.08	0.140				WATER	128.57	128.57
CO_2 44.010	1.94	1.94	2.08	1.987	0.821	0.821		1.642	CH_4 16.042	82.15	10.688	10.688	42.752		TOTAL	496.94	523.47
N_2 28.016	0.23	0.63	0.22	0.360	0.149				C_2H_6 30.068	6.96	0.905	1.810	5.430		FRESH FEED	523.47	
CH_4 16.042	0.43	0.22	0.16	0.270	0.112	0.112	0.448		C_3H_8 44.094	5.59	0.727	2.181	5.816		WEIGHT BALANCE	94.93	
			M. W	12.663876					C_4H_{10} 58.120	1.77	0.230	0.920	2.300				
			H_2O 18.016				7.765	3.883	C_5H_{12} 72.146	0.75	0.098	0.490	1.176		WET GAS FACTOR	1087908	
						16.329	57.929	20.921	MW	20.323024					INDICATED LOSS—S C F H	494	
			BALANCE			100.34	100.79	98.93	TOTAL			16.274	57.474	21.148		6108	

WET GAS					GAS FLOW RATES							LIQUID PRODUCT RATES								
CO 28.010	15.08	15.12	15.24	15.147		$\sqrt{h}$	PRESSURE	TEMP.	M. W.	S. C. F. H.	M/HR	HOUR	GAGE	GAL.	°F	FACTOR	GAL. AT 60	API° #/GAL.	#	# HR GAL HR
H_2 2.016	45.03	46.73	47.04	46.266	FRESH FEED		416.7	74.1	2286029			OIL	5'4-3/4	287.12	64	0.9980	286.55	49.3	1867.16	
CO_2 44.010	24.35	23.30	23.18	23.610	79.31	6.383	20.770	0.9867	1.5120	15687	41.336		0'10½"	45.50	60	1.0000	45.50	6.516	296.48	
N_2 28.016	2.05	1.29	1.25	1.530	WET GAS		1.68	72.6	1419064								4.18		27.25	66.58
CH_4 16.042	5.96	5.73	5.99	5.893	158.44	7.438	4.047	0.9881	1.1912	5614	14.793						245.23		1597.93	10.218
C_2H_4 28.052	1.72	1.67	1.64	1.677	RECYCLE		416.8	125.9												
C_2H_6 33.068	0.95	0.92	0.90	0.923	79.31	8.504	20.773	0.9420	1.1912	15721	41.426									
C_3H_6 42.078	1.80	1.83	1.56	1.730	BLEED															
C_3H_8 44.094	0.27	0.28	0.25	0.267	5.02	8.304	20.773	1.0000	1.1912	1032	2.719	WATER	7'3½"	386.41	80	0.99759	385.48	10.5 8.299	3199.10	
C_4H_8 56.104	1.37	1.57	1.35	1.430	NATURAL GAS		438.5	198.0	1424492				2'10"	105.19	76	0.99819	105.00	10.5 8.299	871.40	
C_4H_{10} 58.120	0.35	0.44	0.43	0.407	28.43	7.688	21.288	0.8890	1.1935	4937	13.009		2'10½	154.23	76	0.99819	153.95	"	1277.63	
C_5H_{10} 70.130	0.68	0.74	0.72	0.713	OXYGEN		444.3	76.8					1'2½"	62.73	75	0.99832	62.62	"	519.68	128.57
C_5H_{12} 72.146	0.12	0.12	0.12	0.120	27.07	6.883	21.424	0.9842	--	3929	10.353						371.81		3085.65	15.492
C_6H_{12} 84.156	0.27	0.26	0.33	0.287	STEAM		52.3													
			M. W.	20.400763	6 215.7	5.360	0.3679		425#/hr											

THE TEXAS COMPANY — MONTEBELLO LABORATORY

RATE CALCULATIONS

RUN NO. 62-J
HOURS 206-230

	GAS ANALYSES				GENERATOR BALANCE										WEIGHT BALANCE		
HOUR	1400	2200	0600	AVERAGE	M/HR	C	H	O		Mol %	M/Hr	C	H	O		#/hr Measured	At Wt. Balance
FRESH FEED									O_2 32.000	0.30	10.311 0.039			20.700	WET GAS	301.27	326.18
CO 28.010	37.12	37.47	37.14	37.244	15.408	15.408		15.408	CO_2 44.010	1.57	0.206	0.206		0.412	OIL	65.89	65.89
H_2 2.016	60.10	60.23	60.48	60.270	24.933		49.866		N_2 28.016	1.13	0.148				WATER	129.91	129.91
CO_2 44.010	2.01	1.83	2.02	1.953	0.808	0.808		1.616	CH_4 16.042	82.92	10.866	10.866	43.464		TOTAL	497.07	521.98
N_2 28.016	0.30	0.18	0.15	0.210	0.087				C_2H_6 30.068	6.49	0.850	1.700	5.100		FRESH FEED	521.98	
CH_4 16.042	0.47	0.29	0.21	0.323	0.134	0.134	0.536		C_3H_8 44.094	5.37	0.704	2.112	5.632		WEIGHT BALANCE	95.23	
			M. W	12.617252					C_4H_{10} 58.120	1.61	0.211	0.844	2.110				
			H_2O 18.016				7.520	3.760	C_5H_{12} 72.146	0.61	0.080	0.400	0.960		WET GAS FACTOR	1082683	
						16.350	57.922	20.764	MW	20.100648					INDICATED LOSS—S C F H	469	
			BALANCE			101.38	101.15	98.45	TOTAL			16.128	57.266	21.112		6145	

WET GAS					GAS FLOW RATES							LIQUID PRODUCT RATES								
CO 28.010	14.96	15.23	14.92	15.037		$\sqrt{h}$	PRESSURE	TEMP.	M. W.	S. C. F. H.	M/HR	HOUR	GAGE	GAL.	°F	FACTOR	GAL. AT 60	API° #/GAL.	#	# HR GAL HR
H_2 2.016	46;25	47.54	47.18	46.990	FRESH FEED		417.4	71.3	2294477			OIL	6'11½"	368.95	73	0.9935	366.55	49.4 8.512	2386.97	
CO_2 44.010	23.34	22.71	23.52	23.190	79.31	6.354	20.787	0.9894	1.5148	15700	41.370		5'4-3/4	287.12	64	0.9980	286.55	49.3 6.516	1867.16	
N_2 28.016	1.18	1.31	1.21	1.233	WET GAS		1.60	69.3	1437281				4'5"	235.83	62	0.9990	235.59	49.4	1534.16	
CH_4 16.042	6.35	5.95	5.98	6.094	158.44	7.467	4.037	0.9912	1.1989	5676	14.957		1'5-5/8	76.52	73	0.9935	76.02	6.512	495.04	
C_2H_4 28.052	1.53	1.59	1.60	1.573	RECYCLE		417.6	123.4									3.46		22.50	65.89
C_2H_6 33.068	0.95	0.89	0.88	0.907	79.31	8.508	20.792	0.9440	1.1989	15878	41.839						243.03		1581.43	10.126
C_3H_6 42.078	1.78	1.53	1.62	1.643	BLEED															
C_3H_8 44.094	0.23	0.26	0.22	0.237	5.02	8.458	20.792	1.0000	1.1989	1,058	2.788	WATER	7'4"	388.59	81	0.99743	387.59	10.5	3216.61	
C_4H_8 56.104	1.63	1.39	1.43	1.483	NATURAL GAS		439.7	199.7	1440252				2'10½"	154.23	76	0.99819	153.95	10.5 8.299	1277.63	
C_4H_{10} 58.120	0.62	0.48	0.39	0.497	28.43	7.700	21.317	0.8879	1.2001	4973	13.104		4'4"	231.47	73	0.99858	231.14	"	1918.23	
C_5H_{10} 70.130	0.79	0.72	0.66	0.723	OXYGEN		444.3	72.8					1'8½"	89.24	76	0.99819	89.08	"	739.27	129.91
C_5H_{12} 72.146	0.12	0.12	0.12	0.120	27.07	6.829	21.424	0.9879		3913	10.311						375.70		3117.94	15.654
C_6H_{12} 84.156	0.27	0.28	0.27	0.273	STEAM		50.7													
			M. W.	20.142196	6 215.7	5.760	0.3630		451#/hr											

THE TEXAS COMPANY — MONTEBELLO LABORATORY

RATE CALCULATIONS

RUN NO. 62-K
HOURS 230-254

	GAS ANALYSES				GENERATOR BALANCE										WEIGHT BALANCE		
HOUR	1400	2200	0600	AVERAGE	M/HR	C	H	O		Mol %	M/Hr	C	H	O		#/hr Measured	At Wt. Balance
FRESH FEED									O_2 32.000	0.22	10.382 0.029			20.822	WET GAS	309.98	334.86
CO 28.010	36.82	37.45	37.51	37.260	15.411	15.411		15.411	CO_2 44.010	1.35	0.177	0.177		0.354	OIL	64.31	64.31
H_2 2.016	60.37	60.10	59.87	60.114	24.863		49.726		N_2 28.016	0.40	0.052				WATER	125.13	125.13
CO_2 44.010	1.93	2.06	2.11	2.033	0.841	0.841		1.682	CH_4 16.042	83.61	10.968	10.968	43.872		TOTAL	499.42	524.30
N_2 28.016	0.35	0.25	0.36	0.320	0.132				C_2H_6 30.068	6.73	0.883	1.766	5.298		FRESH FEED	524.30	
CH_4 16.042	0.53	0.14	0.15	0.273	0.113	0.113	0.452		C_3H_8 44.094	5.50	0.721	2.163	5.768		WEIGHT BALANCE	95.25	
			M. W	12.676583					C_4H_{10} 58.120	1.55	0.203	0.812	2.030				
			H_2O 18.016				7.982	3.991	C_5H_{12} 72.146	0.64	0.084	0.420	1.008		WET GAS FACTOR	1080263	
						16.365	58.160	21.084	MW	20.000656					INDICATED LOSS—S C F H	467	
			BALANCE			100.36	100.32	99.57	TOTAL			16.306	57.976	21.176		6288	

WET GAS					GAS FLOW RATES												LIQUID PRODUCT RATES					
						√h	PRESSURE	TEMP.	M. W.	S. C. F. H.	M/HR	HOUR	GAGE	GAL.	°F	FACTOR	GAL. AT 60	API° #/GAL.	#	# HR GAL HR
CO 28.010	14.71	15.55	15.33	15.197			416.8	73.9	2283736												
H_2 2.016	47.02	46.84	47.14	47.000	FRESH FEED							OIL	7'4½"	390.78	74	0.9930	388.04	49.1 6.523	2531.18	
CO_2 44.010	23.78	23.53	24.17	23.826	79.31	6.388	20.773	0.9869	1.5112	15696	41.360		4'5"	235.83	62	0.9990	235.59	49.4 6.512	1534.16	
N_2 28.016	1.05	1.23	0.97	1.083			1.75	72.0	1432537				2'3"	119;67	59	1.0005	119.73	49.1	781.00	
CH_4 16.042	6.67	5.75	5.55	5.990	WET GAS 158.44	7.654	4.056	0.9887	1.19688	5821	15.339		0'9½"	41.26	61	0.9995	41.24	6.523	269.01	
C_2H_4 28.052	1.52	1.43	1.45	1.467			417.4	124.9									45.29		434.50	64.31
C_2H_6 33.068	0.90	0.94	0.92	0.920	RECYCLE 79.31	8.508	20.787	0.9429	1.19688	15829	41.710						236.23		1543.51	9.843
C_3H_6 42.078	1.24	1.45	1.13	1.273																
C_3H_8 44.094	0.14	0.20	0.16	0.167	BLEED 5.02	8.342	20.787	1.0000	1.19688	1042	2.746	WATER	7'6½"	399.50	82	0.99726	398.41	10.5 8.299	3306.40	
C_4H_8 56.104	1.26	1.42	1.32	1.333			439.6	202.6	1447452		44.456		4'4"	231.47	73	0.99858	231.14	10-5 8.299	1918.23	
C_4H_{10} 58.120	0.45	0.48	0.53	0.487	NATURAL GAS 28.43	7.708	21.314	0.8859	1.2031	4978	13.117		4'11"	262.02	74	0.99846	261.62	"	2171.18	
C_5H_{10} 70.130	0.76	0.73	0.77	0.753			444.9	75.9					1'3½"	67.20	81	0.99743	67.03		556.28	125.13
C_5H_{12} 72.146	0.19	0.19	0.27	0.217	OXYGEN 27.07	6.892	21.438	0.9850	--	3940	10.382						361.86		3003.07	15.078
C_6H_{12} 84.156	0.31	0.26	0.29	0.287			39.6													
			M. W.	20.2089	STEAM 215.7	5.945	0.3268		419#/hr											

THE TEXAS COMPANY — MONTEBELLO LABORATORY

RATE CALCULATIONS

RUN NO. 62-L
HOURS 254-279

	GAS ANALYSES				GENERATOR BALANCE										WEIGHT BALANCE		
HOUR	1400	2200	0600	AVERAGE	M/HR	C	H	O		Mol %	M/Hr	C	H	O		#/hr Measured	At Wt. Balance
FRESH FEED									O_2 32.000	0.28	10.437 0.037			20.948	WET GAS	310.64	338.63
CO 28.010	37.20	37.41	37.22	37.277	15.416	15.416		15.416	CO_2 44.010	1.46	0.191	0.191		0.382	OIL	62.17	62.17
H_2 2.016	60.11	60.15	60.54	60.267	24.922		49.844		N_2 28.016	1.00	0.131				WATER	121.67	121.67
CO_2 44.010	1.94	2.16	1.97	2.023	0.837	0.837		1.674	CH_4 16.042	82.48	10.772	10.772	43.088		TOTAL	494.48	522.47
N_2 28.016	0.19	0.14	0.12	0.150	0.062				C_2H_6 30.068	6.89	0.900	1.800	5.400		FRESH FEED	522.47	
CH_4 16.042	0.56	0.14	0.15	0.283	0.117	0.117	0.468		C_3H_8 44.094	5.54	0.724	2.172	5.792		WEIGHT BALANCE	94.64	
			M. W	12.634016					C_4H_{10} 58.120	1.68	0.219	0.876	2.190				
			H_2O 18.016				7.847	3.924	C_5H_{12} 72.146	0.67	0.088	0.440	1.056		WET GAS FACTOR	1090104	
						16.370	58.159	21.014	MW	20.218035					INDICATED LOSS—S C F H	538	
			BALANCE			100.73	101.10	98.52	TOTAL			16.251	57.526	21.330		6510	

WET GAS 1400	0600			GAS FLOW RATES												LIQUID PRODUCT RATES 25 hours					
					√h	PRESSURE	TEMP.	M. W.	S. C. F. H.	M/HR	HOUR	GAGE	GAL.	°F	FACTOR	GAL. AT 60	API° #/GAL.	#	# HR GAL HR
CO 28.010	16.03	15.96		15.995		416.5	76.7	2291432												
H_2 2.016	48.45	48.02		48.235	FRESH FEED						OIL	6'8"	353.68	63	0.9985	353.15	49.0 6.526	2304.66	
CO_2 44.010	22.35	22.83		22.590	79.31	6.396	20.765	0.9843	1.5137	15694	41.354		2'3"	119.67	59	1.0005	119.73	49.1 6.523	781.00	
N_2 28.016	0.99	1.02		1.005		1.77	74.5	1466499									44.67		430.50	62.17
CH_4 16.042	6.00	5.22		5.610	WET GAS 158.44	7.800	4.046	0.9863	1.2110	5972	15.736						238.09		1554.16	9.524
C_2H_4 28.052	1.37	1.77		1.570		417.3	125.3													
C_2H_6 33.068	0.87	0.90		0.885	RECYCLE 79.31	8.508	20.785	0.9425	1.2110	16008	42.182									
C_3H_6 42.078	0.85	0.72		0.785																
C_3H_8 44.094	0.02	0.14		0.080	BLEED 5.02	8.054	20.785	1.0000	1.2110	1018	2.682	WATER	7'2⅛"	382.05	80	0.99759	381.13	10.5 8.299	3163.00	
C_4H_8 56.104	1.13	1.29		1.210		439.9	201.4	1431889		44.864		4'11	262.02	74	0.99846	261.62	"	2171.18	
C_4H_{10} 58.120	0.60	0.57		0.585	NATURAL GAS 28.43	7.708	21.321	0.8867	1.1966	4957	13.062		5'2⅛"	277.30	76	0.99819	276.80	"	2297.16	
C_5H_{10} 70.130	0.75	0.84		0.795		444.3	79.1						0'6-3/4	29.87	84	0.99692	29.78	"	247.14	121.67
C_5H_{12} 72.146	0.27	0.31		0.290	OXYGEN 27.07	6.954	21.424	0.9822	--	3961	10.437						366.53		3041.84	14.661
C_6H_{12} 84.156	0.32	0.41		0.365		29.1														
			M. W.	19.740855	STEAM 215.7	6.254	0.2881		389#/hr											

THE TEXAS COMPANY — MONTEBELLO LABORATORY

RATE CALCULATIONS

RUN NO. 62-M
HOURS 279-303

	GAS ANALYSES			
HOUR	1400	2200	0600	AVERAGE
FRESH FEED				
CO 28.010	37.13	37.59	37.27	37.330
H_2 2.016	60.18	59.93	60.15	60.086
CO_2 44.010	2.10	2.27	2.16	2.177
N_2 28.016	0.24	0.08	0.18	0.167
CH_4 16.042	0.35	0.13	0.24	0.240
			M. W	12.710852
			H_2O 18.016	
			BALANCE	
WET GAS				
CO 28.010	16.04	16.73	16.24	16.337
H_2 2.016	48.22	48.77	48.85	48.614
CO_2 44.010	22.39	21.95	22.30	22.213
N_2 28.016	1.10	1.35	1.14	1.197
CH_4 16.042	5.65	5.07	5.43	5.383
C_2H_4 28.052	1.31	1.26	1.37	1.313
C_3H_6 33.068	0.75	0.79	0.75	0.763
C_3H_8 42.078	1.46	1.34	1.37	1.390
C_3H_8 44.094	0.17	0.22	0.19	0.193
C_4H_8 56.104	1.31	1.14	1.12	1.190
C_4H_{10} 58.120	0.50	0.47	0.35	0.440
C_5H_{10} 70.130	0.67	0.55	0.54	0.587
C_5H_{12} 72.146	0.12	0.12	0.12	0.120
C_6H_{12} 84.156	0.31	0.24	0.23	0.260
			M. W.	19.439022

GENERATOR BALANCE

M/HR	C	H	O		Mol %	M/Hr	C	H	O
				O_2 32.000	0.25	10.437 0.033			20.940
15.456	15.456	15.456	15.456	CO_2 44.010	1.36	0.178	0.178		0.356
24.877		49.754		N_2 28.016	1.21	0.158			
0.901	0.901		1.802	CH_4 16.042	82.40	10.776	10.776	43.104	
0.069				C_2H_4 30.068	6.78	0.887	1.774	5.322	
0.099	0.099	0.396		C_3H_8 44.094	5.49	0.718	2.154	5.744	
				C_4H_{10} 58.120	1.75	0.229	0.916	2.290	
		7.787	3.894	C_5H_{12} 72.146	0.76	0.099	0.495	1.188	
	16.456	57.937	21.152	MW	20.260918				
	101.00	100.50	99.32	TOTAL			16.293	57.648	21.296

GAS FLOW RATES

	V̄R	PRESSURE	TEMP.	M. W.	S. C. F. H.	M/HR
FRESH FEED		417.5	77.7	2277581		
79.31	6.421	20.789	0.9834	1.5092	15712	41.402
WET GAS		1.79	77.1	1489272		
158.44	7.954	4.060	0.9839	1.2204	6144	16.190
RECYCLE		418.3	125.9			
79.31	8.504	20.809	0.9420	1.2204	16135	42.516
BLEED						
5.02	8.200	20.809	1.0000	1.2204	1045	2.754
NATURAL GAS		4408	200.3	1428859		
28.43	7.713	21.342	0.8872	1.1953	4963	13.078
OXYGEN		445.5	79.7			
27.07	6.950	21.452	0.9815		3961	10.437
STEAM		30.4				
215.7	6.267					

WEIGHT BALANCE

	# hr Measured	At Wt. Balance
WET GAS	314.72	345.92
OIL	61.28	61.28
WATER	119.05	119.05
TOTAL	495.05	526.25
FRESH FEED	526.25	
WEIGHT BALANCE	94.07	
WET GAS FACTOR	1099135	
INDICATED LOSS—S C F H	609	
	6753	

LIQUID PRODUCT RATES

	HOUR	GAGE	GAL.	°F	FACTOR	GAL. AT 60	API° #/GAL.	#	# HR GAL HR
	OIL	7'3"	384.23	66	0.9970	383.08	49.2 6.520	2497.68	
		6'8"	353.68	65	0.9985	353.15	49.0 6.526	2304.66	
		5'0½"	268.57	67	0.9965	267.63	49.2	1744.95	
		1'6"	78.16	65	0.9975	77.96	6.520	508.30	
						46.29		441.00	61.28
						225.89		1470.67	9.412
	WATER	7'5-3/4"	396.23	84	0.99692	395.01	10.5 8.299	3278.19	
		5'2½"	277.30	76	0.99819	276.80	10.5 8.299	2297.16	
		5'4½"	284.93	77	0.99804	284.37	"	2359.99	
		1'1½"	58.47	84.	0.99692	58.29	"	483.75	119.05
						344.29		2857.27	14.345

THE TEXAS COMPANY — MONTEBELLO LABORATORY

RATE CALCULATIONS

RUN NO. 62-N
HOURS 303-327

	GAS ANALYSES			
HOUR	1400	2200	0600	AVERAGE
FRESH FEED				
CO 28.010	36.97	37.15	36.23	36.783
H_2 2.016	60.14	60.28	61.01	60.477
CO_2 44.010	2.13	2.08	2.07	2.093
N_2 28.016	0.36	0.19	0.41	0.320
CH_4 16.042	0.40	0.30	0.28	0.327
			M. W	12.585372
			H_2O 18.016	
			BALANCE	
WET GAS				
CO 28.010	16.64	16.44	17.29	16.790
H_2 2.016	49.38	48.83	49.41	49.206
CO_2 44.010	20.56	21.82	21.42	21.266
N_2 28.016	1.39	1.29	1.10	1.260
CH_4 16.042	5.93	5.52	4.96	5.470
C_2H_4 28.052	1.29	1.19	1.17	1.217
C_3H_6 33.068	0.82	0.80	0.74	0.787
C_3H_8 42.078	1.39	1.23	1.21	1.277
C_3H_8 44.094	0.21	0.23	0.17	0.203
C_4H_8 56.104	1.14	1.19	1.17	1.167
C_4H_{10} 58.120	0.34	0.49	0.45	0.427
C_5H_{10} 70.130	0.57	0.59	0.58	0.580
C_5H_{12} 72.146	0.11	0.15	0.11	0.123
C_6H_{12} 84.156	0.23	0.23	0.22	0.227
			M. W.	19.078846

GENERATOR BALANCE

M/HR	C	H	O		Mol %	M/Hr	C	H	O
				O_2 32.000	0.29	10.372 0.038			20.820
15.369	15.369		15.569	CO_2 44.010	1.34	0.176	0.176		0.352
25.269		50.538		N_2 28.016	1.32	0.173			
0.875	0.875		1.750	CH_4 16.042	81.98	10.746	10.746	42.984	
0.134				C_2H_4 30.068	6.95	0.911	1.822	5.466	
0.137	0.137	0.548		C_3H_8 44.094	5.71	0.749	2.247	5.992	
				C_4H_{10} 58.120	1.70	0.223	0.892	2.230	
		7.404	3.702	C_5H_{12} 72.146	0.71	0.093	0.465	1.116	
	16.381	58.490	20.821	MW	20.311347				
	100.20	101.21	98.34	TOTAL			16.348	57.788	21.172

GAS FLOW RATES

	V̄R	PRESSURE	TEMP.	M. W.	S. C. F. H.	M/HR
FRESH FEED		415.8	74.6	2300289		
79.31	6.442	20.748	0.9863	1.5167	15857	41.784
WET GAS		1.80	74.8	1517387		
158.44	8.125	4.062	0.9861	1.2318	6352	16.738
RECYCLE		416.2	124.6			
79.31	8.504	20.758	0.9432	1.2318	16266	42.862
BLEED						
5.02	8.508	20.758	1.0000	1.2318	1092	2.877
NATURAL GAS		439.4	199.8	1425311		
28.43	7.742	21.310	0.8884	1.1939	4975	13.109
OXYGEN		444.4	76.5			
27.07	6.892	21.427	0.9845	--	3936	10.372
STEAM		29.4				
215.7	6.275					

WEIGHT BALANCE

	# hr Measured	At Wt. Balance
WET GAS	319.34	354.77
OIL	56.54	56.54
WATER	114.56	114.56
TOTAL	490.44	525.87
FRESH FEED	525.87	
WEIGHT BALANCE	93.26	
WET GAS FACTOR	1110947	
INDICATED LOSS—S C F H	705	
	7057	

LIQUID PRODUCT RATES

	HOUR	GAGE	GAL.	°F.	FACTOR	GAL. AT 60	API° #/GAL.	#	# HR GAL HR
	OIL	7'6"	397.32	73	0.9935	394.74	49.1 6.523	2574.89	
		5'0½"	268.57	67	0.9965	267.63	49.2 6.520	1744.95	
		2'3½"	120.83	65	0.9975	120.53	49.1	786.22	
		0'10"	43.36	64	0.9980	43.27	6.523	282.25	
						43.53		423.00	56.54
						207.90		1356.91	8.663
	WATER	7'5½"	395.14	81	0.99743	394.12	10.5 8.299	3270.80	
		5'4½"	284.93	77	0.99804	284.37	"	2359.99	
		5'9-3/4"	308.94	76	0.99819	308.38	"	2559.25	
		1'8"	87.01	78	0.99788	86.83	"	720.60	114.56
						331.30		2749.46	13.304

THE TEXAS COMPANY — MONTEBELLO LABORATORY

RATE CALCULATIONS

RUN NO. 62-0
HOURS 327-351

	GAS ANALYSES			
HOUR	1400	2200	0600	AVERAGE
FRESH FEED				
CO 28.010	37.65	37.78	37.23	37.553
H_2 2.016	59.67	59.81	60.02	59.833
CO_2 44.010	2.24	2.16	2.08	2.160
N_2 28.016	0.21	0.10	0.13	0.147
CH_4 16.042	0.23	0.15	0.54	0.307
			M. W	12.765877
			H_2O 18.016	
			BALANCE	
WET GAS				
CO 28.010	17.99	17.21	17.78	17.660
H_2 2.016	47.78	47.66	49.66	48.367
CO_2 44.010	21.52	21.74	20.11	21.123
N_2 28.016	1.33	1.26	1.12	1.237
CH_4 16.042	4.98	4.90	5.62	5.167
C_2H_4 28.052	1.80	1.26	1.22	1.427
C_2H_6 30.068	0.80	0.81	0.75	0.787
C_3H_6 42.078	1.35	1.45	1.10	1.300
C_3H_8 44.094	0.29	0.25	0.19	0.243
C_4H_8 56.104	0.70	1.65	1.02	1.123
C_4H_{10} 58.120	0.35	0.47	0.42	0.413
C_5H_{10} 70.130	0.76	0.81	0.58	0.717
C_5H_{12} 72.146	0.12	0.16	0.12	0.133
C_6H_{12} 84.156	0.23	0.37	0.31	0.303
			M. W.	19.408287

GENERATOR BALANCE									
M/HR	C	H	O		Mol %	M/Hr	C	H	O
				O_2 32.000	0.27	10.292 0.035			20.654
15.445	15.445		15.445	CO_2 44.010	1.22	0.158	0.158		0.316
24.609		49.218		N_2 28.016	1.63	0.212			
0.888	0.888		1.776	CH_4 16.042	81.39	10.570	10.570	42.280	
0.060				C_2H_4 30.068	7.33	0.952	1.904	5.712	
0.126	0.126	0.504		C_2H_6 44.094	5.84	0.758	2.274	6.064	
				C_4H_{10} 58.120	1.64	0.213	0.852	2.130	
		7.509	3.755	C_5H_{12} 72.146	0.68	0.088	0.440	1.056	
	16.459	57.231	20.976	MW	20.359401				
	101.61	99.98	100.03	TOTAL			16.198	57.242	20.970

GAS FLOW RATES							
	$\sqrt{T}$	PRESSURE	TEMP.	M. W.	S. C. F. H.	M/HR
FRESH FEED 79.31	6.383	4149 20.727	72.9 0.9878	2267764 1.5059	15608	411128
WET GAS 158.44	8.200	1.98 4.084	75.9 0.9851	1491630 1.2213	6384	16.822
RECYCLE 79.31	8.504	415.3 20.736	124.7 0.9430	1.2213	16107	42.443
BLEED 5.02	8.604	20.736	1.0000	1.2213	1094	2.883
NATURAL GAS 28.43	7.688	439.0 21.300	200.0 0.8876	1421947 1.1925	4928	12.986
OXYGEN 27.07	6.842	442.7 21.387	74.9 0.9860	--	3906	10.292
STEAM 215.7	6.271	26.6 0.2781		376#/hr		

WEIGHT BALANCE		
	#/hr Measured	At Wt. Balance
WET GAS	326.49	364.53
OIL	53.38	53.38
WATER	107.12	107.12
TOTAL	486.99	525.03
FRESH FEED	525.03	
WEIGHT BALANCE	92.75	
WET GAS FACTOR	1116511	
INDICATED LOSS—S C F H	744	
	7128	

LIQUID PRODUCT RATES						
HOUR	GAGE	GAL.	°F	FACTOR	GAL. AT 60	API° #/GAL.	#	# HR GAL HR
OIL	5'10-1/8	310.58	61	0.9995	310.42	48.8 6.534	2028.28	
	2'3½"	120.83	65	0.9975	120.53	49.1 6.523	786.22	
					*5.97		*39.00	53.38
					195.86		1281.06	8.161
WATER	7'1"	375.50	78	0.99788	374.70	10.5	3109.64	
	5'9-3/4	308.94	76	0.99819	308.38	8.299	2559.25	
	6'1½"	325.31	74	0.99846	324.81	"	2695.60	
	1'6-3/4	81.48	74	0.99846	81.35	"	675.12	107.12
					309.78		2570.87	12.908

THE TEXAS COMPANY — MONTEBELLO LABORATORY

RATE CALCULATIONS

RUN NO. 62-F
HOURS 351-375

	GAS ANALYSES			
HOUR	1400	2200	0600	AVERAGE
FRESH FEED				
CO 28.010	37.78	37.26	37.78	37.607
H_2 2.016	58.60	59.82	59.71	59.376
CO_2 44.010	2.42	2.08	1.94	2.147
N_2 28.016	0.26	0.34	0.17	0.257
CH_4 16.042	0.94	0.50	0.40	0.613
			M. W	12.845974
			H_2O 18.016	
			BALANCE	
WET GAS				
CO 28.010	18.15	17.64	17.15	17.647
H_2 2.016	49.37	50.43	49.91	49.904
CO_2 44.010	19.95	19.50	20.25	19.900
N_2 28.016	1.00	1.18	1.14	1.107
CH_4 16.042	6.46	5.63	5.66	5.917
C_2H_4 28.052	1.24	1.13	1.11	1.160
C_2H_6 30.068	0.53	0.74	0.78	0.683
C_3H_6 42.078	1.05	1.12	0.75	0.973
C_3H_8 44.094	0.15	0.15	0.03	0.110
C_4H_8 56.104	0.92	1.06	1.09	1.023
C_4H_{10} 58.120	0.33	0.44	0.68	0.483
C_5H_{10} 70.130	0.53	0.59	0.77	0.630
C_5H_{12} 72.146	0.12	0.15	0.27	0.180
C_6H_{12} 84.156	0.20	0.24	0.41	0.283
			M. W.	18.619518

GENERATOR BALANCE									
M/HR	C	H	O		Mol %	M/Hr	C	H	O
				O_2 32.000	0.22	10.131 0.029			20.320
15.332	15.332		15.332	CO_2 44.010	1.98	0.259	0.259		0.518
24.207		48.414		N_2 28.016	0.87	0.114			
0.875	0.875		1.750	CH_4 16.042	83.00	10.877	10.877	43.508	
0.105				C_2H_4 30.068	7.19	0.942	1.884	5.652	
0.250	0.250	1.000		C_2H_6 44.094	4.33	0.567	1.701	4.536	
			3.756	C_4H_{10} 58.120	1.68	0.220	0.880	2.200	
		7.573	3.787	C_5H_{12} 72.146	0.73	0.096	0.480	1.152	
	16.457	56.987	20.869	MW	20.074638				
	102.34	99.89	100.15	TOTAL			16.081	57.048	20.838

GAS FLOW RATES							
	$\sqrt{T}$	PRESSURE	TEMP.	M. W.	S. C. F. H.	M/HR
FRESH FEED 79.31	6.342	415.0 20.729	72.2 0.9885	2253624 1.5012	15472	40.769
WET GAS 158.44	8.333	1.81 4.063	78.5 0.9827	1554820 1.2469	6573	17.320
RECYCLE 79.31	8.504	415.2 20.734	127.5 0.9408	1.2469	16405	43.228
BLEED 5.02	8.579	20.734	1.0000	1.2469	1113	2.933
NATURAL GAS 28.43	7.704	438.9 21.298	199.8 0.8878	1442118 1.2009	4973	13.104
OXYGEN 27.07	6.738	442.1 21.373	74.5 0.9863	--	3845	10.131
STEAM 215.7	6.188	27.3 0.2807		375#/hr		

WEIGHT BALANCE		
	#/hr Measured	At Wt. Balance
WET GAS	322.49	364.95
OIL	53.71	53.71
WATER	105.06	105.06
TOTAL	481.26	523.72
FRESH FEED	523.72	
WEIGHT BALANCE	91.89	
WET GAS FACTOR	1131662	
INDICATED LOSS—S C F H	865	
	7438	

LIQUID PRODUCT RATES						
HOUR	GAGE	GAL.	°F	FACTOR	GAL. AT 60	API° #/GAL.	#	# HR GAL HR
OIL	7'3½"	386.41	73	0.9935	383.90	49.0 6.526	2505.33	
	5'10-1/8	310.58	61	0.9995	310.42	48.8 6.534	2028.28	
	2'7½"	140.41	65	0.9975	140.06	49.0 6.526	914.03	
	0'6"	26.55	80	0.9901	26.29	"	171.57	
					*10.65		*69.50	53.71
					197.90		1289.01	8.246
WATER	7'0-3/4	374.41	74	0.99846	373.83	10.5	3102.42	
	6'1½"	325.31	74	0.99846	324.81	8.299	2695.60	
	5'1"	270.75	76	0.99819	270.26	"	2242.89	
	0'3½"	15.49	75	0.99832	15.46	"	128.30	105.06
					303.82		2521.41	12.659

THE TEXAS COMPANY — MONTEBELLO LABORATORY

RATE CALCULATIONS

RUN NO. 62-Q
HOURS 375-399

HOUR	GAS ANALYSES 1400	2200	0600	AVERAGE
FRESH FEED				
CO 28.010	37.48	37.91	36.87	37.420
H_2 2.016	59.29	59.31	59.77	59.456
CO_2 44.010	2.00	2.20	2.13	2.110
N_2 28.016	0.26	0.21	0.63	0.367
CH_4 16.042	0.97	0.37	0.60	0.647
			M. W	12.815196
			H_2O 18.016	
			BALANCE	

	M/HR	C	H	O
FRESH FEED				
CO 28.010	15.297	15.297		15.297
H_2 2.016	24.306		48.612	
CO_2 44.010	0.863	0.863		1.726
N_2 28.016	0.150			
CH_4 16.042	0.264	0.264	1.056	
			7.022	3.787
			7.298	3.649
		16.424	56.966	20.672
		102.98	100.49	99.34

	Mol %	M/Hr	C	H	O
O_2 32.000	0.28	10.116 0.037			20.306
CO_2 44.010	1.93	0.252	0.252		0.504
N_2 28.016	1.05	0.137			
CH_4 16.042	82.89	10.838	10.838	43.352	
C_2H_4 30.068	7.39	0.966	1.932	5.796	
C_2H_6 44.094	4.16	0.544	1.632	4.352	
C_4H_{10} 58.120	1.61	0.211	0.844	2.110	
C_3H_{12} 72.146	0.69	0.090	0.450	1.080	
MW	20.02025				
TOTAL			15.948	56.690	20.810

WEIGHT BALANCE

	#/hr Measured	At Wt. Balance
WET GAS	319.27	358.91
OIL	55.74	55.74
WATER	109.24	109.24
TOTAL	484.25	523.89
FRESH FEED	523.89	
WEIGHT BALANCE	92.43	
WET GAS FACTOR	1124158	
INDICATED LOSS—S C F H	779	
	7050	

WET GAS 1400	2200		
CO 28.010	16.27	16.28	16.275
H_2 2.016	48.94	47.82	48.380
CO_2 44.010	21.27	22.46	21.865
N_2 28.016	1.18	1.26	1.220
CH_4 16.042	6.92	6.06	6.490
C_2H_4 28.052	1.09	1.33	1.210
C_2H_6 33.069	0.75	0.80	0.775
C_3H_6 42.078	0.79	1.00	0.895
C_3H_8 44.094	0.05	0.20	0.125
C_4H_8 56.104	1.03	1.09	1.060
C_4H_{10} 58.120	0.56	0.44	0.500
C_5H_{10} 70.130	0.65	0.71	0.680
C_5H_{12} 72.146	0.24	0.20	0.220
C_6H_{12} 84.156	0.26	0.35	0.305
		M. W.	19.321451

GAS FLOW RATES

	V̄H	PRESSURE	TEMP.	M. W.	S. C. F. H.	M/HR
FRESH FEED		415.3	73.6	2259036		
79.31	6.358	20.736	0.9872	1.5030	15514	40.880
WET GAS		1.93	77.8	1498336		
158.44	8.063	4.078	0.9833	1.2241	6271	16.524
RECYCLE		416.1	127.0			
79.31	8.508	20.756	0.9412	1.2241	16136	42.519
BLEED						
5.02	8.567	20.756	1.0000	1.2241	1093	2.880
NATURAL GAS		438.1	202.7	1446035		
28.43	7.700	21.279	0.8858	1.2025	4962	13.075
OXYGEN		441.8	76.5			
27.07	6.742	21.366	0.9845	--	3839	10.116
STEAM		27.1				
215.7	6.125	0.2799		370#/hr		

HOUR	GAGE	GAL.
OIL	6'4-3/8"	337.85
	2'7½"	140.41
WATER	7'4"	388.59
	5'1"	270.75
	4'6-7/8"	244.01
	0'10½"	45.50

LIQUID PRODUCT RATES

°F	FACTOR	GAL. AT 60	API° #/GAL.	#	# HR GAL HR
62	0.9990	337.51	46.6 6.541	2207.65	
65	0.9975	140.06	49.0 6.526	914.03	
		46.77		446.25	55.74
		204.22		1337.87	8.509
85	0.99674	387.32	10.4 8.305	3216.69	
76	0.99819	270.26	10.8 8.299	2242.89	
72	0.99872	243.70	10.4	2023.93	
96	0.99467	45.26	8.305	375.88	109.24
		315.50		2621.85	13.146

THE TEXAS COMPANY — MONTEBELLO LABORATORY

RATE CALCULATIONS

RUN NO. 62-R
HOURS 399-423

HOUR	GAS ANALYSES 1400	0600		AVERAGE
FRESH FEED				
CO 28.010	37.94	35.57		36.755
H_2 2.016	59.41	60.02		59.715
CO_2 44.010	1.90	3.30		2.600
N_2 28.016	0.26	0.62		0.440
CH_4 16.042	0.49	0.49		0.490
			M. W	12.845066
			H_2O 18.016	
			BALANCE	

	M/HR	C	H	O
FRESH FEED				
CO 28.010	15.059	15.059		15.059
H_2 2.016	24.465		48.930	
CO_2 44.010	1.065	1.065		2.130
N_2 28.016	0.180			
CH_4 16.042	0.201	0.201	0.804	
			6.753	3.377
		16.325	56.487	20.566
		103.58	100.82	98.99

	Mol %	M/Hr	C	H	O
O_2 32.000	0.28	10.113 0.036			20.298
CO_2 44.010	1.93	0.249	0.249		0.498
N_2 28.016	1.05	0.136			
CH_4 16.042	82.89	10.711	10.711	42.844	
C_2H_4 30.068	7.39	0.955	1.910	5.730	
C_2H_6 44.094	4.16	0.538	1.614	4.304	
C_4H_{10} 58.120	1.61	0.208	0.832	2.080	
C_3H_{12} 72.146	0.69	0.089	0.445	1.068	
MW	20.02025				
TOTAL			15.761	56.026	20.796

WEIGHT BALANCE

	#/hr Measured	At Wt. Balance
WET GAS	305.86	351.61
OIL	61.05	61.05
WATER	113.60	113.60
TOTAL	480.51	526.26
FRESH FEED	526.26	
WEIGHT BALANCE	91.31	
WET GAS FACTOR	1149578	
INDICATED LOSS—S C F H	904	
	6951	

WET GAS	
CO 28.010	15.10
H_2 2.016	49.15
CO_2 44.010	22.22
N_2 28.016	1.13
CH_4 16.042	6.36
C_2H_4 28.052	1.67
C_2H_6 33.068	0.74
C_3H_6 42.078	0.58
C_3H_8 44.094	0.15
C_4H_8 56.104	1.10
C_4H_{10} 58.120	0.48
C_5H_{10} 70.130	0.70
C_5H_{12} 72.146	0.19
C_6H_{12} 84.156	0.36
M. W.	19.195289

GAS FLOW RATES

	V̄H	PRESSURE	TEMP.	M. W.	S. C. F. H.	M/HR
FRESH FEED		415.8	77.0	2253783		
79.31	6.396	20.748	0.9840	1.5013	15548	40.970
WET GAS		1.88	76.0	1508182		
158.44	7.746	4.073	0.9850	1.2281	6047	15.934
RECYCLE		416.8	128.0			
79.31	8.504	20.773	0.9404	1.2281	16181	42.638
BLEED						
5.02	8.217	20.773	1.0000	1.2281	1052	2.772
NATURAL GAS		438.1	205.8	1446035		
28.43	7.629	21.279	0.8837	1.2025	4904	12.922
OXYGEN		442.1	80.4			
27.07	6.763	21.373	0.9809	--	3838	10.113
STEAM		27.7				
215.7	6.238	0.2824		380#/hr		

HOUR	GAGE	GAL.
OIL	7'1½"	376.59
	6'4-3/8"	337.85
	4'10½"	258.75
	1'6½"	80.37
WATER	7'2-3/4"	383.14
	4'6-7/8"	244.01
	5'2"	275.11
	1'7½"	84.80

LIQUID PRODUCT RATES

°F	FACTOR	GAL. AT 60	API° #/GAL.	#	# HR GAL HR
68	0.9961	375.12	49.4 6.512	2442.78	
62	0.9990	337.51	46.6 6.541	2207.65	
59	1.005	260.04	49.4	1693.38	
68	0.9961	80.06	6.512	521.35	
		8.91		58.00	61.05
		226.50		1465.16	9.438
87	0.99638	381.75	10.4 8.305	3170.43	
72	0.99872	243.70	10.4 8.305	2023.93	
72	0.99872	274.76	"	2281.88	
85	0.99674	84.52	"	701.94	113.60
		328.29		2726.44	13.679

THE TEXAS COMPANY — MONTEBELLO LABORATORY

RATE CALCULATIONS

RUN NO. 62-S
HOURS 423-447

	GAS ANALYSES				GENERATOR BALANCE										WEIGHT BALANCE		
HOUR	1400	2200	0600	AVERAGE	M/HR	C	H	O		Mol %	M/Hr	C	H	O		#/hr Measured	At Wt. Balance
FRESH FEED									O_2 32.000	0	10.050 0			20.100	WET GAS	312.24	355.82
CO 28.010	37.69	37.65	37.47	37.604	15.435	15.435		15.435	CO_2 44.010	1.93	0.251	0.251		0.502	OIL	59.34	59.34
H_2 2.016	58.99	59.45	59.48	59.310	24.344		48.688		N_2 28.016	1.32	0.172				WATER	111.76	111.76
CO_2 44.010	2.08	2.10	2.09	2.090	0.858	0.858		1.716	CH_4 16.042	82.81	10.775	10.775	43.100		TOTAL	483.34	526.92
N_2 28.016	0.16	0.24	0.33	0.243	0.100				C_2H_6 30.068	7.19	0.936	1.872	5.616		FRESH FEED	526.92	
CH_4 16.042	1.08	0.55	0.63	0.753	0.309	0.309	1.236		C_3H_8 44.094	4.27	0.556	1.668	4.448		WEIGHT BALANCE	91.73	
			M. W	12.837254					C_4H_{10} 58.120	1.70	0.221	0.884	2.210				
			H_2O 18.016				6.782	3.391	C_5H_{12} 72.146	0.78	0.101	0.505	1.212		WET GAS FACTOR	1139572	
						16.602	56.706	20.542	MW	20.099066					INDICATED LOSS—S C F H	820	
			BALANCE			104.06	100.21	99.71	TOTAL			15.955	56.886	20.602		5695	

WET GAS					GAS FLOW RATES							LIQUID PRODUCT RATES							
CO 28.010	14.06	15.08	13.88	14.340		V̄R	PRESSURE	TEMP.	M. W.	S. C. F. H.	M/HR	HOUR	GAGE	GAL.	°F	FACTOR	GAL. AT 60	API° #/GAL.	#	#/HR GAL HR
H_2 2.016	48.36	43.53	48.99	46.960	FRESH FEED		416	81	2255155			OIL	7'3"	384.23	82	0.9891	380.04	48.9 6.530	2481.66	
CO_2 44.010	23.04	26.96	24.27	24.757	79.31	6.428	20.753	0.9804	1.5017	15577	41046		4'10½"	258.75	59	1.005	260.04	6.512 49.4	1693.38	
N_2 28.016	1.09	1.63	1.24	1.320	WET GAS		1.82	78	1435365				3'3½"	175.82	62	0.9990	175.64	48.9 6.530	1146.93	
CH_4 16.042	7.41	6.50	5.46	6.457	158.44	7.746	4.064	0.8831	1.1981	5875	15.481		1'7"	82.59	82	0.9891	81.69	49.4 6.512	531.97	
C_2H_6 28.052	1.33	1.79	1.22	1.447	RECYCLE		417	129									3.22		21.00	59.34
C_3H_8 33.068	0.74	0.36	0.74	0.613	79.31	8.510	20.777	0.9396	1.1981	15786	41.597						217.17	6.552	1424.24	9.049
C_3H_6 42.078	1.31	1.14	1.27	1.240	BLEED															
C_3H_8 44.094	0.21	0.09	0.28	0.193	5.02	8.50	20.777	1.0000	1.1981	1062	2.798	WATER	7'6½"	398.41	84	.99692	397.18	10.5 8.299	3296.20	
C_4H_8 56.104	1.14	1.14	1.19	1.157	NATURAL GAS		439	208	1440365				5'2"	275.11	72	0.99872	274.76	10.4 8.305	2281.88	
C_4H_{10} 58.120	0.31	0.49	0.38	0.393	28.43	7.700	21.300	0.8823	1.2002	4938	13.012		5'5½"	289.30	74	.99846	288.85	10.5 8.299	2397.17	
C_5H_{10} 70.130	0.54	0.71	0.67	0.673	OXYGEN		442	85					1'8½"	88.12	86	.99656	87.92	10.4 8.305	729.35	111.76
C_5H_{12} 72.146	0.12	0.25	0.15	0.173	27.07	6.750	21.371	0.9768		3814	10.050						323.45		2682.14	13.477
C_6H_{12} 84.156	0.24	0.33	0.26	0.277	STEAM		25													
			M. W.	20.169079	215.7	6.20														

THE TEXAS COMPANY — MONTEBELLO LABORATORY

RATE CALCULATIONS

RUN NO. 62-T
HOURS 447-471

	GAS ANALYSES				GENERATOR BALANCE										WEIGHT BALANCE		
HOUR	2200	0600		AVERAGE	M/HR	C	H	O		Mol %	M/Hr	C	H	O		#/hr Measured	At Wt. Balance
FRESH FEED									O_2 32.000	0.27	10.092 0.035			20.254	WET GAS	310.48	358.53
CO 28.010	36.90	36.87		36.885	15.147	15.147		15.147	CO_2 44.010	2.12	0.275	0.275		0.550	OIL	57.43	57.43
H_2 2.016	60.00	60.05		60.025	24.649		49.298		N_2 28.016	1.08	0.140				WATER	107.96	107.96
CO_2 44.010	2.43	2.41		2.420	0.994	0.994		1.988	CH_4 16.042	82.55	10.722	10.722	42.888		TOTAL	475.87	523.92
N_2 28.016	0.43	0.31		0.370	0.152				C_2H_6 30.068	7.16	0.930	1.860	5.580		FRESH FEED	523.92	
CH_4 16.042	0.24	0.36		0.300	0.123	0.123	0.492		C_3H_8 44.094	4.20	0.545	1.635	4.360		WEIGHT BALANCE	90.83	
			M. W	12.75842			6.572	3.669	C_4H_{10} 58.120	1.76	0.229	0.916	2.290				
			H_2O 18.016				7.005	3.503	C_5H_{12} 72.146	0.86	0.112	0.560	1.344		WET GAS FACTOR	1154760	
						16.264	56.795	20.638	MW	20.21284					INDICATED LOSS—S C F H	978	
			BALANCE			101.85	100.59	99.20	TOTAL			15.968	56.462	20.804		7300	

WET GAS	1400	2200	0600		GAS FLOW RATES							LIQUID PRODUCT RATES							
CO 28.010	14.67	14.90	14.38	14.650		V̄R	PRESSURE	TEMP.	M. W.	S. C. F. H.	M/HR	HOUR	GAGE	GAL.	°F	FACTOR	GAL. AT 60	API° #/GAL.	#	#/HR GAL HR
H_2 2.016	49.51	53.04	49.57	50.706	FRESH FEED		415	80	2269089			OIL	7'3½"	385.32	67	.9965	383.97	49.6 6.505	2497.72	
CO_2 44.010	22.35	17.90	24.09	21.446	79.31	6.413	20.729	0.9813	15063	15584	41.065		3'3½"	175.82	62	.9990	175.64	48.9 6.530	1146.93	
N_2 28.016	1.70	1.23	1.21	1.380	WET GAS		1.85	80	1553344								4.23		27.50	57.43
CH_4 16.042	6.27	6.03	5.72	6.007	158.44	7.996	4.080	0.9813	1.2463	6322	16.659						212.56	6.484	1378.29	8.857
C_2H_6 28.052	1.26	1.41	1.19	1.287	RECYCLE		417	130										6.505	1382.70	
C_3H_8 33.068	0.69	0.80	0.91	0.800	79.31	8.510	20.777	0.9388	1.2463	16407	43.233									
C_3H_6 42.078	1.04	1.41	1.03	1.160	BLEED															
C_3H_8 44.094	0.10	0.24	0.05	0.130	5.02	8.000	20.777	1.0000	1.2463	1040	2.740	WATER	7'3"	384.23	84	.99692	383.05	10.4 8.305	3181.23	
C_4H_8 56.104	1.09	1.35	0.18	0.873	NATURAL GAS		438	205	1432257				5'5½"	289.30	74	.99846	-288.85	10.5 8.299	2397.17	
C_4H_{10} 58.120	0.31	0.48	0.46	0.417	28.43	7.700	21.277	0.8843	1.1968	4929	12.988		5'4-3/4	287.12	74	.99846	+286.68	10.4 8.305	2380.88	107.96
C_5H_{10} 70.130	0.61	0.73	0.70	0.680	OXYGEN		441	85					1'4"	69.39	86	.99656	-69.15	10.5 8.299	573.88	12.989
C_5H_{12} 72.146	0.16	0.24	0.19	0.197	27.07	6.785	21.347	0.9768	--	3830	10.092						311.73		2591.06	
C_6H_{12} 84.156	0.24	0.24	0.32	0.267	STEAM		24													
			M. W.	18.637203	215.7	5.880														

THE TEXAS COMPANY — MONTEBELLO LABORATORY

RATE CALCULATIONS

RUN NO. 62-U
HOURS 471-495

	GAS ANALYSES				GENERATOR BALANCE										WEIGHT BALANCE		
HOUR	1400	2200	0600	AVERAGE	M/HR	C	H	O		Mol %	M/Hr	C	H	O		#/hr Measured	At Wt. Balance
FRESH FEED									O_2 32.000	0.26	10.116 0.034			20.300	WET GAS	318.67	369.03
CO 28.010	37.21	41.15	36.44	38.267	15.394	15.394		15.394	CO_2 44.010	2.05	0.267	0.267		0.534	OIL	56.61	56.61
H_2 2.016	59.26	54.67	60.52	58.150	23.393		46.786		N_2 28.016	0.73	0.095				WATER	106.09	106.09
CO_2 44.010	2.23	3.02	2.41	2.553	1.027	1.027		2.054	CH_4 16.042	82.57	10.748	10.748	42.992		TOTAL	481.37	531.73
N_2 28.016	0.35	0.45	0.15	0.317	0.128				C_2H_6 30.068	7.34	0.955	1.910	5.730		FRESH FEED	531.73	
CH_4 16.042	0.95	0.71	0.48	0.713	0.287	0.287	1.148		C_3H_8 44.094	4.50	0.586	1.758	4.688		WEIGHT BALANCE	90.53	
			M. W	13.217656					C_4H_{10} 58.120	1.77	0.230	0.920	2.300				
			H_2O 18.016				7.886	3.943	C_5H_{12} 72.146	0.78	0.102	0.510	1.224		WET GAS FACTOR	115805	
						16.708	55.820	21.391	MW	20.21849					INDICATED LOSS—S C F H	1012	
			BALANCE			103.69	98.04	102.67	TOTAL			16.113	56.934	20.834			

WET GAS					GAS FLOW RATES							LIQUID PRODUCT RATES								
CO 28.010		16.09	15.54	15.815		V̄R	PRESSURE	TEMP.	M. W.	S. C. F. H.	M/HR	HOUR	GAGE	GAL.	°F	FACTOR	GAL. AT 60	API° #/GAL.	#	# HR GAL HR
H_2 2.016		50.30	50.37	50.335	FRESH FEED		415	80	2190252			OIL	5'6"	292.57	65	.9975	291.64	49.1 6.523		
CO_2 44.010		22.17	22.31	22.240	79.31	6394	20.729	0.9813	1.4800	15267	40.229		1'8"	87.01	64	.9980	86.84			
N_2 28.016		1.04	1.25	1.145	WET GAS		1.93	81	153231								205.00		1337.22	
CH_4 16.042		5.16	5.16	5.160	158.44	8.163	4.078	0.9804	1.2379	6401	16.867						3.30		21.50	8.679
C_2H_6 28.052		1.11	1.14	1.125	RECYCLE		416	129									208.30		1358.72	56.614
C_3H_8 33.068		0.64	0.62	0.630	79.31	8.52	20.753	0.9396	1.2379	16311	42.980									
C_4H_{10} 42.078		1.06	0.97	1.015	BLEED															
C_5H_{12} 44.094		0.09	0.21	0.150	5.02	8.20	20.753	1.0000	1.2379	1057	2.785	WATER	7'4½"	390.78	83	.99709	389.64	10.3 8.311		
C_4H_8 56.104		1.02	1.00	1.010	NATURAL GAS		438	202	1431857		45.765		5'4-3/4	287.12	74	.99846	286.68	10.4 8.305	2380.88	
C_4H_{10} 58.120		0.42	0.42	0.420	28.43	7.700	21.277	0.9863	1.1966	4940	13.017		5'0"	266.38	76	.99819	265.90	10.3 83.11		
C_5H_{10} 70.130		0.55	0.61	0.580	OXYGEN		441	84					1'2⅝"	62.73	86	.99656	62.50			12.765
C_5H_{12} 72.146		0.16	0.16	0.160	27.07	6.795	21.347	0.9777	--	3839	10.116						306.36	8.311	2546.16	106.09
C_6H_{12} 84.156		0.19	0.24	0.215	STEAM		26													
			M. W.	18.8930	215.7	5.528	0.2753		328#/hr											

THE TEXAS COMPANY — MONTEBELLO LABORATORY

RATE CALCULATIONS

RUN NO. 62-V
HOURS 495-519

	GAS ANALYSES				GENERATOR BALANCE										WEIGHT BALANCE		
HOUR	1400	2200	0600	AVERAGE	M/HR	C	H	O		Mol %	M/Hr	C	H	O		#/hr Measured	At Wt. Balance
FRESH FEED									O_2 32.000	0.26	10.169 0.034			20.406	WET GAS	315.85	347.02
CO 28.010	36.71	36.70	36.86	36.756	15.208	15.208		15.208	CO_2 44.010	2.05	0.269	0.269		0.538	OIL	63.46	63.46
H_2 2.016	59.59	60.34	60.21	60.080	24.857		49.714		N_2 28.016	0.73	0.096				WATER	113.62	113.62
CO_2 44.010	2.20	2.23	2.32	2.250	0.931	0.931		1.862	CH_4 16.042	82.57	10.849	10.849	43.396		TOTAL	492.93	524.10
N_2 28.016	0.19	0.27	0.13	0.197	0.082				C_2H_6 30.068	7.34	0.964	1.928	5.784		FRESH FEED	524.10	
CH_4 16.042	1.21	0.46	0.48	0.717	0.297	0.297	1.188		C_3H_8 44.094	4.50	0.591	1.773	4.728		WEIGHT BALANCE	94.05	
			M. W	12.667006			6.560	3.874	C_4H_{10} 58.120	1.77	0.233	0.932	2.330				
			H_2O 18.016				7.154	3.577	C_5H_{12} 72.146	0.78	0.102	0.510	1.224		WET GAS FACTOR	1098686	
						16.436	58.056	20.647	MW	20.21849					INDICATED LOSS—S C F H	597	
			BALANCE			101.08	101.03	98.58	TOTAL			16.261	57.462	20.944		6648	

WET GAS					GAS FLOW RATES							LIQUID PRODUCT RATES								
CO 28.010	13.87	12.78	13.00	13.216		V̄R	PRESSURE	TEMP.	M. W.	S. C. F. H.	M/HR	HOUR	GAGE	GAL.	°F	FACTOR	GAL. AT 60	API° #/GAL.	#	# HR GAL HR
H_2 2.016	47.02	49.28	48.79	48.363	FRESH FEED		419	73	2285465			OIL	7'1⅛"	377.68	82	0.9891	373.56	49.2 6.520	2435.61	
CO_2 44.010	23.92	24.50	24.45	24.290	79.31	6.367	20.825	0.9877	1.5118	15702	41.375		5'6"	292.57	65	0.9975	291.84	49.1 6.523	1903.67	
N_2 28.016	1.11	1.35	1.34	1.267	WET GAS		1.92	77	1461471				3'11"	209.64	60	1.0000	209.64	49.2	1366.85	
CH_4 16.042	7.38	6.26	6.16	6.600	158.44	7.875	4.077	0.9840	1.2089	6051	15.945		1'2-3/4	63.92	87	0.9866	63.06	6.520	411.15	
C_2H_6 28.052	1.38	1.35	1.40	1.377	RECYCLE		417	123									45.44		435.50	63.46
C_3H_8 33.068	0.72	0.72	0.73	0.723	79.31	8.504	20.777	0.9444	1.2089	15999	42.158						233.74		1523.14	9.739
C_4H_{10} 42.078	0.98	1.00	1.09	1.023	BLEED															
C_5H_{12} 44.094	0.18	0.05	0.07	0.100	5.02	8.013	20.777	1.0000	1.2089	1010	2.661	WATER	7'3½"	385.32	85	0.99674	384.06	10.3 8.311	3191.92	
C_4H_8 56.104	1.34	1.07	1.24	1.217	NATURAL GAS		442	197	1431857				5'0"	266.38	76	0.99819	265.90		2209.89	
C_4H_{10} 58.120	0.59	0.46	0.50	0.517	28.43	7.708	21.371	0.8897	1.1966	4996	13.138		5'5½"	290.39	70	0.99896	290.09		2410.94	
C_5H_{10} 70.130	0.88	0.69	0.73	0.767	OXYGEN		445	76					1'6⅛"	80.37	83	0.99709	80.14		666.04	113.62
C_5H_{12} 72.146	0.25	0.19	0.20	0.213	27.07	6.750	21.441	0.9850	--	3859	10.169						328.11		2726.93	13.671
C_6H_{12} 84.156	0.38	0.30	0.30	0.327	STEAM		28													
			M. W.	19.808807	215.7	5.683	0.2837		348#/hr											

THE TEXAS COMPANY — MONTEBELLO LABORATORY

RATE CALCULATIONS

RUN NO. 62-W

HOURS 519-543

	GAS ANALYSES			
HOUR	1400	2200	0600	AVERAGE
FRESH FEED				
CO 28.010	36.48	36.62	37.08	36.727
H_2 2.016	60.08	60.54	60.09	60.236
CO_2 44.010	2.12	2.39	2.39	2.300
N_2 28.016	0.23	0.18	0.12	0.177
CH_4 16.042	1.09	0.27	0.32	0.560
			M. W	12.653244
			H_2O 18.016	
			BALANCE	
WET GAS				
CO 28.010	13.77	15.26	17.26	15.430
H_2 2.016	49.72	40.75	38.13	42.868
CO_2 44.010	23.05	27.70	27.86	26.203
N_2 28.016	1.00	2.26	3.56	2.273
CH_4 16.042	6.78	6.08	6.11	6.323
C_2H_4 28.052	1.35	1.60	1.48	1.477
C_2H_6 30.068	0.66	0.66	0.95	0.757
C_3H_6 42.078	1.17	1.60	1.13	1.300
C_3H_8 44.094	0.10	0.23	0.09	0.140
C_4H_8 56.104	1.09	1.69	1.39	1.390
C_4H_{10} 58.120	0.37	0.66	0.69	0.573
C_5H_{10} 70.130	0.63	0.96	0.84	0.810
C_5H_{12} 72.146	0.10	0.16	0.20	0.153
C_6H_{12} 84.156	0.21	0.39	0.31	0.303
			M. W.	21.6662

GENERATOR BALANCE									
M/HR	C	H	O		Mol %	M/Hr	C	H	O
				O_2 32.000	0	10.155			20.310
15.160	15.160		15.160	CO_2 44.010	2.01	0.265	0.265		0.530
24.865		49.730		N_2 28.016	1.05	0.138			
0.949	0.949		1.898	CH_4 16.042	83.23	10.955	10.955	43.820	
0.073				C_2H_6 30.068	7.02	0.924	1.848	5.544	
0.231	0.231	0.924		C_3H_8 44.094	4.12	0.542	1.626	4.336	
				C_4H_{10} 58.120	1.78	0.234	0.936	2.340	
		7.099	3.550	C_5H_{12} 72.146	0.79	0.104	0.520	1.248	
	16.340	57.753	20.608	MW	20.06246				
	101.18	100.81	98.89	TOTAL			16.150	57.288	20.840

GAS FLOW RATES							
	$\sqrt{H}$	PRESSURE	TEMP.	M. W.	S. C. F. H.	M/HR
FRESH FEED 79.31	6.342	419 20.825	72 0.9887	228795 1.5126	15665	41.278
WET GAS 158.44	8.042	1.93 4.078	79 0.9822	1336182 1.15593	5899	15.544
RECYCLE 79.31	8.500	417 20.777	124 0.9436	1.15593	15277	40.256
BLEED 5.02	8.388	20.777	1.0000	1.15593	1011	2.664
NATURAL GAS 28.43	7.692	442 21.371	197 0.8897	1442993 1.2012	4995	42.920 13.162
OXYGEN 27.07	6.742	444 21.417	75 0.9859	--	3854	10.155
STEAM 215.7	5.704	26 0.2753		339#/hr		

	HOUR	GAGE	GAL.
OIL		7'3½"	386.41
		3'11"	209.64
		2'4-3/4	127.74
		1'7"	82.59
WATER		7'4"	388.59
		5'5½"	290.39
		5'8"	301.30
		1'5-3/4	77.06

WEIGHT BALANCE		
	#/hr Measured	At Wt. Balance
WET GAS	336.78	349.08
OIL	61.66	61.66
WATER	111.56	111.56
TOTAL	510.00	522.30
FRESH FEED	522.30	
WEIGHT BALANCE	97.65	
WET GAS FACTOR	1036522	
INDICATED LOSS—S C F H	215	
	6114	

LIQUID PRODUCT RATES					
°F	FACTOR	GAL. AT 60	API° #/GAL.	#	# HR GAL HR
68	0.9961	384.90	48.6 6.541	2517.63	
60	1.0000	209.64	49.2 6.520	1366.85	
62	0.9990	127.61	48.6	834.70	
62	0.9990	82.51	6.541	539.70	61.66
		*5.20		*34.00	9.398
		225.56		1479.78	
76	0.99819	387.89	10.2 8.317	3226.08	
70	0.99896	290.09	10.3 8.311	2410.94	
74	0.99846	300.84	10.2	2502.09	
76	0.99819	76.92	8.317	639.74	111.56
		321.72		2677.49	13.405