ChevronTexaco provides no warranties, either express or implied, as to the accuracy or validity of any of the work in this report. Anyone accessing or using the reports indemnifies and holds ChevronTexaco harmless against any liability that comes from using or relying on the information contained therein.

THE TEXAS COMPANY

REFINING DEPARTMENT

TECHNICAL & RESEARCH DIVISION

REPORT ON

RUNS 39 THROUGH 43 WITH THE STRATCO REACTOR

ERSONAL AND
ONFIDENTIAL

Laboratory MONTEBELLO

Report No. TDC-802-31-P

Date APRIL 15, 1950

STRICTLY CONFIDENTIAL

BRIEF OF PARTIAL REPORT

Laboratory Montebello
Date Approved April 15, 1950
Work Completed July 23, 1948

Experiment No. TDC-802
Partial Report No. 31
Subject: Hydrocarbon Synthesis

Subject: Runs 39 through 43 with the Stratco Reactor.

Object: To determine whether the Stratco Reactor employing a mechanically agitated powdered catalyst might possess any advantages over the conventional fluid bed reactors for the hydrocarbon synthesis process.

History: All previous synthesis work at Montebello had been done in the conventional type of fluid reactors in which suspension of the powdered catalyst had been maintained entirely by the upflow of the gaseous reactants and products. Beacon had successfully employed a laboratory scale stirred reactor differing somewhat, however, from the Stratco unit.

Experimental Results: After an extended shakedown and personnel training period during which many mechanical difficulties were experienced, the Stratco Reactor was operated satisfactorily at 300 pounds pressure with mill scale catalyst promoted with 1.0 per cent K_2O.

Conclusions:

1. There was no indication that the stirred-bed Stratco Reactor possessed any advantages over a conventional fluid type such as the Montebello Tubular Reactor.

2. The net yield of methane from the reactor remained practically constant over a wide range of methane content of the fresh feed, when other variables were held constant.

3. When other conditions remained the same, a drop in feed rate accompanied by an increase in recycle ratio produced higher yields of C_{3+} and better conversion of $H_2 + CO$.

HYDROCARBON SYNTHESIS

PARTIAL REPORT NO. 31

Montebello Laboratory Experiment No. TDC-802
Work Completed July 23, 1948 Report Approved April 15, 1950

RUNS 39 THROUGH 43 WITH THE STRATCO REACTOR

INDEX

STRICTLY CONFIDENTIAL

HYDROCARBON SYNTHESIS

PARTIAL REPORT NO. 31

Montebello Laboratory — Experiment No. TDC-802
Work Completed July 23, 1948 — Report Approved April 15, 1950

RUNS 39 THROUGH 43 WITH THE STRATCO REACTOR

I. INTRODUCTION

The general objective of the research conducted at Montebello Laboratory under Experiment No. TDC-802 is to investigate in a pilot plant scale the generation of synthesis gas (carbon monoxide and hydrogen) and its conversion to liquid hydrocarbons and salable by-products. The present report describes the testing of a powdered catalyst synthesis reactor equipped with a mechanically driven stirrer. The results of these tests, Synthesis runs 39 through 43, are discussed in some detail and compared in a general way with those obtained during the earlier operation of a conventional type of fluidized catalyst contactor.

The use of the stirred reactor (manufactured by the Stratford Engineering Company and referred to henceforth as the Stratco Reactor) was prompted by the fear that fluidization difficulties might be encountered with the conventional type of unit. The Beacon Laboratories' hydrocarbon synthesis group had earlier resorted to a stirred reactor in order to avoid such difficulties in small scale units. The Beacon reactor, however, differed from the Stratco Reactor not only in size but also in the fact that the latter unit provided for the internal circulation of catalyst fines to the bottom of the reactor while the

Beacon unit was not so designed.

A considerable portion of the time spent on the Stratco unit was devoted to overcoming the many mechanical difficulties that arose since the unit as originally built was designed for use at lower pressure operation than the 250 psig level at which it was employed for the hydrocarbon synthesis work.

II. EXPERIMENTAL WORK

A. EQUIPMENT AND METHOD OF OPERATION

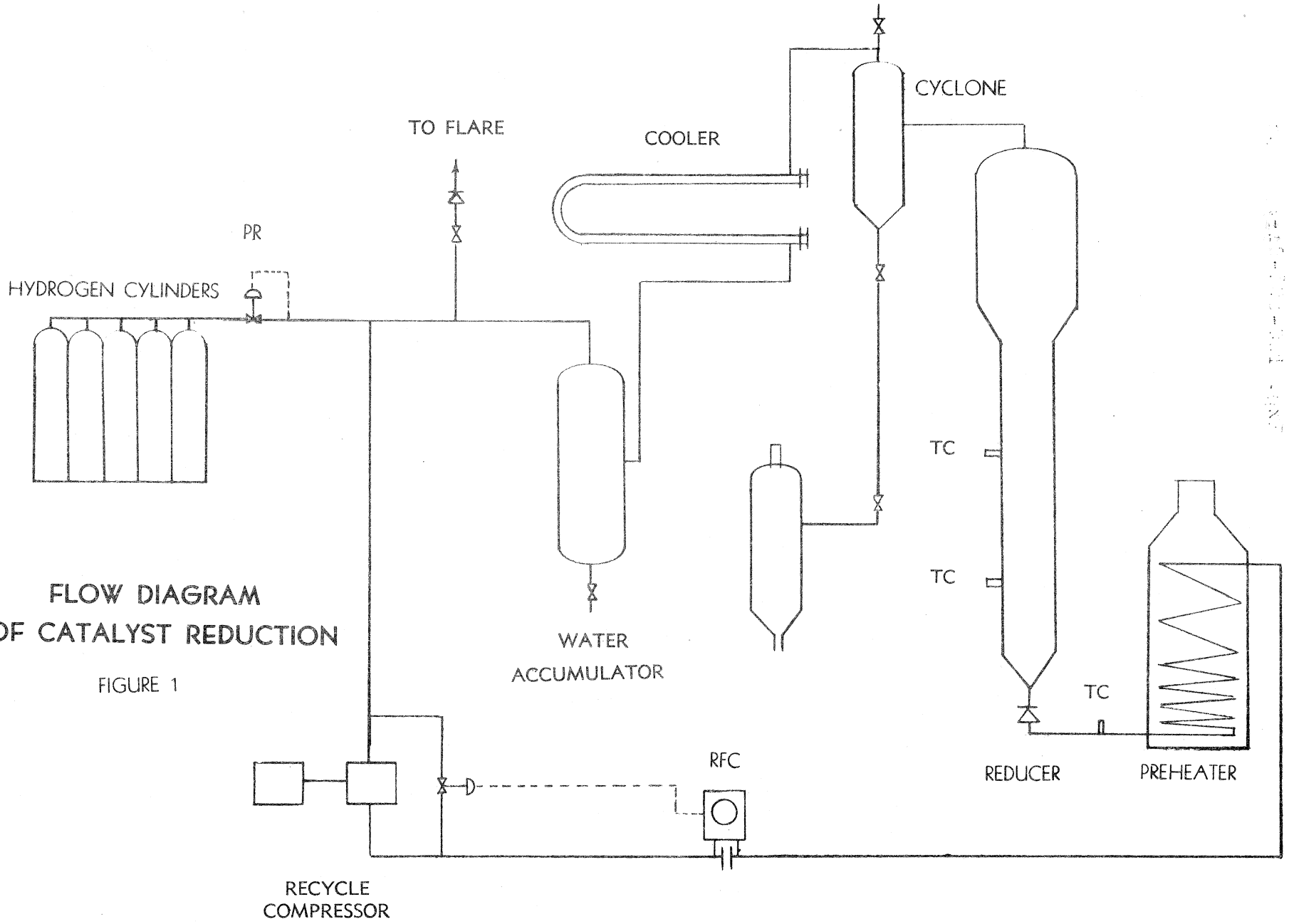
1. Synthesis Gas Generation

The synthesis gas mixture of carbon monoxide and hydrogen was the product of the uncatalyzed reaction between natural gas and oxygen at 280 psig and at temperatures in the 2300°F. range. The natural gas normally contained approximately 85 per cent methane, 1.5 per cent CO_2, 9.5 per cent ethane, 3.5 per cent propane, and small amounts of butane and nitrogen. The generator product gas was composed of hydrogen and carbon monoxide in the ratio of 1.5-1.7:1 and contained 4 per cent unconverted methane, two per cent carbon dioxide and less than one per cent nitrogen. The generator system has been described in detail in previous reports(1) and since it serves only as a utility unit for the reactor, no further details are included in the present report.

2. Catalyst Pretreatment and Reduction

Mill scale resulting from the rerolling of steel railroad rails served as the base material for the catalyst used in the present work. The scale was obtained from the Finkelstein Supply Corporation of Los Angeles, California, and sent to the Twining Laboratories of Fresno, California, for drying and grinding

(1) Partial Reports 5, 10, and 13, Experiment No. TDC-802



FLOW DIAGRAM OF CATALYST REDUCTION

FIGURE 1

A sieve analysis of the ground material gave the following results:

A.S.T.M. Sieve No.	Weight Per Cent
On 40	21.2
100	37.3
140	8.6
200	9.8
230	2.6
325	5.7
Through 325	14.8

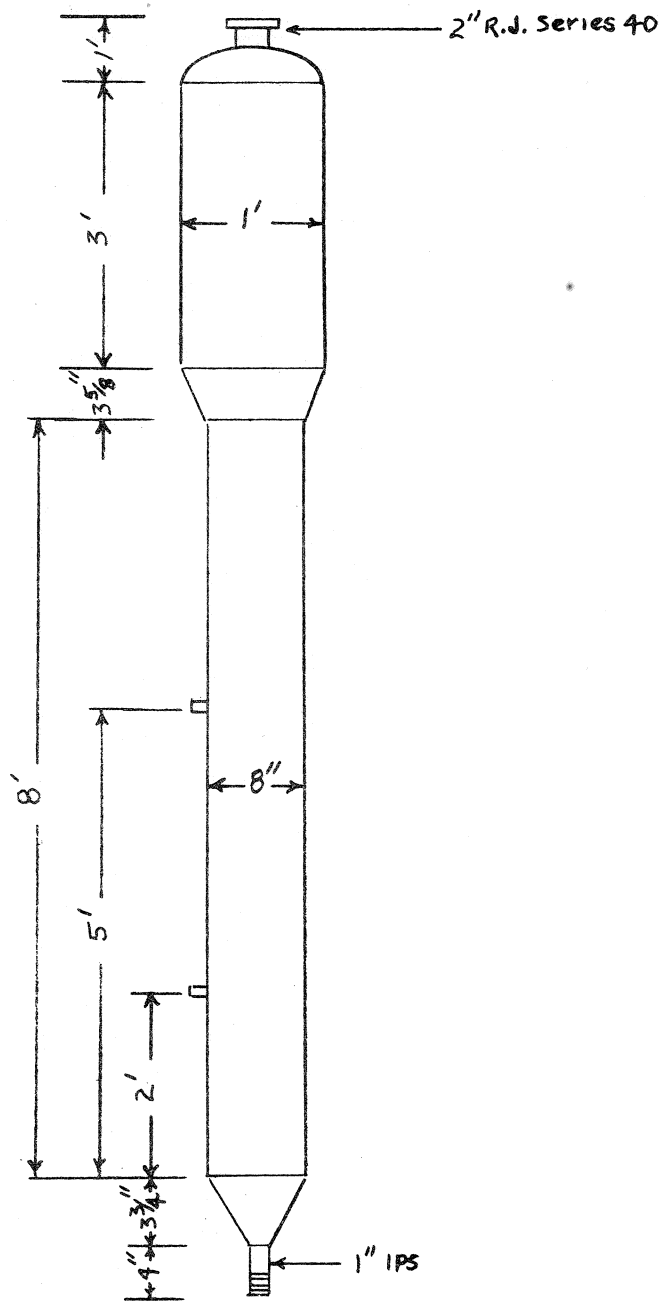
The impregnation of the mill scale with potassium carbonate was conducted in a rectangular steel gas-heated tray in batches of 250 to 1000 pounds. An amount of carbonate sufficient to provide 1.0 part K_2O/100 Fe was dissolved in steam condensate and poured over the mill scale in the tray. Additional condensate water was added to make a thick slurry, after which the mixture was stirred thoroughly. While being dried by the heat of the gas burners it was raked frequently to prevent caking.

The dried catalyst was transferred to the reduction system, shown in Figure 1 facing, and Figure 2 following, and treated with Linde cylinder hydrogen at 200 psig and at temperatures varying from 625 to 725°F. During the reduction the hydrogen was recycled after being cooled to approximately 80°F. to remove the bulk of the water. Make-up hydrogen was added to the system as required to maintain operating pressure.

The catalyst was considered sufficiently reduced when water production decreased to approximately one-tenth pound per hour. After reduction and prior to use the catalyst was kept blanketed and handled in an atmosphere of carbon dioxide obtained by the evaporation of "dry ice" furnished by Pure Carbonic, Inc., of Los Angeles, California.

CATALYST REDUCER

FIGURE 2



Natural gas was used as a purging medium to remove air from the reactor system. The reduced catalyst was then charged to the reactor and bed temperatures brought to the desired level by circulating hot natural gas before introducing the synthesis gas. In previous work with the unstirred reactors hydrogen had been used prior to the synthesis gas, but the heat loss from the Stratco Reactor was so great that it was impossible to preheat the catalyst bed to a sufficiently high temperature with hot hydrogen.

3. Synthesis System.

a. Description of Synthesis Reactor

The synthesis vessel, known as the Stratco Reactor or Stratco Contactor, made use of a mechanically-stirred catalyst bed cooled by oil jackets containing Regal Oil K (R & O). The overall height was 29 feet and the height of the reaction zone was 21 feet. The outside diameter of the uninsulated vessel was 16 inches.(1)

The synthesis gas entered the bottom and was carried along with some catalyst by the impellers on the center shaft. When the catalyst and gas got near the top, most of the catalyst dropped down into a chamber (annulus)(2) surrounding the stirring chamber, while the gas and catalyst fines continued upward. The catalyst that dropped down was recirculated. At the top of the reactor there was a multi-vaned spinner arrangement which rejected most of the fines entrained in the gas and returned this catalyst back down into the reactor.

---

(1)Stratford Engineering Corporation Drawing No. 1814C1.

(2)A glossary of terms used with the Stratco Reactor System is in Appendix I, page 29.

The effluent gas left the reactor and passed through an external cyclone, then to a product condenser, and finally to a product separator. The non-condensable gas was used for recycle gas, the excess having gone to the flare as wet gas.

Flow diagrams are shown in Figures 3, 4, 5, 6, and 7, pages 8 through 12.

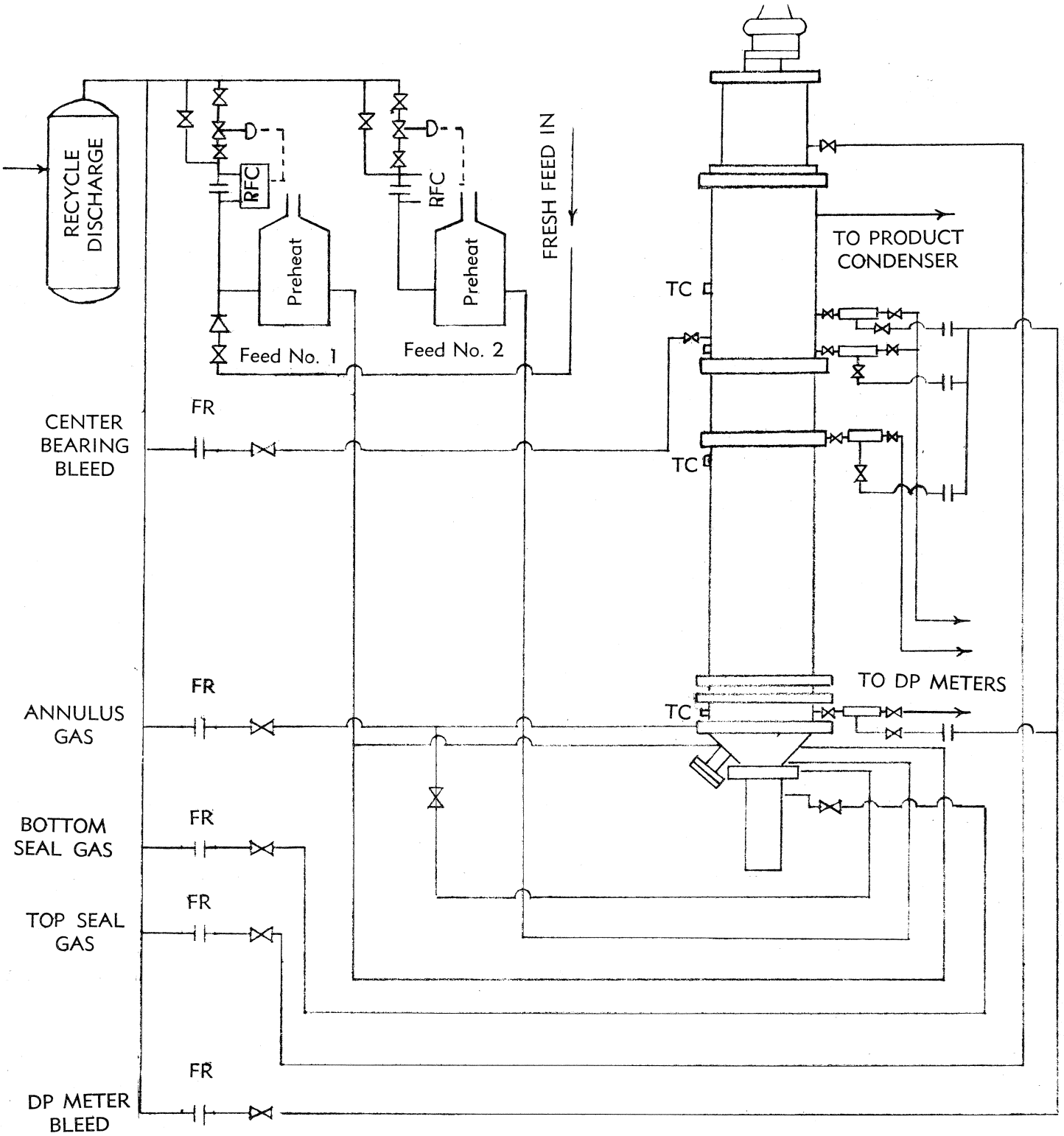
b. Methods of Sampling and Analysis

Prior to Run 42-C, 24-hour composite gas samples were collected by displacement of 0.1 per cent sulfuric acid solution. There was some indication that the wet-gas samples were being affected by the acidified water solution so that, beginning with Run 42-C, spot gas samples were taken in dry aluminum bombs and no composites were made. The 24-hour composite samples had been composed of samples of gas taken at two-hour intervals. The bomb samples were taken every four hours, but normally only every other bomb sample was analyzed and a 24-hour average made of these analyses.

The liquid product samples were taken directly from the product separator into glass bottles.

The catalyst samples were taken in bombs which were cooled with "dry ice" before being opened. The cooled catalyst was removed to jars containing pieces of "dry ice" to keep a blanket of carbon dioxide on the pyrophoric material. After the catalyst had been stored in the presence of the carbon dioxide, it usually lost its pyrophoricity.

All gas analyses, including those for carbon dioxide, were made with a Consolidated Engineering Corporation mass spectrometer. Orsat analyses were made of the synthesis gas from

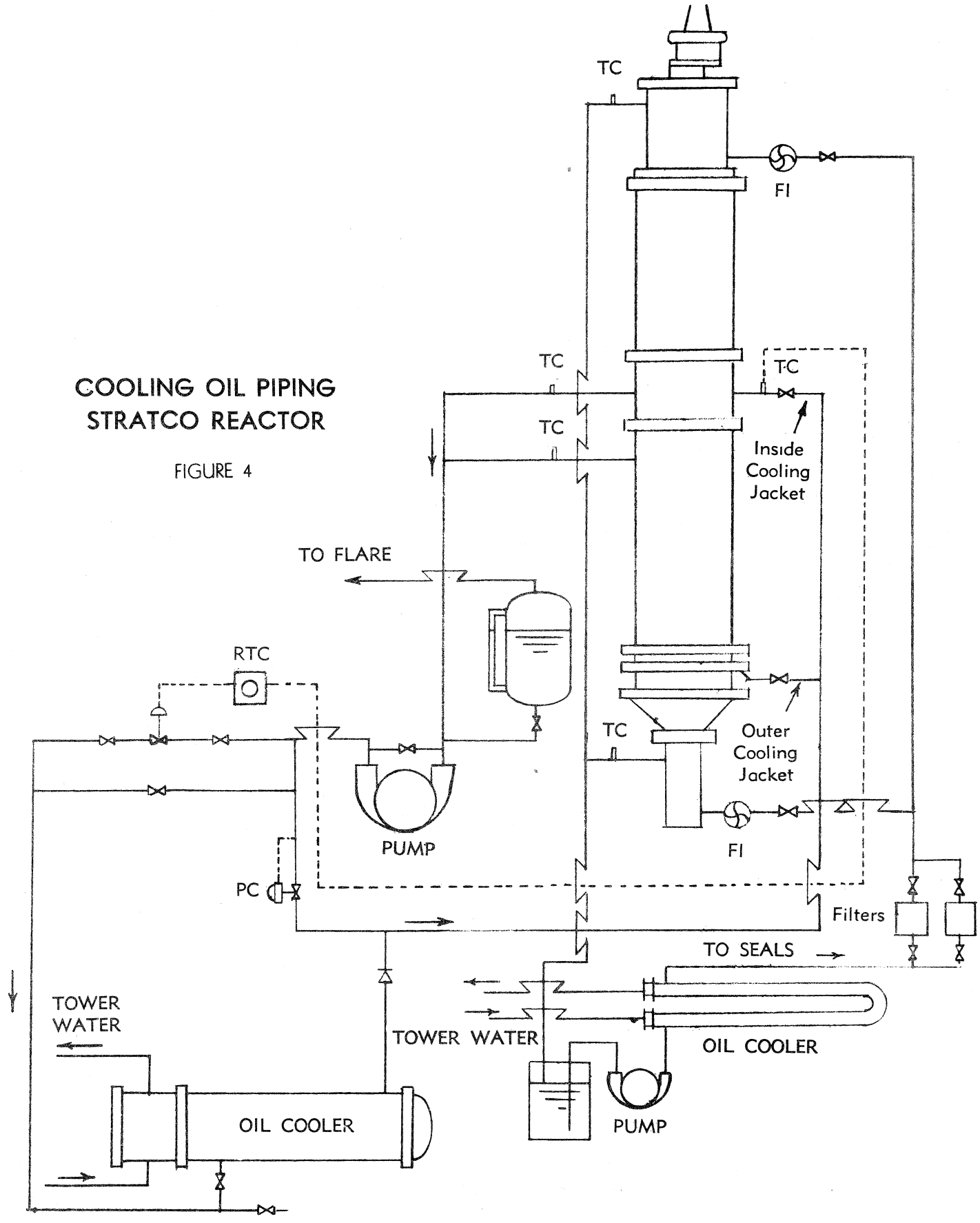


PIPING LAYOUT FOR GAS FLOW
STRATCO REACTOR

FIGURE 3

COOLING OIL PIPING STRATCO REACTOR

FIGURE 4



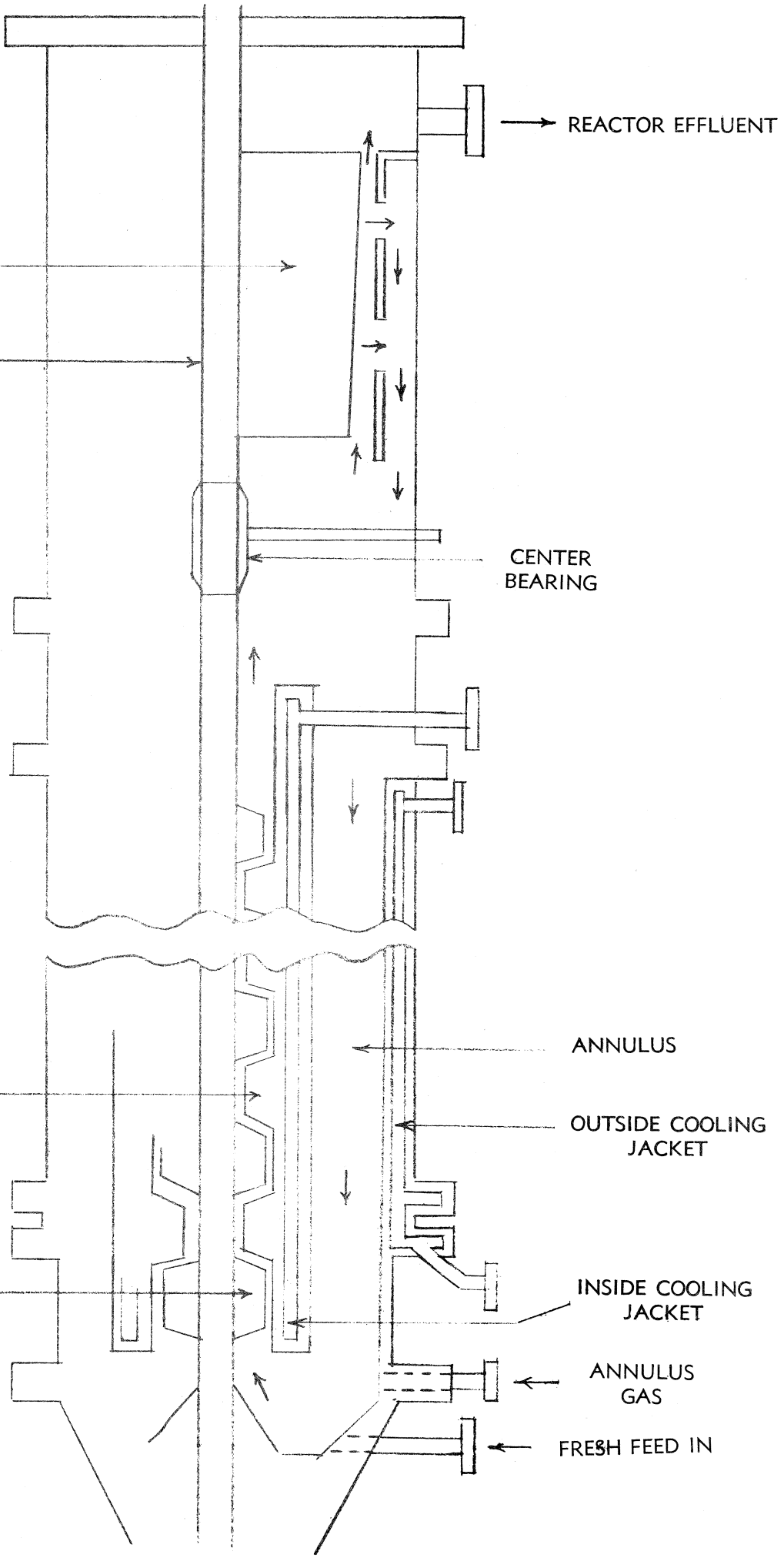


DIAGRAM OF STRATCO REACTOR

FIGURE 5

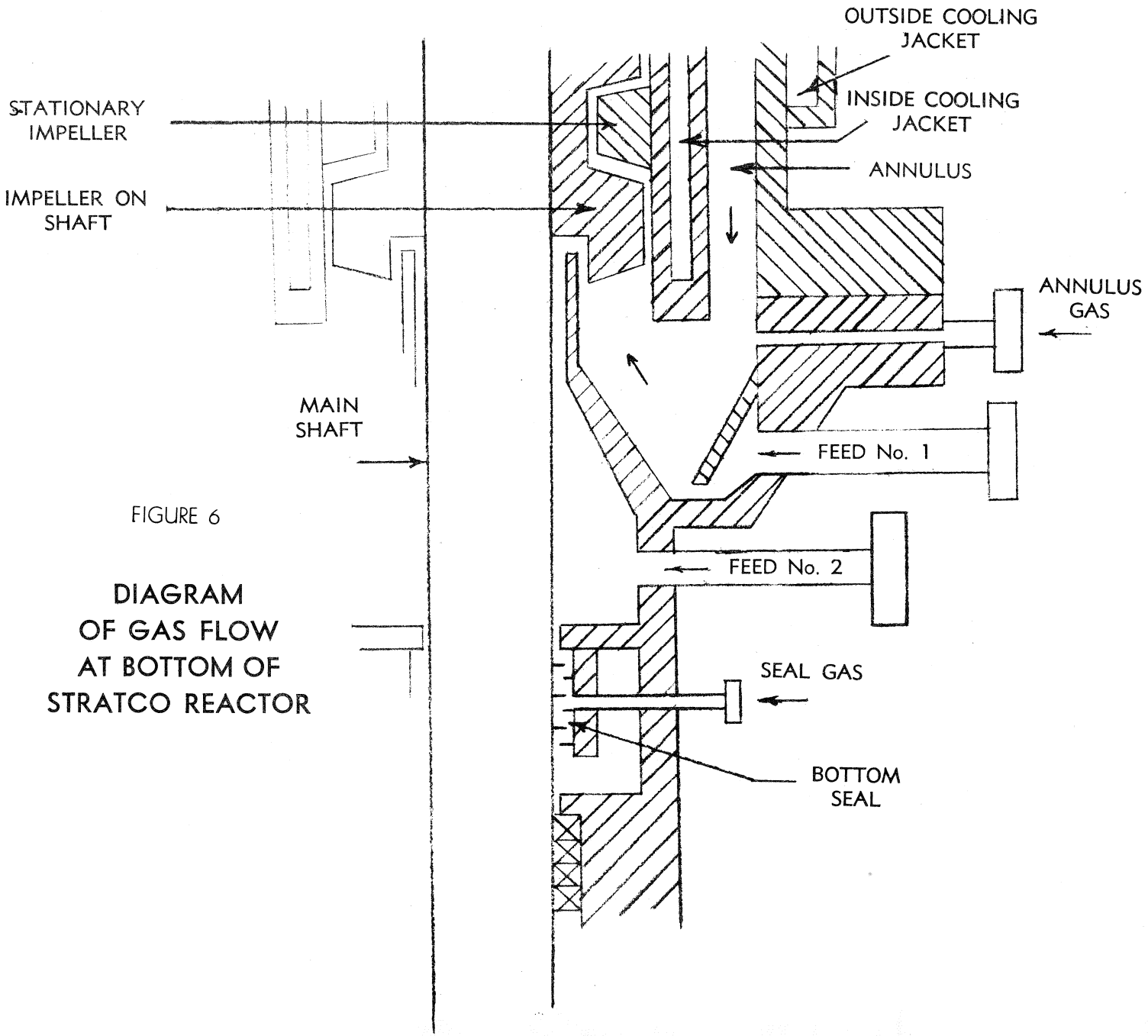
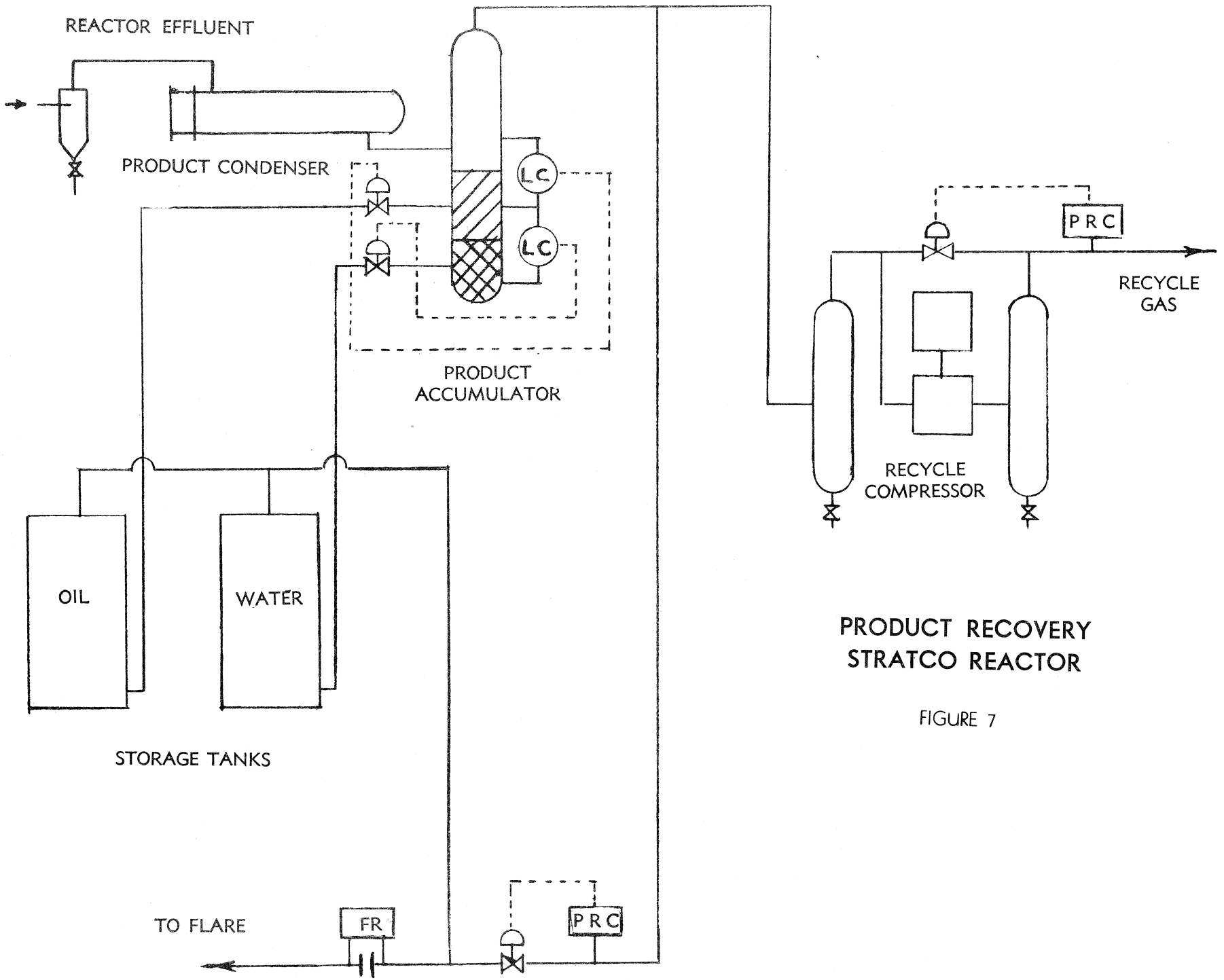


FIGURE 6

DIAGRAM OF GAS FLOW AT BOTTOM OF STRATCO REACTOR



PRODUCT RECOVERY
STRATCO REACTOR

FIGURE 7

the generator but these were only for control purposes.

The tests made on catalyst and product were by methods found in The Texas Company Standard Methods of Test Book or Special Methods of Test Book. The specific surface of the catalyst was determined by ammonia adsorption. It must be pointed out that this method was devised and calibrated using F.C.C.U. catalyst and does not give absolute values for specific surface of iron catalyst. It may, however, give an indication of the change in specific surface of iron.

The specific gravity of the catalyst was determined by using carbon tetrachloride and a picnometer.

The alcohol content of the water was determined by salting out with potassium carbonate at 40°F. to 50°F.

c. Methods of Calculation

The yield data used in this report were obtained by forcing the weight balances on the assumption that any losses or gains were in wet gas flow measurements. The liquid hydrocarbon yields were calculated by the difference in carbon balances, and the water yields were calculated by difference on both hydrogen and oxygen balances.

B. EXPERIMENTAL RESULTS

Since the Stratco Reactor was by nature a complicated machine, the difficulties encountered in its operation were quite different from those experienced in previous reactors which did not use power to fluidize the bed. The reactor was the first one of its particular kind to be built and as originally constructed, was not designed to be operated at the 250 psi pressure level used in the runs. These factors necessitated an extended shakedown and

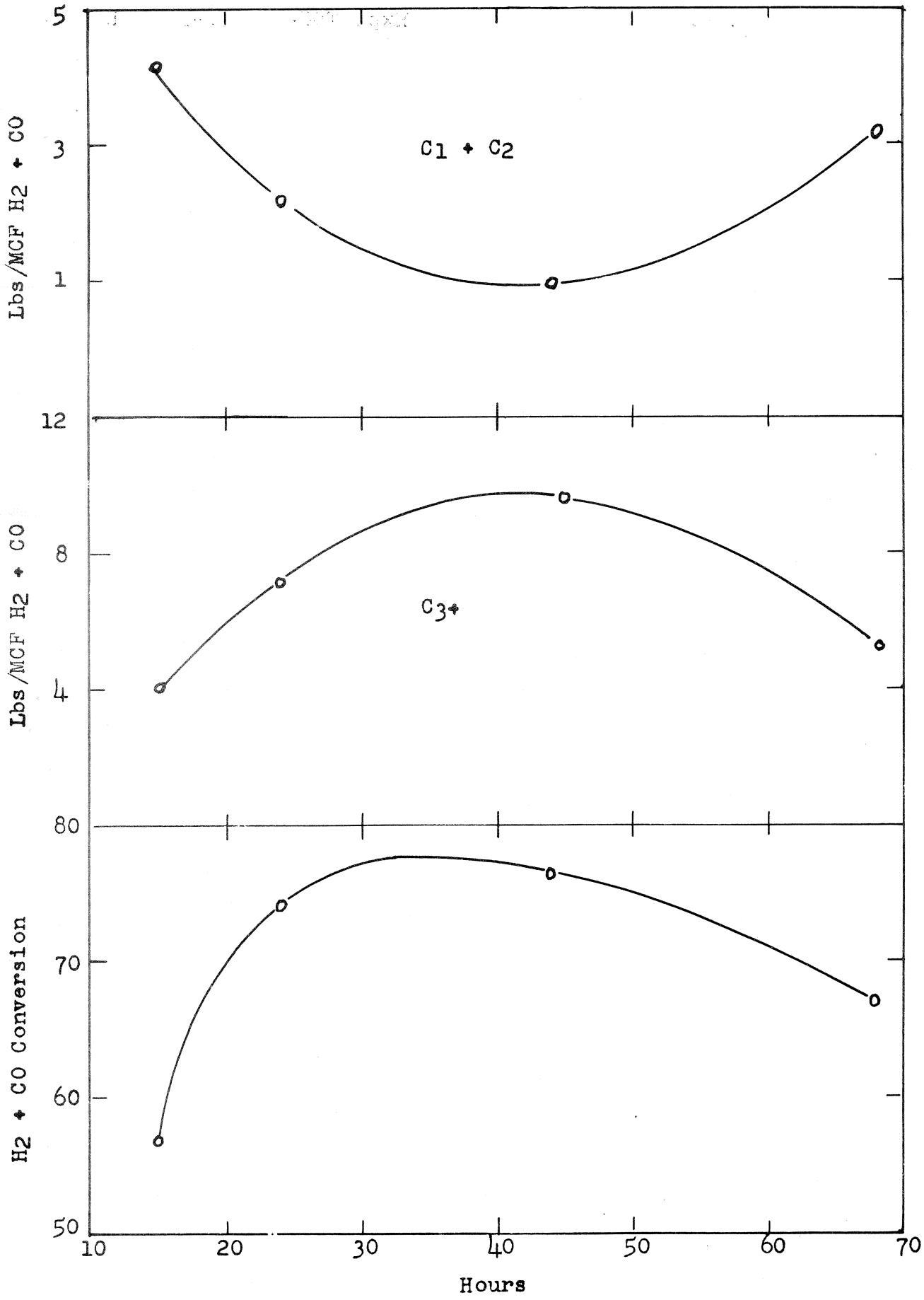


FIGURE 8
RUN 39

personnel training period during which many changes were made. Runs 39, 40, and 41 may be considered as part of this training and shakedown period and are discussed only briefly in the present report. Emphasis is placed on the data from Run 42 because this run was relatively long and unencumbered by mechanical difficulties, and the data were consistent from day to day.

1. Run 39

Run 39 was the first synthesis run made on the Stratco Reactor. A total of 743 pounds of reduced mill scale catalyst was used during the period. Considerable difficulty was experienced with maintaining the center shaft at a constant speed. The turbine stalled frequently, and finally the run was ended after 68 hours when it became impossible to turn the main shaft.

The yields of $C_1 + C_2$ and C_{3+} have been plotted chronologically as pounds yield per thousand cubic feet of $H_2 + CO$ fed. These data are given in Figure 8, opposite. In the same figure is shown the $H_2 + CO$ conversion variation with time.

The yields of $C_1 + C_2$ declined to a minimum of 1.13#/MCF of $H_2 + CO$ and then increased again to 3.22#/MCF during the last 24 hours of operation. The C_{3+} yields reached a maximum of 9.70#/MCF of $H_2 + CO$ after 44 hours of operation. The conversion of $H_2 + CO$ increased from a low of 57.1 per cent to about 78 per cent after 35 hours and then decreased to 66.9 per cent after 68 hours.

The yields were calculated during this run without forcing the wet gas to make 100 per cent weight balance. Since the overall weight balances on the reactor varied between 68 per cent (Run 39-C) and 113 per cent (Run 39-D), these data should be viewed with caution.

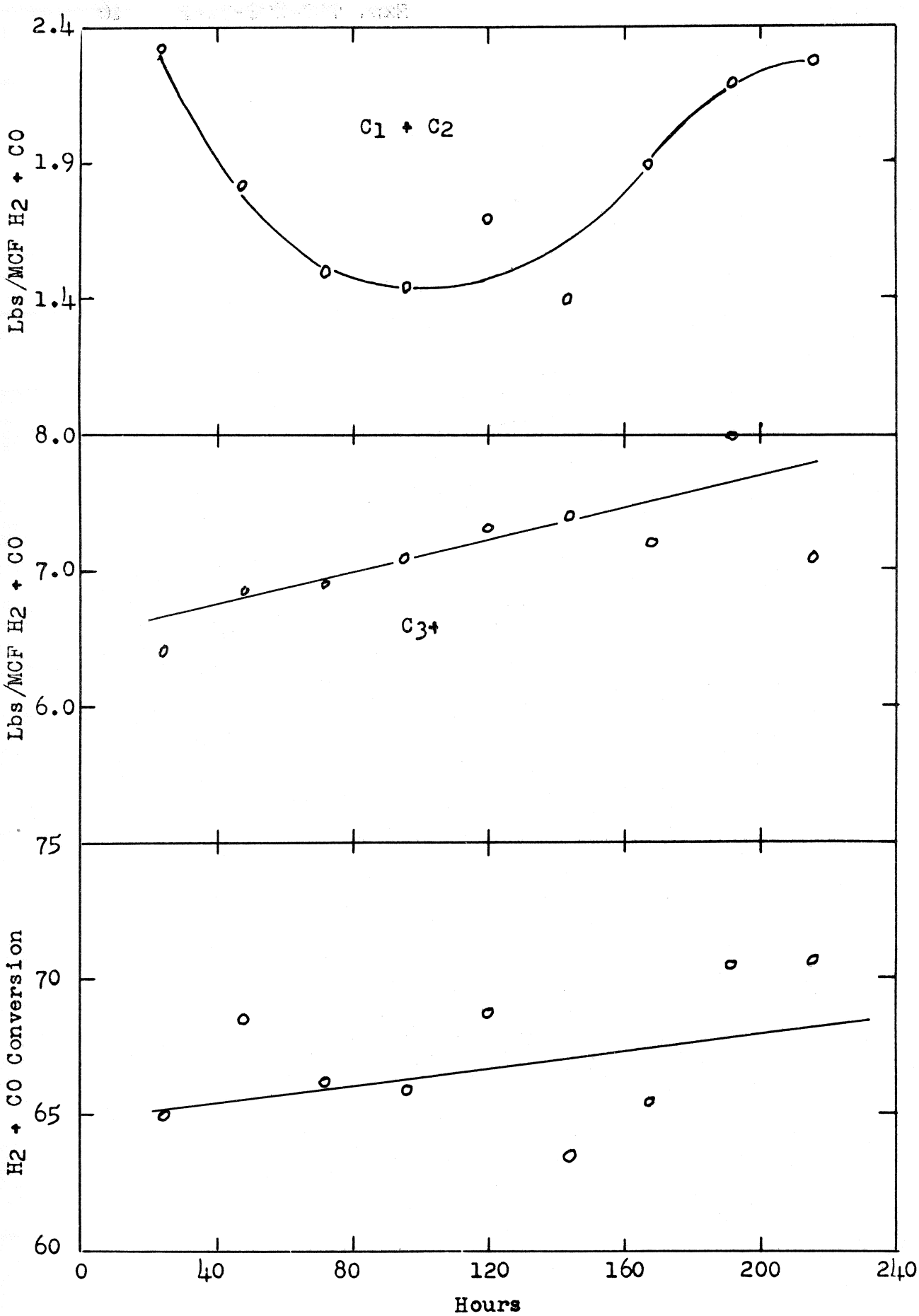


FIGURE 9
RUN 40

2. Run 40

Most of the catalyst was removed from the reactor in order to free the main shaft. Then Run 40 was started with 418 pounds of used catalyst from Run 39. Both fresh and used catalyst was charged during the run, making a total of 778 pounds used altogether.

The same shaft speed troubles were experienced in Run 40 as in Run 39. Various methods were tried to alleviate the trouble, such as varying the gas flows and temperatures; but it was decided finally that a larger turbine would be necessary, and the run was terminated after 216 hours.

Figure 9, opposite, shows the H_2 + CO conversion and yields of C_1 + C_2 and C_{3+} for Run 40. The yields from Run 40 were calculated the same as in Run 39. The weight balances were not as erratic, however, and usually were in the 85 to 90 per cent range.

The C_1 + C_2 yields declined steadily to about 1.4#/MCF H_2 + CO after 100 hours and then increased to 2.27#/MCF H_2 + CO after 216 hours. The C_{3+} yields and H_2 + CO conversion both increased steadily as the run progressed.

3. Run 41

A larger turbine was installed for Run 41, and although it solved the problem of controlling the speed of the main shaft and impellers, the circulation of the catalyst was so poor that the run was continued only 79 hours. There were 994 pounds of catalyst charged to the reactor for this run. Figure 10, following, shows the C_1 + C_2 and C_{3+} yields and the H_2 + CO conversion data for Run 41.

The yields of C_1 + C_2 declined to a minimum of 2.0#/MCF

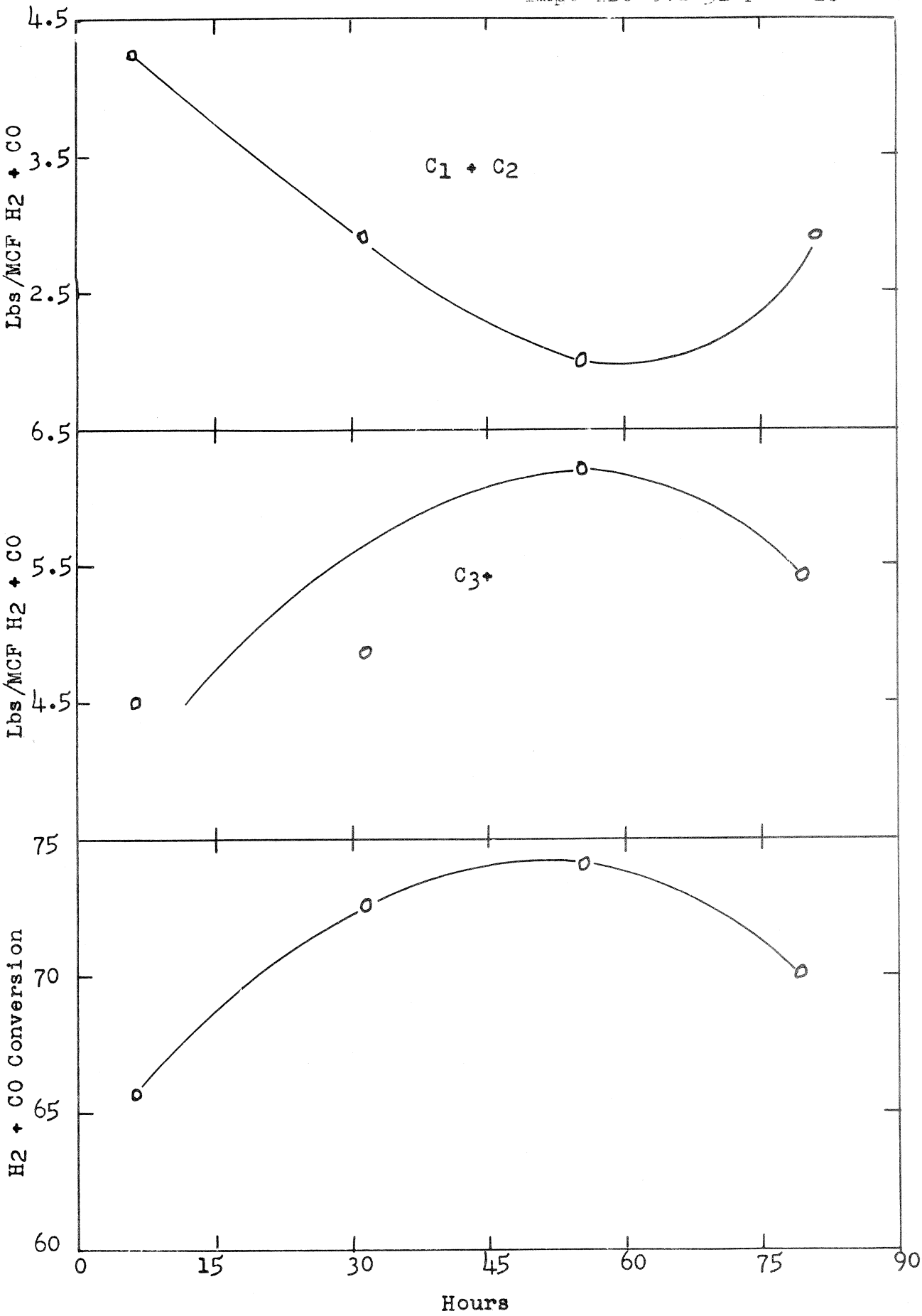


FIGURE 10
RUN 41

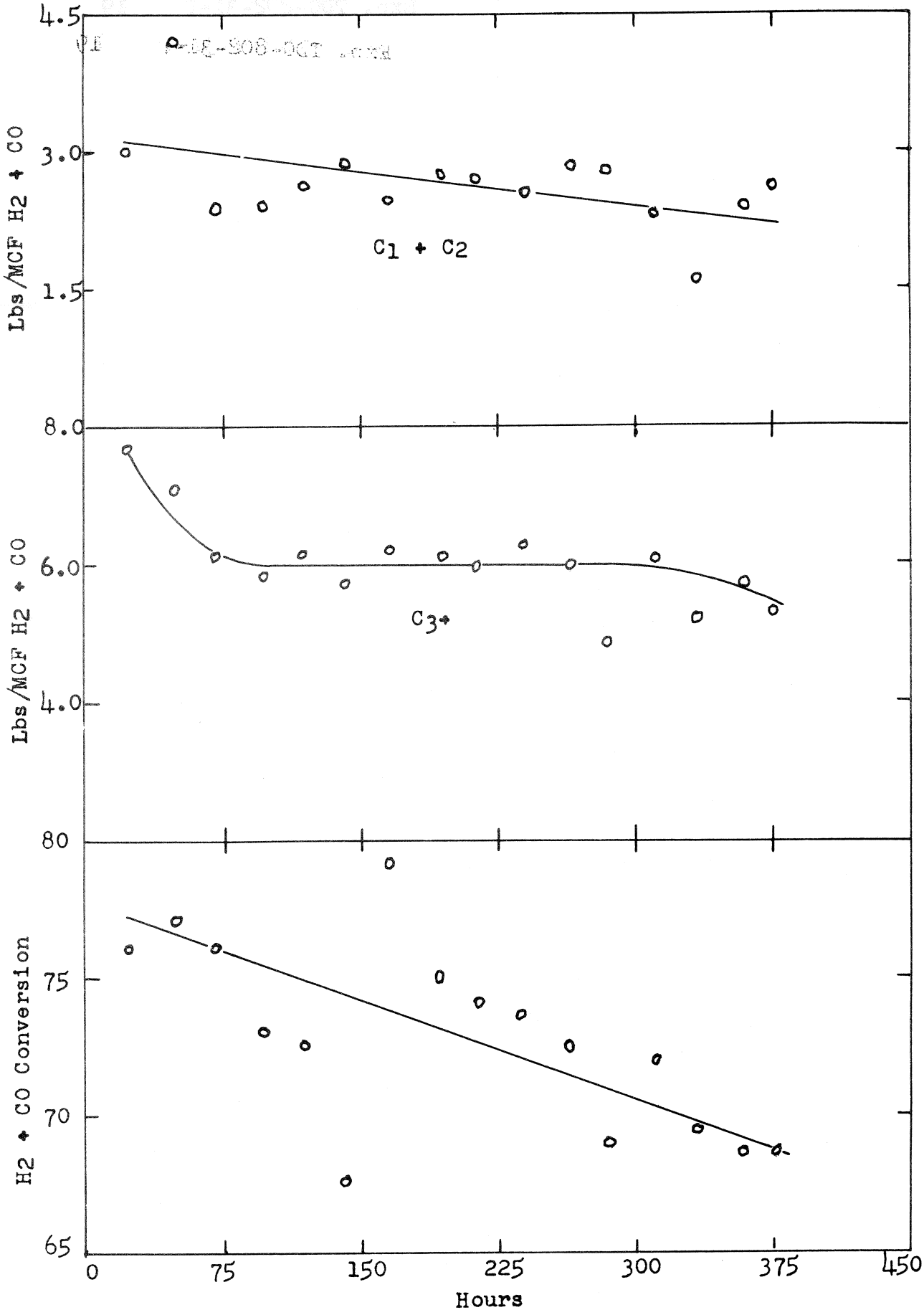


FIGURE 11
RUN 42

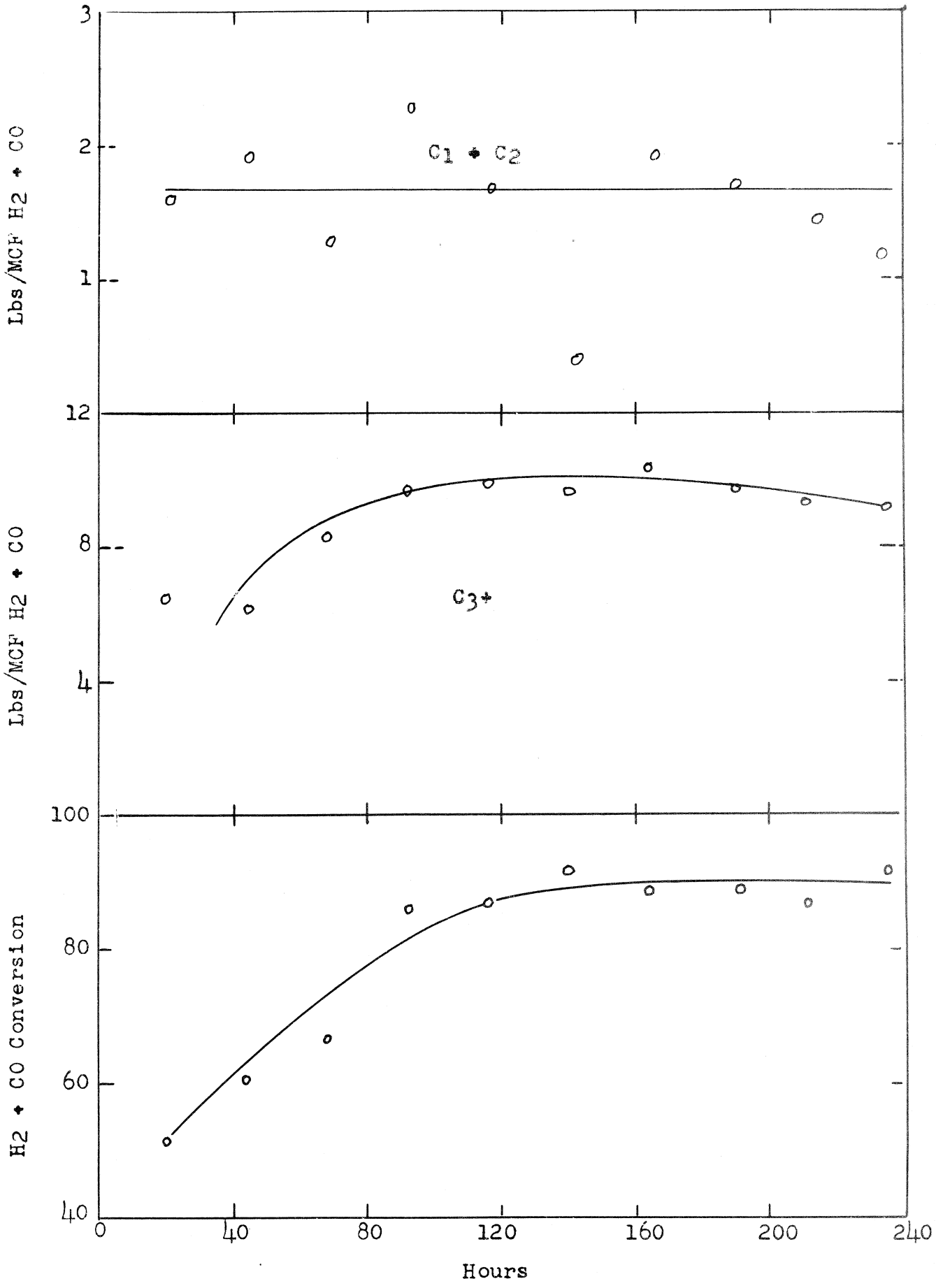


FIGURE 12
RUN 22

H_2 + CO and then increased again to 2.9#/MCF H_2 + CO. The minimum was reached after 55 hours. At the same time, the C_{3+} yields and H_2 + CO conversion had risen to maximums of 6.3#/MCF H_2 + CO and 74 per cent respectively.

4. Run 42

Run 42 continued for 378 hours and was the longest one made on the Stratco Reactor. A total of 899 pounds of catalyst was used. In general no mechanical difficulties were encountered until the run was terminated by an explosion in the generator system. The explosion, which split several pieces of pipe, was caused by a failure in the natural gas supply which created a large excess of oxygen in the fresh feed gas going to the reactor. An alarm, governed by the ratio of oxygen to gas flowing to the generator, was installed to prevent a recurrence of this incident.

Figure 11, page 19, shows the H_2 + CO conversion and yields of C_1 + C_2 and C_{3+} for Run 42. For comparison, the same type of data from Run 22 is shown in Figure 12, page 20. Run 22 was made with KF promoted pyrites ash catalyst on the original Montebello Vertical Tubular Reactor.(1) The yields of C_{3+} were considerably higher in Run 22, whereas the less desirable yields of C_1 + C_2 were lower. The 400 end-point fraction of the product oil was about 10 to 15 per cent higher in Run 42 than in Run 22 and reached a maximum of 82.6 per cent after 360 hours operation.

During a portion of Run 42, the methane content of the fresh feed varied between 1.6 per cent and 6.7 per cent while most other conditions remained constant. The fresh feed and wet gas were sampled every eight hours at identical times. This

(1) Partial Report No. 13, Experiment No. TDC-802

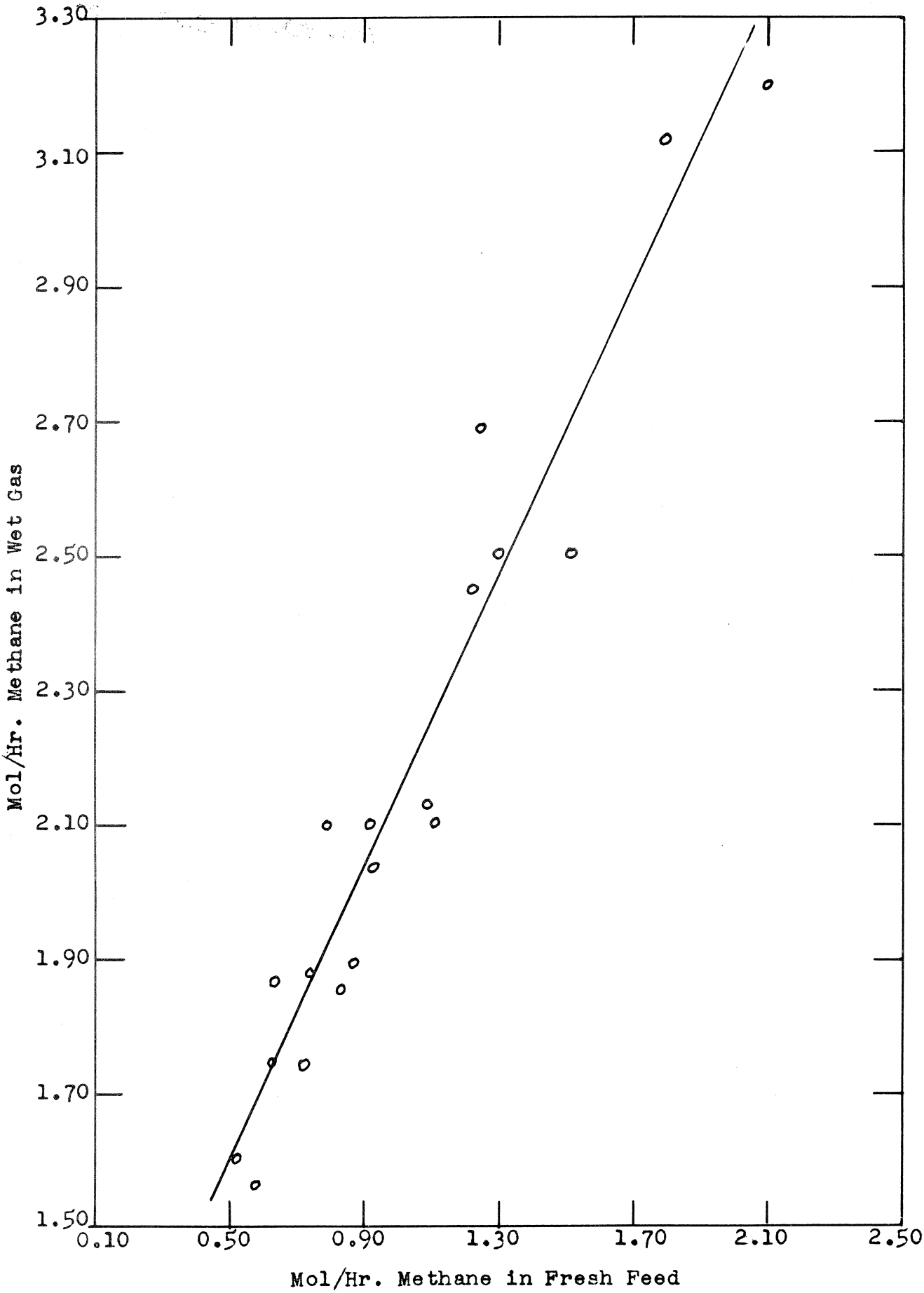


FIGURE 13
RUN 42

afforded an excellent opportunity to study what effect the methane content of the fresh feed had on the methane yield of the synthesis unit.

In Figure 13, opposite, the moles per hour of methane in the wet gas were plotted against moles per hour of methane in the fresh feed. This plot was a straight line and indicated that the methane yield of the reactor was almost constant during the test period, varying between 1.1 moles per hour and 1.2 moles per hour.

The catalyst particle size distribution for Run 42 is compared with that of Run 22 in Table I below. There was no make-up catalyst added to the reactor in Run 42 except for one charge of 120 pounds after 30 hours operation, but there were considerable amounts of catalyst added to the reactor at frequent intervals during Run 22.

TABLE I

Run No.	22	42	22	42	22	42	22	42	22	42
Hours	21	24	69	72	93	96	189	192	237	240
Microns										
420+	3.6	19.2	2.8	14.4	2.8	5.6	1.5	0.6	2.3	0.4
419-150	19.2	30.6	19.3	44.6	9.8	48.2	9.1	61.6	9.2	44.7
149-105	24.4	8.3	22.7	7.4	12.5	8.4	8.2	13.6	8.8	17.8
104-74	18.6	9.7	20.6	9.6	10.9	9.4	11.2	8.4	8.3	9.6
73-62	5.0	8.1	4.4	3.4	5.1	6.2	0.9	2.8	1.1	3.4
61-44	10.8	7.5	11.5	8.8	4.1	7.0	1.1	5.0	1.2	11.2
43-0	18.4	16.6	18.7	11.8	54.8	17.2	68.0	8.0	69.1	12.8

In order to give a picture of the size of the Stratco Reactor relative to throughput, some yield and dimensional data are given in Table II for Runs 42 and 45.(1) Run 45 was made on a conventional type Vertical Tubular Reactor using the same type of catalyst and approximately the same flow conditions as existed in Run 42.

The data indicate that yields of the same magnitude

(1)More complete data for Run 45 will be found in Partial Report 32 Experiment No. TDC-802.

were obtained with the Stratco Reactor as with the Vertical Tubular Reactor, using the same quantities of fresh feed, but at the expense of using a complicated vessel of twice the bulk size.

If it be assumed that most of the synthesis reaction takes place in the center tube (stirred section), then it appears that this section has very good reaction efficiency in view of the high space velocity in this section. This is more than offset, however, by the low efficiency in the annulus, making the overall efficiency lower than that of the Vertical Tubular Reactor.

TABLE II

	Run 42			Run 45	
	Gross	Net Open Space Used	Center Tube Open Space	Gross	Net Open Space Used
Height, Ft.	21	13	12	19	8
Cross Section, Sq. Ft.	1.4	0.6	0.275	0.79	0.66
Volume, Cu. Ft.	29	7.8	3.3	15	5.3
Feed Rate, SCFH	12,000	12,000	12,000	12,000	12,000
SCFH/Cu.Ft. Reactor	400	1,500	3,600	800	2,300
Yield, Gals. of C_{3+}/MCF H_2 + CO	1.2	1.2	1.2	1.2	1.2

5. Run 43

Run 43 was the last run of the present series made on the Stratco Reactor. The total number of hours on stream was 168 and the number of pounds of catalyst used was 1359. The system was shut down when a slug of water carried over from the generator system into the reactor, lowering the catalyst temperature and stopping the synthesis reaction.

The fresh feed rate during the last 48 hours on stream was about half of the rate which existed during the first 72 hours of the run, and the recycle to fresh-feed ratio was about doubled

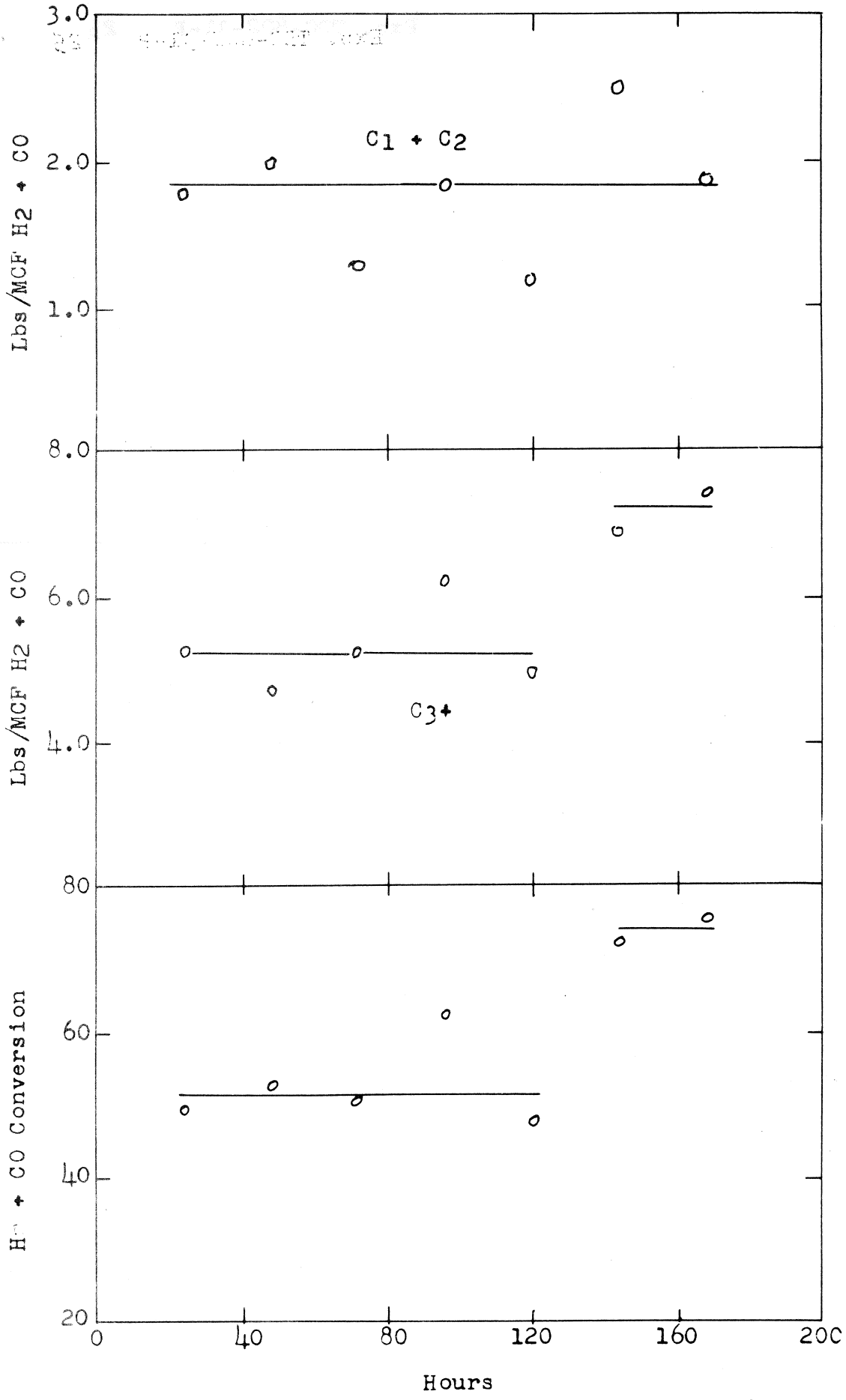


FIGURE 14
RUN 43

by lowering the feed rate. This change in feed rate was accompanied by an increase in yields of C_{3+} and an increase in $H_2 + CO$ conversion as shown in Figure 14, opposite.

6. Suggested Changes in the Stratco Reactor

It is thought that the operability of the Stratco Reactor for hydrocarbon synthesis could be improved by increasing the diameter-to-length ratio of the main shaft to reduce vibration and whipping. This could be accompanied by an increase in the volume of the reaction (stirred) zone in relation to the volume of the annulus. The outside cooling jacket possibly may be eliminated. In actual operation the outside jacket was used only as an air jacket in the runs discussed in this report. A change in design of the outside of the vessel to allow better insulation would be helpful because the heat loss from the Stratco Reactor was much higher than from the conventional type.

III. CONCLUSIONS

1. There was no indication that the stirred-bed Stratco Reactor possessed any advantages over a conventional fluid type such as the Montebello Vertical Tubular Reactor.

2. The net yield of methane from the reactor remained practically constant over a wide range of methane content of the fresh feed, when other variables were held constant.

3. When other conditions remained the same, a drop in feed rate accompanied by an increase in recycle ratio produced higher yields of C_{3+} and better conversion of $H_2 + CO$.

IV. RECOMMENDATIONS

No recommendations are made at this time.

V. FUTURE WORK

No future work is planned for the Stratco Reactor. There is a possibility of using this type of reactor with a slurry system of catalyst in oil for the production of heavier hydrocarbons or oxygenated derivatives.

REPORT PREPARED BY W. L. Slater

APPROVED BY A. B. Eastman/RAB

WLS:HV

WEK-LCKJr-CEL-WJC-dBE
WMS-RFB-KGM-JMB

WORK DONE BY

du Bois Eastman	Ass't. Dir. of Research
Gordon Kiddoo	Chemical Engineer
W. L. Slater	Chemical Engineer
J. B. Malin	Mechanical Engineer
Clyde Potter	Operator
James Elliott	Operator
Lawrence Estabrook	Operator
Gerald Scott	Operator
Cecil Mitchell	Operator Helper
Loris Javine	Operator Helper
Doyle Moore	Operator Helper
Willard Herrick	Operator Helper
Elwood Smith	Operator Helper
Thomas Foster	Operator Helper
Lloyd Jackson	Operator Helper
Harley Heins	Operator Helper
Charles Turbyfill	Operator Helper
Harlan Crystal	Operator Helper
Roy Gothard	Operator Helper
Ernest Brown	Operator Helper
John Hughes	Operator Helper
Lowell Bell	Operator Helper

Analytical Work - Mass Spectrometer

Arthur Edwards	Chemist
Eugene Metcalf	Operator Helper
Ralph Ricketts	Operator Helper
William Sample	Operator Helper
Alfred Whitmore	Operator Helper

REPORT WRITTEN BY

W. L. Slater — Chemical Engineer

WEK-LCKJr-CEL-WJC-dBE
WMS-RFB-KGM-JMB

VI. APPENDIX I

GLOSSARY OF TERMS

GLOSSARY OF TERMS USED WITH STRATCO REACTOR SYSTEM

FRESH FEED - Fresh synthesis gas direct from the generator. Consists of approximately 33 per cent carbon monoxide, 60 per cent hydrogen, some carbon dioxide, some methane, and a little nitrogen.

FEED NO. 1 - Consists of all of the fresh feed fed to the reactor plus part of the recycle gas.

FEED NO. 2 - Consists of 100 per cent recycle gas.

RECYCLE GAS - This is approximately the same composition as wet gas. It is gas containing some unreacted synthesis gas and is fed back to the reactor to obtain more complete reaction.

WET GAS - Effluent gas from the reactor after all of the product oil and water have been removed by condensation. Consists of 10-25 per cent carbon dioxide, 2-15 per cent carbon monoxide, 40-55 per cent hydrogen, 8-15 per cent methane, small amounts of heavier hydrocarbons, and some nitrogen.

d-P BLEED GAS - Small flow of recycle gas used to purge the d-P meter taps.

TOP AND BOTTOM SEAL GASES - Small flow of recycle gas used to purge the seals to keep them free of catalyst.

SEALS - Mechanical means of sealing the reactor where the center shaft extends out of the top and bottom.

ANNULUS OR ANNULAR SPACE - The chamber surrounding the center impeller chamber. The catalyst drops down into this chamber and feeds into the bottom of the impeller space where it is circulated again.

ANNULUS GAS - Recycle gas used to fluidize the catalyst in the bottom of the annulus to prevent it from packing.

CENTER BEARING BLEED - Recycle gas fed to the guide bearing around the center of the shaft. Its use is to prevent catalyst from getting on the bearing surfaces, and it is also used as a carrier for the bearing lubricant.

TURBINE - Steam turbine on top of reactor structure used to turn the main shaft of the reactor. On this shaft are the multi-vaned spinner for catalyst separation, and the impellers for catalyst circulation.

COOLING OIL JACKETS - In the reactor there are two jackets through which oil is circulated to remove the heat of reaction. Jacket No. 1 is around the impeller chamber and is surrounded by the annulus. The oil enters the top of this jacket, circulates vertically, and comes out at the top opposite where it enters. Jacket No. 2 is around the annulus and forms the outside of the reactor vessel. The oil enters this jacket at the bottom and circulates upward in a spiral until it leaves at the top, directly above where it enters at the bottom.

VII. APPENDIX II

DETAILED EXPERIMENTAL DATA

THE TEXAS COMPANY — MONTEBELLO LABORATORY

DATA SUMMARY SHEET

Synthesis Run Number 394 From April-22-48 Hr. 1200 to April-23-48 Hr. 0300

FLOWS	SCFH	%
Oxygen	3361	
Nat. Gas	5019	
Total	8380	40.1
Fresh Feed	12065	
F. F. by C	13634	
Avg. F. F.		
Wet Gas	7224	
Contraction	–	40.1
Recycle	24728	
Bleed	3403	
Total	28131	
Total Feed	40196	
Recycle/F.F.	2.33	
Inlet Vel.		
Steam Flow		

RUN CONDITIONS	
Generator Press.	275
O_2 Preheat, °F	333
Gas Preheat, °F	725
Reactor Press.	253
Steam Back Press.	
Temperatures, °F	
Heater Outlet	
Catalyst #1	621
#2	514
PRE-HEAT #3	769
" #4	744
#5	
Average	
Product Separator	

DISTILLATIONS	A S T M				Hempel Dist.		
					°F	%	A.P.I.
Prod.	GAS OIL						
A.P.I.	38.5				to 400	56.6	50.5
I.B.P.	138				400-550	24.6	35.1
5%					550+	18.8	
10%	198						
20	222						
30	242						
40	258						
50	278						
60	294						
70	318						
80	338						
90	362						
95	386						
E.P.	406						
Rec.	98.0						
Res.	1.0						
Loss.	1.0						

WATER	
Temp.	%
200	
203	
208	
WATER A.P.I.	9.3

CATALYST DATA	
In Reactor at Start of Period	638
Fresh Catalyst Charged	–
Catalyst Recharged	–
Total	638
Catalyst Taken Out	10
In Reactor at End of Period	628
Reactor d-P, H_2O	84.0
Pounds in Reactor	
Density, lbs./cu. ft.	
Bed Height, Feet	
Space Vel. SCFH/lb. cat.	
Inventory Figures	64.01
From d-P Meters	

CATALYST ANALYSIS	Particle Size				
	Screen			Sedimentation	
	Frac.	M	%	M	%
	On 40	420+	18.0	80+	
	100	419-150	19.4	80-40	
	150	149-105	34.4	40-20	
	200	104-74	10.8	20-10	
	250	73-62	2.2	10-0	
	325	61-44	6.8		
	<325	43-0	8.4		
	Density, lbs./cu. ft.			Chem. Anal.	
	Aerated			% Fe	
	Settled			% C	
	Compacted			% Oil	
	Sp. Grav. 5.1			Specific Surface	
					m^2/gm

NATURAL GAS	%
CO_2	1.45
CH_4	85.74
C_2H_6	8.77
C_3H_8	3.64
C_4H_{10}	
N_2	
O_2	

PRODUCT INSPECTION					
	Oil	Water	Product	Pour °F	SUS @ °F
Neut. No.	45.1	42.7			
Sap. No.	52.6	40.8			
Hydrox. No.	46.1				
Bromine No.	66.9				
% Fe					
% Alc					

GENERATOR ELEMENTAL BALANCE

IN	Mol %	SCFH m/hr	C	H	O
O_2	285.18	8.87			17.74
CO_2	8.36	.19	.19		.38
CH_4	182.08	11.38	11.38	45.52	
C_2H_6	35.70	1.19	2.38	7.14	
C_3H_8	21.12	.48	1.44	3.84	
C_4H_{10}					
N_2					
Total		22.11	15.39	56.50	18.12

OUT	Mol %	SCFH m/hr	C	H	O
CO_2	2.27	.72	.72		1.44
CO	55.48	11.29	11.29		11.29
CH_4	4.47	1.58	1.58	6.32	
H_2	36.83	18.09		36.18	
N_2	.45	.14			
H_2O				10.78	5.39
Total		31.82	13.59	53.28	18.12

	FRESH FEED			WET GAS					RECYCLE	COMB. FEED		EFFLUENT		NET CHANGE ON REACTION									
					Measured		At Wt. Balance							Carbon		Hydrogen		Oxygen	Ultimate Oil			Unsats.
	%	m/hr	#/hr	%	m/hr	#/hr	m/hr	#/hr	m/hr	m/hr	%	m/hr	%	a/hr	%	a/hr	%	a/hr	#/hr	#/gal	gal/hr	%
CO	35.48	11.29	316.12	13.88	2.65	74.20			10.16	21.45	19.87	12.81	13.14	-8.64	-8.64	23.47			-8.64				
H2	56.83	18.09	36.18	44.79	8.54	17.08			32.79	50.88	47.14	41.33	42.40	-9.55			-19.10						
CO2	2.27	.72	31.68	12.76	2.43	106.92			9.34	10.06	9.32	11.77	12.07	1.71	1.71	15.15			3.42				
N2	.45	.14	3.92	1.45	.28	7.84			1.06	1.20	1.11	1.34	1.37	.14									
CH4	4.47	1.58	25.28	20.68	3.98	63.68			15.29	19.87	18.41	19.27	19.77	2.40	2.40	21.26	9.60						
C2H4				.97	.18	5.04			.71	.71	.66	.84	.91	.18	.36	3.19	.72						
C2H6				1.65	.31	9.30			1.21	1.21	1.12	1.52	1.56	.31	.62	5.49	1.86						
C3H6				.97	.18	7.56			.71	.71	.66	.89	.91	.18	.54	4.78	1.08			6.50	0.25	1.09	
C3H8				1.00	.19	8.36			.73	.73	.68	.92	.94	.19	.57	5.05	1.52						
C4H8				.68	.13	7.28			.50	.50	.46	.63	.65	.13	.32	4.61	1.04			6.92	6.10	1.13	
C4H10				.11	.02	1.16			.08	.08	.07	.10	.10	.02	.08	.71	.20			1.16	4.76	.24	
C5H10				.48	.09	6.30			.35	.35	.32	.44	.45	.09	.45	3.99	.90			6.30	5.43	1.17	
C6H12				.26	.05	4.20			.19	.19	.18	.24	.25	.05	.30	2.66	.60			4.20	5.50	.76	
OIL						(15.26)						.11	.11		1.09	9.65	2.18			15.26	0.50	2.35	
WATER												5.22	5.35				-.40		5.22				
TOTAL		31.83	413.18		19.06	318.92			73.12	107.94	100.00	97.48	99.99	12.79		100.01							
H2+CO		29.38																					
H2/CO		1.60			3.22					2.37		3.23											

ULTIMATE YIELDS	% C0 Fed	#/hr	H2 / C0 #/MCF	H2 / C0 g/M3	Gal/hr	H2 / C0 Gal/MCF	H2 / C0 cc/M3
C1+C2	29.94	52.74	4.37	77.90			
C3+	31.45	50.12	9.16	70.35			
C4+	21.62	34.20	2.84	48.02			
Ult. Oil		40.64	3.37	56.99	6.74	.56	79.13
C02	15.15	75.24	6.24	105.52			
H20		93.96	7.79	131.73			

WEIGHT BALANCE	#/hr	%	#/hr
Wet Gas			
Oil			
Water			
Total			

EFFLUENT RATIOS	
H2/H20	7.92
C02/C0	.92
(H2) (C02) / (H20) (C0)	7.27

CONTRACTION: 40.2

C0 Conversion: 76.5

H2 Conversion: 52.8

$H_2 + CO = 57.1$

Yield Calculations assume "oil" is CH2, and is found by difference on Carbon, and H20 by difference on Hydrogen. "Oil" figures therefore include hydrocarbon fraction of oxygenated compounds. Standard cubic feet measured at 60 F and 14.7 psig. Cubic Meters measured at 0 C. and 14.7 psig. g/M3 = 16.91 × #/MCF. cc/M3 = 141.3 × gal/MCF.

THE TEXAS COMPANY — MONTEBELLO LABORATORY

DATA SUMMARY SHEET

Synthesis Run Number 39B From April 23 48 Hr. 2300 to April 24 48 Hr. 0700

FLOWS	SCFH	%
Oxygen	3130	
Nat. Gas	4470	
Total	7600	41.2
Fresh Feed	13000	
F. F. by C	13100	
Avg. F. F.		
Wet Gas	5060	
Contraction		61.1
Recycle	23200	
Bleed	3334	
Total	26534	
Total Feed	39534	
Recycle/F.F.	2.02	
Inlet Vel.		
Steam Flow		

RUN CONDITIONS	
Generator Press.	272
O_2 Preheat, °F	350
Gas Preheat, °F	722
Reactor Press.	252
Steam Back Press.	
Temperatures, °F	
Heater Outlet	
Catalyst #1	645
#2	642
Pre-Heat #3	819
" #4	800
#5	
Average	
Product Separator	

DISTILLATIONS	A S T M					Hempel Dist.		
	Prod.	Gas Oil				°F	%	A.P.I.
	A.P.I.	42.8				to 400	7.23	54.4
	I.B.P.	112				400-550	20.6	31.9
	5%					550+		
	10%	162						
	20	192						
	30	216				WATER		
	40	236				Temp.	%	
	50	256				200		
	60	276				203		
	70	300				208		
	80	328				WATER APP.	9.9	
	90	216						
	95	266						
	E.P.	409						
	Rec.	98.0						
	Res.	1.0						
	Loss.	1.0						

CATALYST DATA	
In Reactor at Start of Period	628
Fresh Catalyst Charged	-
Catalyst Recharged	-
Total	628
Catalyst Taken Out	16
In Reactor at End of Period	612
Reactor d-P, H_2O	96.0
Pounds in Reactor	
Density, lbs./cu. ft.	
Bed Height, Feet	
Space Vel. SCFH/lb. cat.	
Inventory Figures	664.6
From d-P Meters	

CATALYST ANALYSIS	Particle Size				
	Screen			Sedimentation	
	Frac.	M	%	M	%
	On 40	420+		80+	
	100	419-150		80-40	
	150	149-105		40-20	
	200	104-74		20-10	
	250	73-62		10-0	
	325	61-44			
	<325	43-0			
	Density, lbs./cu. ft.			Chem. Anal.	
	Aerated			% Fe	
	Settled			% C	
	Compacted			% Oil	
	Sp. Grav.			Specific Surface	
					m^2/gm

NATURAL GAS	%
CO_2	1.37
CH_4	85.84
C_2H_6	9.19
C_3H_8	3.59
C_4H_{10}	
N_2	
O_2	

PRODUCT INSPECTION						
		Oil	Water	Product	Pour °F	SUS @ °F
Neut. No.	42.1		34.2			
Sap. No.	45.5		34.9			
Hydrox. No.	43.2					
Bromine No.	62.3					
% Fe						
% Alc			3.5			

GENERATOR ELEMENTAL BALANCE

IN	Mol %	SCFH m/hr	C	H	O
O_2	264.32	8.26			16.52
CO_2	7.04	.16	.16		.32
CH_4	161.92	10.12	10.12	40.48	
C_2H_6	32.40	1.08	2.16	6.48	
C_3H_8	18.48	.42	1.26	3.36	
C_4H_{10}					
N_2					
Total		19.04	13.70	50.32	16.84

OUT	Mol %	SCFH m/hr	C	H	O
CO_2	2.15	.74	.74		1.48
CO	35.66	12.23	12.23		12.23
CH_4	.69	.24	.24	.96	
H_2	61.44	21.07		42.14	
N_2	.05	.02			
H_2O				6.26	3.13
Total		34.30	13.21	49.36	16.84

	FRESH FEED			WET GAS					RECYCLE	COMB. FEED		EFFLUENT		NET CHANGE ON REACTION									Unsats.
					Measured		At Wt. Balance							Carbon			Hydrogen		Oxygen	Ultimate Oil			
	%	m/hr	#/hr	%	m/hr	#/hr	m/hr	#/hr	m/hr	m/hr	%	m/hr	%	m/hr	a/hr	%	a/hr	%	a/hr	#/hr	#/gal	gal/hr	%
CO	35.66	12.23	342.44	11.80	1.58	44.24			8.18	20.41	19.70	9.76	10.88	-10.65	-10.65	12.92			-10.65				
H2	61.44	21.07	42.14	48.37	6.46	12.92			33.52	54.54	52.70	39.88	44.56	-14.61			-29.22						
CO2	2.15	.74	32.56	20.42	2.73	120.12			14.15	14.89	14.37	16.88	18.81	1.99	1.99	16.27			3.98				
N2	.05	.02	.56	1.12	.15	4.20			.28	.80	.77	.93	1.04	.13									
CH4	.69	.24	3.84	9.87	1.32	21.12			6.84	7.08	6.83	8.16	9.09	1.09	1.08	8.83	4.32			9.83	6.25	1.57	
C2H4				1.93	.26	7.28			1.34	1.34	1.29	1.60	1.78	.26	.52	4.25	1.04						
C2H6				1.16	.19	5.70			1.01	1.01	.97	1.20	1.34	.19	.28	3.11	1.14						
C3H6				1.98	.36	10.92			1.37	1.37	1.32	1.63	1.82	.26	.78	6.38	1.56			9.83	6.25	1.57	
C3H8				.52	.07	3.08			.76	.36	.35	.43	.48	.07	.21	1.72	.56						
C4H8				1.25	.17	9.52			.87	.87	.84	1.04	1.16	.17	.68	5.56	1.36			9.04	6.10	1.48	
C4H10				.26	.03	1.74			.18	.18	.17	.21	.23	.03	.12	.98	.30			1.74	4.86	.36	
C5H10				.55	.07	4.90			.38	.38	.37	.45	.50	.07	.35	2.86	.70			4.90	5.40	.91	
C6H12				.45	.06	5.04			.31	.31	.30	.37	.41	.06	.36	2.94	.72			5.04	5.50	.92	
OIL						(58.52)						.42	.47		4.18	34.18	8.36			58.52	6.50	9.00	
WATER												6.67	7.43				9.16		(4.38) 6.67				
TOTAL		34.30	421.54		13.35	250.78			69.29	103.59	99.98	89.73	100.00	20.95		100.00				89.07		14.24	
H2+CO		33.30			8.04																		
H2/CO		1.72			4.09					2.67		4.10											

ULTIMATE YIELDS	% C0 Fed	#/hr	H2 / C0 #/MCF	H2 / C0 g/M3	Gal/hr	H2 / C0 Gal/MCF	H2 / C0 cc/M3
C1+C2	16.19	30.26	2.33	39.40			
C3+	54.62	93.72	7.21	121.92			
C4+	46.52	79.72	6.13	103.66			
Ult. Oil		89.07	6.85	115.83	14.24	1.10	15543
C02	16.27	87.56	6.74	113.97			
H20		120.06	9.24	156.25			

WEIGHT BALANCE	#/hr	%	#/hr
Wet Gas			
Oil			
Water			
Total			

EFFLUENT RATIOS	
H2/H20	5.49
C02/C0	1.73
(H2) (C02) / (H20) (C0)	10.37

CONTRACTION: 61.1

C0 Conversion: 87.1

H2 Conversion: 69.3

$H_2 + CO = 73.6$

Yield Calculations assume "oil" is CH2, and is found by difference on Carbon, and H20 by difference on Hydrogen. "Oil" figures therefore include hydrocarbon fraction of oxygenated compounds. Standard cubic feet measured at 60 F and 14.7 psig. Cubic Meters measured at 0 C. and 14.7 psig. g/M3 = 16.91 × #/MCF. cc/M3 = 141.3 × gal/MCF.

THE TEXAS COMPANY — MONTEBELLO LABORATORY

DATA SUMMARY SHEET

Synthesis Run Number 390 From April 24-48 Hr. 0800 to April 25-48 Hr. 0700
Shut Down Four (4) Hours

FLOWS	SCFH	%
Oxygen	3000	
Nat. Gas	4466	
Total	7466	40.2
Fresh Feed	14650	
F. F. by C	13175	
Avg. F. F.		
Wet Gas	3832	
Contraction		70.9
Recycle	25070	
Bleed	3256	
Total	28326	
Total Feed	41501	
Recycle/F.F.	2.15	
Inlet Vel.	1.49	
Steam Flow		

RUN CONDITIONS	
Generator Press.	275
O_2 Preheat, °F	369
Gas Preheat, °F	760
Reactor Press.	252
Steam Back Press.	
Temperatures, °F	
Heater Outlet	
Catalyst #1	623
#2	622
Pre-Heat #3	759
" #4	756
#5	
Average	
Product Separator	

DISTILLATIONS	A S T M					Hempel Dist.		
	Prod.	GAS OIL				°F	%	A.P.I.
	A.P.I.	43.8				to 400	76.6	52.7
	I.B.P.	110				400-550	17.3	33.8
	5%					550+		
	10%	156						
	20	186						
	30	210				WATER		
	40	230				Temp.	%	
	50	252				200		
	60	272				203		
	70	296				208		
	80	324				WATER A.P.I.	10.0	
	90	352						
	95	394						
	E.P.	400						
	Rec.	98.0						
	Res.	1.0						
	Loss.	1.0						

CATALYST DATA	
In Reactor at Start of Period	612
Fresh Catalyst Charged	—
Catalyst Recharged	—
Total	612
Catalyst Taken Out	40
In Reactor at End of Period	572
Reactor d-P, H_2O	
Pounds in Reactor	98.0
Density, lbs./cu. ft.	
Bed Height, Feet	
Space Vel. SCFH/lb. cat.	
Inventory Figures	72.55
From d-P Meters	

CATALYST ANALYSIS	Particle Size				
	Screen			Sedimentation	
	Frac.	M	%	M	%
	On 40	420+	4.8	80+	
	100	419-150	2.0	80-40	
	150	149-105	.0	40-20	
	200	104-74	.1	20-10	
	250	73-62	.1	10-0	
	325	61-44	.0		
	<325	43-0	93.0		
	Density, lbs./cu. ft.			Chem. Anal.	
	Aerated			% Fe	
	Settled			% C	
	Compacted			% Oil	
	Sp. Grav. 4.7			Specific Surface	
					m^2/gm

NATURAL GAS	%
CO_2	1.56
CH_4	86.21
C_2H_6	8.83
C_3H_8	3.39
C_4H_{10}	
N_2	
O_2	

PRODUCT INSPECTION						
	Oil	Water	Product	Pour °F	SUS @ °F	
Neut. No.	42.4	38.6				
Sap. No.	43.2	37.9				
Hydrox. No.	57.6					
Bromine No.	63.8					
% Fe						
% Alc		3.0				

GENERATOR ELEMENTAL BALANCE

	IN Mol %	SCFH m/hr	C	H	O	OUT Mol %	SCFH m/hr	C	H	O
O_2	253.44	7.92			15.84	CO_2	2.07	.72	.72		1.44
CO_2	7.92	.18	.18		.36	CO	34.27	11.91	11.91		11.91
CH_4	162.56	10.16	10.16	40.64		CH_4	2.30	.80	.80	3.20	
C_2H_6	31.20	1.04	2.08	12.48		H_2	60.87	21.19		42.38	
C_3H_8	17.60	.40	1.20	9.60		N_2	.39	.14			
C_4H_{10}						H_2O				5.70	2.85
N_2	199.0	13.62	62.72	16.20		Total		34.96	13.43	51.28	16.20
Total											

	FRESH FEED			WET GAS					RECYCLE	COMB. FEED		EFFLUENT	
					Measured		At Wt. Balance						
	%	m/hr	#/hr	%	m/hr	#/hr	m/hr	#/hr	m/hr	m/hr	%	m/hr	%
CO	34.39	11.95	334.60	14.70	1.49	41.72			10.99	22.94	20.96	12.48	13.22
H2	61.29	21.30	42.60	51.42	5.20	10.40			38.43	59.73	54.56	43.63	46.22
CO2	1.62	.63	27.72	14.29	1.44	63.36			10.68	11.31	10.33	14.12	12.64
N2	.10	.03	.84	.19	.02	.56			.14	.17	.16	.16	.17
CH4	2.40	.83	13.28	11.92	1.21	19.36			8.91	9.74	8.90	10.12	10.72
C2H4				1.47	.15	4.20			1.10	1.10	1.00	1.25	1.32
C2H6				1.25	.13	3.90			.93	.93	.85	1.06	1.12
C3H6				1.50	.15	6.30			1.12	1.12	1.02	1.27	1.35
C3H8				1.22	.12	5.28			.91	.91	.83	1.03	1.09
C4H8				1.03	.10	5.60			.77	.77	.70	.87	.92
C4H10				.28	.03	1.74			.21	.21	.19	.24	.25
C5H10				.47	.05	3.50			.35	.35	.32	.40	.42
C6H12				.25	.03	2.52			.19	.19	.17	.22	.23
OIL						(97.30)						.70	.74
WATER												8.84	9.37
TOTAL		34.76	419.04		10.11	168.44			74.73	109.47	99.99	94.39	99.98
H2+CO		33.25			6.69								
H2/CO		1.78			3.49					2.60		3.49	

NET CHANGE ON REACTION	Carbon			Hydrogen		Oxygen	Ultimate Oil			Unsats.
	m/hr	a/hr	%	a/hr	%	a/hr	#/hr	#/gal	gal/hr	%
CO	-10.46	-10.46	12.47			-10.46				
H2	-16.10			-32.20						
CO2	.81	.81	6.78			1.62				
N2	-.01									
CH4	.38	.38	3.18	1.52						
C2H4	.15	.30	2.51	.60						
C2H6	.13	.26	2.18	.78						
C3H6	.15	.45	3.77	.90			5.67	6.25	.91	
C3H8	.12	.36	3.01	.96						
C4H8	.10	.40	3.35	.80			8.32	6.10	.87	
C4H10	.03	.12	1.00	.30			1.74	4.86	.36	
C5H10	.05	.25	2.09	.50			3.50	5.40	.65	
C6H12	.03	.18	1.57	.36			2.52	5.50	.46	
OIL		6.95	58.16	13.90		(5.79)	97.30	6.50	14.97	
WATER				11.58		8.84				
TOTAL	27.62		100.01				116.05		18.22	

ULTIMATE YIELDS	% C0 Fed	#/hr	H2 / C0 #/MCF	H2 / C0 g/M3	Gal/hr	H2 / C0 Gal/MCF	H2 / C0 cc/M3
C1+C2	7.59	14.18	1.13	19.11			
C3+	72.59	122.24	9.70	164.03			
C4+	66.11	110.66	8.78	148.47			
Ult. Oil		116.05	9.21	155.74	18.22	1.45	204.89
C02	6.78	35.64	2.83	47.86			
H20		159.12	12.63	213.57			

WEIGHT BALANCE	#/hr	%	#/hr
Wet Gas			
Oil			
Water			
Total			

EFFLUENT RATIOS	
H2/H20	4.94
C02/C0	.97
(H2) (C02) / (H20) (C0)	4.79

CONTRACTION: 70.8
C0 Conversion: 87.5
H2 Conversion: 75.6
$N_2 + CO = 76.4$

Yield Calculations assume "oil" is CH2, and is found by difference on Carbon, and H20 by difference on Hydrogen. "Oil" figures therefore include hydrocarbon fraction of oxygenated compounds. Standard cubic feet measured at 60 F and 14.7 psig. Cubic Meters measured at 0 C. and 14.7 psig. g/M3 = 16.91 × #/MCF. cc/M3 = 141.3 × gal/MCF.

THE TEXAS COMPANY — MONTEBELLO LABORATORY

DATA SUMMARY SHEET

Synthesis Run Number 391 From April 25-48 Hr. 0800 to April 26-48 Hr. 0700

FLOWS	SCFH	%
Oxygen	3020	
Nat. Gas	4420	
Total	7440	40.6
Fresh Feed	12000	
F. F. by C	13300	
Avg. F. F.		
Wet Gas	5900	
Contraction		50.8
Recycle	21600	
Bleed	5421	
Total	27021	
Total Feed	39021	
Recycle/F.F.	2.25	
Inlet Vel.		
Steam Flow		

RUN CONDITIONS	
Generator Press.	278
O_2 Preheat, °F	358
Gas Preheat, °F	760
Reactor Press.	300
Steam Back Press.	
Temperatures, °F	
Heater Outlet	
Catalyst ±1	645
±2	650
PRE-HEAT ±3	770
±4	770
±5	
Average	
Product Separator	

DISTILLATIONS	A S T M				Hempel Dist.		
					°F	%	A.P.I.
Prod.	GAS OIL						
A.P.I.	43.4				to 400	65.0	51.5
I.B.P.	126				400-550	26.0	34.4
5%					550+	9.0	
10%	182						
20	216						
30	236				WATER		
40	246				Temp.	%	
50	258				200		
60	268				203		
70	308				208		
80	338				WATER API.	10.0	
90	364						
95	388						
E.P.	408						
Rec.	98.0						
Res.	1.0						
Loss	1.0						

CATALYST DATA	
In Reactor at Start of Period	572
Fresh Catalyst Charged	105
Catalyst Recharged	—
Total	677
Catalyst Taken Out	27
In Reactor at End of Period	650
Reactor d-P, H_2O	100.0
Pounds in Reactor	
Density, lbs./cu. ft.	
Bed Height, Feet	
Space Vel. SCFH/lb. cat.	
Inventory Figures	60.03
From d-P Meters	

CATALYST ANALYSIS	Particle Size				
	Screen			Sedimentation	
Frac.	M	%	M	%
On 40	420+	3.4	80+	
100	419-150	68.4	80-40	
150	149-105	6.6	40-20	
200	104-74	7.8	20-10	
250	73-62	2.0	10-0	
325	61-44	4.4		
<325	43-0	6.4		

Density, lbs./cu. ft		Chem. Anal.	
Aerated	137.0	% Fe	
Settled	138.0	% C	
Compacted	144.5	% Oil	
Sp. Grav.	3.9	Specific Surface	
			m^2 gm

NATURAL GAS	%
CO_2	1.29
CH_4	84.52
C_2H_6	9.53
C_3H_8	4.66
C_4H_{10}	
N_2	
O_2	

PRODUCT INSPECTION					
	Oil	Water	Product	Pour °F	SUS @ °F
Neut. No.	39.0	36.6			
Sap. No.	43.7	37.2			
Hydrox. No.	41.2				
Bromine No.	62.0				
% Fe					
% Alc		4.0			

GENERATOR ELEMENTAL BALANCE

IN	Mol %	SCFH m/hr	C	H	O
O_2	255.04	7.97			15.94
CO_2	6.60	.15	.15		.30
CH_4	157.76	9.86	9.86	39.44	
C_2H_6	33.30	1.11	2.22	13.32	
C_3H_8	23.76	.54	1.62	4.32	
C_4H_{10}					
N_2					
Total		19.63	13.85	57.08	16.24

OUT	Mol %	SCFH m/hr	C	H	O
CO_2	1.82	.58	.58		1.16
CO	34.39	10.89	10.89		10.89
CH_4	2.40	.76	.76	3.04	
H_2	61.24	19.40		38.80	
N_2	.10	.03			
H_2O				8.38	4.19
Total		31.66	12.23	50.22	16.24

	FRESH FEED			WET GAS					RECYCLE	COMB. FEED		EFFLUENT		NET CHANGE ON REACTION								
					Measured		At Wt. Balance							Carbon			Hydrogen		Oxygen	Ultimate Oil			Unsats.
	%	m/hr	#/hr	%	m/hr	#/hr	m/hr	#/hr	m/hr	m/hr	%	m/hr	%	m/hr	a/hr	%	a/hr	%	a/hr	#/hr	#/gal	gal/hr	%
CO	34.3	10.86	30408	12.66	1.97	55.16			9.02	19.88	19.31	10.99	12.00	-8.89	-8.89	18.14			-8.89				
H2	61.0	19.31	38.62	45.11	7.02	14.04			32.14	51.45	49.98	34.16	42.75	12.24			-24.58						
CO2	2.1	.66	29.04	17.43	2.79	122.76			13.77	13.43	13.05	15.56	16.99	2.13	2.13	19.61			4.26				
N2	.4	.13	3.64	2.73	.43	12.04			1.94	2.07	2.01	2.37	2.54	.30									
CH4	2.3	.73	11.68	13.66	2.16	34.56			9.87	10.60	10.30	12.03	13.13	1.43	1.43	13.17	5.72						
C2H4				1.45	.23	6.44			1.03	1.03	1.00	1.26	1.38	.23	.46	4.24	.92						
C2H6				1.59	.25	7.50			1.13	1.13	1.10	1.38	1.51	.25	.50	4.60	1.50						
C3H6				1.39	.22	9.24			.99	.99	.96	1.21	1.32	.22	.66	6.08	1.32			8.32	6.45	1.33	
C3H8				.67	.10	4.40			.48	.48	.47	.58	.63	.10	.30	2.76	.80						
C4H8				1.17	.18	10.08			.83	.83	.81	1.01	1.10	.18	.72	6.63	1.44			9.58	6.10	1.57	
C4H10				.31	.05	2.90			.22	.22	.21	.27	.29	.05	.20	1.64	.50			3.40	4.36	.60	
C5H10				.64	.10	7.00			.46	.46	.45	.56	.61	.10	.50	4.60	1.00			7.00	5.40	1.30	
C6H12				.50	.08	6.72			.37	.37	.36	.45	.49	.08	.48	4.42	.96			6.72	5.52	1.22	
OIL						(91.14)						.15	.16		1.51	13.90	3.02			21.14	6.52	3.25	
WATER												4.63	5.05				7.40		(3.70) 4.63				
TOTAL		31.66	387.06		15.57	292.84			71.24	102.94	100.01	91.61	100.00	16.11		99.99				55.66		9.27	
H2+CO		30.17			8.99																		
H2/CO		1.28			3.56					2.59		3.56											

ULTIMATE YIELDS

	% C0 Fed	#/hr	H2 / C0 #/MCF	H2 / C0 g/M3	Gal/hr	H2 / C0 Gal/MCF	H2 / C0 cc/M3
C1+C2	22.01	36.82	3.22	54.45			
C3+	40.23	61.48	5.38	90.98			
C4+	31.39	47.84	4.19	70.85			
Ult. Oil		55.66	4.87	82.35	9.27	.81	114.45
C02	19.61	93.72	8.20	138.66			
H20		83.34	7.29	123.27			

WEIGHT BALANCE	#/hr	%	#/hr
Wet Gas			
Oil			
Water			
Total			

EFFLUENT RATIOS	
H2/H20	8.46
C02/C0	1.42
(H2) (C02) / (H20) (C0)	11.98

CONTRACTION: 50.9

C0 Conversion: 81.9

H2 Conversion: 63.6

N2+CO = 66.9

Yield Calculations assume "oil" is CH2, and is found by difference on Carbon, and H20 by difference on Hydrogen. "Oil" figures therefore include hydrocarbon fraction of oxygenated compounds. Standard cubic feet measured at 60 F and 14.7 psig. Cubic Meters measured at O C. and 14.7 psig. g/M3 = 16.91 × #/MCF. cc/M3 = 141.3 × gal/MCF.

THE TEXAS COMPANY — MONTEBELLO LABORATORY

DATA SUMMARY SHEET

Synthesis Run Number 40A From April 30-48 Hr. 0800 to May 1-48 Hr. 0700

FLOWS	SCFH	%
Oxygen	2978	
Nat. Gas	4311	
Total	7289	40.8
Fresh Feed	12437	
F. F. by C	13000	
Avg. F. F.		
Wet Gas	5700	
Contraction		54.2
Recycle	21191	
Bleed	3079	
Total	24270	
Total Feed	36707	
Recycle/F.F.	1.97	
Inlet Vel.	1.28	
Steam Flow		

RUN CONDITIONS	
Generator Press.	280
O_2 Preheat, °F	384
Gas Preheat, °F	768
Reactor Press.	250
Steam Back Press.	
Temperatures, °F	
Heater Outlet	
Catalyst #1	639
#2	640
#3	650
#4	621
#5	
Average	
Product Separator	
PRE-HEATER #3	707
#4	700

DISTILLATIONS	A S T M				Hempel Dist.		
					°F	%	A.P.I.
Prod.	Gas Oil						
A.P.I.	45.2				to 400	65.0	52.3
I.B.P.	120				400-550	19.6	35.0
5%					550+		
10%	146						
20	192						
30	218				WATER		
40	238				Temp.	%	
50	262				200		
60	282				203		
70	308				208		
80	330				WATER API	9.7	
90	360						
95	390						
E.P.	410						
Rec.	98.0						
Res.	1.0						
Loss	1.0						

CATALYST DATA	
In Reactor at Start of Period	257
Fresh Catalyst Charged	—
Catalyst Recharged	161
Total	418
Catalyst Taken Out	28
In Reactor at End of Period	390
Reactor d-P, H_2O	170.0
Pounds in Reactor	
Density, lbs./cu. ft.	
Bed Height, Feet	
Space Vel. SCFH/lb. cat.	
Inventory Figures	9X.12
From d-P Meters	

CATALYST ANALYSIS					
Particle Size					
Screen			Sedimentation		
Frac.	M	%	M	%	
On 40	420+	41.2	80+		
100	419-150	50.8	80-40		
150	149-105	7.6	40-20		
200	104-74	7.4	20-10		
250	73-62	2.2	10-0		
325	61-44	4.8			
<325	43-0	13.6			
Density, lbs./cu. ft			Chem. Anal.		
Aerated			% Fe		
Settled			% C		
Compacted			% Oil		
Sp. Grav. 4.5			Specific Surface		
					m^2 gm

NATURAL GAS	%
CO_2	1.41
CH_4	86.56
C_2H_6	8.75
C_3H_8	3.28
C_4H_{10}	
N_2	
O_2	

PRODUCT INSPECTION					
	Oil	Water	Product	Pour °F	SUS @ °F
Neut No.	45.3	42.4			
Sap No.	48.4	42.4			
Hydrox. No.	52.7				
Bromine No.	65.5				
% Fe					
% Alc		3.1			

GENERATOR ELEMENTAL BALANCE

IN	Mol %	SCFH m/hr	C	H	O
O_2	251.52	7.86			15.73
CO_2	7.04	.16	.16		.32
CH_4	157.44	9.84	9.84	39.36	
C_2H_6	29.70	.99	1.98	5.94	
C_3H_8	16.28	.37	1.11	2.96	
C_4H_{10}					
N_2					
Total		19.22	13.09	48.26	16.04

OUT	Mol %	SCFH m/hr	C	H	O
CO_2	1.87	.61	.61		1.22
CO	34.36	11.28	11.28		11.28
CH_4	1.68	.55	.55	2.20	
H_2	60.37	19.81		39.62	
N_2	1.71	.56			
H_2O				7.08	3.54
Total		32.81	12.44	48.90	16.04

FRESH FEED	%	m/hr	#/hr
CO	34.4	11.29	316.12
H2	60.4	19.82	39.64
CO2	1.9	.62	27.28
N2	1.7	.56	15.68
CH4	1.6	.53	8.48
C2H4			
C2H6			
C3H6			
C3H8			
C4H8			
C4H10			
C5H10			
C6H12			
OIL			
WATER			
TOTAL		32.82	407.20
H2+CO		31.11	
H2/CO		1.76	

WET GAS	%	Measured m/hr	Measured #/hr	At Wt. Balance m/hr	At Wt. Balance #/hr
CO	13.67	2.06	57.68		
H2	51.15	7.69	15.38		
CO2	17.87	2.69	118.36		
N2	.62	.09	2.52		
CH4	10.51	1.58	25.28		
C2H4	1.36	.20	5.60		
C2H6	1.14	.17	5.10		
C3H6	1.48	.22	9.24		
C3H8	.59	.09	3.96		
C4H8	.83	.12	6.72		
C4H10	.12	.02	1.16		
C5H10	.43	.06	4.20		
C6H12	.22	.03	2.52		
OIL			(47.60)		
WATER					
TOTAL		15.04	257.72		
H2+CO		9.75			
H2/CO		3.73			

RECYCLE	m/hr
CO	8.84
H2	33.07
CO2	11.55
N2	.40
CH4	6.80
C2H4	.88
C2H6	.74
C3H6	.96
C3H8	.38
C4H8	.54
C4H10	.08
C5H10	.28
C6H12	.14
OIL	
WATER	
TOTAL	64.66
H2+CO	
H2/CO	

COMB. FEED	m/hr	%
CO	20.13	20.65
H2	52.89	54.26
CO2	12.17	12.48
N2	.96	.98
CH4	7.33	7.52
C2H4	.88	.90
C2H6	.74	.76
C3H6	.96	.98
C3H8	.38	.39
C4H8	.54	.55
C4H10	.08	.08
C5H10	.28	.29
C6H12	.14	.14
OIL		
WATER		
TOTAL	97.48	99.98
H2+CO		
H2/CO	2.63	

EFFLUENT	m/hr	%
CO	10.90	12.81
H2	40.76	47.89
CO2	14.24	16.73
N2	.49	.58
CH4	8.38	9.85
C2H4	1.08	1.27
C2H6	.91	1.07
C3H6	1.18	1.39
C3H8	.47	.55
C4H8	.66	.78
C4H10	.10	.12
C5H10	.34	.40
C6H12	.17	.20
OIL	.34	.40
WATER	5.09	5.98
TOTAL	85.11	100.02
H2+CO		
H2/CO	3.74	

NET CHANGE ON REACTION

	Carbon m/hr	Carbon a/hr	Carbon %	Hydrogen a/hr	Hydrogen %	Oxygen a/hr	Ultimate Oil #/hr	Ultimate Oil #/gal	Ultimate Oil gal/hr	Unsats. %
CO	-9.23	-9.23	18.25			-9.23				
H2	-12.13			-24.26						
CO2	2.07	2.07	18.33			4.14				
N2	-.47									
CH4	1.05	1.05	9.30	4.20						
C2H4	.20	.40	3.54	.80						
C2H6	.17	.34	3.01	1.02						
C3H6	.22	.66	5.85	1.32			8.32	6.25	1.33	
C3H8	.09	.27	2.39	.72						
C4H8	.12	.48	4.25	.96			6.36	6.10	1.05	
C4H10	.02	.08	.71	.20			1.16	4.86	.24	
C5H10	.06	.30	2.66	.60			4.20	5.40	.78	
C6H12	.03	.18	1.59	.36			2.52	5.50	.46	
OIL		3.40	30.12	6.80			47.60	6.50	7.32	
WATER				7.28		(3.64) 5.09				
TOTAL	17.80		100.00				70.18		11.18	

ULTIMATE YIELDS	% C0 Fed	#/hr	H2/C0 #/MCF	H2/C0 g/M3	Gal/hr	H2/C0 Gal/MCF	H2/C0 cc/M3
C1+C2	15.85	27.50	2.33	39.40			
C3+	47.57	75.40	6.40	106.22			
C4+	39.33	62.20	5.28	89.28			
Ult. Oil		70.18	5.95	100.61	11.18	.95	134.24
C02	16.33	41.08	7.73	130.71			
H20		41.62	7.77	131.39			

WEIGHT BALANCE	#/hr	%	#/hr
Wet Gas			
Oil			
Water			
Total			

EFFLUENT RATIOS	
H2/H20	8.01
C02/C0	1.31
(H2) (C02) / (H20) (C0)	10.46

CONTRACTION: 54.2

C0 Conversion: 81.8

H2 Conversion: 61.2

$H_2 + CO = 65.1$

Yield Calculations assume "oil" is CH2, and is found by difference on Carbon, and H20 by difference on Hydrogen. "Oil" figures therefore include hydrocarbon fraction of oxygenated compounds. Standard cubic feet measured at 60 F and 14.7 psig. Cubic Meters measured at 0 C. and 14.7 psig. g/M3 = 16.91 × #/MCF. cc/M3 = 141.3 × gal/MCF.

THE TEXAS COMPANY — MONTEBELLO LABORATORY

DATA SUMMARY SHEET

Synthesis Run Number 40B From May 1-48 Hr. 0800 to May 2-48 Hr. 0700

FLOWS

	SCFH	%
Oxygen	2959	
Nat. Gas	4317	
Total	7276	40.7
Fresh Feed	12811	
F. F. by C	13887	
Avg. F. F.		
Wet Gas	5105	
Contraction		60.2
Recycle	20552	
Bleed	4068	
Total	24620	
Total Feed	37431	
Recycle F.F.	1.87	
Inlet Vel	1.17	
Steam Flow		

RUN CONDITIONS

Generator Press.	285
O_2 Preheat, °F	440
Gas Preheat, °F	735
Reactor Press.	298
Steam Back Press.	
Temperatures, °F	
Heater Outlet	
Catalyst #1	640
#2	650
Pre-Heat #3	778
#4	784
#5	
Average	
Product Separator	

DISTILLATIONS

	A S T M	Hempel Dist.		
		°F	%	A.P.I.
Prod.	645			
A.P.I.	44.5	to 400	69.3	57.8
I.B.P.	118	400-550	20.3	35.1
5%		550+		
10%	152			
20	186			
30	202			
40	226			
50	248			
60	268			
70	302			
80	336			
90	362			
95	390			
E.P.	413			
Rec.	980			
Res.	1.0			
Loss.	1.0			

WATER	
Temp.	%
200	
203	
208	
Water A.P.I.	9.8

CATALYST DATA

In Reactor at Start of Period	390
Fresh Catalyst Charged	107
Catalyst Recharged	—
Total	497
Catalyst Taken Out	31
In Reactor at End of Period	466
Reactor d-P, H_2O	176.0
Pounds in Reactor	
Density, lbs./cu. ft.	
Bed Height, Feet	
Space Vel. SCFH/lb. cat.	
Inventory Figures	80.30
From d-P Meters	

CATALYST ANALYSIS

Particle Size

Screen			Sedimentation	
Frac.	M	%	M	%
On 40	420+	7.4	80+	
100	419-150	36.8	80-40	
150	149-105	7.2	40-20	
200	104-74	7.8	20-10	
250	73-62	3.4	10-0	
325	61-44	4.6		
<325	43-0	12.8		

Density, lbs./cu. ft — Chem. Anal.

Aerated — % Fe

Settled — % C

Compacted — % Oil

Sp. Grav. 4.2 — Specific Surface m^2 gm

NATURAL GAS

	%
CO_2	1.36
CH_4	85.77
C_2H_6	9.49
C_3H_8	3.39
C_4H_{10}	
N_2	
O_2	

PRODUCT INSPECTION

	Oil	Water	Product	Pour °F	SUS @ °F
Neut No.	50.8	43.9			
Sap. No.	53.3	44.6			
Hydrox No.	52.8				
Bromine No.	68.7				
% Fe					
% Alc		2.6			

GENERATOR ELEMENTAL BALANCE

IN	Mol %	SCFH m/hr	C	H	O
O_2	249.92	7.81			15.62
CO_2	6.60	.15	.15		.30
CH_4	156.32	9.77	9.77	39.08	
C_2H_6	32.40	1.08	2.16	6.48	
C_3H_8	17.16	.39	1.17	3.12	
C_4H_{10}					
N_2					
Total		19.20	13.25	48.68	15.92

OUT	Mol %	SCFH m/hr	C	H	O
CO_2	1.85	.63	.63		1.26
CO	32.37	10.44	10.44		10.44
CH_4	1.98	.67	.67	2.68	
H_2	61.67	30.84		41.68	
N_2	2.12	.72			
H_2O				7.44	3.72
Total		33.80	12.24	51.80	15.92

	FRESH FEED			WET GAS					RECYCLE	COMB. FEED		EFFLUENT		NET CHANGE ON REACTION										
					Measured		At Wt. Balance							Carbon			Hydrogen		Oxygen	Ultimate Oil			Unsats.
	%	m/hr	#/hr	%	m/hr	#/hr	m/hr	#/hr	m/hr	m/hr	%	m/hr	%	m/hr	a/hr	%	a/hr	%	a/hr	#/hr	#/gal	gal/hr	%
CO	22.4	10.93	306.60	12.97	1.75	49.00			8.20	19.15	19.74	9.95	12.05	-9.20	-9.20	15.98			-9.20				
H2	61.7	30.85	41.70	51.00	6.87	13.74			32.24	53.09	54.72	39.11	47.38	-13.98			-27.96						
CO2	1.8	.61	26.84	18.41	2.48	109.12			11.64	12.25	12.63	14.12	17.10	1.87	1.87	17.08			3.74				
N2	2.1	.71	19.88	.77	.10	2.80			.49	1.20	1.24	.59	.71	-.61									
CH4	2.0	.68	10.88	10.51	1.42	22.72			6.64	7.32	7.54	8.06	9.76	.74	.74	6.76	2.96						
C2H4				1.48	.20	5.60			.94	.94	.97	1.14	1.38	.20	.40	3.65	.80						
C2H6				1.14	.15	4.50			.72	.72	.74	.87	1.05	.15	.30	2.74	.90						
C3H6				1.48	.20	8.40			.94	.94	.97	1.14	1.38	.20	.60	5.48	1.20			7.56	6.25	1.21	
C3H8				.24	.04	1.76			.18	.18	.19	.22	.27	.04	.12	1.10	.32						
C4H8				.95	.13	7.28			.60	.60	.62	.73	.88	.13	.52	4.75	1.04			6.92	6.10	1.13	
C4H10				.18	.02	1.16			.11	.11	.11	.13	.16	.02	.08	.73	.20			1.16	4.86	.24	
C5H10				.50	.07	4.90			.32	.32	.33	.39	.47	.07	.35	3.20	.70			4.90	5.40	.91	
C6H12				.32	.04	3.36			.20	.20	.21	.24	.29	.04	.24	2.19	.48			3.36	5.50	.61	
OIL						(55.72)						.40	.48		3.98	36.35	7.96			55.72	6.50	8.57	
WATER												5.46	6.61				11.40		(5.70) 5.46				
TOTAL		33.80	405.90		13.47	234.34			63.21	97.02	100.00	82.55	99.97	20.33		100.01				79.62		12.67	
H2+CO		31.80			8.62																		
H2/CO		1.90			3.93					2.77		3.93											

ULTIMATE YIELDS

	% C0 Fed	#/hr	H2 / C0 #/MCF	H2 / C0 g/M3	Gal/hr	H2 / C0 Gal/MCF	H2 / C0 cc/M3
C1+C2	13.15	21.94	1.82	30.78			
C3+	53.80	82.58	6.85	115.83			
C4+	47.22	72.42	6.01	101.63			
Ult. Oil		79.62	6.61	111.78	12.67	1.05	148.37
C02	17.08	82.28	6.83	115.50			
H20		98.28	8.16	137.99			

WEIGHT BALANCE	#/hr	%	#/hr
Wet Gas			
Oil			
Water			
Total			

EFFLUENT RATIOS	
H2/H20	7.16
C02/C0	1.42
(H2) (C02) / (H20) (C0)	10.16

CONTRACTION: 60.1

C0 Conversion: 85.0

H2 Conversion: 67.1

H2+C0 = 65.6

Yield Calculations assume "oil" is CH2, and is found by difference on Carbon, and H20 by difference on Hydrogen. "Oil" figures therefore include hydrocarbon fraction of oxygenated compounds. Standard cubic feet measured at 60 F and 14.7 psig. Cubic Meters measured at 0 C. and 14.7 psig. g/M3 = 16.91 × #/MCF. cc/M3 = 141.3 × gal/MCF.

THE TEXAS COMPANY — MONTEBELLO LABORATORY

DATA SUMMARY SHEET

Synthesis Run Number 40C From May 2-48 Hr. 0500 to May 3-48 Hr. 0700

FLOWS	SCFH	%
Oxygen	3025	
Nat. Gas	4023	
Total	7048	42.9
Fresh Feed	12272	
F. F. by C	11710	
Avg. F. F.		
Wet Gas	5261	
Contraction		57.1
Recycle	19243	
Bleed	4026	
Total	23269	
Total Feed	35541	
Recycle/F.F.	1.64	
Inlet Vel.	1.11	
Steam Flow		

RUN CONDITIONS	
Generator Press.	285
O_2 Preheat, °F	430
Gas Preheat, °F	715
Reactor Press.	250
Steam Back Press.	
Temperatures, °F	
Heater Outlet	
Catalyst ±1	640
±2	643
PRE-HEAT ±3	770
" ±4	772
±5	
Average	
Product Separator	

DISTILLATIONS A S T M					Hempel Dist. °F	%	A.P.I.
Prod.	GAS OIL						
A.P.I.	43.9				to 400	64.6	51.2
I.B.P.	128				400-550	20.0	36.7
5%					550+		
10%	162						
20	198						
30	222				WATER		
40	242				Temp.	%	
50	268				200		
60	288				203		
70	310				208		
80	332				WATER API	9.9	
90	360						
95	390						
E.P.	409						
Rec.	98.0						
Res.	1.0						
Loss.	1.0						

CATALYST DATA	
In Reactor at Start of Period	466
Fresh Catalyst Charged	93
Catalyst Recharged	
Total	559
Catalyst Taken Out	30
In Reactor at End of Period	529
Reactor d-P, H_2O	160.0
Pounds in Reactor	
Density, lbs./cu. ft.	
Bed Height, Feet	
Space Vel. SCFH/lb. cat.	
Inventory Figures	67.2
From d-P Meters	

CATALYST ANALYSIS Particle Size				
	Screen		Sedimentation	
Frac.	M	%	M	%
On 40	420+	10.6	80+	
100	419-150	57.1	80-40	
150	149-105	7.4	40-20	
200	104-74	8.0	20-10	
250	73-62	2.4	10-0	
325	61-44	3.4		
<325	43-0	11.0		

Density, lbs./cu. ft.	Chem. Anal.
Aerated	% Fe
Settled	% C
Compacted	% Oil
Sp. Grav. 3.6	Specific Surface
	m^2 gm

NATURAL GAS	%
CO_2	1.75
CH_4	85.71
C_2H_6	8.89
C_3H_8	3.55
C_4H_{10}	
N_2	
O_2	

PRODUCT INSPECTION					
	Oil	Water	Product	Pour °F	SUS @ °F
Neut. No.	58.6	46.0			
Sap. No.	57.1	48.3			
Hydrox. No.	55.7				
Bromine No.	76.4				
% Fe					
% Alc		2.6			

GENERATOR ELEMENTAL BALANCE

	IN Mol %	SCFH m/hr	C	H	O	OUT Mol %	SCFH m/hr	C	H	O
O_2	255.36	7.98			15.96	CO_2 1.96	.63	.63		1.26
CO_2	8.36	.19	.19		.38	CO 34.34	11.19	11.12		11.12
CH_4	145.44	9.09	9.09	36.36		CH_4 3.18	1.03	1.03	4.12	
C_2H_6	28.20	.94	1.88	5.64		H_2 58.80	19.04		38.08	
C_3H_8	16.72	.38	1.14	3.04		N_2 1.73	.56			
C_4H_{10}						H_2O			7.92	3.96
N_2						Total	32.38	12.78	50.12	16.34
Total		18.56	12.50	45.04	16.34					

	FRESH FEED %	m/hr	#/hr	WET GAS %	Measured m/hr	Measured #/hr	At Wt. Balance m/hr	At Wt. Balance #/hr	RECYCLE m/hr	COMB. FEED m/hr	COMB. FEED %	EFFLUENT m/hr	EFFLUENT %
CO	34.3	11.11	311.08	16.17	2.24	62.72			9.63	20.74	22.69	11.87	15.13
H2	58.8	19.04	38.08	46.53	6.46	12.92			27.72	46.76	51.16	34.18	43.56
CO2	2.0	.65	28.60	19.69	2.73	120.12			11.73	12.38	13.54	14.46	18.43
N2	1.7	.55	15.40	—	—	—							
CH4	3.2	1.04	16.64	10.48	1.45	23.20			6.24	7.28	7.96	7.69	9.80
C2H4				1.64	.23	6.44			.98	.98	1.07	1.21	1.54
C2H6				1.03	.14	4.20			.61	.61	.67	.75	.96
C3H6				1.70	.24	10.08			1.01	1.01	1.11	1.25	1.59
C3H8				.30	.04	1.76			.18	.18	.20	.22	.28
C4H8				1.12	.16	8.96			.67	.67	.73	.83	1.06
C4H10				.30	.04	2.37			.18	.18	.20	.22	.28
C5H10				.64	.09	6.30			.38	.38	.42	.47	.60
C6H12				.39	.05	4.20			.23	.23	.25	.28	.36
OIL						(45.50)						.33	.42
WATER												4.71	6.00
TOTAL		32.38	409.60		13.68	263.22			59.38	91.40	100.00	78.47	100.01
H2+CO		30.15			8.70								
H2/CO		1.71			3.58					2.25		2.68	

NET CHANGE ON REACTION	Carbon m/hr	Carbon a/hr	Carbon %	Hydrogen a/hr	Hydrogen %	Oxygen a/hr	Ultimate Oil #/hr	Ultimate Oil #/gal	Ultimate Oil gal/hr	Unsats. %
CO	-8.87	-8.87	20.16			-8.87				
H2	-12.58			-25.16						
CO2	2.08	2.08	18.77			4.16				
N2	-.55									
CH4	.41	.41	3.69	1.64						
C2H4	.83	.46	4.14	.92						
C2H6	.14	.28	2.52	.84						
C3H6	.24	.72	6.48	1.44			9.07	6.25	1.45	
C3H8	.04	.12	1.08	.32						
C4H8	.16	.64	5.76	1.28			8.51	6.10	1.40	
C4H10	.04	.16	1.44	.40			2.32	4.86	.48	
C5H10	.09	.45	4.05	.90			6.30	5.40	1.17	
C6H12	.05	.30	2.70	.60			4.20	5.50	.76	
OIL		3.25	29.25	6.50			45.50	6.50	7.00	
WATER				10.32		(3.16) 4.71				
TOTAL	18.52		99.99				75.90		12.26	

ULTIMATE YIELDS	% C0 Fed	#/hr	H2/C0 #/MCF	H2/C0 g/M3	Gal/hr	H2/C0 Gal/MCF	H2/C0 cc/M3
C1+C2	10.35	17.20	1.50	25.37			
C3+	50.76	79.12	6.92	117.02			
C4+	43.20	67.28	5.89	99.60			
Ult. Oil		75.90	6.64	112.28	12.26	1.07	157.19
C02	18.79	91.52	8.01	135.45			
H20		84.78	7.42	125.47			

WEIGHT BALANCE	#/hr	%	#/hr
Wet Gas			
Oil			
Water			
Total			

EFFLUENT RATIOS	
H2/H20	7.26
C02/C0	1.22
(H2) (C02) / (H20) (C0)	8.84

CONTRACTION: 57.2

C0 Conversion: 74.8

H2 Conversion: 66.1

$H_2 + CO = 66.2$

Yield Calculations assume "oil" is CH2, and is found by difference on Carbon, and H20 by difference on Hydrogen. "Oil" figures therefore include hydrocarbon fraction of oxygenated compounds. Standard cubic feet measured at 60 F and 14.7 psig. Cubic Meters measured at 0 C. and 14.7 psig. g/M3 = 16.91 × #/MCF. cc/M3 = 141.3 × gal/MCF.

THE TEXAS COMPANY — MONTEBELLO LABORATORY

DATA SUMMARY SHEET

Synthesis Run Number 40D From May 3-48 Hr. 0800 to May 4-48 Hr. 0700

FLOWS	SCFH	%
Oxygen	2950	
Nat. Gas	4370	
Total	7320	40.3
Fresh Feed	12400	
F. F. by C	14000	
Avg. F. F.		
Wet Gas	5560	
Contraction		55.2
Recycle	19780	
Bleed	3750	
Total	27530	
Total Feed	35930	
Recycle/F.F.	1.93	
Inlet Vel.		
Steam Flow		

RUN CONDITIONS	
Generator Press.	292
O_2 Preheat, °F	460
Gas Preheat, °F	740
Reactor Press.	248
Steam Back Press.	
Temperatures, °F	
Heater Outlet	
Catalyst #1	640
#2	645
#3	656
#4	635
#5	
Average	
Product Separator	
Pre-Heat #3	785
" #4	790

DISTILLATIONS	A S T M					Hempel Dist.		
	Prod.	GAS OIL				°F	%	A.P.I.
	A.P.I.	45.4				to 400	71.3	57.9
	I.B.P.	132				400-550	20.0	36.5
	5%					°550+		
	10%	166						
	20	195						
	30	218				WATER		
	40	240				Temp.	%	
	50	258				200		
	60	278				203		
	70	296				208		
	80	318				water A.P.I.	9.7	
	90	348						
	95	376						
	E.P.	400						
	Rec.	96.0						
	Res.	1.0						
	Loss	1.0						

CATALYST DATA	
In Reactor at Start of Period	529
Fresh Catalyst Charged	—
Catalyst Recharged	—
Total	529
Catalyst Taken Out	30
In Reactor at End of Period	499
Reactor d-P, H_2O	162.0
Pounds in Reactor	
Density, lbs./cu. ft.	
Bed Height, Feet	
Space Vel. SCFH/lb. cat.	
Inventory Figures	72.0
From d-P Meters	

CATALYST ANALYSIS	Particle Size				
	Screen			Sedimentation	
	Frac.	M	%	M	%
	On 40	420+	8.0	80+	
	100	419-150	65.6	80-40	
	150	149-105	8.2	40-20	
	200	104-74	6.8	20-10	
	250	73-62	1.7	10-0	
	325	61-44	2.7		
	<325	43-0	6.8		
	Density, lbs./cu. ft.			Chem. Anal.	
	Aerated	144.5		% Fe	
	Settled	158.3		% C	
	Compacted	158.3		% Oil	
	Sp. Grav.	4.1		Specific Surface	
					m^2/gm

NATURAL GAS	%
CO_2	1.32
CH_4	87.10
C_2H_6	8.37
C_3H_8	3.25
C_4H_{10}	
N_2	
O_2	

PRODUCT INSPECTION					
	Oil	Water	Product	Pour °F	SUS @ °F
Neut. No.	49.5	46.0			
Sap. No.	50.0	47.0			
Hydrox. No.	48.7				
Bromine No.	68.5				
% Fe					
% Alc		1.3			

GENERATOR ELEMENTAL BALANCE

	IN Mol %	IN SCFH m/hr	IN C	IN H	IN O	OUT Mol %	OUT SCFH m/hr	OUT C	OUT H	OUT O
O_2	248.96	7.78			15.56					
CO_2	6.60	.15	.15		.30	1.99	.65	.65		1.30
CO						34.13	11.17	11.17		11.17
CH_4	160.64	10.04	10.04	40.16		2.80	.92	.92	3.68	
C_2H_6	28.80	.96	1.92	8.64						
C_3H_8	16.28	.37	1.11	3.96						
C_4H_{10}										
N_2						1.31	.43			
H_2						54.77	19.56		39.12	
H_2O									6.78	3.39
Total		19.30	13.22	51.76	15.86		32.73	12.74	49.58	15.86

	FRESH FEED %	FRESH FEED m/hr	FRESH FEED #/hr	WET GAS %	WET GAS Measured m/hr	WET GAS Measured #/hr	WET GAS At Wt. Balance m/hr	WET GAS At Wt. Balance #/hr	RECYCLE m/hr	COMB. FEED m/hr	COMB. FEED %	EFFLUENT m/hr	EFFLUENT %
CO	34.1	11.16	312.48	13.66	2.00	56.00			8.63	19.79	20.64	10.63	12.79
H2	59.8	19.57	39.14	51.26	7.52	15.04			32.37	51.94	34.18	39.89	48.01
CO2	2.0	.65	28.60	18.99	2.79	122.76			11.99	12.64	13.18	14.78	17.79
N2	1.3	.43	12.04	1.08	.16	4.48			.68	1.11	1.16	.84	1.01
CH4	7.8	.92	14.72	9.27	1.36	21.76			5.85	6.77	7.06	7.21	8.68
C2H4				1.32	.19	5.32			.83	.83	.87	1.02	1.23
C2H6				1.02	.15	4.50			.64	.64	.67	.79	.95
C3H6				1.41	.21	8.82			.89	.89	.93	1.10	1.32
C3H8				.22	.03	1.32			.14	.14	.15	.17	.20
C4H8				.83	.12	6.72			.52	.52	.54	.64	.77
C4H10				.14	.02	1.16			.09	.09	.09	.11	.13
C5H10				.44	.06	4.20			.28	.28	.29	.34	.41
C6H12				.36	.05	4.20			.23	.23	.24	.28	.34
OIL					(56.28)							.40	.48
WATER												4.88	5.87
TOTAL		32.72	406.98		14.67	256.28			63.15	95.87	100.00	83.08	99.98
H2+CO		30.73			9.52								
H2/CO		1.75			3.76					2.62		3.75	

NET CHANGE ON REACTION	Carbon m/hr	Carbon a/hr	Carbon %	Hydrogen a/hr	Hydrogen %	Oxygen a/hr	Ultimate Oil #/hr	Ultimate Oil #/gal	Ultimate Oil gal/hr	Unsats. %
CO	-9.16	-9.16	17.92			-9.16				
H2	-12.05			-24.10						
CO2	2.14	2.14	19.18			4.28				
N2	-.27									
CH4	.44	.44	3.94	1.76						
C2H4	.19	.38	3.41	.76						
C2H6	.15	.30	2.69	.90						
C3H6	.21	.63	5.65	1.26			7.94	6.25	1.27	
C3H8	.03	.09	.81	.24						
C4H8	.12	.48	4.30	.96			6.38	6.10	1.05	
C4H10	.02	.08	.72	.20			1.16	4.86	.24	
C5H10	.06	.30	2.69	.60			4.20	5.40	.78	
C6H12	.05	.30	2.69	.60			4.20	5.50	.76	
OIL		4.02	36.02	8.04		(24.39)	56.28	6.50	8.66	
WATER				8.78		4.88				
TOTAL	18.07		100.02				80.16		12.76	

ULTIMATE YIELDS	% C0 Fed	#/hr	H2/C0 #/MCF	H2/C0 g/M3	Gal/hr	H2/C0 Gal/MCF	H2/C0 cc/M3
C1+C2	10.04	16.86	1.45	24.52			
C3+	52.88	82.70	7.10	120.06			
C4+	46.42	72.56	6.23	105.35			
Ult. Oil		80.16	6.88	116.34	12.76	1.10	155.43
C02	19.18	94.16	8.08	136.63			
H20		87.84	7.54	127.50			

WEIGHT BALANCE	#/hr	%	#/hr
Wet Gas			
Oil			
Water			
Total			

EFFLUENT RATIOS	
H2/H20	8.17
C02/C0	1.39
(H2)(C02)/(H20)(C0)	11.37

CONTRACTION: 55.2

C0 Conversion: 82.1

H2 Conversion: 61.6

N2+C0 = 64.8

Yield Calculations assume "oil" is CH2, and is found by difference on Carbon, and H20 by difference on Hydrogen. "Oil" figures therefore include hydrocarbon fraction of oxygenated compounds. Standard cubic feet measured at 60 F and 14.7 psig. Cubic Meters measured at 0 C. and 14.7 psig. g/M3 = 16.91 × #/MCF. cc/M3 = 141.3 × gal/MCF.

THE TEXAS COMPANY — MONTEBELLO LABORATORY

DATA SUMMARY SHEET

Synthesis Run Number 40 E From May 4-48 Hr. 0800 to May 5-48 Hr. 0700

FLOWS	SCFH	%
Oxygen	3000	
Nat. Gas	4360	
Total	7360	40.8
Fresh Feed	12800	
F. F. by C	14100	
Avg. F. F.		
Wet Gas	5600	
Contraction		56.3
Recycle	20080	
Bleed	3516	
Total	23596	
Total Feed	36396	
Recycle F.F.	1.84	
Inlet Vel.		
Steam Flow		

RUN CONDITIONS	
Generator Press.	290
O_2 Preheat, °F	420
Gas Preheat, °F	750
Reactor Press.	249
Steam Back Press.	
Temperatures, °F	
Heater Outlet	
Catalyst ±1	645
±2	640
±3	660
±4	630
±5	
Average	
Product Separator	
Pre-Heat #3	760
" #4	780

DISTILLATIONS	A S T M				Hempel Dist.		
					°F	%	A.P.I.
Prod.	Gas Oil						
A.P.I.	44.4				to 400	64.6	52.5
I.B.P.	123				400-550	24.6	36.1
5%					550+		
10%	166						
20	196						
30	216				WATER		
40	236				Temp.	%	
50	256				200		
60	276				203		
70	296				208	10.0	
80	316				water A.P.I.	10.0	
90	346						
95	378						
E.P.	404						
Rec.	98.0						
Res.	1.0						
Loss	1.0						

CATALYST DATA	
In Reactor at Start of Period	499
Fresh Catalyst Charged	35
Catalyst Recharged	–
Total	534
Catalyst Taken Out	10.5
In Reactor at End of Period	523.5
Reactor d-P, H_2O	144.00
Pounds in Reactor	
Density, lbs./cu. ft.	
Bed Height, Feet	
Space Vel. SCFH/lb. cat.	
Inventory Figures	69.59
From d-P Meters	

CATALYST ANALYSIS	Particle Size				
	Screen			Sedimentation	
	Frac.	M	%	M	%
	On 40	420+	6.7	80+	
	100	419-150	64.4	80-40	
	150	149-105	8.3	40-20	
	200	104-74	7.7	20-10	
	250	73-62	3.0	10-0	
	325	61-44	2.6		
	<325	43-0	7.3		
	Density, lbs./cu. ft			Chem. Anal.	
	Aerated 142.9			% Fe	
	Settled 143.4			% C	
	Compacted 149.9			% Oil	
	Sp. Grav. 4.05			Specific Surface	
					m^2 gm

NATURAL GAS	%
CO_2	1.32
CH_4	36.31
C_2H_6	9.14
C_3H_8	5.14
C_4H_{10}	
N_2	
O_2	

PRODUCT INSPECTION					
	Oil	Water	Product	Pour °F	SUS @ °F
Neut. No.	54.3	41.2			
Sap. No.	52.9	45.7			
Hydrox No.	52.8				
Bromine No.	40.0				
% Fe					
% Alc		1.5			

GENERATOR ELEMENTAL BALANCE

IN	Mol %	SCFH m/hr	C	H	O
O_2	252.44	7.92			15.84
CO_2	6.60	.15	.15		.30
CH_4	158.88	9.93	9.93	39.72	
C_2H_6	31.80	1.06	2.12	12.72	
C_3H_8	16.28	.37	1.11	2.96	
C_4H_{10}					
N_2					
Total		19.43	13.31	55.40	16.14

OUT	Mol %	SCFH m/hr	C	H	O
CO_2	2.21	.75	.75		1.50
CO	34.44	11.63	11.63		11.63
CH_4	2.02	.68	.68	2.72	
H_2	60.40	20.40		40.80	
N_2	.92	.31			
H_2O				5.48	3.01 ~~4.79~~
Total		33.77	13.06	49.50	16.14

	FRESH FEED			WET GAS					RECYCLE	COMB. FEED		EFFLUENT		NET CHANGE ON REACTION									
					Measured		At Wt. Balance							Carbon			Hydrogen		Oxygen	Ultimate Oil			Unsats.
	%	m/hr	#/hr	%	m/hr	#/hr	m/hr	#/hr	m/hr	m/hr	%	m/hr	%	m/hr	a/hr	%	a/hr	%	a/hr	#/hr	#/gal	gal/hr	%
CO	34.4	11.62	325.36	14.09	2.08	58.24			8.76	20.38	21.33	10.84	13.03	-9.54	-9.54	17.90			-9.54				
H2	60.4	20.40	40.80	52.62	7.69	15.38			32.33	52.73	55.19	40.02	48.10	-12.71			-25.42						
CO2	2.2	.74	32.56	17.44	2.58	113.52			10.84	11.22	11.74	13.42	16.13	1.84	1.84	15.83			3.68				
N2	0.9	.30	8.40	1.04	.15	4.20			.65	.95	.99	.80	.96	- .15									
CH4	2.1	.71	11.36	9.19	1.36	21.76			5.71	6.42	6.72	7.07	8.50	.65	.65	5.59	2.60						
C2H4				1.42	.21	5.88			.88	.88	.92	1.09	1.31	.21	.42	3.61	.84						
C2H6				1.00	.15	4.50			.62	.62	.65	.77	.93	.15	.30	2.58	.90						
C3H6				1.55	.23	9.66			.96	.96	1.00	1.19	1.43	.23	.69	5.94	1.38			8.69	6.25	1.39	
C3H8				.24	.04	1.76			.15	.15	.16	.19	.23	.04	.12	1.03	.32						
C4H8				.93	.14	7.84			.58	.58	.61	.72	.87	.14	.56	4.82	1.12			7.45	6.10	1.22	
C4H10				.21	.03	1.74			.13	.13	.14	.16	.19	.03	.12	1.03	.30			1.74	4.96	.36	
C5H10				.55	.08	5.60			.34	.34	.36	.42	.50	.08	.40	3.44	.80			5.60	5.40	1.04	
C6H12				.31	.05	4.20			.19	.19	.20	.24	.29	.05	.30	2.58	.60			4.20	5.50	.76	
OIL					(57.96)							.41	.49		4.14	35.63	8.28			57.96	6.50	8.92	
WATER												5.86	7.04				8.28		(14.14) 5.86				
TOTAL		33.77	418.48		14.78	254.28			62.14	95.55	100.01	83.20	100.00	18.98		99.98				85.64		13.69	
H2+CO		32.02			9.77																		
H2/CO		1.76			3.70					2.59		3.69											

ULTIMATE YIELDS	% C0 Fed	#/hr	H2 / C0 #/MCF	H2 / C0 g/M3	Gal/hr	H2 / C0 Gal/MCF	H2 / C0 cc/M3
C1+C2	11.28	20.78	1.71	28.92			
C3+	54.47	88.76	7.31	123.61			
C4+	47.50	77.34	6.37	107.72			
Ult. Oil		85.64	7.05	119.22	13.69	113	159.67
C02	15.83	80.96	6.67	112.79			
H20		105.48	8.69	146.95			

WEIGHT BALANCE	#/hr	%	#/hr
Wet Gas			
Oil			
Water			
Total			

EFFLUENT RATIOS	
H2/H20	6.83
C02/C0	1.24
(H2) (C02) / (H20) (C0)	8.46

CONTRACTION: 56.9

C0 Conversion: 84.1

H2 Conversion: 62.3

$N_2 + CO = 68.8$

Yield Calculations assume "oil" is CH2, and is found by difference on Carbon, and H20 by difference on Hydrogen. "Oil" figures therefore include hydrocarbon fraction of oxygenated compounds. Standard cubic feet measured at 60 F and 14.7 psig. Cubic Meters measured at 0 C. and 14.7 psig. g/M3 = 16.91 × #/MCF. cc/M3 = 141.3 × gal/MCF.

THE TEXAS COMPANY — MONTEBELLO LABORATORY

DATA SUMMARY SHEET

Synthesis Run Number 40F From May 5-48 Hr. 0F00 to May 6-48 Hr. 0700

FLOWS	SCFH	%
Oxygen	2943	
Nat. Gas	7474	
Total	6417	45.9
Fresh Feed	12648	
F. F. by C	10262	
Avg. F. F.		
Wet Gas	5785	
Contraction		54.3
Recycle	18644	
Bleed	3486	
Total	22130	
Total Feed	34778	
Recycle/F.F.	1.20	
Inlet Vel	1.13	
Steam Flow		

RUN CONDITIONS	
Generator Press.	290
O_2 Preheat, °F	400
Gas Preheat, °F	785
Reactor Press.	250
Steam Back Press.	
Temperatures, °F	
Heater Outlet	
Catalyst #1	630
#2	640
#3	650
#4	630
#5	
Average	
Product Separator	
Pre-Heat #3	790
" #4	800

DISTILLATIONS	A S T M					Hempel Dist.		
	Prod.	Gas Oil				°F	%	A.P.I.
	A.P.I.	42.4				to 400	65.3	57.5
	I.B.P.	122				400-550	20.0	36.2
	5%					550+		
	10%	156						
	20	176						
	30	216				WATER		
	40	236				Temp.	%	
	50	258				200		
	60	276				203		
	70	298				208		
	80	326				Water A.P.I.	10.2	
	90	352						
	95	374						
	E.P.	403						
	Rec.	98.0						
	Res.	1.0						
	Loss.	1.0						

CATALYST DATA	
In Reactor at Start of Period	523.5
Fresh Catalyst Charged	—
Catalyst Recharged	—
Total	523.5
Catalyst Taken Out	19.0
In Reactor at End of Period	504.5
Reactor d-P, H_2O	140.0
Pounds in Reactor	
Density, lbs./cu. ft.	
Bed Height, Feet	
Space Vel. SCFH/lb. cat.	
Inventory Figures	69.0
From d-P Meters	

CATALYST ANALYSIS	Particle Size				
	Screen			Sedimentation	
	Frac.	M	%	M	%
	On 40	420+	1.8	80+	
	100	419-150	56.3	80-40	
	150	149-105	13.6	40-20	
	200	104-74	10.8	20-10	
	250	73-62	2.4	10-0	
	325	61-44	5.8		
	<325	43-0	9.4		
	Density, lbs./cu. ft			Chem. Anal.	
	Aerated	139.5		% Fe	
	Settled	144.0		% C	
	Compacted	146.0		% Oil	
	Sp. Grav.	3.8		Specific Surface	
					m^2 gm

NATURAL GAS	%
CO_2	1.95
CH_4	85.16
C_2H_6	9.35
C_3H_8	4.23
C_4H_{10}	
N_2	
O_2	

PRODUCT INSPECTION					
	Oil	Water	Product	Pour °F	SUS @ °F
Neut No.	53.7	45.8			
Sap. No.	57.1	45.7			
Hydrox. No.	59.5				
Bromine No.	59.9				
% Fe					
% Alc		1.3			

GENERATOR ELEMENTAL BALANCE

	IN Mol %	IN SCFH m/hr	IN C	IN H	IN O	OUT Mol %	OUT SCFH m/hr	OUT C	OUT H	OUT O
O_2	248.64	7.77			15.54					
CO_2		.11	.11		.22	1.66	.55	.55		1.10
CO						35.44	11.83	11.83		11.83
CH_4		7.81	7.81	31.24		2.78	.93	.93	3.74	
C_2H_6		.86	1.72	5.16						
C_3H_8		.39	1.17	3.12						
C_4H_{10}										
N_2						1.09	.36			
H_2						59.02	19.69		39.38	
H_2O									5.66	2.83
Total		16.94	10.81	39.52	15.76		25.36	13.21	48.76	15.76

	FRESH FEED %	FRESH FEED m/hr	FRESH FEED #/hr	WET GAS %	WET GAS Measured m/hr	WET GAS Measured #/hr	WET GAS At Wt. Balance m/hr	WET GAS At Wt. Balance #/hr	RECYCLE m/hr	COMB. FEED m/hr	COMB. FEED %	EFFLUENT m/hr	EFFLUENT %
CO	35.4	11.81	330.68	15.37	2.35	65.80			8.72	20.53	22.79	11.07	14.22
H2	59.0	19.69	39.38	52.48	8.01	16.02			29.77	49.46	54.91	37.78	48.54
CO2	1.7	.57	23.08	17.04	2.60	114.40			9.67	10.24	11.37	12.27	15.76
N2	1.1	.37	10.36	.89	.14	3.92			.50	.87	.97	.64	.82
CH4	2.8	.93	14.88	9.08	1.39	22.24			5.15	6.08	6.75	6.54	8.40
C2H4				1.26	.19	5.32			.71	.71	.79	.90	1.16
C2H6				.89	.14	4.20			.50	.50	.56	.64	.82
C3H6				1.24	.19	7.98			.70	.70	.78	.89	1.14
C3H8				.14	.02	.68			.08	.08	.09	.10	.13
C4H8				.72	.11	6.16			.41	.41	.46	.52	.67
C4H10				.20	.03	1.74			.11	.11	.12	.14	.18
C5H10				.46	.07	4.90			.26	.26	.29	.33	.42
C6H12				.23	.04	3.36			.13	.13	.14	.17	.22
OIL						(63.42)						.45	.58
WATER												5.40	6.94
TOTAL		33.37	470.38		15.26	256.82			56.73	90.08	100.02	77.84	100.00
H2+CO		31.50			10.36								
H2/CO		1.67			3.41					2.41		3.41	

NET CHANGE ON REACTION	Carbon m/hr	Carbon a/hr	Carbon %	Hydrogen a/hr	Hydrogen %	Oxygen a/hr	Ultimate Oil #/hr	Ultimate Oil #/gal	Ultimate Oil gal/hr	Unsats. %
CO	-9.46	-9.46	19.90			-9.46				
H2	-11.68			-23.36						
CO2	2.03	2.03	17.19			4.06				
N2	-.23									
CH4	.46	.46	3.90	1.84						
C2H4	.19	.38	3.22	.76						
C2H6	.14	.28	2.37	.84						
C3H6	.19	.57	4.83	1.14			7.18	6.25	1.15	
C3H8	.02	.06	.51	.16						
C4H8	.11	.44	3.73	.88			5.85	6.10	.96	
C4H10	.03	.12	1.02	.30			1.74	4.86	.35	
C5H10	.07	.35	2.96	.70			4.90	5.40	.91	
C6H12	.04	.24	2.03	.48			3.36	5.50	.61	
OIL		4.53	38.36	9.06			6.34	6.50	9.76	
WATER				7.20		(3.60) 5.40				
TOTAL	18.09		100.02				86.45		13.74	
H2+CO										
H2/CO										

ULTIMATE YIELDS	% C0 Fed	#/hr	H2/C0 #/MCF	H2/C0 g/M3	Gal/hr	H2/C0 Gal/MCF	H2/C0 cc/M3
C1+C2	9.49	16.88	1.41	23.83			
C3+	53.44	88.44	7.41	125.23			
C4+	48.10	79.58	6.66	112.55			
Ult. Oil		86.45	7.24	122.36	13.74	1.15	162.50
C02	17.19	88.32	7.48	126.41			
H20		97.20	8.14	137.57			

WEIGHT BALANCE	#/hr	%	#/hr
Wet Gas			
Oil			
Water			
Total			

EFFLUENT RATIOS	
H2/H20	7.00
C02/C0	1.11
(H2)(C02)/(H20)(C0)	7.75

CONTRACTION: 54.2

C0 Conversion: 80.1

H2 Conversion: 59.3

N2+CO = 63.4

Yield Calculations assume "oil" is CH2, and is found by difference on Carbon, and H20 by difference on Hydrogen. "Oil" figures therefore include hydrocarbon fraction of oxygenated compounds. Standard cubic feet measured at 60 F and 14.7 psig. Cubic Meters measured at 0 C. and 14.7 psig. g/M3 = 16.91 × #/MCF. cc/M3 = 141.3 × gal/MCF.

THE TEXAS COMPANY — MONTEBELLO LABORATORY

DATA SUMMARY SHEET

Synthesis Run Number 40G From May 6-48 Hr. 0800 to May 7-48 Hr. 0700

FLOWS	SCFH	%
Oxygen	2928	
Nat. Gas	4320	
Total	7248	40.4
Fresh Feed	12732	
F. F. by C	12700	
Avg. F. F.		
Wet Gas	5488	
Contraction		56.9
Recycle	18880	
Bleed	4057	
Total	22937	
Total Feed	35669	
Recycle/F.F.	1.80	
Inlet Vel.		
Steam Flow		

RUN CONDITIONS	
Generator Press.	289
O_2 Preheat, °F	445
Gas Preheat, °F	820
Reactor Press.	250
Steam Back Press.	
Temperatures, °F	
Heater Outlet	
Catalyst ±1	685
±2	660
±3	675
±4	660
±5	
Average	
Product Separator	
Pre-Heat #3	795
" #4	810

DISTILLATIONS	A S T M				Hempel Dist.		
					°F	%	A.P.I.
Prod.	Gas 0.2						
A.P.I.	42.9				to 400	65.6	51.3
I.B.P.	114				400-550	18.6	35.1
5%					550+		
10%	156						
20	196						
30	222				WATER		
40	249				Temp.	%	
50	263				200		
60	282				203		
70	302				208		
80	326				WATER A.P.I.	10.1	
90	346						
95	386						
E.P.	405						
Rec.	98.0						
Res.	1.0						
Loss	1.0						

CATALYST DATA	
In Reactor at Start of Period	504.5
Fresh Catalyst Charged	—
Catalyst Recharged	50.0
Total	554.5
Catalyst Taken Out	18.0
In Reactor at End of Period	536.5
Reactor d-P, H_2O	
Pounds in Reactor	
Density, lbs./cu. ft.	
Bed Height, Feet	
Space Vel. SCFH/lb. cat.	
Inventory Figures	66.5
From d-P Meters	

CATALYST ANALYSIS — Particle Size				
Screen			Sedimentation	
Frac.	M	%	M	%
On 40	420+	1.6	80+	
100	419-150	62.7	80-40	
150	149-105	12.2	40-20	
200	104-74	7.6	20-10	
250	73-62	1.6	10-0	
325	61-44	3.2		
<325	43-0	6.0		

Density, lbs./cu. ft.	Chem. Anal.
Aerated 133.5	% Fe
Settled 137.3	% C
Compacted 139.2	% Oil
Sp. Grav. 3.7	Specific Surface
	m^2 gm

NATURAL GAS	%
CO_2	1.19
CH_4	85.22
C_2H_6	7.59
C_3H_8	4.20
C_4H_{10}	
N_2	
O_2	

PRODUCT INSPECTION					
	Oil	Water	Product	Pour °F	SUS @ °F
Neut. No.	47.2	42.6			
Sap. No.	50.6	45.5			
Hydrox. No.	00.5				
Bromine No.	58.9				
% Fe					
% Alc		3.3			

GENERATOR ELEMENTAL BALANCE

IN	Mol %	SCFH m/hr	C	H	O
O_2	247.36	7.73			15.46
CO_2	6.16	.14	.14		.28
CH_4	155.52	9.72	9.72	38.88	
C_2H_6	32.10	1.07	2.14	6.42	
C_3H_8	21.12	.48	1.44	3.04	
C_4H_{10}					
N_2					
Total		19.14	13.44	48.34	15.74

OUT	Mol %	SCFH m/hr	C	H	O
CO_2	1.63	.55	.55		1.10
CO	34.53	11.60	11.60		11.60
CH_4	2.64	.89	.89	3.56	
H_2	59.35	19.94		39.88	
N_2	1.86	.62			
H_2O				6.08	3.04
Total		33.60	13.04	49.52	15.74

	FRESH FEED			WET GAS					RECYCLE	COMB. FEED		EFFLUENT		NET CHANGE ON REACTION									
					Measured		At Wt. Balance							Carbon			Hydrogen		Oxygen	Ultimate Oil			Unsats.
	%	m/hr	#/hr	%	m/hr	#/hr	m/hr	#/hr	m/hr	m/hr	%	m/hr	%	m/hr	a/hr	%	a/hr	%	a/hr	#/hr	#/gal	gal/hr	%
CO	34.5	11.59	324.52	14.77	2.14	59.92			8.93	20.52	21.62	16.07	13.64	-9.45	-9.45	18.46			-9.45				
H2	59.4	19.95	39.90	51.10	7.40	14.80			30.90	50.85	54.07	38.30	47.18	-12.55			-25.10						
CO2	1.6	.54	23.76	16.24	2.35	103.40			9.82	10.36	11.02	13.17	14.99	1.81	1.81	15.62			3.62				
N2	1.9	.64	17.92	.40	.06	1.68			.24	.88	.94	.30	.37	- .58									
CH4	2.6	.87	13.92	11.02	1.60	25.60			6.66	7.53	8.01	8.26	10.17	.73	.73	6.30	2.92						
C2H4				1.39	.20	5.60			.84	.84	.89	1.04	1.28	.20	.40	3.45	.80						
C2H6				1.26	.18	5.40			.76	.76	.81	.94	1.16	.18	.36	3.11	1.08						
C3H6				1.47	.21	8.82			.89	.89	.95	1.11	1.37	.21	.63	5.44	1.26			7.94	6.25	1.27	
C3H8				.27	.04	1.76			.16	.16	.17	.20	.25	.04	.12	1.04	.32						
C4H8				1.07	.15	8.40			.65	.65	.69	.80	.99	.15	.60	5.18	1.20			7.98	6.10	1.31	
C4H10				.19	.03	1.74			.11	.11	.12	.14	.17	.03	.12	1.04	.30			1.74	4.86	.36	
C5H10				.56	.08	5.60			.34	.34	.36	.42	.52	.08	.40	3.45	.80			5.60	5.40	1.04	
C6H12				.27	.04	3.36			.16	.16	.17	.20	.25	.04	.24	2.07	.48			3.36	5.50	.61	
OIL					(56.56)							.40	.49		4.04	34.86	8.08			56.56	6.60	8.70	
WATER												5.83	7.18				7.86		(5.93) 5.83				
TOTAL		33.59	420.02		14.48	246.08			60.46	94.05	100.02	81.18	100.01	19.11		100.82				83.18		13.29	
H2+CO		31.54			9.54																		
H2/CO		1.72			3.46					2.48		3.46											

ULTIMATE YIELDS	% C0 Fed	#/hr	H2 / C0 #/MCF	H2 / C0 g/M3	Gal/hr	H2 / C0 Gal/MCF	H2 / C0 cc/M3
C1+C2	12.86	22.68	1.90	32.13			
C3+	53.08	86.24	7.22	122.09			
C4+	46.60	75.66	6.33	107.04			
Ult. Oil		83.18	6.96	117.69	13.29	1.11	156.84
C02	15.62	79.64	6.66	112.62			
H20		104.94	8.78	148.47			

WEIGHT BALANCE	#/hr	%	#/hr
Wet Gas			
Oil			
Water			
Total			

EFFLUENT RATIOS	
H2/H20	6.57
C02/C0	1.10
(H2) (C02) / (H20) (C0)	7.22

CONTRACTION: 56.9

C0 Conversion: 81.8

H2 Conversion: 62.9

H2+CO = 65.5

Yield Calculations assume "oil" is CH2, and is found by difference on Carbon, and H20 by difference on Hydrogen. "Oil" figures therefore include hydrocarbon fraction of oxygenated compounds. Standard cubic feet measured at 60 F and 14.7 psig. Cubic Meters measured at 0 C. and 14.7 psig. g/M3 = 16.91 × #/MCF. cc/M3 = 141.3 × gal/MCF.

THE TEXAS COMPANY — MONTEBELLO LABORATORY

DATA SUMMARY SHEET

Synthesis Run Number 40N From May 7-48 Hr. 0800 to May 8-48 Hr. 0700

FLOWS	SCFH	%
Oxygen	2942	
Nat. Gas	4320	
Total	7262	40.5
Fresh Feed	12797	
F. F. by C	12150	
Avg. F. F.		
Wet Gas	5096	
Contraction		60.2
Recycle	18624	
Bleed	3441	
Total	22065	
Total Feed	24862	
Recycle/F.F.	1.67	
Inlet Vel.	1.20	
Steam Flow		

RUN CONDITIONS	
Generator Press.	288
O_2 Preheat, °F	504
Gas Preheat, °F	790
Reactor Press.	250
Steam Back Press.	
Temperatures, °F	
Heater Outlet	
Catalyst #1	666
#2	672
#3	684
#4	667
#5	
Average	
Product Separator	
Pre-Heat #3	796
" #4	800

DISTILLATIONS	ASTM			Hempel Dist.		
				°F	%	A.P.I.
Prod.	Gas Oil					
A.P.I.	44.7			to 400	66.0	51.3
I.B.P.	112			400-550	19.3	33.9
5%				550+		
10%	154					
20	194					
30	218			WATER		
40	240			Temp.	%	
50	258			200		
60	278			203		
70	300			208		
80	320			water & P.T.	10.2	
90	352					
95	378					
E.P.	405					
Rec.	96.0					
Res.	1.0					
Loss.	2.0					

CATALYST DATA	
In Reactor at Start of Period	536.5
Fresh Catalyst Charged	–
Catalyst Recharged	75.0
Total	611.5
Catalyst Taken Out	16.0
In Reactor at End of Period	595.5
Reactor d-P, H_2O	
Pounds in Reactor	
Density, lbs./cu. ft.	
Bed Height, Feet	
Space Vel. SCFH/lb. cat.	
Inventory Figures	58.5
From d-P Meters	

CATALYST ANALYSIS	Particle Size				
	Screen			Sedimentation	
Frac.	M	%		M	%
On 40	420+	1.4		80+	
100	419-150	61.2		80-40	
150	149-105	14.3		40-20	
200	104-74	9.7		20-10	
250	73-62	1.4		10-0	
325	61-44	4.2			
<325	43-0	6.8			
Density, lbs./cu. ft.			Chem. Anal.		
Aerated 128.5			% Fe		
Settled 130.4			% C		
Compacted 131.0			% Oil		
Sp. Grav. 3.6			Specific Surface		
					m^2 gm

NATURAL GAS	%
CO_2	1.51
CH_4	86.93
C_2H_6	8.80
C_3H_8	2.76
C_4H_{10}	
N_2	
O_2	

PRODUCT INSPECTION					
	Oil	Water	Product	Pour °F	SUS @ °F
Neut. No.	45.3	38.3			
Sap. No.	48.4	37.5			
Hydrox No.	52.8				
Bromine No.	65.9				
% Fe					
% Alc		7.0			

GENERATOR ELEMENTAL BALANCE

IN	Mol %	SCFH m/hr	C	H	O
O_2	248.32	7.76			15.52
CO_2	7.48	.17	.17		.28
CH_4	158.56	9.91	9.91	39.64	
C_2H_6	30.00	1.00	2.00	6.00	
C_3H_8	13.64	.31	.93	2.48	
C_4H_{10}					
N_2					
Total		19.15	13.01	49.12	15.80

OUT	Mol %	SCFH m/hr	C	H	O
CO_2	2.12	.72	.72		1.44
CO	35.53	12.00	12.00		12.00
CH_4	2.58	.97	.97	3.88	
H_2	59.41	20.06		40.12	
N_2	.07	.02			
H_2O				4.72	2.36
Total		33.74	13.69	48.72	15.80

	FRESH FEED			WET GAS					RECYCLE	COMB. FEED		EFFLUENT		NET CHANGE ON REACTION									
					Measured		At Wt. Balance							Carbon			Hydrogen		Oxygen	Ultimate Oil			Unsats.
	%	m/hr	#/hr	%	m/hr	#/hr	m/hr	#/hr	m/hr	m/hr	%	m/hr	%	m/hr	a/hr	%	a/hr	%	a/hr	#/hr	#/gal	gal/hr	%
CO	35.5	11.99	335.72	12.76	1.72	48.16			7.20	19.19	21.28	8.92	11.51	-10.27	-10.27	14.35			-10.27				
H2	59.4	20.06	40.12	48.68	6.55	13.10			27.46	47.52	52.69	34.01	43.88	-13.51			-27.02						
CO2	2.1	.71	31.24	16.97	2.28	100.32			9.57	10.28	11.40	11.85	15.29	1.57	1.57	13.09			3.14				
N2	0.1	.03	.84	.59	.08	2.24			.33	.36	.40	.41	.53	.05									
CH4	2.9	.98	15.68	14.42	1.94	31.04			8.13	9.11	10.10	10.07	12.99	.96	.96	8.01	3.84						
C2H4				1.39	.19	5.32			.78	.78	.86	.97	1.25	.19	.38	3.17	.76						
C2H6				1.45	.20	6.00			.82	.82	.91	1.02	1.32	.20	.40	3.34	1.20						
C3H6				1.69	.23	9.66			.95	.95	1.05	1.18	1.52	.23	.69	5.75	1.38			8.69	6.25	1.39	
C3H8				.33	.04	1.76			.19	.19	.21	.23	.30	.04	.12	1.00	.32						
C4H8				.86	.12	6.72			.49	.49	.54	.61	.79	.12	.48	4.00	.96			6.78	6.10	1.05	
C4H10				.24	.03	1.24			.14	.14	.16	.17	.22	.03	.12	1.00	.30			1.74	4.86	.36	
C5H10				.44	.06	4.20			.25	.25	.28	.31	.40	.06	.30	2.50	.60			4.20	5.40	.78	
C6H12				.18	.02	1.68			.10	.10	.11	.12	.15	.02	.12	1.00	.24			1.68	5.50	.31	
OIL						(71.82)						.51	.66		5.13	42.79	10.26		(3.58)	71.82	6.50	11.05	
WATER												7.13	9.20				7.16		7.13				
TOTAL		33.77	423.60		13.45	231.94			56.40	90.18	99.99	77.51	100.01	20.31		100.00				94.51		14.94	
H2+CO		32.05			8.27																		
H2/CO		1.67			3.81					2.48		3.81											

ULTIMATE YIELDS	% CO Fed	#/hr	H2/CO #/MCF	H2/CO g/M3	Gal/hr	H2/CO Gal/MCF	H2/CO cc/M3
C1+C2	14.52	26.68	2.20	37.20			
C3+	58.04	97.58	8.03	135.79			
C4+	51.29	86.16	7.09	119.89			
Ult. Oil		94.51	7.78	131.56	14.94	1.23	173.80
C02	13.09	69.08	5.69	96.22			
H20		128.74	10.56	178.57			

WEIGHT BALANCE	#/hr	%	#/hr
Wet Gas			
Oil			
Water			
Total			

EFFLUENT RATIOS	
H2/H20	4.77
C02/C0	1.33
(H2) (C02) / (H20) (C0)	6.34

CONTRACTION: 60.1

C0 Conversion: 85.7

H2 Conversion: 67.3

$H_2+CO = 70.4$

Yield Calculations assume "oil" is CH2, and is found by difference on Carbon, and H20 by difference on Hydrogen. "Oil" figures therefore include hydrocarbon fraction of oxygenated compounds. Standard cubic feet measured at 60 F and 14.7 psig. Cubic Meters measured at 0 C. and 14.7 psig. g/M3 = 16.91 × #/MCF. cc/M3 = 141.3 × gal/MCF.

THE TEXAS COMPANY — MONTEBELLO LABORATORY

DATA SUMMARY SHEET

Synthesis Run Number 401 From May 8-48 Hr. 0800 to May 9-48 Hr. 0700

FLOWS	SCFH	%
Oxygen	2938	
Nat. Gas	4369	
Total	7307	40.2
Fresh Feed	12863	
F. F. by C	12478	
Avg. F. F.		
Wet Gas	5266	
Contraction		59.1
Recycle	18414	
Bleed	3107	
Total	21521	
Total Feed	34384	
Recycle/F.F.	1.62	
Inlet Vel.	1.18	
Steam Flow		

RUN CONDITIONS	
Generator Press.	295
O_2 Preheat, °F	467
Gas Preheat, °F	762
Reactor Press.	250
Steam Back Press.	
Temperatures, °F	
Heater Outlet	
Catalyst #1	656
#2	679
#3	700
#4	676
#5	
Average	
Product Separator	
Pre-Heat #3	772
" #4	767

DISTILLATIONS	A S T M	Hempel Dist.	°F	%	A.P.I.
Prod.	Gas 0.2				
A.P.I.	44.8		to 400	7.2.0	57.3
I.B.P.	116		400-550	17.0	35.9
5%			550+		
10%	160				
20	192				
30	214	WATER	Temp.	%	
40	234		200		
50	252		203		
60	274		208		
70	294		Water A.P.I.	10.2	
80	320				
90	350				
95	378				
E.P.	400				
Rec.	98.0				
Res.	1.0				
Loss.	1.0				

CATALYST DATA	
In Reactor at Start of Period	595.5
Fresh Catalyst Charged	—
Catalyst Recharged	—
Total	595.5
Catalyst Taken Out	28.5
In Reactor at End of Period	567.0
Reactor d-P, H_2O	
Pounds in Reactor	
Density, lbs./cu. ft.	
Bed Height, Feet	
Space Vel. SCFH/lb. cat.	
Inventory Figures	60.6
From d-P Meters	

CATALYST ANALYSIS	Particle Size				
	Screen			Sedimentation	
	Frac.	M	%	M	%
	On 40	420+	0.4	80+	
	100	419-150	51.0	80-40	
	150	149-105	17.3	40-20	
	200	104-74	12.7	20-10	
	250	73-62	1.6	10-0	
	325	61-44	6.7		
	<325	43-0	10.3		
	Density, lbs./cu. ft.			Chem. Anal.	
	Aerated 118.6			% Fe	
	Settled 124.8			% C	
	Compacted 125.2			% Oil	
	Sp. Grav. 3.5			Specific Surface	
				m^2/gm	

NATURAL GAS	%
CO_2	1.30
CH_4	85.35
C_2H_6	9.74
C_3H_8	3.60
C_4H_{10}	
N_2	
O_2	

PRODUCT INSPECTION					
	Oil	Water	Product	Pour °F	SUS @ °F
Neut. No.	41.5	34.3			
Sap. No.	43.5	33.1			
Hydrox. No.	49.9				
Bromine No.	72.2				
% Fe					
% Alc		6.0			

GENERATOR ELEMENTAL BALANCE

	IN Mol %	SCFH m/hr	C	H	O	OUT Mol %	SCFH m/hr	C	H	O
O_2	248.00	7.75			15.50	CO_2	1.68	.67	.67		1.28
CO_2		.15	.15		.30	CO	35.43	12.02	12.02		12.02
CH_4		9.84	9.84	39.36		CH_4	3.62	1.23	1.23	4.92	
C_2H_6		1.18	2.24	6.72		H_2	58.06	20.04		40.08	
C_3H_8		.42	1.26	3.36		N_2	—				
C_4H_{10}						H_2O				5.00	2.50
N_2						Total		33.93	13.89	50.00	15.80
Total		19.28	13.49	49.44	15.80						

	FRESH FEED %	m/hr	#/hr	WET GAS %	Measured m/hr	Measured #/hr	At Wt. Balance m/hr	At Wt. Balance #/hr	RECYCLE m/hr	COMB. FEED m/hr	COMB. FEED %	EFFLUENT m/hr	EFFLUENT %
CO	35.4	12.01	336.28	13.08	1.68	47.04			6.64	18.65	20.97	8.32	10.97
H2	59.1	20.06	40.12	46.27	6.43	12.86			25.44	45.50	51.17	31.87	42.01
CO2	1.9	.64	28.16	18.13	2.52	110.88			9.97	10.61	11.93	12.49	16.46
N2	—	—	—	.89	.12	3.36			.49	.49	.55	.61	.80
CH4	3.6	1.22	19.52	15.44	2.14	34.24			8.49	9.71	10.92	10.63	14.01
C2H4				1.42	.20	5.60			.78	.78	.88	.98	1.29
C2H6				1.71	.24	7.20			.94	.94	1.06	1.18	1.56
C3H6				1.80	.25	10.50			.99	.99	1.11	1.24	1.63
C3H8				.41	.06	2.64			.23	.23	.36	.29	.38
C4H8				.94	.13	7.28			.52	.52	.58	.65	.86
C4H10				.24	.03	1.74			.13	.13	.15	.16	.21
C5H10				.50	.07	4.90			.27	.27	.30	.34	.45
C6H12				.68	.03	2.52			.10	.10	.11	.13	.17
OIL						(56.98)						.41	.54
WATER												6.57	8.66
TOTAL		33.94	424.08		13.89	250.76			54.98	88.92	99.99	75.87	100.00
H2+CO		32.07			8.11								
H2/CO		1.67			3.83					2.44		3.83	

NET CHANGE ON REACTION	Carbon m/hr	Carbon a/hr	Carbon %	Hydrogen a/hr	Hydrogen %	Oxygen a/hr	Ultimate Oil #/hr	Ultimate Oil #/gal	Ultimate Oil gal/hr	Unsats. %
CO	-10.33	-10.33	13.99			-10.33				
H2	-13.63			-27.26						
CO2	1.88	1.88	15.65			3.76				
N2										
CH4	.92	.92	7.66	3.68						
C2H4	.20	.40	3.33	.80						
C2H6	.24	.96	7.99	1.44						
C3H6	.25	.75	6.24	1.50			9.45	6.25	1.51	
C3H8	.06	.18	1.50	.48						
C4H8	.13	.52	4.33	1.04			6.52	6.10	1.13	
C4H10	.03	.12	1.00	.30			1.74	4.86	.36	
C5H10	.07	.35	2.91	.70			4.90	5.40	.91	
C6H12	.03	.18	1.50	.36			2.52	5.50	.46	
OIL		4.07	33.89	8.14		(4.41)	56.88	6.50	8.77	
WATER				8.82		6.57				
TOTAL	20.03		99.99				82.51		13.14	
H2+CO										
H2/CO										

ULTIMATE YIELDS	% C0 Fed	#/hr	H2 / C0 #/MCF	H2 / C0 g/M3	Gal/hr	H2 / C0 Gal/MCF	H2 / C0 cc/M3
C1+C2	18.88	27.52	2.27	38.39			
C3+	51.37	86.56	7.12	120.40			
C4+	63.63	73.42	6.04	102.14			
Ult. Oil		82.51	6.79	114.82	13.14	1.08	152.60
C02	15.65	82.72	6.81	115.16			
H20		118.26	9.73	164.53			

WEIGHT BALANCE	#/hr	%	#/hr
Wet Gas			
Oil			
Water			
Total			

EFFLUENT RATIOS	
H2/H20	4.65
C02/C0	1.50
(H2) (C02) / (H20) (C0)	7.28

CONTRACTION: 59.0

C0 Conversion: 86.0

H2 Conversion: 67.9

Wet CO = 70.6

Yield Calculations assume "oil" is CH_2, and is found by difference on Carbon, and H20 by difference on Hydrogen. "Oil" figures therefore include hydrocarbon fraction of oxygenated compounds. Standard cubic feet measured at 60 F and 14.7 psig. Cubic Meters measured at 0 C. and 14.7 psig. g/M3 = 16.91 × #/MCF. cc/M3 = 141.3 × gal/MCF.

THE TEXAS COMPANY — MONTEBELLO LABORATORY

DATA SUMMARY SHEET

Synthesis Run Number 41 A From 5/31/48 Hr. 1200 to 6/1/48 Hr. 0700

FLOWS	SCFH	%
Oxygen	2870	
Nat. Gas	4340	
Total	7210	39.8
Fresh Feed	12500	
F. F. by C		
Avg. F. F.		
Wet Gas	3820	
Contraction		43.7
Recycle	18160	
Bleed	3510	
Total	21670	
Total Feed	34170	
Recycle/F.F.	1.73	
Inlet Vel.		
Steam Flow		

RUN CONDITIONS	
Generator Press.	262
O_2 Preheat, °F	458
Gas Preheat, °F	772
Reactor Press.	250
Steam Back Press.	
Temperatures, °F	
Heater Outlet	
Catalyst #1	480
#2	470
#3	499
#4	486
#5	
Average	
Product Separator	

DISTILLATIONS	A S T M	
	Raw Oil	Gaso-line
Prod.		
A.P.I.	43.5	
I.B.P.		116
5%		
10%		158
20		192
30		212
40		232
50		252
60		274
70		294
80		322
90		348
95		378
E.P.		402
Rec.		98.0
Res.		1.0
Loss.		1.0

Hempel Dist.	°F	%	A.P.I.
to 400		68.0	51.5
400-550		18.0	32.4
550+			

WATER	
Temp.	%
200	
203	
208	
A.P.I.	10.1

CATALYST DATA	
In Reactor at Start of Period	740
Fresh Catalyst Charged	
Catalyst Recharged	
Total	740
Catalyst Taken Out	.68
In Reactor at End of Period	672
Reactor d-P, H_2O	
Pounds in Reactor	
Density, lbs./cu. ft.	
Bed Height, Feet	
Space Vel. SCFH/lb. cat.	
Inventory Figures	50.8
From d-P Meters	

CATALYST ANALYSIS	Particle Size				
	Screen			Sedimentation	
Frac.	M	%	M	%
On 40	420+	13.4	80+	
100	419-150	35.8	80-40	
150	149-105	8.7	40-20	
200	104-74	9.3	20-10	
250	73-62	3.2	10-0	
325	61-44	7.9		
<325	43-0	21.7		

Density, lbs./cu. ft		Chem. Anal.	
Aerated		% Fe	
Settled		% C	
Compacted		% Oil	
Sp. Grav.	5.0	Specific Surface	
		7.2	m^2 gm

NATURAL GAS	%
CO_2	1.31
CH_4	85.00
C_2H_6	9.64
C_3H_8	3.81
C_4H_{10}	.24
N_2	
O_2	

PRODUCT INSPECTION					
	Oil	Water	Product	Pour °F	SUS @ °F
Neut. No.	34.2	8.5			
Sap. No.	31.6	8.2			
Hydrox No.	41.8				
Bromine No.	59.2				
% Fe					
% Alc		6.5			

GENERATOR ELEMENTAL BALANCE

IN	Mol %	SCFH m/hr	C	H	O
O_2	238.08	7.44			14.88
CO_2	6.60	.15	.15		.30
CH_4	155.68	9.73	9.73	38.92	
C_2H_6	33.00	1.10	2.20	6.60	
C_3H_8	19.36	.44	1.32	3.42	
C_4H_{10}	1.74	.03	.12	.30	
N_2					
Total		18.89	13.52	49.24	15.18

OUT	Mol %	SCFH m/hr	C	H	O
CO_2	2.4	.79	.79		1.58
CO	33.9	11.18	11.18		11.18
CH_4	5.4	1.78	1.78	7.12	
H_2	57.4	18.93		37.86	
N_2	0.9	.30			
H_2O				4.84	2.42
Total		32.98	13.75	49.82	15.18

	FRESH FEED			WET GAS					RECYCLE	COMB. FEED		EFFLUENT	
					Measured		At Wt. Balance						
	%	m/hr	#/hr	%	m/hr	#/hr	m/hr	#/hr	m/hr	m/hr	%	m/hr	%
CO	33.9	11.18	313.04	10.86	1.09	30.52	2.01	56.33	6.20	17.38	19.30	8.21	10.10
H2	57.4	18.93	37.86	44.70	4.51	9.02	8.32	16.65	25.51	44.44	49.36	33.83	41.61
CO2	2.4	.79	34.76	13.62	1.38	60.72	2.55	112.07	7.81	8.60	9.55	10.36	12.74
N2	0.9	.30	8.40	.34	.03	.84	.06	1.55	.19	.49	.54	.25	.31
CH4	5.4	1.78	28.48	21.66	2.18	34.88	4.02	64.38	12.36	14.14	15.70	16.38	20.15
C2H4				2.02	.20	5.60	.37	10.34	1.15	1.15	1.28	1.52	1.87
C2H6				1.19	.12	3.60	.22	6.64	.68	.68	.76	.90	1.11
C3H6				2.02	.20	8.40	.37	15.50	1.15	1.15	1.28	1.52	1.87
C3H8				.40	.04	1.76	.07	3.25	.23	.23	.26	.30	.37
C4H8				1.68	.17	9.52	.31	17.57	.96	.96	1.07	1.27	1.56
C4H10				.18	.02	1.16	.04	2.14	.10	.10	.11	.14	.17
C5H10				.89	.09	6.30	.17	11.63	.51	.51	.57	.68	.84
C6H12				.37	.04	3.36	.07	6.20	.21	.21	.23	.28	.34
OIL								--				.00	.00
WATER												5.65	6.95
TOTAL		32.98	422.54		10.08	175.6	18.58	324.25	57.06	90.04	100.01	81.29	99.99
H2+CO		30.11			5.60		10.33						
H2/CO		1.69			4.14		4.14			2.56		4.18	

NET CHANGE ON REACTION	Carbon			Hydrogen		Oxygen	Ultimate Oil			Unsats.
	m/hr	a/hr	%	a/hr	%	a/hr	#/hr	#/gal	gal/hr	%
CO	- 9.17	- 9.17	17.98			- 9.17				
H2	-10.61			-21.22						
CO2	1.76	1.76	15.74			3.52				
N2	- .24									
CH4	2.24	2.24	20.04	8.96						
C2H4	.37	.74	6.62	1.48						
C2H6	.22	.44	3.94	1.32						
C3H6	.37	1.11	9.93	2.22			13.95	6.25	2.23	
C3H8	.07	.21	1.88	.56						
C4H8	.31	1.24	11.09	2.48			16.69	6.10	2.74	
C4H10	.04	.16	1.43	.40			2.14	4.86	.44	
C5H10	.17	.85	7.60	1.70			11.63	5.40	2.15	
C6H12	.07	.42	3.76	.84			6.20	5.50	1.13	
OIL		.00		.00						
WATER				1.26		(0.63) 5.65				
TOTAL	14.40		100.01				50.61		8.69	

ULTIMATE YIELDS	% C0 Fed	#/hr	H2 / C0 #/MCF	H2 / C0 g/M3	Gal/hr	H2 / C0 Gal/MCF	H2 / C0 cc/M3
C1+C2	30.60	52.88	4.23	71.53			
C3+	35.69	56.29	4.50	76.10			
C4+	23.88	37.54	3.00	50.73			
Ult. Oil		50.61	4.05	68.49	8.69	0.70	98.91
C02	15.74	77.31	6.18	104.50			
H20		101.70	8.14	137.65			

WEIGHT BALANCE	#/hr	%	#/hr
Wet Gas	175.7		323.4
Oil	19.1		19.1
Water	80.0		80.0
Total	274.8	64.9	422.5

EFFLUENT RATIOS	
H2/H20	5.99
C02/C0	1.26
(H2) (C02) / (H20) (C0)	7.56

CONTRACTION: 43.7

C0 Conversion: 82.0

H2 Conversion: 56.0

$H_2 + CO = 65.7$

Yield Calculations assume "oil" is CH2, and is found by difference on Carbon, and H20 by difference on Hydrogen. "Oil" figures therefore include hydrocarbon fraction of oxygenated compounds. Standard cubic feet measured at 60 F and 14.7 psig. Cubic Meters measured at 0 C. and 14.7 psig. g/M3 = 16.91 × #/MCF. cc/M3 = 141.3 × gal/MCF.

THE TEXAS COMPANY — MONTEBELLO LABORATORY

DATA SUMMARY SHEET

Synthesis Run Number 41 B From 6/1/48 Hr. 0800 to 6/2/48 Hr. 0700

FLOWS	SCFH	%
Oxygen	2640	
Nat. Gas	4260	
Total	6900	38.3
Fresh Feed	12200	
F. F. by C		
Avg. F. F.		
Wet Gas	5000	
Contraction		50.7
Recycle	18070	
Bleed	3929	
Total	21999	
Total Feed	34199	
Recycle F.F.	1.80	
Inlet Vel.		
Steam Flow		

RUN CONDITIONS	
Generator Press.	265
O_2 Preheat, °F	440
Gas Preheat, °F	709
Reactor Press.	250
Steam Back Press.	
Temperatures, °F	
Heater Outlet	
Catalyst #1	635
#2	628
#3	655
#4	620
#5	
Average	
Product Separator	

DISTILLATIONS	ASTM	
	Raw Oil	Gasoline
Prod.		
A.P.I.	46.7	
I.B.P.		108
5%		
10%		145
20		174
30		198
40		218
50		238
60		260
70		290
80		320
90		358
95		384
E.P.		408
Rec.		98.0
Res.		1.0
Loss		1.0

Hempel Dist.	°F	%	A.P.I.
to 400		74.3	53.1
400-550		18.6	34.2
550+			

WATER	Temp.	%
	200	
	203	
	208	
A.P.I.	10.5	

CATALYST DATA	
In Reactor at Start of Period	672
Fresh Catalyst Charged	100
Catalyst Recharged	
Total	772
Catalyst Taken Out	78
In Reactor at End of Period	694
Reactor d-P, H_2O	
Pounds in Reactor	
Density, lbs./cu. ft.	
Bed Height, Feet	
Space Vel. SCFH/lb. cat.	
Inventory Figures	49.3
From d-P Meters	

CATALYST ANALYSIS — Particle Size	Screen			Sedimentation	
Frac.	M	%	M	%
On 40	420+	14.1	80+	
100	419-150	34.0	80-40	
150	149-105	8.5	40-20	
200	104-74	9.7	20-10	
250	73-62	4.4	10-0	
325	61-44	9.9		
<325	43-0	19.4		

Density, lbs./cu. ft	Chem. Anal.
Aerated	% Fe
Settled	% C
Compacted	% Oil
Sp. Grav. 5.0	Specific Surface
	8.7 m^2 gm

NATURAL GAS	%
CO_2	1.53
CH_4	83.80
C_2H_6	10.30
C_3H_8	4.07
C_4H_{10}	.21
N_2	.09
O_2	

PRODUCT INSPECTION					
	Oil	Water	Product	Pour °F	SUS @ °F
Neut. No.	46.0	34.5			
Sap. No.	40.3	27.7			
Hydrox No.	57.4				
Bromine No.	59.7				
% Fe					
% Alc		8.5			

GENERATOR ELEMENTAL BALANCE

IN	Mol %	SCFH m/hr	C	H	O
O_2	223.04	6.97			13.94
CO_2	7.48	.17	.17		.34
CH_4	150.72	9.42	9.42	37.68	
C_2H_6	34.80	1.16	2.32	6.96	
C_3H_8	20.24	.46	1.38	3.68	
C_4H_{10}	1.16	.02	.08	.20	
N_2	.28	.01			
Total		18.21	13.37	48.52	14.28

OUT	Mol %	SCFH m/hr	C	H	O
CO_2	1.8	.58	.58		1.16
CO	34.8	11.20	11.20		11.20
CH_4	2.8	.90	.90	3.60	
H_2	60.2	19.38		38.76	
N_2	0.4	.13			
H_2O				3.84	1.92
Total		32.19	12.68	46.20	14.28

	FRESH FEED			WET GAS					RECYCLE	COMB. FEED		EFFLUENT		NET CHANGE ON REACTION								
					Measured		At Wt. Balance							Carbon			Hydrogen		Oxygen	Ultimate Oil			Unsats.
	%	m/hr	#/hr	%	m/hr	#/hr	m/hr	#/hr	m/hr	m/hr	%	m/hr	%	m/hr	a/hr	%	a/hr	%	a/hr	#/hr	#/gal	gal/hr	%
CO	34.8	11.20	313.60	7.81	1.03	28.84	1.24	34.68	4.53	15.73	17.45	5.77	7.30	- 9.96	- 9.96	11.07			- 9.96				
H2	60.2	19.38	38.76	44.97	5.93	11.86	7.13	14.26	26.06	45.44	50.42	33.19	41.98	-12.25			-24.50						
CO2	1.8	.58	25.52	19.13	2.52	110.88	3.03	133.33	11.08	11.66	12.94	14.11	17.85	2.45	2.45	21.87			4.90				
N2	0.4	.13	3.64	1.14	.15	4.20	.18	5.05	.66	.79	.88	.84	1.06	.05									
CH4	2.8	.90	25.20	19.39	2.56	4.96	3.08	49.25	11.23	12.13	13.46	14.31	18.10	2.18	2.18	19.46	8.72						
C2H4				1.99	.26	7.28	.31	8.75	1.15	1.15	1.28	1.46	1.85	.31	.62	5.54	1.24						
C2H6				1.56	.21	6.30	.25	7.58	.90	.90	1.00	1.15	1.45	.25	.50	4.46	1.50						
C3H6				1.92	.25	10.50	.30	12.63	1.11	1.11	1.23	1.41	1.78	.30	.90	8.04	1.80			11.37	6.25	1.82	
C3H8				.33	.04	1.76	.05	2.12	.19	.19	.21	.24	.30	.05	.15	1.34	.40						
C4H8				.94	.12	6.72	.14	8.08	.54	.54	.60	.68	.86	.14	.56	5.00	1.12			7.68	6.10	1.26	
C4H10				.20	.03	1.74	.04	2.09	.12	.12	.13	.16	.20	.04	.16	1.43	.40			2.09	4.86	.43	
C5H10				.42	.06	4.20	.07	5.05	.24	.24	.27	.31	.39	.07	.35	3.12	.70			5.05	5.40	.94	
C6H12				.20	.03	2.52	.04	3.03	.12	.12	.13	.16	.20	.04	.24	2.14	.48			3.03	5.50	.55	
OIL								(25.90)				.19	.24		1.85	16.52	3.70			25.90	6.50	3.98	
WATER												5.06	6.40				4.44		(2.22) 5.06				
TOTAL		32.19	406.72		13.19	237.7	15.86	285.90	57.94	90.12	100.0	79.04	99.97	16.33		99.99				55.12		8.98	
H2+CO		30.58			6.96		8.37																
H2/CO		1.73			5.76		5.75			2.89		5.75											

ULTIMATE YIELDS	% C0 Fed	#/hr	H2 / C0 #/MCF	H2 / C0 g/M3	Gal/hr	H2 / C0 Gal/MCF	H2 / C0 cc/M3
C1+C2	29.46	35.38	2.90	49.04			
C3+	37.59	58.90	4.83	81.68			
C4+	28.21	44.15	3.62	61.21			
Ult. Oil		55.12	4.52	76.43	8.98	0.74	104.56
C02	21.87	107.81	8.84	149.48			
H20		91.08	7.47	126.32			

WEIGHT BALANCE	#/hr	%	#/hr
Wet Gas	237.7		285.7
Oil	40.9		40.9
Water	80.1		80.1
Total	358.7	88.2	406.7

EFFLUENT RATIOS	
H2/H20	6.56
C02/C0	2.45
(H2) (C02) / (H20) (C0)	16.04

CONTRACTION: 50.7

C0 Conversion: 88.9

H2 Conversion: 63.2

$H_2 + CO = 72.6$

Yield Calculations assume "oil" is CH2, and is found by difference on Carbon, and H20 by difference on Hydrogen. "Oil" figures therefore include hydrocarbon fraction of oxygenated compounds. Standard cubic feet measured at 60 F and 14.7 psig. Cubic Meters measured at O C. and 14.7 psig. g/M3 = 16.91 × #/MCF. cc/M3 = 141.3 × gal/MCF.

THE TEXAS COMPANY — MONTEBELLO LABORATORY

DATA SUMMARY SHEET

Synthesis Run Number 41 C From 6/2/48 Hr. 0800 to 6/3/48 Hr. 0700

FLOWS	SCFH	%
Oxygen	2570	
Nat. Gas	4230	
Total	6800	37.8
Fresh Feed	11900	
F. F. by C		
Avg. F. F.		
Wet Gas	4800	
Contraction		57.1
Recycle	16980	
Bleed	3452	
Total	20432	
Total Feed	32332	
Recycle/F.F.	1.72	
Inlet Vel.		
Steam Flow		

RUN CONDITIONS	
Generator Press.	270
O_2 Preheat, °F	465
Gas Preheat, °F	746
Reactor Press.	250
Steam Back Press.	
Temperatures, °F	
Heater Outlet	
Catalyst #1	630
#2	645
#3	670
#4	640
#5	
Average	
Product Separator	

DISTILLATIONS	A S T M	
Prod.	Raw Oil	Gasoline
A.P.I.	47.7	
I.B.P.		114
5%		
10%		152
20		174
30		194
40		214
50		234
60		254
70		274
80		304
90		342
95		374
E.P.		404
Rec.		99.0
Res.		1.0
Loss		

Hempel Dist.		
°F	%	A.P.I.
to 400	75.6	54.4
400-550	13.6	34.8
550+	10.8	

WATER	
Temp.	%
200	
203	
208	
A.P.I.	10.4

CATALYST DATA	
In Reactor at Start of Period	694
Fresh Catalyst Charged	
Catalyst Recharged	76
Total	770
Catalyst Taken Out	51
In Reactor at End of Period	719
Reactor d-P, H_2O	
Pounds in Reactor	
Density, lbs./cu. ft.	
Bed Height, Feet	
Space Vel. SCFH/lb. cat.	
Inventory Figures	45.0
From d-P Meters	

CATALYST ANALYSIS				
Particle Size				
Screen			Sedimentation	
Frac.	M	%	M	%
On 40	420+	22.1	80+	
100	419-150	40.2	80-40	
150	149-105	6.4	40-20	
200	104-74	6.6	20-10	
250	73-62	2.3	10-0	
325	61-44	7.3		
<325	43-0	15.1		
Density, lbs./cu. ft			Chem. Anal.	
Aerated	179.0		% Fe	
Settled	180.0		% C	
Compacted	182.0		% Oil	
Sp. Grav.	4.5		Specific Surface	
			14.2	m^2 gm

NATURAL GAS	%
CO_2	1.47
CH_4	85.71
C_2H_6	9.20
C_3H_8	3.43
C_4H_{10}	.20
N_2	
O_2	

PRODUCT INSPECTION					
	Oil	Water	Product	Pour °F	SUS @ °F
Neut. No.	39.2	39.2			
Sap. No.	42.2	38.3			
Hydrox No.	66.2				
Bromine No.	71.7				
% Fe					
% Alc		8.9			

GENERATOR ELEMENTAL BALANCE

IN	Mol %	SCFH m/hr	C	H	O
O_2	216.96	6.78			13.56
CO_2	7.04	.16	.16		.32
CH_4	153.12	9.57	9.57	38.28	
C_2H_6	30.90	1.03	2.06	6.18	
C_3H_8	16.72	.38	1.14	3.04	
C_4H_{10}	1.16	.02	.08	.20	
N_2					
Total		17.94	13.01	47.70	13.88

OUT	Mol %	SCFH m/hr	C	H	O
CO_2	1.7	.53	.53		1.06
CO	31.8	9.99	9.99		9.99
CH_4	5.2	1.63	1.63	6.52	
H_2	58.7	18.43		36.86	
N_2	2.6	.82			
H_2O				5.66	2.83
Total		31.40	12.15	49.04	13.88

	FRESH FEED			WET GAS					RECYCLE	COMB. FEED		EFFLUENT		NET CHANGE ON REACTION								
					Measured		At Wt. Balance							Carbon			Hydrogen		Oxygen	Ultimate Oil			Unsats.
	%	m/hr	#/hr	%	m/hr	#/hr	m/hr	#/hr	m/hr	m/hr	%	m/hr	%	m/hr	a/hr	%	a/hr	%	a/hr	#/hr	#/gal	gal/hr	%
CO	31.8	9.99	279.72	9.52	1.21	33.88	1.29	36.08	5.14	15.13	17.71	6.43	8.87	- 8.70	- 8.70	12.91			- 8.70				
H2	58.7	18.43	36.86	45.21	5.72	11.44	6.09	12.18	24.42	42.85	50.16	30.51	42.08	-12.34			-24.68						
CO2	1.7	.53	23.32	18.70	2.37	104.28	2.52	111.05	10.10	10.63	12.44	12.62	17.41	1.99	1.99				3.98				
N2	2.6	.82	22.96	1.03	.13	3.64	.14	3.88	.56	1.38	1.62	.70	.97	.68									
CH4	5.2	1.63	26.08	18.08	2.29	36.64	2.44	39.02	9.77	11.40	13.34	12.21	16.84	.81	.81	8.11	3.24						
C2H4				1.72	.22	6.16	.23	6.56	.93	.93	1.09	1.16	1.60	.23	.46	4.60	.92						
C2H6				1.03	.13	3.90	.14	4.15	.56	.56	.66	.70	.97	.14	.28	2.80	.84						
C3H6				1.77	.22	9.24	.23	9.84	.96	.96	1.12	1.19	1.64	.23	.69	6.90	1.38			8.86	6.25	1.42	
C3H8				.32	.04	1.76	.04	1.87	.17	.17	.20	.21	.29	.04	.12	1.20	.32						
C4H8				1.57	.20	11.20	.21	11.93	.85	.85	.99	1.06	1.46	.21	.84	8.40	1.68			11.33	6.10	1.86	
C4H10				.20	.03	1.74	.03	1.85	.11	.11	.13	.14	.19	.03	.12	1.20	.30			1.85	4.86	.38	
C5H10				.59	.07	4.90	.07	5.22	.32	.32	.37	.39	.54	.07	.35	3.50	.70			5.22	5.40	.97	
C6H12				.25	.03	2.52	.03	2.68	.14	.14	.16	.17	.23	.03	.18	1.80	.36			2.68	5.50	.49	
OIL								(40.04)				.29	.40		2.86	28.63	5.72			40.04	6.50	6.16	
WATER												4.72	6.51				9.22		(4.61) 4.72				
TOTAL		31.40	388.94		12.66	231.3	13.46	246.31	54.01	85.43	99.99	72.50	100.00	17.94		99.97				69.98		11.28	
H2+CO		28.42			6.93		7.38																
H2/CO		1.84			4.73		4.72			2.83		4.74											

ULTIMATE YIELDS	% C0 Fed	#/hr	H2 / C0 #/MCF	H2 / C0 g/M3	Gal/hr	H2 / C0 Gal/MCF	H2 / C0 cc/M3
C1+C2	15.51	23.65	1.99	33.65			
C3+	51.63	73.43	6.17	104.33			
C4+	43.53	61.72	5.19	87.76			
Ult. Oil		69.98	5.88	99.43	11.28	0.95	134.24
C02	19.92	87.73	7.37	123.63			
H20		84.96	7.14	120.74			

WEIGHT BALANCE	#/hr	%	#/hr
Wet Gas	231.3		246.0
Oil	58.0		58.0
Water	84.0		84.0
Total	373.3	95.8	388.9

EFFLUENT RATIOS	
H2/H20	6.46
C02/C0	1.96
(H2) (C02) / (H20) (C0)	12.69

CONTRACTION:	57.1
C0 Conversion:	87.1
H2 Conversion:	66.9
Hg+C0 =	74.0

Yield Calculations assume "oil" is CH2, and is found by difference on Carbon, and H20 by difference on Hydrogen. "Oil" figures therefore include hydrocarbon fraction of oxygenated compounds. Standard cubic feet measured at 60 F and 14.7 psig. Cubic Meters measured at 0 C. and 14.7 psig. g/M3 = 16.91 × #/MCF. cc/M3 = 141.3 × gal/MCF.

THE TEXAS COMPANY — MONTEBELLO LABORATORY

DATA SUMMARY SHEET

Synthesis Run Number 41 D From 6/3/48 Hr. 0800 to 6/4/48 Hr. 0700

FLOWS	SCFH	%
Oxygen	2500	
Nat. Gas	4200	
Total	6700	37.3
Fresh Feed	11700	
F. F. by C		
Avg. F. F.		
Wet Gas	4600	
Contraction		49.6
Recycle	16560	
Bleed	5589	
Total	22149	
Total Feed	33849	
Recycle/F.F.	1.89	
Inlet Vel.		
Steam Flow		

RUN CONDITIONS	
Generator Press.	274
O_2 Preheat, °F	450
Gas Preheat, °F	665
Reactor Press.	250
Steam Back Press.	
Temperatures, °F	
Heater Outlet	
Catalyst #1	640
#2	650
#3	675
#4	640
#5	
Average	
Product Separator	

DISTILLATIONS	A S T M	
Prod.	Ray Oil	Gasoline
A.P.I.	43.8	
I.B.P.		110
5%		
10%		156
20		182
30		208
40		232
50		250
60		274
70		296
80		324
90		362
95		392
E.P.		414
Rec.		97.0
Res.		2.0
Loss.		1.0

Hempel Dist.		
°F	%	A.P.I.
to 400	72.0	51.4
400-550	16.6	32.6
550+		

WATER	
Temp.	%
200	
203	
208	
A.P.I.	

CATALYST DATA	
In Reactor at Start of Period	719
Fresh Catalyst Charged	78
Catalyst Recharged	
Total	797
Catalyst Taken Out	72.75
In Reactor at End of Period	724.25
Reactor d-P, H_2O	
Pounds in Reactor	
Density, lbs./cu. ft.	
Bed Height, Feet	
Space Vel. SCFH/lb. cat.	
Inventory Figures	46.8
From d-P Meters	

CATALYST ANALYSIS					
Particle Size					
Screen			Sedimentation		
Frac.	M	%	M	%	
On 40	420+	29.3	80+		
100	419-150	37.2	80-40		
150	149-105	4.9	40-20		
200	104-74	5.1	20-10		
250	73-62	1.6	10-0		
325	61-44	5.1			
<325	43-0	16.8			
Density, lbs./cu. ft.			Chem. Anal.		
Aerated			% Fe		
Settled			% C		
Compacted			% Oil		
Sp. Grav. 4.9			Specific Surface		
			17.3		m^2 gm

NATURAL GAS	%
CO_2	1.41
CH_4	84.98
C_2H_6	9.46
C_3H_8	3.95
C_4H_{10}	.20
N_2	
O_2	

PRODUCT INSPECTION					
	Oil	Water	Product	Pour °F	SUS @ °F
Neut. No.	51.0				
Sap. No.	53.3				
Hydrox. No.	65.2				
Bromine No.	62.1				
% Fe					
% Alc					

GENERATOR ELEMENTAL BALANCE

IN	Mol %	SCFH m/hr	C	H	O
O_2	211.20	6.60			13.20
CO_2	7.04	.16	.16		.32
CH_4	150.72	9.42	9.42	37.68	
C_2H_6	31.50	1.05	2.10	6.30	
C_3H_8	19.36	.44	1.32	3.52	
C_4H_{10}	1.16	.02	.08	.20	
N_2					
Total		17.69	13.08	47.70	13.52

OUT	Mol %	SCFH m/hr	C	H	O
CO_2	2.6	.80	.80		1.60
CO	33.6	10.37	10.37		10.37
CH_4	6.0	1.85	1.85	7.40	
H_2	56.6	17.47		34.94	
N_2	1.2	.37			
H_2O				3.10	1.55
Total		30.86	13.02	45.44	13.52

	FRESH FEED			WET GAS					RECYCLE	COMB. FEED		EFFLUENT		NET CHANGE ON REACTION									
					Measured		At Wt. Balance							Carbon			Hydrogen		Oxygen	Ultimate Oil			Unsats.
	%	m/hr	#/hr	%	m/hr	#/hr	m/hr	#/hr	m/hr	m/hr	%	m/hr	%	m/hr	a/hr	%	a/hr	%	a/hr	#/hr	#/gal	gal/hr	%
CO	33.6	10.37	290.36	10.18	1.24	34.72	1.59	44.42	5.94	16.31	18.29	7.53	9.56	- 8.78	- 8.78	15.33			- 8.78				
H2	56.6	17.47	34.94	43.58	5.29	10.58	6.77	13.53	25.42	42.89	48.09	32.19	40.87	-10.70			-21.40						
CO2	2.6	.80	35.20	18.33	2.23	98.12	2.85	125.52	10.69	11.49	12.88	13.54	17.19	2.05	2.05	19.77			4.10				
N2	1.2	.37	10.36	.47	.06	1.68	.08	2.15	.27	.64	.72	.35	.44	- .29									
CH4	6.0	1.85	29.60	20.01	2.34	38.98	3.11	49.74	11.67	13.52	15.16	14.78	18.77	1.26	1.26	12.15	5.04						
C2H4				1.87	.23	6.44	.29	8.24	1.09	1.09	1.22	1.38	1.75	.29	.58	5.59	1.16						
C2H6				1.19	.14	4.20	.18	5.37	.69	.69	.77	.87	1.10	.18	.36	3.47	1.08						
C3H6				1.90	.23	9.66	.29	12.36	1.11	1.11	1.24	1.40	1.78	.29	.87	8.39	1.40			11.12	6.25	1.78	
C3H8				.26	.03	1.32	.04	1.69	.15	.15	.17	.19	.24	.04	.12	1.16	.32						
C4H8				1.19	.14	7.84	.18	10.03	.69	.69	.77	.87	1.10	.18	.72	6.94	1.44			9.53	6.10	1.56	
C4H10				.24	.03	1.74	.04	2.23	.14	.14	.16	.18	.23	.04	.16	1.54	.40			2.23	4.86	.46	
C5H10				.55	.07	4.90	.09	6.27	.32	.32	.36	.41	.52	.09	.45	4.34	.90			6.27	5.40	1.16	
C6H12				.24	.03	2.52	.04	3.22	.14	.14	.16	.18	.23	.04	.24	2.31	.48			3.22	5.50	.59	
OIL								(27.58)				.20	.25		1.97	19.00	3.94			27.58	6.50	4.24	
WATER												4.68	5.94				4.90		(2.45) 4.68				
TOTAL		30.87	400.46		12.14	222.6	15.55	284.77	58.34	89.18	99.99	78.75	99.97	15.31		99.99				59.95		9.79	
H2+CO		27.84			6.53		8.36																
H2/CO		1.68			4.27		4.26			2.63		4.27											

ULTIMATE YIELDS	% C0 Fed	#/hr	H2/C0 #/MCF	H2/C0 g/M3	Gal/hr	H2/C0 Gal/MCF	H2/C0 cc/M3
C1+C2	21.21	33.75	2.88	48.70			
C3+	43.68	63.38	5.42	91.65			
C4+	34.13	49.33	4.22	71.36			
Ult. Oil		59.95	5.12	86.58	9.79	0.84	118.69
C02	19.77	90.32	7.72	130.55			
H20		84.24	7.20	121.75			

WEIGHT BALANCE	#/hr	%	#/hr
Wet Gas	222.6		284.5
Oil	27.0		27.0
Water	89.0		89.0
Total	338.6	84.8	400.5

EFFLUENT RATIOS	
H2/H20	6.88
C02/C0	1.80
(H2) (C02) / (H20) (C0)	12.37

CONTRACTION: 49.6

C0 Conversion: 84.7

H2 Conversion: 61.2

H_2 + CO = 70.0

Yield Calculations assume "oil" is CH2, and is found by difference on Carbon, and H20 by difference on Hydrogen. "Oil" figures therefore include hydrocarbon fraction of oxygenated compounds. Standard cubic feet measured at 60 F and 14.7 psig. Cubic Meters measured at O C. and 14.7 psig. g/M3 = 16.91 × #/MCF. cc/M3 = 141.3 × gal/MCF.

THE TEXAS COMPANY — MONTEBELLO LABORATORY

DATA SUMMARY SHEET

Synthesis Run Number 42 A From 6/12/48 Hr. 0800 to 6/13/48 Hr. 0700

FLOWS

	SCFH	%
Oxygen	2790	
Nat. Gas	4230	
Total	7020	39.7
Fresh Feed	12600	
F. F. by C	13416	
Avg. F. F.		
Wet Gas	3270	
Contraction		56.8
Recycle	18540	
Bleed	6842	
Total	25382	
Total Feed	37982	
Recycle/F.F.	2.01	
Inlet Vel.		
Steam Flow		

RUN CONDITIONS

Generator Press.	274
O_2 Preheat, °F	470
Gas Preheat, °F	780
Reactor Press.	250
Steam Back Press.	
Temperatures, °F	
Heater Outlet	
Catalyst #1	615
#2	650
#3	660
#4	604
#5	
Average	
Product Separator	

DISTILLATIONS

ASTM

Prod.	Raw Oil	Gasoline		
A.P.I.	44.5			
I.B.P.		110		
5%				
10%		148		
20		176		
30		202		
40		224		
50		244		
60		264		
70		288		
80		314		
90		340		
95		378		
E.P.		400		
Rec.		98.0		
Res.		1.0		
Loss.		1.0		

Hempel Dist.

°F	%	A.P.I.
to 400	67.6	53.8
400-550	19.0	33.5
550+		

WATER

Temp.	%
200	
203	
208	
A.P.I.	10.3

CATALYST DATA

In Reactor at Start of Period	779.0
Fresh Catalyst Charged	
Catalyst Recharged	
Total	779.0
Catalyst Taken Out	78.0
In Reactor at End of Period	701.0
Reactor d-P, H_2O	
Pounds in Reactor	
Density, lbs./cu. ft.	
Bed Height, Feet	
Space Vel. SCFH/lb. cat.	
Inventory Figures	54.2
From d-P Meters	

CATALYST ANALYSIS

Particle Size

Screen Frac.	Screen M	Screen %	Sedimentation M	Sedimentation %
On 40	420+	19.2	80+	
100	419-150	30.6	80-40	
150	149-105	8.3	40-20	
200	104-74	9.7	20-10	
250	73-62	8.1	10-0	
325	61-44	7.5		
<325	43-0	16.6		

Density, lbs./cu. ft.		Chem. Anal.	
Aerated	180.0	% Fe	
Settled	179.7	% C	
Compacted	224.0	% Oil	
Sp. Grav.	5.0	Specific Surface	
		10.9	m²/gm

NATURAL GAS

	%
CO_2	1.21
CH_4	85.66
C_2H_6	8.98
C_3H_8	3.89
C_4H_{10}	.25
N_2	
O_2	

PRODUCT INSPECTION

	Oil	Water	Product	Pour °F	SUS @ °F	
Neut. No.	43.4	32.5				
Sap. No.	44.1	31.6				
Hydrox. No.	28.6					
Bromine No.	61.2					
% Fe						
% Alc		6.7				

GENERATOR ELEMENTAL BALANCE

IN

	Mol %	SCFH m/hr	C	H	O
O_2	235.52	7.36			14.72
CO_2	6.16	.14	.14		.28
CH_4	152.96	9.56	9.56	38.24	
C_2H_6	30.00	1.00	2.00	6.00	
C_3H_8	18.92	.43	1.29	3.44	
C_4H_{10}	1.74	.03	.12	.30	
N_2					
Total		18.52	13.11	47.98	15.00

OUT

	Mol %	SCFH m/hr	C	H	O
CO_2	1.7	.57	.57		1.14
CO	34.1	11.34	11.34		11.34
CH_4	4.4	1.46	1.46	5.84	
H_2	59.8	19.88		39.76	
N_2					
H_2O				5.04	2.52
Total		33.25	13.37	50.64	15.00

	FRESH FEED			WET GAS	Measured		At Wt. Balance		RECYCLE	COMB. FEED		EFFLUENT		NET CHANGE ON REACTION	Carbon		Hydrogen		Oxygen	Ultimate Oil			Unsats.
	%	m/hr	#/hr	%	m/hr	#/hr	m/hr	#/hr	m/hr	m/hr	%	m/hr	%	m/hr	a/hr	%	a/hr	%	a/hr	#/hr	#/gal	gal/hr	%
CO	34.1	11.34	317.52	4.73	.41	11.48	.68	19.14	3.16	14.50	14.49	3.84	4.34	-10.66	-10.66	5.99			-10.66				
H2	59.8	19.88	39.76	48.59	4.19	8.38	6.98	13.97	32.47	52.35	52.31	39.45	44.62	-12.90			-25.80						
CO2	1.7	.57	25.08	17.31	1.49	65.56	2.48	109.29	11.57	12.14	12.13	14.05	15.89	1.91	1.91	16.84			3.82				
N2	-	-	-	1.51	.13	3.64	.22	6.07	1.01	1.01	1.01	1.23	1.39	.22									
CH4	4.4	1.46	23.36	19.54	1.69	27.04	2.82	45.08	13.06	14.52	14.51	15.88	17.96	1.36	1.36	11.99	5.44						
C2H4				1.65	.14	3.92	.23	6.53	1.10	1.10	1.10	1.33	1.50	.23	.46	4.06	.92						
C2H6				1.70	.15	4.50	.25	7.50	1.14	1.14	1.14	1.39	1.57	.25	.50	4.41	1.50						
C3H6				2.00	.17	7.14	.28	11.90	1.34	1.34	1.34	1.62	1.83	.28	.84	7.41	1.68			10.71	6.25	1.71	
C3H8				.51	.04	1.76	.07	2.93	.34	.34	.34	.41	.46	.07	.21	1.85	.56						
C4H8				1.32	.11	6.16	.18	10.27	.88	.88	.88	1.06	1.20	.18	.72	6.35	1.44			9.76	6.10	1.60	
C4H10				.30	.03	1.74	.05	2.90	.20	.20	.20	.25	.28	.05	.20	1.76	.50			2.90	4.86	.60	
C5H10				.62	.05	3.50	.08	5.83	.41	.41	.41	.49	.55	.08	.40	3.53	.80			5.83	5.40	1.08	
C6H12				.22	.02	1.68	.03	2.80	.15	.15	.15	.18	.20	.03	.18	1.59	.36			2.80	5.50	.51	
OIL								(54.32)				.39	.44		3.88	34.22	7.76			54.32	6.50	8.36	
WATER												6.84	7774				4.84		(2.42) 6.84				
TOTAL		33.25	405.72		8.63	146.50	14.35	244.21	66.83	100.08	100.01	88.41	99.97	18.90		100.00				86.32		13.86	
H2+CO		31.22			4.60		7.66																
H2/CO		1.75			10.22		10.26			3.61		10.27											

ULTIMATE YIELDS

	% CO Fed	#/hr	H2/CO #/MCF	H2/CO g/M3	Gal/hr	H2/CO Gal/MCF	H2/CO cc/M3
C1+C2	20.46	35.75	3.02	51.07			
C3+	51.15	90.95	7.69	130.04			
C4+	47.45	76.12	6.43	108.73			
Ult. Oil		86.32	7.30	123.44	13.86	1.17	165.32
C02	16.84	84.21	7.12	120.40			
H20		123.12	10.41	176.03			

WEIGHT BALANCE

	#/hr	%	#/hr
Wet Gas	146.5		244.2
Oil	49.2		49.2
Water	112.3		112.3
Total	308.0	76.0	405.7

EFFLUENT RATIOS

H2/H20	5.77
C02/C0	3.66
(H2) (C02) / (H20) (C0)	21.10

CONTRACTION: 56.8

C0 Conversion: 94.0

H2 Conversion: 64.9

H_2 + CO = 75.3

Yield Calculations assume "oil" is CH2, and is found by difference on Carbon, and H20 by difference on Hydrogen. "Oil" figures therefore include hydrocarbon fraction of oxygenated compounds. Standard cubic feet measured at 60 F and 14.7 psig. Cubic Meters measured at O C. and 14.7 psig. g/M3 = 16.91 × #/MCF. cc/M3 = 141.3 × gal/MCF.

THE TEXAS COMPANY — MONTEBELLO LABORATORY

DATA SUMMARY SHEET

Synthesis Run Number 42 B From 6/13/48 Hr. 0800 to 6/14/48 Hr. 0700

FLOWS	SCFH	%
Oxygen	2800	
Nat. Gas	4280	
Total	7080	39.5
Fresh Feed	12300	
F. F. by C	12500	
Avg. F. F.		
Wet Gas	3880	
Contraction		58.9
Recycle	17490	
Bleed	5797	
Total	23287	
Total Feed	35587	
Recycle/F.F.	1.89	
Inlet Vel.		
Steam Flow		

RUN CONDITIONS	
Generator Press.	276
O_2 Preheat, °F	490
Gas Preheat, °F	775
Reactor Press.	250
Steam Back Press.	
Temperatures, °F	
Heater Outlet	
Catalyst #1	630
#2	655
#3	660
#4	605
#5	
Average	
Product Separator	

DISTILLATIONS								
	A S T M				Hempel Dist.			
Prod.	Raw Oil	Gasoline			°F	%	A.P.I.	
A.P.I.	45.6				to 400	71.3	53.4	
I.B.P.		112			400-550	15.3	33.6	
5%					550+			
10%		146						
20		166						
30		198			WATER			
40		218			Temp.	%		
50		238			200			
60		258			203			
70		280			208			
80		314			A.P.I.	10.2		
90		346						
95		362						
E.P.		396						
Rec.		98.0						
Res.		1.0						
Loss.		1.0						

CATALYST DATA	
In Reactor at Start of Period	701.0
Fresh Catalyst Charged	120.0
Catalyst Recharged	
Total	821.0
Catalyst Taken Out	79.0
In Reactor at End of Period	742.0
Reactor d-P, H_2O	
Pounds in Reactor	
Density, lbs./cu. ft.	
Bed Height, Feet	
Space Vel. SCFH/lb. cat.	
Inventory Figures	48.0
From d-P Meters	

CATALYST ANALYSIS					
Particle Size					
Screen			Sedimentation		
Frac.	M	%	M	%	
On 40	420+	7.0	80+		
100	419-150	23.9	80-40		
150	149-105	8.4	40-20		
200	104-74	11.0	20-10		
250	73-62	5.6	10-0		
325	61-44	22.5			
<325	43-0	21.5			
Density, lbs./cu. ft			Chem. Anal.		
Aerated	180.0		% Fe		
Settled	183.0		% C		
Compacted	197.0		% Oil		
Sp. Grav.	4.7		Specific Surface		
			9.9	m^2 gm	

NATURAL GAS	
	%
CO_2	1.40
CH_4	86.27
C_2H_6	9.05
C_3H_8	2.94
C_4H_{10}	.17
N_2	.17
O_2	

PRODUCT INSPECTION					
	Oil	Water	Product	Pour °F	SUS @ °F
Neut. No.	49.2	38.9			
Sap. No.	51.1	31.0			
Hydrox No.	54.1				
Bromine No.	61.6				
% Fe					
% Alc		8.4			

GENERATOR ELEMENTAL BALANCE

IN						OUT					
	Mol %	SCFH m/hr	C	H	O		Mol %	SCFH m/hr	C	H	O
O_2	236.48	7.39			14.78	CO_2	2.4	.78	.78		1.56
CO_2	7.04	.16	.16		.32	CO	34.8	11.29	11.29		11.29
CH_4	155.84	9.74	9.74	38.96		CH_4	2.9	.94	.94	3.76	
C_2H_6	30.60	1.02	2.04	6.12		H_2	59.7	19.37		38.74	
C_3H_8	14.52	.33	.99	2.64		N_2	0.2	.06			
C_4H_{10}	1.16	.02	.08	.20		H_2O				4.50	2.25
N_2	.56	.02				Total		32.44	13.01	46.90	15.10
Total		18.68	13.01	47.92	15.10						

	FRESH FEED			WET GAS					RECYCLE	COMB. FEED		EFFLUENT		NET CHANGE ON REACTION									
					Measured		At Wt. Balance							Carbon			Hydrogen		Oxygen	Ultimate Oil			Unsats.
	%	m/hr	#/hr	%	m/hr	#/hr	m/hr	#/hr	m/hr	m/hr	%	m/hr	%	m/hr	a/hr	%	a/hr	%	a/hr	#/hr	#/gal	gal/hr	%
CO	34.8	11.29	316.12	8.99	.92	25.76	1.20	33.48	5.51	16.80	17.92	6.71	8.27	-10.09	-10.09	10.63			-10.09				
H2	59.7	19.37	38.74	44.04	4.51	9.02	5.86	11.72	27.01	46.38	49.47	32.87	40.53	-13.51			-27.02						
CO2	2.4	.78	34.32	20.66	2.12	93.28	2.75	121.22	12.67	13.45	14.35	15.42	19.01	1.97	1.97	17.45			3.94				
N2	0.2	.06	1.68	.62	.06	1.68	.08	2.18	.38	.42	.45	.46	.57	.02									
CH4	2.9	.94	15.04	16.50	1.69	27.04	2.20	35.14	10.12	11.06	11.80	12.32	15.19	1.26	1.26	11.16	5.04						
C2H4				2.25	.23	6.44	.30	8.37	1.38	1.38	1.47	1.68	2.07	.30	.60	5.31	1.20						
C2H6				1.50	.15	4.50	.19	5.85	.92	.92	.98	1.11	1.37	.19	.38	3.37	1.14						
C3H6				2.41	.25	10.50	.32	13.64	1.48	1.48	1.58	1.80	2.22	.32	.96	8.50	1.92			12.28	6.25	1.96	
C3H8				.11	.01	.44	.01	.57	.07	.07	.07	.08	.10	.01	.03	.27	.08						
C4H8				1.37	.14	7.84	.18	10.19	.84	.84	.90	1.02	1.26	.18	.72	6.38	1.44			9.68	6.10	1.59	
C4H10				.59	.06	3.48	.08	4.52	.36	.36	.38	.44	.54	.08	.32	2.83	.80			4.52	4.86	.93	
C5H10				.64	.07	4.90	.09	6.37	.39	.39	.42	.48	.59	.09	.45	3.99	.90			6.37	5.40	1.18	
C6H12				.32	.03	2.52	.04	3.27	.20	.20	.21	.24	.30	.04	.24	2.13	.48			3.27	5.50	.59	
OIL								(44.24)				.32	.39		3.16	27.99	6.32			44.24	6.50	6.81	
WATER												6.15	7.58				7.70		(3.85) 6.15				
TOTAL		32.45	405.90		10.24	197.40	13.30	256.52	61.33	93.75	100.00	81.10	99.99	19.14		100.01				80.36		13.06	
H2+CO		30.66			5.43		7.06																
H2/CO		1.72			4.90		4.88			2.76		4.90											

ULTIMATE YIELDS							
	% C0 Fed	#/hr	H2 / C0 #/MCF	g/M3	Gal/hr	H2 / C0 Gal/MCF	cc/M3
C1+C2	19.84	49.36	4.25	71.87			
C3+	52.09	82.80	7.13	120.57			
C4+	43.32	68.59	5.90	99.77			
Ult. Oil		80.36	6.92	117.02	13.06	1.12	158.26
C02	17.45	86.90	7.48	126.49			
H20		110.70	9.53	161.15			

WEIGHT BALANCE	#/hr	%	#/hr
Wet Gas	197.4		256.9
Oil	42.0		42.0
Water	107.0		107.0
Total	346.4	85.4	405.9

EFFLUENT RATIOS	
H2/H20	5.34
C02/C0	2.30
(H2) (C02) / (H20) (C0)	12.28

CONTRACTION: 58.9

C0 Conversion: 89.4

H2 Conversion: 69.7

$H_2 + CO = 76.9$

Yield Calculations assume "oil" is CH2, and is found by difference on Carbon, and H20 by difference on Hydrogen. "Oil" figures therefore include hydrocarbon fraction of oxygenated compounds. Standard cubic feet measured at 60 F and 14.7 psig. Cubic Meters measured at O C. and 14.7 psig. g/M3 = 16.91 × #/MCF. cc/M3 = 141.3 × gal/MCF.

THE TEXAS COMPANY — MONTEBELLO LABORATORY

DATA SUMMARY SHEET

Synthesis Run Number 42 C From 6/14/48 Hr. 0800 to 6/15/48 Hr. 0700

FLOWS	SCFH	%
Oxygen	2820	
Nat. Gas	4200	
Total	7020	40.2
Fresh Feed	12350	
F. F. by C	12700	
Avg. F. F.		
Wet Gas	4300	
Contraction		58.2
Recycle	17880	
Bleed	5520	
Total	23050	
Total Feed	35400	
Recycle/F.F.	1.87	
Inlet Vel.		
Steam Flow		

RUN CONDITIONS	
Generator Press.	278
O_2 Preheat, °F	445
Gas Preheat, °F	770
Reactor Press.	250
Steam Back Press.	
Temperatures, °F	
Heater Outlet	
Catalyst #1	650
#2	660
#3	665
#4	640
#5	
Average	
Product Separator	

DISTILLATIONS								
	A S T M				Hempel Dist.			
Prod.	Raw Oil	Gasoline			°F	%	A.P.I.	
A.P.I.	44.7				to 400	72.3	52.1	
I.B.P.		113			400-550	21.6	33.7	
5%					550+	5.1		
10%		154						
20		180						
30		206			WATER			
40		226			Temp.	%		
50		246			200			
60		264			203			
70		292			208			
80		320			A.P.I.	10.3		
90		343						
95		384						
E.P.		402						
Rec.		98.0						
Res.		1.0						
Loss		1.0						

CATALYST DATA	
In Reactor at Start of Period	742.0
Fresh Catalyst Charged	
Catalyst Recharged	
Total	742.0
Catalyst Taken Out	80.0
In Reactor at End of Period	662.0
Reactor d-P, H_2O	
Pounds in Reactor	
Density, lbs./cu. ft.	
Bed Height, Feet	
Space Vel. SCFH/lb. cat.	
Inventory Figures	53.5
From d-P Meters	

CATALYST ANALYSIS					
Particle Size					
Screen			Sedimentation		
Frac.	M	%	M	%	
On 40	420+	14.4	80+		
100	419-150	44.6	80-40		
150	149-105	7.4	40-20		
200	104-74	9.6	20-10		
250	73-62	3.4	10-0		
325	61-44	8.8			
<325	43-0	11.8			
Density, lbs./cu. ft			Chem. Anal.		
Aerated			% Fe		
Settled			% C		
Compacted			% Oil		
Sp. Grav. 4.5			Specific Surface		
			14.9		m^2 gm

NATURAL GAS	%
CO_2	1.31
CH_4	84.11
C_2H_6	9.70
C_3H_8	4.80
C_4H_{10}	.09
N_2	
O_2	

PRODUCT INSPECTION					
	Oil	Water	Product	Pour °F	SUS @ °F
Neut. No.	51.5	40.9			
Sap. No.	54.4	38.6			
Hydrox. No.	54.1				
Bromine No.	65.7				
% Fe					
% Alc		8.7			

GENERATOR ELEMENTAL BALANCE

IN	Mol %	SCFH m/hr	C	H	O
O_2	238.08	7.44			14.88
CO_2	6.60	.15	.15		.30
CH_4	149.12	9.32	9.32	37.28	
C_2H_6	32.10	1.07	2.14	6.42	
C_3H_8	23.32	.53	1.59	4.24	
C_4H_{10}	.58	.01	.04	.10	
N_2					
Total		18.52	13.24	48.04	15.18

OUT	Mol %	SCFH m/hr	C	H	O
CO_2	2.1	.68	.68		1.36
CO	34.1	11.11	11.11		11.11
CH_4	2.9	.95	.95	3.70	
H_2	60.1	19.59		39.18	
N_2	0.8	.26			
H_2O				4.42	2.71
Total		32.59	12.74	47.30	15.18

STRATCO REACTOR

	FRESH FEED			WET GAS					RECYCLE	COMB. FEED		EFFLUENT		NET CHANGE ON REACTION								
					Measured		At Wt. Balance							Carbon			Hydrogen		Oxygen	Ultimate Oil			Unsats.
	%	m/hr	#/hr	%	m/hr	#/hr	m/hr	#/hr	m/hr	m/hr	%	m/hr	%	m/hr	a/hr	%	a/hr	%	a/hr	#/hr	#/gal	gal/hr	%
CO	34.1	11.11	311.08	10.91	1.24	34.72	1.49	41.66	6.65	17.76	18.99	8.14	10.19	- 9.62	- 9.62	13.41			- 9.62				
H2	60.1	19.59	39.18	43.40	4.93	9.86	5.92	11.83	26.45	46.04	49.22	32.37	40.52	-13.67			-27.34						
CO2	2.1	.68	29.92	22.38	2.54	111.76	3.05	134.11	13.64	14.32	15.31	16.69	20.89	2.37	2.37	21.33			4.74				
N2	0.8	.26	7.28	.18	.02	.56	.02	.67	.11	.37	.40	.13	.16	- .24									
CH4	2.9	.95	15.20	14.51	1.65	26.40	1.98	31.68	8.84	9.79	10.47	10.82	13.54	1.03	1.03	9.27	4.12						
C2H4				1.93	.22	6.16	.26	7.39	1.18	1.18	1.26	1.44	1.80	.26	.52	4.68	1.04						
C2H6				1.25	.14	4.20	.17	5.04	.76	.76	.81	.93	1.16	.17	.28	2.52	1.02						
C3H6				1.84	.21	8.82	.25	10.58	1.12	1.12	1.20	1.37	1.71	.25	.75	6.75	1.50			9.52	6.25	1.52	
C3H8				.15	.02	.88	.02	1.06	.09	.09	.10	.11	.14	.02	.06	.54	.16						
C4H8				1.46	.17	9.52	.20	11.42	.89	.89	.95	1.09	1.36	.20	.80	7.20	1.60			10.85	6.10	1.78	
C4H10				.92	.10	5.80	.12	6.96	.56	.56	.60	.68	.85	.12	.48	4.32	1.20			6.96	4.86	1.43	
C5H10				.74	.08	5.60	.10	6.72	.45	.45	.48	.55	.69	.10	.50	4.50	1.00			6.72	5.40	1.24	
C6H12				.33	.04	3.36	.05	4.03	.20	.20	.21	.25	.31	.05	.30	2.70	.60			4.03	5.50	.73	
OIL								(35.42)				.25	.31		2.53	22.77	5.06			35.42	6.50	5.45	
WATER												5.06	6.33				10.04		(5.02) 4.88				
TOTAL		32.59	402.66		11.35	227.64	13.63	273.15	60.94	93.53	100.0	79.88	99.99	18.96		99.99				73.50		12.15	
H2+CO		30.70			6.17		7.41																
H2/CO		1.76			3.98		3.97			2.59		3.98											

ULTIMATE YIELDS	% C0 Fed	#/hr	H2 / C0 #/MCF	H2 / C0 g/M3	Gal/hr	H2 / C0 Gal/MCF	H2 / C0 cc/M3
C1+C2	16.47	28.91	2.34	39.55			
C3+	48.78	76.19	6.17	104.27			
C4+	41.49	64.55	5.23	88.39			
Ult. Oil		73.50	5.95	100.56	12.15	0.98	138.47
C02	21.33	104.19	8.44	142.64			
H20		87.84	7.11	120.16			

WEIGHT BALANCE	#/hr	%	#/hr
Wet Gas	229.6		272.3
Oil	37.2		37.2
Water	93.1		93.1
Total	357.9	88.9	402.6

EFFLUENT RATIOS	
H2/H20	6.63
C02/C0	2.05
(H2) (C02) / (H20) (C0)	13.60

CONTRACTION: 58.2

C0 Conversion: 86.6

H2 Conversion: 69.8

H_2+CO = 75.9

Yield Calculations assume "oil" is CH2, and is found by difference on Carbon, and H20 by difference on Hydrogen. "Oil" figures therefore include hydrocarbon fraction of oxygenated compounds. Standard cubic feet measured at 60 F and 14.7 psig. Cubic Meters measured at O C. and 14.7 psig. g/M3 = 16.91 × #/MCF. cc/M3 = 141.3 × gal/MCF.

THE TEXAS COMPANY — MONTEBELLO LABORATORY

DATA SUMMARY SHEET

Synthesis Run Number 42 D From 6/15/48 Hr. 0800 to 6/16/48 Hr. 0700

FLOWS	SCFH	%
Oxygen	2780	
Nat. Gas	4260	
Total	7040	39.5
Fresh Feed	12100	
F. F. by C	12700	
Avg. F. F.		
Wet Gas	4530	
Contraction		55.8
Recycle	17840	
Bleed	5240	
Total	23080	
Total Feed	35182	
Recycle/F.F.	1.91	
Inlet Vel.		
Steam Flow		

RUN CONDITIONS	
Generator Press.	280
O_2 Preheat, °F	465
Gas Preheat, °F	780
Reactor Press.	250
Steam Back Press.	
Temperatures, °F	
Heater Outlet	
Catalyst #1	655
#2	660
#3	665
#4	630
#5	
Average	
Product Separator	

DISTILLATIONS	A S T M	
	Raw Oil	Gasoline
Prod.		
A.P.I.	45.2	
I.B.P.		112
5%		
10%		146
20		182
30		206
40		225
50		246
60		264
70		290
80		317
90		350
95		378
E.P.		394
Rec.		98.0
Res.		1.0
Loss.		1.0

Hempel Dist.		
°F	%	A.P.I.
to 400	70.0	52.7
400-550	19.3	34.1
550+		

WATER	
Temp.	%
200	
203	
208	
A.P.I.	10.4

CATALYST DATA	
In Reactor at Start of Period	662.0
Fresh Catalyst Charged	
Catalyst Recharged	
Total	662.0
Catalyst Taken Out	51.5
In Reactor at End of Period	610.5
Reactor d-P, H_2O	
Pounds in Reactor	
Density, lbs./cu. ft.	
Bed Height, Feet	
Space Vel. SCFH/lb. cat.	
Inventory Figures	57.7
From d-P Meters	

CATALYST ANALYSIS				
Particle Size				
Screen			Sedimentation	
Frac.	M	%	M	%
On 40	420+	5.6	80+	
100	419-150	48.2	80-40	
150	149-105	8.4	40-20	
200	104-74	9.4	20-10	
250	73-62	6.2	10-0	
325	61-44	7.0		
<325	43-0	17.2		
Density, lbs./cu. ft			Chem. Anal.	
Aerated 153.4			% Fe	
Settled 156.0			% C	
Compacted 172.0			% Oil	
Sp. Grav. 4.2			Specific Surface	
			27.7	m^2 gm

NATURAL GAS	%
CO_2	1.60
CH_4	85.95
C_2H_6	9.00
C_3H_8	2.93
C_4H_{10}	.18
N_2	.34
O_2	

PRODUCT INSPECTION					
	Oil	Water	Product	Pour °F	SUS @ °F
Neut. No.	53.2	42.2			
Sap. No.	53.3	40.8			
Hydrox. No.	52.0				
Bromine No.	70.7				
% Fe					
% Alc		8.4			

GENERATOR ELEMENTAL BALANCE

IN	Mol %	SCFH m/hr	C	H	O
O_2	234.88	7.34			14.68
CO_2	7.92	.18	.18		.36
CH_4	154.56	9.66	9.66	38.64	
C_2H_6	30.30	1.01	2.02	6.06	
C_3H_8	14.52	.33	.99	2.64	
C_4H_{10}	1.16	.02	.08	.20	
N_2	1.12	.04			
Total		18.58	12.93	47.54	15.06

OUT	Mol %	SCFH m/hr	C	H	O
CO_2	2.2	.70	.70		1.40
CO	33.2	10.60	10.60		10.60
CH_4	2.9	.93	.93	3.72	
H_2	59.2	18.90		37.80	
N_2	2.5	.80			
H_2O				6.12	3.06
Total		31.93	12.23	47.62	15.06

	FRESH FEED			WET GAS					RECYCLE	COMB. FEED		EFFLUENT		NET CHANGE ON REACTION								
					Measured		At Wt. Balance							Carbon			Hydrogen		Oxygen	Ultimate Oil			Unsats.
	%	m/hr	#/hr	%	m/hr	#/hr	m/hr	#/hr	m/hr	m/hr	%	m/hr	%	m/hr	a/hr	%	a/hr	%	a/hr	#/hr	#/gal	gal/hr	%
CO	33.2	10.60	296.80	12.59	1.50	42.00	1.77	49.54	7.68	18.28	19.67	9.45	11.89	- 8.83	- 8.83	16.70			- 8.83				
H2	59.2	18.90	37.80	44.40	5.31	10.62	6.26	12.53	27.08	45.98	49.48	33.34	41.93	-12.64			-25.28						
CO2	2.2	.70	30.80	21.40	2.56	112.64	3.02	132.86	13.05	13.75	14.80	16.07	20.21	2.32	2.32	21.89			4.64				
N2	2.5	.80	22.40	.72	.09	2.52	.11	2.97	.44	1.24	1.33	.55	.69	- .69									
CH4	2.9	.93	14.88	13.05	1.56	24.96	1.84	29.44	7.96	8.89	9.57	9.80	12.33	.91	.91	8.58	3.64						
C2H4				1.80	.22	6.16	.26	7.27	1.10	1.10	1.18	1.36	1.71	.26	.52	4.91	1.04						
C2H6				1.23	.15	4.50	.18	5.31	.75	.75	.81	.93	1.17	.18	.36	3.40	1.08						
C3H6				1.84	.22	9.24	.26	10.90	1.12	1.12	1.21	1.38	1.74	.26	.78	7.36	1.56			9.81	6.25	1.57	
C3H8				.20	.02	.88	.02	1.04	.12	.12	.13	.14	.18	.02	.06	.57	.16						
C4H8				1.23	.15	8.40	.18	9.91	.75	.75	.81	.93	1.17	.18	.72	6.79	1.44			9.41	6.10	1.54	
C4H10				.53	.06	3.48	.07	4.10	.32	.32	.34	.39	.48	.07	.28	2.64	.70			4.10	4.86	.84	
C5H10				.72	.09	6.30	.11	7.43	.44	.44	.47	.55	.69	.11	.55	5.19	1.10			7.43	5.40	1.38	
C6H12				.29	.03	2.52	.04	2.97	.18	.18	.19	.22	.28	.04	.24	2.26	.48			2.97	5.50	.54	
OIL								(29.26)				.21	.26		2.09	19.72	4.18			29.26	6.50	4.50	
WATER												4.19	5.27				9.90		(4.95) 4.19				
TOTAL		31.93	402.68		11.95	234.22	14.12	276.27	60.99	92.92	99.99	79.51	100.01	17.81		100.01				62.98		10.37	
H2+CO		29.50			6.81		8.03																
H2/CO		1.78			3.54		3.54			2.52		3.53											

ULTIMATE YIELDS	% C0 Fed	#/hr	H2 / C0 #/MCF	H2 / C0 g/M3	Gal/hr	H2 / C0 Gal/MCF	H2 / C0 cc/M3
C1+C2	16.89	27.14	2.43	41.09			
C3+	44.53	65.61	5.87	99.26			
C4+	36.60	53.67	4.80	81.17			
Ult. Oil		68.98	5.63	95.20	10.37	0.93	131.41
C02	21.89	102.06	9.13	154.39			
H20		75.42	6.75	114.14			

WEIGHT BALANCE	#/hr	%	#/hr
Wet Gas	234.2		276.5
Oil	31.8		31.8
Water	94.4		94.4
Total	360.4	89.6	402.7

EFFLUENT RATIOS	
H2/H20	7.96
C02/C0	1.70
(H2) (C02) / (H20) (C0)	13.53

CONTRACTION:	55.8
C0 Conversion:	83.3
H2 Conversion:	66.9

$H_2 + CO = 72.8$

Yield Calculations assume "oil" is CH2, and is found by difference on Carbon, and H20 by difference on Hydrogen. "Oil" figures therefore include hydrocarbon fraction of oxygenated compounds. Standard cubic feet measured at 60 F and 14.7 psig. Cubic Meters measured at O C. and 14.7 psig. g/M3 = 16.91 × #/MCF. cc/M3 = 141.3 × gal/MCF.

THE TEXAS COMPANY — MONTEBELLO LABORATORY

DATA SUMMARY SHEET

Synthesis Run Number 42 E From 6/16/48 Hr. 0800 to 6/17/48 Hr. 0700

FLOWS

	SCFH	%
Oxygen	2830	
Nat. Gas	4250	
Total	7080	40.0
Fresh Feed	12300	
F. F by C	12800	
Avg. F. F.		
Wet Gas	4700	
Contraction		53.5
Recycle	17600	
Bleed	6994	
Total	24594	
Total Feed	36894	
Recycle/F.F.	2.00	
Inlet Vel.		
Steam Flow		

RUN CONDITIONS

Generator Press.	280
O_2 Preheat, °F	490
Gas Preheat, °F	765
Reactor Press.	248
Steam Back Press.	
Temperatures, °F	
Heater Outlet	
Catalyst #1	645
#2	655
#3	660
#4	625
#5	
Average	
Product Separator	

DISTILLATIONS

ASTM

Prod.	Raw Oil	Gasoline
A.P.I.	46.4	
I.B.P.		112
5%		
10%		149
20		182
30		208
40		230
50		250
60		274
70		304
80		332
90		370
95		400
E.P.		97.5
Rec.		1.25
Res.		1.25
Loss.		

Hempel Dist.

°F	%	A.P.I.
to 400	74.0	52.5
400-550	15.6	35.8
550+		

WATER

Temp.	%
200	
203	
208	
A.P.I. 10.3	

CATALYST DATA

In Reactor at Start of Period	610.5
Fresh Catalyst Charged	
Catalyst Recharged	
Total	610.5
Catalyst Taken Out	35.75
In Reactor at End of Period	574.75
Reactor d-P, H_2O	
Pounds in Reactor	
Density, lbs./cu. ft.	
Bed Height, Feet	
Space Vel. SCFH/lb. cat.	
Inventory Figures	64.2
From d-P Meters	

CATALYST ANALYSIS

Particle Size

Screen Frac.	Screen M	Screen %	Sedimentation M	Sedimentation %
On 40	420+	7.9	80+	
100	419-150	50.4	80-40	
150	149-105	8.5	40-20	
200	104-74	7.5	20-10	
250	73-62	5.3	10-0	
325	61-44	8.3		
<325	43-0	12.0		

Density, lbs./cu. ft		Chem. Anal.	
Aerated	149.0	% Fe	
Settled	151.0	% C	
Compacted	175.0	% Oil	
Sp. Grav.	4.1	Specific Surface	29.7 m^2/gm

NATURAL GAS

	%
CO_2	1.60
CH_4	85.95
C_2H_6	9.00
C_3H_8	2.93
C_4H_{10}	.18
N_2	.34
O_2	

PRODUCT INSPECTION

	Oil	Water	Product	Pour °F	SUS @ °F
Neut. No.	58.6	49.1			
Sap. No.	60.4	44.1			
Hydrox. No.	58.4				
Bromine No.	62.0				
% Fe					
% Alc		10.0			

GENERATOR ELEMENTAL BALANCE

IN

	Mol %	SCFH m/hr	C	H	O
O_2	239.04	7.47			14.94
CO_2	7.92	.18	.18		.36
CH_4	154.08	9.63	9.63	38.52	
C_2H_6	30.30	1.01	2.02	6.06	
C_3H_8	14.52	.33	.99	2.54	
C_4H_{10}	1.16	.02	.08	.20	
N_2	1.12	.04			
Total		18.68	12.90	47.32	15.30

OUT

	Mol %	SCFH m/hr	C	H	O
CO_2	2.2	.71	.71		1.42
CO	35.6	11.55	11.55		11.55
CH_4	3.6	1.17	1.17	4.68	
H_2	58.6	19.02		38.04	
N_2					
H_2O				4.66	2.33
Total		32.45	13.43	47.38	15.30

	FRESH FEED %	FRESH FEED m/hr	FRESH FEED #/hr	WET GAS %	WET GAS Measured m/hr	WET GAS Measured #/hr	WET GAS At Wt. Balance m/hr	WET GAS At Wt. Balance #/hr	RECYCLE m/hr	COMB. FEED m/hr	COMB. FEED %	EFFLUENT m/hr	EFFLUENT %	NET CHANGE m/hr	Carbon a/hr	Carbon %	Hydrogen a/hr	Hydrogen %	Oxygen a/hr	Ultimate Oil #/hr	Ultimate Oil #/gal	Ultimate Oil gal/hr	Unsats. %
CO	35.6	11.55	323.40	12.75	1.58	44.24	1.92	53.81	8.27	19.82	20.36	10.19	12.02	-9.63	-9.63	16.62			-9.63				
H2	58.6	19.02	38.04	43.19	5.36	10.72	6.52	13.04	28.03	47.05	48.33	34.55	40.75	-12.50			-25.00						
CO2	2.2	.71	31.24	21.52	2.67	117.48	3.25	142.89	13.97	14.68	15.08	17.22	20.31	2.54	2.54	21.99			5.08				
N2	-	-	-	.26	.03	2.52	.04	3.07	.17	.17	.17	.21	.25	.04									
CH4	3.6	1.17	18.72	14.54	1.80	28.80	2.19	35.03	9.44	10.61	10.90	11.63	13.72	1.02	1.02	8.83	4.08						
C2H4				1.82	.23	6.44	.28	7.83	1.18	1.18	1.21	1.46	1.72	.28	.56	4.85	1.12						
C2H6				1.38	.17	5.10	.21	6.20	.90	.90	.92	1.11	1.31	.21	.42	3.64	1.26						
C3H6				1.57	.19	7.98	.23	9.71	1.02	1.02	1.05	1.25	1.47	.23	.69	5.97	1.38			8.74	6.25	1.40	
C3H8				.19	.02	.88	.02	1.07	.12	.12	.12	.14	.17	.02	.06	.52	.16						
C4H8				1.14	.14	7.84	.17	9.54	.74	.74	.76	.91	1.07	.17	.68	5.89	1.36			9.06	6.10	1.49	
C4H10				.67	.08	4.64	.10	5.64	.43	.43	.44	.53	.63	.10	.40	3.46	1.00			5.64	4.86	1.16	
C5H10				.66	.08	5.60	.10	6.81	.43	.43	.44	.53	.63	.10	.50	4.33	1.00			6.81	5.40	1.26	
C6H12				.31	.04	3.36	.05	4.09	.20	.20	.21	.25	.29	.05	.30	2.60	.60			4.09	5.50	.74	
OIL								(34.44)				.25	.29		2.46	21.30	4.92			34.44	6.50	5.30	
WATER												4.55	5.37				8.12		(4.06) 4.55				
TOTAL		32.45	411.40		12.40	245.60	15.08	298.73	64.90	97.35	99.99	84.78	100.00	17.37		100.00				68.78		11.35	
H2+CO		30.57			6.94		8.44																
H2/CO		1.65			3.39		3.40			2.37		3.39											

ULTIMATE YIELDS

	% CO Fed	#/hr	H2 / CO #/MCF	H2 / CO g/M3	Gal/hr	H2 / CO Gal/MCF	H2 / CO cc/M3
C1+C2	17.32	30.34	2.62	44.30			
C3+	44.07	71.30	6.15	104.00			
C4+	37.58	60.52	5.22	88.27			
Ult. Oil		68.78	5.93	100.28	11.35	0.98	138.47
C02	21.99	111.65	9.63	162.84			
H20		81.90	7.07	119.55			

WEIGHT BALANCE

	#/hr	%	#/hr
Wet Gas	245.6		298.7
Oil	26.4		26.4
Water	86.3		86.3
Total	358.3	87.1	411.4

EFFLUENT RATIOS

H2/H20	10.34
C02/C0	1.69
(H2) (C02) / (H20) (C0)	12.83

CONTRACTION: 53.5

C0 Conversion: 83.4

H2 Conversion: 65.7

$H_2 + CO = 72.4$

Yield Calculations assume "oil" is CH2, and is found by difference on Carbon, and H20 by difference on Hydrogen. "Oil" figures therefore include hydrocarbon fraction of oxygenated compounds. Standard cubic feet measured at 60 F and 14.7 psig. Cubic Meters measured at O C. and 14.7 psig. g/M3 = 16.91 × #/MCF. cc/M3 = 141.3 × gal/MCF.

THE TEXAS COMPANY — MONTEBELLO LABORATORY

DATA SUMMARY SHEET

Synthesis Run Number 42 F From 6/17/48 Hr. 0800 to 6/18/48 Hr. 0700

FLOWS	SCFH	%
Oxygen	2720	
Nat. Gas	4180	
Total	6900	39.4
Fresh Feed	11800	
F. F. by C	12100	
Avg. F. F.		
Wet Gas	5050	
Contraction		48.3
Recycle	18440	
Bleed	13021	
Total	31461	
Total Feed	43261	
Recycle/F.F.	2.60	
Inlet Vel.		
Steam Flow		

RUN CONDITIONS	
Generator Press.	282
O_2 Preheat, °F	490
Gas Preheat, °F	805
Reactor Press.	245
Steam Back Press.	
Temperatures, °F	
Heater Outlet	
Catalyst ±1	645
±2	655
±3	660
±4	625
±5	
Average	
Product Separator	

DISTILLATIONS	ASTM Raw Oil	ASTM Gasoline
Prod.		
A.P.I.	46.9	
I.B.P.		108
5%		
10%		150
20		179
30		203
40		224
50		244
60		262
70		284
80		308
90		336
95		368
E.P.		387
Rec.		98.0
Res.		1.0
Loss		1.0

Hempel Dist. °F	%	A.P.I.
to 400	70.6	54.0
400-550	19.3	35.6
550+		

WATER Temp.	%
200	
203	
208	
A.P.I.	10.4

CATALYST DATA	
In Reactor at Start of Period	574.75
Fresh Catalyst Charged	
Catalyst Recharged	
Total	574.75
Catalyst Taken Out	26.00
In Reactor at End of Period	548.75
Reactor d-P, H_2O	
Pounds in Reactor	
Density, lbs./cu. ft	
Bed Height, Feet	
Space Vel. SCFH/lb. cat.	
Inventory Figures	78.8
From d-P Meters	

CATALYST ANALYSIS — Particle Size	Screen			Sedimentation	
	Frac.	M	%	M	%
	On 40	420+	24.7	80−	
	100	419-150	49.3	80-40	
	150	149-105	7.0	40-20	
	200	104-74	4.6	20-10	
	250	73-62	2.2	10-0	
	325	61-44	3.9		
	<325	43-0	8.4		

Density, lbs./cu. ft	Chem. Anal.
Aerated 147.0	% Fe
Settled 147.0	% C
Compacted 156.0	% Oil
Sp. Grav. 4.6	Specific Surface
	31.4 m^2 gm

NATURAL GAS	%
CO_2	1.56
CH_4	84.61
C_2H_6	10.29
C_3H_8	3.19
C_4H_{10}	.14
N_2	.20
O_2	

PRODUCT INSPECTION					
	Oil	Water	Product	Pour °F	SUS @ °F
Neut. No.	60.9	44.9			
Sap. No.	62.0	43.5			
Hydrox. No.	60.5				
Bromine No.	72.5				
% Fe					
% Alc		8.9			

GENERATOR ELEMENTAL BALANCE

IN	Mol %	SCFH m/hr	C	H	O
O_2	229.76	7.18			14.36
CO_2	7.48	.17	.17		.34
CH_4	149.28	9.33	9.33	37.32	
C_2H_6	33.90	1.13	2.26	6.78	
C_3H_8	15.40	.35	1.05	2.80	
C_4H_{10}	1.16	.02	.08	.20	
N_2	.56	.02			
Total		18.20	12.89	47.10	14.70

OUT	Mol %	SCFH m/hr	C	H	O
CO_2	2.1	.65	.65		1.30
CO	34.6	10.77	10.77		10.77
CH_4	5.3	1.65	1.65	6.60	
H_2	57.5	17.90		35.80	
N_2	0.5	.16			
H_2O				5.26	2.63
Total		31.13	13.07	47.66	14.70

	FRESH FEED %	m/hr	#/hr	WET GAS %	Measured m/hr	Measured #/hr	At Wt. Balance m/hr	At Wt. Balance #/hr	RECYCLE m/hr	COMB. FEED m/hr	%	EFFLUENT m/hr	%
CO	34.6	10.77	301.56	13.15	1.75	49.00	2.11	59.08	10.64	21.41	19.10	12.75	12.57
H2	57.5	17.90	35.08	44.88	5.98	11.96	7.21	14.42	36.33	54.23	48.39	43.54	42.91
CO2	2.1	.65	28.60	17.60	2.34	102.96	2.82	124.15	14.25	14.90	13.30	17.07	16.82
N2	0.5	.16	4.48	-	-	-	-	-	-	.16	.14	-	-
CH4	5.3	1.65	26.40	17.14	2.28	36.48	2.75	43.99	13.87	15.52	13.85	16.62	16.38
C2H4				1.64	.22	6.16	.27	7.43	1.33	1.33	1.19	1.60	1.58
C2H6				1.29	.17	5.10	.20	6.15	1.04	1.04	.93	1.24	1.22
C3H6				1.41	.19	7.98	.23	9.62	1.14	1.14	1.02	1.37	1.35
C3H8				.27	.04	1.76	.05	2.12	.22	.22	.20	.27	.27
C4H8				1.09	.15	8.40	.18	10.13	.88	.88	.79	1.06	1.04
C4H10				.74	.10	5.80	.12	6.99	.60	.60	.54	.72	.71
C5H10				.59	.08	5.60	.10	6.75	.48	.48	.43	.58	.57
C6H12				.20	.03	2.52	.04	3.04	.16	.16	.14	.20	.20
OIL								(23.38)				.17	.17
WATER												4.28	4.28
TOTAL		31.13	396.84		13.32	243.72	16.08	293.87	80.94	112.07	100.02	101.47	100.01
H2+CO		28.67			7.73		9.32			2.53		3.41	
H2/CO		1.66			3.42		3.42						

NET CHANGE ON REACTION	Carbon m/hr	Carbon a/hr	Carbon %	Hydrogen a/hr	Hydrogen %	Oxygen a/hr	Ultimate Oil #/hr	Ultimate Oil #/gal	Ultimate Oil gal/hr	Unsats. %
CO	-8.66	-8.66	19.59			-8.66				
H2	-10.69			-21.38						
CO2	2.17	2.17	20.15			4.38				
N2	- .16									
CH4	1.10	1.10	10.21	2.20						
C2H4	.27	.54	5.01	1.08						
C2H6	.20	.40	3.71	1.20						
C3H6	.23	.69	6.41	1.38			8.66	6.25	1.39	
C3H8	.05	.15	1.39	.40						
C4H8	.18	.72	6.69	1.44			9.62	6.10	1.58	
C4H10	.12	.48	4.46	1.20			6.99	4.86	1.44	
C5H10	.10	.50	4.64	1.00			6.75	5.40	1.25	
C6H12	.04	.24	2.23	.48			3.04	5.50	.55	
OIL		1.67	15.51	3.34			23.38	6.50	3.60	
WATER				7.66		(3.83) 4.28				
TOTAL	15.05		100.00				58.44		9.81	

ULTIMATE YIELDS	% C0 Fed	#/hr	H2/C0 #/MCF	H2/C0 g/M3	Gal/hr	H2/C0 Gal/MCF	H2/C0 cc/M3
C1+C2	18.93	31.17	2.87	48.53			
C3+	41.33	62.03	5.71	96.56			
C4+	33.53	50.29	4.63	78.29			
Ult. Oil		58.44	5.38	90.98	9.81	0.90	127.17
C02	20.15	95.55	8.80	148.81			
H20		77.04	7.09	119.89			

WEIGHT BALANCE	#/hr	%	#/hr
Wet Gas	243.7		293.8
Oil	30.0		30.0
Water	73.0		73.0
Total	346.7	87.4	396.8

EFFLUENT RATIOS	
H2/H20	10.17
C02/C0	1.34
(H2) (C02) / (H20) (C0)	13.62

CONTRACTION: 48.3

C0 Conversion: 80.4

H2 Conversion: 59.7

$H_2 + CO = 67.5$

Yield Calculations assume "oil" is CH2, and is found by difference on Carbon, and H20 by difference on Hydrogen. "Oil" figures therefore include hydrocarbon fraction of oxygenated compounds. Standard cubic feet measured at 60 F and 14.7 psig. Cubic Meters measured at 0 C. and 14.7 psig. g/M3 = 16.91 × #/MCF. cc/M3 = 141.3 × gal/MCF.

THE TEXAS COMPANY — MONTEBELLO LABORATORY

DATA SUMMARY SHEET

Synthesis Run Number 42 G From 6/18/48 Hr. 0800 to 6/19/48 Hr. 0700

FLOWS	SCFH	%
Oxygen	2730	
Nat. Gas	4280	
Total	7010	38.9
Fresh Feed	12000	
F. F. by C	12300	
Avg. F. F.		
Wet Gas	4050	
Contraction		59.5
Recycle	16950	
Bleed	12957	
Total	29907	
Total Feed	41097	
Recycle/F.F.	2.49	
Inlet Vel.		
Steam Flow		

RUN CONDITIONS	
Generator Press.	285
O_2 Preheat, °F	475
Gas Preheat, °F	780
Reactor Press.	245
Steam Back Press.	
Temperatures, °F	
Heater Outlet	
Catalyst #1	630
#2	655
#3	660
#4	625
#5	
Average	
Product Separator	

DISTILLATIONS							
	A S T M			Hempel Dist.			
	Prod.	Raw Oil	Gasoline	°F	%	A.P.I.	
	A.P.I.	49.9		to 400	76.3	54.6	
	I.B.P.		108	400-550	15.0	34.1	
	5%			550+			
	10%		138				
	20		164				
	30		190	WATER			
	40		210	Temp.	%		
	50		230	200			
	60		250	203			
	70		276	208			
	80		304	A.P.I.	10.5		
	90		344				
	95		376				
	E.P.		398				
	Rec.		98.0				
	Res.		1.0				
	Loss		1.0				

CATALYST DATA	
In Reactor at Start of Period	548.75
Fresh Catalyst Charged	
Catalyst Recharged	
Total	548.75
Catalyst Taken Out	41.75
In Reactor at End of Period	507.00
Reactor d-P, H_2O	
Pounds in Reactor	
Density, lbs./cu. ft.	
Bed Height, Feet	
Space Vel. SCFH/lb. cat.	
Inventory Figures	82.7
From d-P Meters	

CATALYST ANALYSIS					
Particle Size					
Screen			Sedimentation		
Frac.	M	%	M	%	
On 40	420+	1.6	80+		
100	419-150	49.0	80-40		
150	149-105	11.2	40-20		
200	104-74	9.4	20-10		
250	73-62	3.8	10-0		
325	61-44	12.4			
<325	43-0	12.6			
Density, lbs./cu. ft			Chem. Anal.		
Aerated	142.0		% Fe		
Settled	144.0		% C		
Compacted	155.0		% Oil		
Sp. Grav.	3.8		Specific Surface		
					m^2 gm

NATURAL GAS	%
CO_2	1.60
CH_4	84.62
C_2H_6	9.76
C_3H_8	3.87
C_4H_{10}	.14
N_2	
O_2	

PRODUCT INSPECTION						
	Oil	Water	Product	Pour °F	SUS @ °F	
Neut. No.	60.2	42.4				
Sap. No.	59.3	41.3				
Hydrox. No.	73.0					
Bromine No.	64.1					
% Fe						
% Alc		11.1				

GENERATOR ELEMENTAL BALANCE

IN	Mol %	SCFH m/hr	C	H	O
O_2	230.40	7.20			14.40
CO_2	7.92	.18	.18		.36
CH_4	152.80	9.55	9.55	38.20	
C_2H_6	33.00	1.10	2.20	6.60	
C_3H_8	19.36	.44	1.32	3.52	
C_4H_{10}	1.16	.02	.08	.20	
N_2					
Total		18.49	13.33	48.52	14.76

OUT	Mol %	SCFH m/hr	C	H	O
CO_2	2.2	.70	.70		1.40
CO	33.9	10.73	10.73		10.73
CH_4	5.1	1.61	1.61	6.44	
H_2	58.8	18.62		37.24	
N_2					
H_2O				5.26	2.63
Total		31.66	13.04	48.94	14.76

	FRESH FEED			WET GAS					RECYCLE	COMB. FEED		EFFLUENT		NET CHANGE ON REACTION								
					Measured		At Wt. Balance							Carbon		Hydrogen	Oxygen	Ultimate Oil			Unsats.
	%	m/hr	#/hr	%	m/hr	#/hr	m/hr	#/hr	m/hr	m/hr	%	m/hr	%	m/hr	%	a/hr	a/hr	#/hr	#/gal	gal/hr	%
CO	33.9	10.73	300.44	9.77	1.04	29.12	1.25	34.87	7.52	18.25	16.80	8.77	9.19	- 9.48	- 9.48	11.65		- 9.48				
H2	58.8	18.62	37.24	37.73	4.03	8.06	4.83	9.65	29.03	47.65	43.87	33.86	35.49	-13.79			-27.58					
CO2	2.2	.70	30.80	23.46	2.51	110.44	3.01	132.24	18.05	18.75	17.26	21.06	22.08	2.31	2.31	21.53		4.62				
N2	-	-	-	.22	.02	.56	.02	.67	.17	.17	.16	.73	.77	.02								
CH4	5.1	1.61	25.76	18.56	1.98	31.68	2.37	37.93	14.28	15.89	14.63	16.65	17.45	.76	.76	7.08	3.04					
C2H4				2.31	.25	7.00	.30	8.38	1.78	1.78	1.64	2.08	2.18	.30	.60	5.59	1.20					
C2H6				1.65	.18	5.40	.22	6.47	1.27	1.27	1.17	1.49	1.56	.22	.44	4.10	1.32					
C3H6				2.44	.26	10.92	.31	13.08	1.88	1.88	1.73	2.19	2.30	.31	.93	8.67	1.86		11.77	6.25	1.88	
C3H8				.31	.03	1.32	.04	1.58	.24	.24	.22	.28	.29	.04	.12	1.12	.32					
C4H8				1.68	.18	10.08	.22	12.07	1.29	1.29	1.19	1.51	1.58	.22	.88	8.20	1.76		11.47	6.10	1.88	
C4H10				.72	.08	4.64	.10	5.56	.55	.55	.51	.65	.68	.10	.40	3.73	1.00		5.56	4.86	1.14	
C5H10				.80	.09	6.30	.11	7.54	.62	.62	.57	.73	.77	.11	.55	5.13	1.10		7.54	5.40	1.40	
C6H12				.35	.04	3.36	.05	4.02	.27	.27	.25	.32	.34	.05	.30	2.80	.60		4.02	5.50	.73	
OIL								(30.66)				.28	.23		2.19	20.40	4.38		30.66	6.50	4.72	
WATER												4.86	5.09				11.00		(5.50) 4.86			
TOTAL		31.66	394.24		10.68	228.88	12.83	274.06	76.93	108.61	100.00	95.40	100.00	18.83		100.00			71.02		11.75	
H2+CO		29.35			5.07		6.08															
H2/CO		1.74			3.88		3.86			2.61		3.86										

ULTIMATE YIELDS	% CO Fed	#/hr	H2/CO #/MCF	H2/CO g/M3	Gal/hr	H2/CO Gal/MCF	H2/CO cc/M3
C1+C2	16.77	27.02	2.43	41.09			
C3+	50.05	74.51	6.20	104.84			
C4+	40.26	59.85	5.38	90.98			
Ult. Oil		71.02	6.39	108.05	11.75	1.06	149.78
C02	21.53	101.44	9.12	154.22			
H20		87.48	7.87	133.08			

WEIGHT BALANCE	#/hr	%	#/hr
Wet Gas	228.9		273.0
Oil	23.0		23.0
Water	98.2		98.2
Total	350.1	88.8	394.2

EFFLUENT RATIOS	
H2/H20	6.97
C02/C0	2.40
(H2) (C02) / (H20) (C0)	16.97

CONTRACTION: 59.5

C0 Conversion: 88.4

H2 Conversion: 74.1

$H_2 + CO = 79.3$

Yield Calculations assume "oil" is CH2, and is found by difference on Carbon, and H20 by difference on Hydrogen. "Oil" figures therefore include hydrocarbon fraction of oxygenated compounds. Standard cubic feet measured at 60 F and 14.7 psig. Cubic Meters measured at 0 C. and 14.7 psig. g/M3 = 16.91 × #/MCF. cc/M3 = 141.3 × gal/MCF.

THE TEXAS COMPANY — MONTEBELLO LABORATORY

DATA SUMMARY SHEET

Synthesis Run Number 42 H From 6/19/48 Hr. 0800 to 6/20/48 Hr. _____

FLOWS	SCFH	%
Oxygen	2920	
Nat. Gas	4340	
Total	7260	40.2
Fresh Feed	12600	
F. F. by C	12600	
Avg. F. F.		
Wet Gas	4760	
Contraction		56.0
Recycle	17120	
Bleed	13028	
Total	30148	
Total Feed	42748	
Recycle/F.F.	2.39	
Inlet Vel.		
Steam Flow		

RUN CONDITIONS	
Generator Press.	292
O_2 Preheat, °F	440
Gas Preheat, °F	735
Reactor Press.	245
Steam Back Press.	
Temperatures, °F	
Heater Outlet	
Catalyst #1	630
#2	650
#3	660
#4	620
#5	
Average	
Product Separator	

DISTILLATIONS	ASTM	
	Raw Oil	Gasoline
Prod.		
A.P.I.	50.9	
I.B.P.		102
5%		
10%		140
20		168
30		190
40		210
50		232
60		254
70		274
80		308
90		344
95		376
E.P.		400
Rec.		98.0
Res.		1.0
Loss		1.0

Hempel Dist.		
°F	%	A.P.I.
to 400	82.1	54.9
400-550	9.6	54.8
550+		

WATER	
Temp.	%
200	
203	
208	
A.P.I.	10.7

CATALYST DATA	
In Reactor at Start of Period	507.0
Fresh Catalyst Charged	
Catalyst Recharged	
Total	507.0
Catalyst Taken Out	5.0
In Reactor at End of Period	502.0
Reactor d-P, H_2O	
Pounds in Reactor	
Density, lbs./cu. ft.	
Bed Height, Feet	
Space Vel. SCFH/lb. cat.	
Inventory Figures	85.2
From d-P Meters	

CATALYST ANALYSIS	Particle Size				
	Screen			Sedimentation	
	Frac.	M	%	M	%
	On 40	420+	0.6	80+	
	100	419-150	61.6	80-40	
	150	149-105	13.6	40-20	
	200	104-74	8.4	20-10	
	250	73-62	2.8	10-0	
	325	61-44	5.0		
	<325	43-0	8.0		
	Density, lbs./cu. ft			Chem. Anal.	
	Aerated	130.0		% Fe	
	Settled	133.0		% C	
	Compacted	139.0		% Oil	
	Sp. Grav.	3.9		Specific Surface	
				21.6	m^2 gm

NATURAL GAS	%
CO_2	1.65
CH_4	84.70
C_2H_6	10.12
C_3H_8	3.33
C_4H_{10}	.14
N_2	.07
O_2	

PRODUCT INSPECTION					
	Oil	Water	Product	Pour °F	SUS @ °F
Neut. No.	60.1	44.6			
Sap. No.	63.1	43.0			
Hydrox. No.	80.6				
Bromine No.	65.2				
% Fe					
% Alc		13.0			

GENERATOR ELEMENTAL BALANCE

IN	Mol %	SCFH m/hr	C	H	O
O_2	246.40	7.70			15.40
CO_2	8.36	.19	.19		.38
CH_4	155.20	9.70	9.70	38.80	
C_2H_6	34.80	1.16	2.32	6.96	
C_3H_8	16.72	.38	1.14	3.04	
C_4H_{10}	1.16	.02	.08	.20	
N_2	.28	.01			
Total		19.16	13.43	49.00	15.78

OUT	Mol %	SCFH m/hr	C	H	O
CO_2	2.3	.76	.76		1.52
CO	35.5	11.80	11.80		11.80
CH_4	2.6	.86	.86	3.44	
H_2	58.9	19.58		39.16	
N_2	0.7	.23			
H_2O				4.92	2.46
Total		33.25	13.42	47.52	15.78

	FRESH FEED			WET GAS					RECYCLE	COMB. FEED		EFFLUENT		NET CHANGE ON REACTION									
					Measured		At Wt. Balance							Carbon			Hydrogen		Oxygen	Ultimate Oil			Unsats.
	%	m/hr	#/hr	%	m/hr	#/hr	m/hr	#/hr	m/hr	m/hr	%	m/hr	%	m/hr	a/hr	%	a/hr	%	a/hr	#/hr	#/gal	gal/hr	%
CO	35.5	11.80	330.40	12.00	1.51	42.28	1.75	49.11	9.54	21.34	18.93	11.29	11.38	-10.05	-10.05	14.83			-10.05				
H2	58.9	19.58	39.16	41.75	5.24	10.48	6.09	12.17	33.18	52.76	46.81	39.27	39.60	-13.49			-26.98						
CO2	2.3	.76	33.44	22.90	2.88	126.72	3.35	147.19	18.20	18.96	16.82	21.55	21.73	2.59	2.59	21.95			5.18				
N2	0.7	.23	6.44	.35	.04	1.12	.05	1.30	.28	.51	.45	.33	.33	- .18									
CH4	2.6	.86	13.76	13.22	1.66	26.56	1.93	30.85	10.51	11.37	10.09	12.44	12.54	1.07	1.07	9.07	4.28						
C2H4				2.23	.28	7.84	.33	9.11	1.77	1.77	1.57	2.10	2.12	.33	.66	5.59	1.32						
C2H6				1.68	.21	6.30	.24	7.32	1.34	1.34	1.19	1.58	1.59	.24	.48	4.07	1.44						
C3H6				2.29	.29	12.18	.34	14.15	1.82	1.82	1.61	2.16	2.18	.34	1.02	8.64	2.04			12.74	6.25	2.04	
C3H8				.31	.04	1.76	.05	2.04	.25	.25	.22	.30	.30	.05	.15	1.27	.40						
C4H8				1.46	.18	10.08	.21	11.71	1.16	1.16	1.03	1.37	1.38	.21	.84	7.12	1.68			11.12	6.10	1.82	
C4H10				.76	.10	5.80	.12	6.74	.60	.60	.53	.72	.73	.12	.48	4.07	1.20			6.74	4.86	1.39	
C5H10				.73	.09	6.30	.10	7.32	.58	.58	.51	.68	.69	.10	.50	4.24	1.00			7.32	5.40	1.36	
C6H12				.32	.04	3.36	.05	3.90	.25	.25	.22	.30	.30	.05	.30	2.54	.60			3.90	5.50	.71	
OIL								(27.44)				.20	.20		1.96	16.61	3.92			27.44	6.50	4.22	
WATER												4.87	4.91				9.10		(4.55) 4.87				
TOTAL		33.25	423.20		12.56	260.78	14.61	302.91	79.47	112.71	99.98	99.16	99.98	18.62		100.00				69.26		11.54	
H2+CO		31.38			6.75		7.84																
H2/CO		1.66			3.47		3.48			2.47		3.48											

ULTIMATE YIELDS	% C0 Fed	#/hr	H2 / C0 #/MCF	H2 / C0 g/M3	Gal/hr	H2 / C0 Gal/MCF	H2 / C0 cc/M3
C1+C2	18.73	33.52	2.82	47.69			
C3+	44.49	73.30	6.16	104.17			
C4+	34.58	57.11	4.80	81.17			
Ult. Oil		69.26	5.83	98.59	11.54	0.97	137.06
C02	21.95	113.75	9.57	161.83			
H20		87.66	7.37	124.63			

WEIGHT BALANCE	#/hr	%	#/hr
Wet Gas	260.8		302.6
Oil	23.4		23.4
Water	97.2		97.2
Total	381.4	90.1	423.2

EFFLUENT RATIOS	
H2/H20	8.06
C02/C0	1.91
(H2) (C02) / (H20) (C0)	15.27

CONTRACTION:	56.0
C0 Conversion:	85.2
H2 Conversion:	69.0

$H_2 + CO = 75.1$

Yield Calculations assume "oil" is CH2, and is found by difference on Carbon, and H20 by difference on Hydrogen. "Oil" figures therefore include hydrocarbon fraction of oxygenated compounds. Standard cubic feet measured at 60 F and 14.7 psig. Cubic Meters measured at 0 C. and 14.7 psig. g/M3 = 16.91 × #/MCF. cc/M3 = 141.3 × gal/MCF.

THE TEXAS COMPANY — MONTEBELLO LABORATORY

DATA SUMMARY SHEET

Synthesis Run Number 42 I From 6/20/48 Hr. 0800 to 6/21/48 Hr. 0700

FLOWS	SCFH	%
Oxygen	2960	
Nat. Gas	4240	
Total	7200	41.1
Fresh Feed	12350	
F. F. by C	12600	
Avg. F. F.		
Wet Gas	4950	
Contraction		54.7
Recycle	16860	
Bleed	5145	
Total	22005	
Total Feed	34355	
Recycle/F.F.	1.75	
Inlet Vel.		
Steam Flow		

RUN CONDITIONS	
Generator Press.	275
O_2 Preheat, °F	510
Gas Preheat, °F	740
Reactor Press.	234
Steam Back Press.	
Temperatures, °F	
Heater Outlet	
Catalyst #1	640
#2	655
#3	660
#4	620
#5	
Average	
Product Separator	

DISTILLATIONS	A S T M	
Prod.	Raw Oil	Gasoline
A.P.I.	48.4	
I.B.P.		110
5%		
10%		152
20		180
30		200
40		220
50		240
60		260
70		282
80		310
90		344
95		376
E.P.		399
Rec.		98.0
Res.		1.0
Loss.		1.0

Hempel Dist.		
°F	%	A.P.I.
to 400	80.6	53.2
400-550	14.6	33.0
550+		

WATER	
Temp.	%
200	
203	
208	
A.P.I.	10.4

CATALYST DATA	
In Reactor at Start of Period	502.0
Fresh Catalyst Charged	
Catalyst Recharged	
Total	502.0
Catalyst Taken Out	11.0
In Reactor at End of Period	491.0
Reactor d-P, H_2O	
Pounds in Reactor	
Density, lbs./cu. ft.	
Bed Height, Feet	
Space Vel. SCFH/lb. cat.	
Inventory Figures	70.0
From d-P Meters	

CATALYST ANALYSIS — Particle Size				
Screen			Sedimentation	
Frac.	M	%	M	%
On 40	420+	0.6	80+	
100	419-150	46.0	80-40	
150	149-105	15.6	40-20	
200	104-74	9.6	20-10	
250	73-62	3.4	10-0	
325	61-44	8.6		
<325	43-0	16.2		

Density, lbs./cu. ft.		Chem. Anal.	
Aerated	135.0	% Fe	
Settled	137.0	% C	
Compacted	155.0	% Oil	
Sp. Grav.	3.74	Specific Surface	
		22.9	m^2 gm

NATURAL GAS	%
CO_2	1.65
CH_4	84.85
C_2H_6	9.28
C_3H_8	3.67
C_4H_{10}	.16
N_2	.39
O_2	

PRODUCT INSPECTION					
	Oil	Water	Product	Pour °F	SUS @ °F
Neut. No.	60.4	42.4			
Sap. No.	61.5	39.8			
Hydrox. No.	72.2				
Bromine No.	69.2				
% Fe					
% Alc		8.9			

GENERATOR ELEMENTAL BALANCE

IN	Mol %	SCFH m/hr	C	H	O
O_2	249.92	7.81			15.62
CO_2	7.92	.18	.18		.36
CH_4	151.84	9.49	9.49	37.96	
C_2H_6	31.20	1.04	2.08	6.24	
C_3H_8	18.04	.41	1.23	3.28	
C_4H_{10}	1.16	.02	.08	.20	
N_2	1.12	.04			
Total		17.99	13.06	47.68	15.98

OUT	Mol %	SCFH m/hr	C	H	O
CO_2	2.2	.72	.72		1.44
CO	35.6	11.60	11.60		11.60
CH_4	2.3	.75	.75	3.00	
H_2	59.3	19.32		38.64	
N_2	0.6	.20			
H_2O				5.88	2.94
Total		32.59	13.07	47.52	15.98

	FRESH FEED			WET GAS					RECYCLE	COMB. FEED		EFFLUENT		NET CHANGE ON REACTION								
					Measured		At Wt. Balance							Carbon			Hydrogen		Oxygen	Ultimate Oil			Unsats.
	%	m/hr	#/hr	%	m/hr	#/hr	m/hr	#/hr	m/hr	m/hr	%	m/hr	%	m/hr	a/hr	%	a/hr	%	a/hr	#/hr	#/gal	gal/hr	%
CO	35.6	11.60	324.80	13.17	1.72	48.16	1.94	54.31	7.51	19.11	21.32	9.45	12.35	- 9.66	- 9.66	16.72			- 9.66				
H2	59.3	19.32	38.64	41.79	5.46	10.92	6.16	12.31	23.83	43.15	48.14	29.99	39.20	-13.16			-26.32						
CO2	2.2	.72	31.68	22.14	2.89	127.16	3.26	143.40	12.62	13.34	14.88	15.88	20.76	2.54	2.54	21.90			5.08				
N2	0.6	.20	5.60	.36	.05	1.40	.06	1.58	.21	.41	.46	.27	.35	- .14									
CH4	2.3	.75	12.00	12.01	1.57	25.12	1.77	28.33	6.85	7.60	8.48	8.62	11.27	1.02	1.02	8.79	4.08						
C2H4				2.12	.28	7.84	.32	8.84	1.21	1.21	1.35	1.53	2.00	.32	.64	5.52	1.28						
C2H6				1.63	.21	6.30	.24	7.10	.93	.93	1.04	1.17	1.53	.24	.48	4.14	1.44						
C3H6				2.42	.32	13.44	.36	15.16	1.38	1.38	1.54	1.74	2.27	.36	1.08	9.31	2.16			13.64	6.25	2.18	
C3H8				.33	.04	1.76	.05	1.98	.19	.19	.21	.24	.31	.05	.15	1.29	.40						
C4H8				1.71	.22	12.32	.25	13.89	.98	.98	1.09	1.23	1.61	.25	1.00	8.62	2.00			13.20	6.10	2.16	
C4H10				.95	.12	6.96	.14	7.85	.54	.54	.60	.68	.89	.14	.56	4.83	1.40			7.85	4.86	1.62	
C5H10				.94	.12	8.40	.14	9.47	.54	.54	.60	.68	.89	.14	.60	5.17	1.40			9.47	5.40	1.75	
C6H12				.43	.06	5.04	.07	5.68	.25	.25	.28	.32	.42	.07	.42	3.62	.84			5.68	5.50	1.03	
OIL								(16.38)				.12	.16		1.17	10.09	2.34			16.38	6.50	2.52	
WATER												4.58	5.99				8.98		(4.49) 4.58				
TOTAL		32.58	412.72		13.06	274.82	14.76	309.90	57.02	89.63	99.99	76.50	100.00	17.83		100.00				66.22		11.28	
H2+CO		30.92			7.18		8.10																
H2/CO		1.67			3.17		3.18			2.26		3.17											

ULTIMATE YIELDS	% C0 Fed	#/hr	H2 / C0 #/MCF	H2 / C0 g/M3	Gal/hr	H2 / C0 Gal/MCF	H2 / C0 cc/M3
C1+C2	18.45	32.27	2.75	46.50			
C3+	42.93	70.41	6.01	101.63			
C4+	32.33	53.27	4.55	76.94			
Ult. Oil		66.22	5.65	95.54	11.26	0.96	135.65
C02	21.90	111.72	9.53	161.15			
H20		82.44	7.03	118.88			

WEIGHT BALANCE	#/hr	%	#/hr
Wet Gas	274.8		309.1
Oil	21.4		21.4
Water	82.2		82.2
Total	378.4	91.7	412.7

EFFLUENT RATIOS	
H2/H20	6.55
C02/C0	1.68
(H2) (C02) / (H20) (C0)	11.00

CONTRACTION: 54.7

C0 Conversion: 83.3

H2 Conversion: 68.1

$H_2 + CO = 73.8$

Yield Calculations assume "oil" is CH2, and is found by difference on Carbon, and H20 by difference on Hydrogen. "Oil" figures therefore include hydrocarbon fraction of oxygenated compounds. Standard cubic feet measured at 60 F and 14.7 psig. Cubic Meters measured at O C. and 14.7 psig. g/M3 = 16.91 × #/MCF. cc/M3 = 141.3 × gal/MCF.

THE TEXAS COMPANY — MONTEBELLO LABORATORY

DATA SUMMARY SHEET

Synthesis Run Number 42 J From 6/21/48 Hr. 0800 to 6/22/48 Hr. 0700

FLOWS	SCFH	%
Oxygen	2860	
Nat. Gas	4230	
Total	7090	40.3
Fresh Feed	12400	
F. F. by C	12900	
Avg. F. F.		
Wet Gas	5020	
Contraction		55.7
Recycle	17280	
Bleed	9047	
Total	26327	
Total Feed	38727	
Recycle/F.F.	2.12	
Inlet Vel.		
Steam Flow		

RUN CONDITIONS	
Generator Press.	275
O_2 Preheat, °F	490
Gas Preheat, °F	765
Reactor Press.	230
Steam Back Press.	
Temperatures, °F	
Heater Outlet	
Catalyst #1	650
#2	660
#3	660
#4	630
#5	
Average	
Product Separator	

DISTILLATIONS						
	A S T M			Hempel Dist.		
Prod.	Raw Oil	Gasoline		°F	%	A.P.I.
A.P.I.	48.8			to 400	82.0	53.4
I.B.P.		112		400-550	14.2	34.0
5%				550+		
10%		150				
20		176				
30		200		WATER		
40		220		Temp.	%	
50		240		200		
60		260		203		
70		280		208		
80		310		A.P.I.	10.4	
90		342				
95		378				
E.P.		400				
Rec.		97.5				
Res.		1.2				
Loss		1.3				

CATALYST DATA	
In Reactor at Start of Period	491.0
Fresh Catalyst Charged	
Catalyst Recharged	
Total	491.0
Catalyst Taken Out	2.5
In Reactor at End of Period	488.5
Reactor d-P, H_2O	
Pounds in Reactor	
Density, lbs./cu. ft.	
Bed Height, Feet	
Space Vel. SCFH/lb. cat.	
Inventory Figures	79.4
From d-P Meters	

CATALYST ANALYSIS					
Particle Size					
Screen			Sedimentation		
Frac.	M	%	M	%	
On 40	420+	0.4	80+		
100	419-150	44.7	80-40		
150	149-105	17.8	40-20		
200	104-74	9.6	20-10		
250	73-62	3.4	10-0		
325	61-44	11.2			
<325	43-0	12.8			
Density, lbs./cu. ft			Chem. Anal		
Aerated	127.2		% Fe		
Settled	131.0		% C		
Compacted	153.0		% Oil		
Sp. Gravity	4.1		Specific Surface		
			24.2		m^2 gm

NATURAL GAS	%
CO_2	1.44
CH_4	83.92
C_2H_6	9.72
C_3H_8	4.35
C_4H_{10}	.18
N_2	.39
O_2	

PRODUCT INSPECTION					
	Oil	Water	Product	Pour °F	SUS @ °F
Neut. No.	59.9	43.3			
Sap. No.	60.8	41.2			
Hydrox No.	76.9				
Bromine No.	65.4				
% Fe					
% Alc		10.0			

GENERATOR ELEMENTAL BALANCE

IN	Mol %	SCFH m/hr	C	H	O
O_2	241.60	7.55			15.10
CO_2	7.04	.16	.16		.32
CH_4	149.92	9.37	9.37	37.48	
C_2H_6	32.40	1.08	2.16	6.48	
C_3H_8	21.56	.49	1.47	3.12	
C_4H_{10}	1.16	.02	.08	.20	
N_2	1.12	.04			
Total		18.71	13.24	47.28	15.42

OUT	Mol %	SCFH m/hr	C	H	O
CO_2	2.1	.69	.69		1.38
CO	34.6	11.32	11.32		11.32
CH_4	2.4	.79	.79	3.16	
H_2	60.2	19.70		39.40	
N_2	0.7	.23			
H_2O				5.44	2.72
Total		32.73	12.80	48.00	15.42

	FRESH FEED			WET GAS					RECYCLE	COMB. FEED		EFFLUENT		NET CHANGE ON REACTION									
					Measured		At Wt. Balance							Carbon			Hydrogen		Oxygen	Ultimate Oil			Unsats.
	%	m/hr	#/hr	%	m/hr	#/hr	m/hr	#/hr	m/hr	m/hr	%	m/hr	%	m/hr	a/hr	%	a/hr	%	a/hr	#/hr	#/gal	gal/hr	%
CO	34.6	11.32	316.96	13.01	1.72	48.16	1.88	52.65	9.03	20.35	19.94	10.91	12.32	- 9.44	- 9.44	16.61			- 9.44				
H2	60.2	19.70	39.40	43.39	5.75	11.50	6.29	12.57	30.10	49.80	48.80	36.39	41.09	-13.41			-26.82						
CO2	2.1	.69	30.36	21.66	2.87	126.28	3.14	138.06	15.03	15.72	15.40	18.17	20.52	2.45	2.45	21.64			4.90				
N2	0.7	.23	6.44	.43	.06	1.68	.07	1.84	.30	.53	.52	.37	.42	- .16									
CH4	2.4	.79	12.64	12.21	1.62	25.92	1.77	28.34	8.47	9.26	9.07	10.24	11.56	.98	.98	8.66	3.92						
C2H4				1.89	.25	7.00	.27	7.65	1.31	1.31	1.28	1.58	1.78	.27	.54	4.77	1.18						
C2H6				1.51	.20	6.00	.22	6.56	1.05	1.05	1.03	1.27	1.43	.22	.44	3.89	1.32						
C3H6				2.16	.29	12.18	.32	13.32	1.50	1.50	1.47	1.82	2.05	.32	.96	8.48	1.92			11.99	6.25	1.92	
C3H8				.46	.06	2.64	.07	2.89	.32	.32	.31	.39	.44	.07	.21	1.86	.56						
C4H8				1.63	.22	12.32	.24	13.47	1.13	1.13	1.11	1.37	1.55	.24	.72	6.36	1.92			12.80	6.10	2.10	
C4H10				.52	.07	4.06	.08	4.44	.36	.36	.35	.44	.50	.08	.32	2.83	.80			4.44	4.86	.91	
C5H10				.72	.10	7.00	.11	7.65	.50	.50	.49	.61	.69	.11	.55	4.86	1.10			7.65	5.40	1.42	
C6H12				.31	.04	3.36	.04	3.67	.22	.22	.22	.26	.29	.04	.24	2.12	.48			3.67	5.50	.67	
OIL								(28.42)				.20	.23		2.03	17.93	4.06			28.42	6.50	4.37	
WATER												4.54	5.13				9.56		(4.78) 4.54				
TOTAL		32.72	405.80		13.25	268.10	14.50	293.11	69.37	102.05	99.99	88.56	100.0	18.23		100.01				68.97		11.39	
H2+CO		31.02			7.47		8.17																
H2/CO		1.74			3.34		3.35			2.45		3.34											

ULTIMATE YIELDS	% C0 Fed	#/hr	H2/C0 #/MCF	H2/C0 g/M3	Gal/hr	H2/C0 Gal/MCF	H2/C0 cc/M3
C1+C2	17.32	29.91	2.54	42.95			
C3+	44.44	73.86	6.28	106.19			
C4+	34.10	57.65	4.90	82.86			
Ult. Oil		68.97	5.86	99.09	11.39	0.97	137.06
C02	21.64	107.70	9.16	154.90			
H20		81.72	6.95	117.52			

WEIGHT BALANCE	#/hr	%	#/hr
Wet Gas	268.1		293.6
Oil	20.8		20.8
Water	91.4		91.4
Total	380.3	93.8	405.8

EFFLUENT RATIOS	
H2/H20	8.02
C02/C0	1.67
(H2) (C02) / (H20) (C0)	13.35

CONTRACTION: 55.7

C0 Conversion: 83.4

H2 Conversion: 68.1

$H_2 + CO = 73.7$

Yield Calculations assume "oil" is CH2, and is found by difference on Carbon, and H20 by difference on Hydrogen. "Oil" figures therefore include hydrocarbon fraction of oxygenated compounds. Standard cubic feet measured at 60 F and 14.7 psig. Cubic Meters measured at 0 C. and 14.7 psig. g/M3 = 16.91 × #/MCF. cc/M3 = 141.3 × gal/MCF.

THE TEXAS COMPANY — MONTEBELLO LABORATORY

DATA SUMMARY SHEET

Synthesis Run Number 42 K From 6/22/48 Hr. 0800 to 6/23/48 Hr. 0700

FLOWS	SCFH	%
Oxygen	2920	
Nat. Gas	4200	
Total	7120	41.0
Fresh Feed	12200	
F. F. by C	12700	
Avg. F. F.		
Wet Gas	5140	
Contraction		53.3
Recycle	17260	
Bleed	13073	
Total	30333	
Total Feed	42533	
Recycle/F.F.	2.49	
Inlet Vel.		
Steam Flow		

RUN CONDITIONS	
Generator Press.	270
O_2 Preheat, °F	475
Gas Preheat, °F	805
Reactor Press.	230
Steam Back Press.	
Temperatures, °F	
Heater Outlet	
Catalyst #1	650
#2	655
#3	660
#4	630
#5	
Average	
Product Separator	

DISTILLATIONS	A S T M	
Prod.	Raw Oil	Gasoline
A.P.I.	49.8	
I.B.P.		106
5%		
10%		146
20		174
30		194
40		214
50		236
60		258
70		284
80		310
90		346
95		376
E.P.		400
Rec.		98.0
Res.		1.0
Loss.		1.0

Hempel Dist.		
°F	%	A.P.I.
to 400	81.6	54.0
400-550	12.0	34.2
550+	6.4	

WATER	
Temp.	%
200	
203	
208	
A.P.I.	10.5

CATALYST DATA	
In Reactor at Start of Period	488.5
Fresh Catalyst Charged	
Catalyst Recharged	
Total	488.5
Catalyst Taken Out	0.5
In Reactor at End of Period	488.0
Reactor d-P, H_2O	
Pounds in Reactor	
Density, lbs./cu. ft.	
Bed Height, Feet	
Space Vel. SCFH/lb. cat.	
Inventory Figures	87.2
From d-P Meters	

CATALYST ANALYSIS				
Particle Size				
Screen			Sedimentation	
Frac.	M	%	M	%
On 40	420+	0.6	80+	
100	419-150	73.0	80-40	
150	149-105	14.0	40-20	
200	104-74	5.3	20-10	
250	73-62	1.2	10-0	
325	61-44	2.2		
<325	43-0	3.7		
Density, lbs./cu. ft			Chem. Anal.	
Aerated	128.5		% Fe	
Settled	130.0		% C	
Compacted	134.0		% Oil	
Sp. Grav.	3.75		Specific Surface	
			17.0	m^2 gm

NATURAL GAS	%
CO_2	1.44
CH_4	83.92
C_2H_6	9.72
C_3H_8	4.35
C_4H_{10}	.18
N_2	.39
O_2	

PRODUCT INSPECTION						
	Oil	Water	Product	Pour °F	SUS @ °F	
Neut. No.	57.3	43.0				
Sap. No.	58.6	40.0				
Hydrox. No.	69.2					
Bromine No.	67.3					
% Fe						
% Alc		9.6				

GENERATOR ELEMENTAL BALANCE

	IN Mol %	SCFH m/hr	C	H	O	OUT Mol %	SCFH m/hr	C	H	O
O_2	246.40	7.70			15.40	CO_2 2.3	.74	.74		1.48
CO_2	7.04	.16	.16		.32	CO 35.7	11.49	11.49		11.49
CH_4	148.80	9.30	9.30	37.20		CH_4 3.2	1.03	1.03	4.12	
C_2H_6	32.40	1.08	2.16	6.48		H_2 58.2	18.73		37.46	
C_3H_8	21.12	.48	1.44	3.84		N_2 0.6	.19			
C_4H_{10}	1.16	.02	.08	.20		H_2O			5.50	2.75
N_2	1.12	.04				Total	32.18	13.26	47.08	15.72
Total		18.78	13.14	47.72	15.72					

	FRESH FEED %	m/hr	#/hr	WET GAS %	Measured m/hr	Measured #/hr	At Wt. Balance m/hr	At Wt. Balance #/hr	RECYCLE rn/hr	COMB. FEED m/hr	COMB. FEED %	EFFLUENT m/hr	EFFLUENT %
CO	35.7	11.49	321.72	13.66	1.85	51.80	2.05	57.34	9.50	20.99	20.44	11.55	12.92
H2	58.2	18.73	37.46	41.96	5.69	11.38	6.30	12.60	29.17	47.90	46.64	35.47	39.68
CO2	2.3	.74	32.56	20.90	2.83	124.52	3.13	137.84	14.53	15.27	14.87	17.66	19.75
N2	0.6	.19	5.32	.47	.06	1.68	.07	1.86	.33	.52	.51	.40	.45
CH4	3.2	1.03	16.48	14.51	1.97	31.52	2.18	34.89	10.09	12.12	11.80	12.27	13.73
C2H4				1.83	.25	7.00	.28	7.75	1.27	1.27	1.24	1.55	1.73
C2H6				1.44	.20	6.00	.22	6.64	1.00	1.00	.97	1.22	1.36
C3H6				2.03	.28	11.76	.31	13.02	1.41	1.41	1.37	1.72	1.92
C3H8				.47	.06	2.64	.07	2.92	.33	.33	.32	.40	.45
C4H8				1.33	.18	10.08	.20	11.16	.92	.92	.90	1.12	1.25
C4H10				.43	.06	3.48	.07	3.85	.30	.30	.29	.37	.41
C5H10				.68	.09	6.30	.10	6.97	.47	.47	.46	.57	.64
C6H12				.29	.04	3.36	.04	3.72	.20	.20	.18	.24	.27
OIL								(27.16)				.19	.21
WATER												4.66	5.21
TOTAL		32.19	413.54		13.56	271.52	15.02	300.56	69.53	102.70	100.00	89.39	99.98
H2+CO		30.22			7.54		8.35						
H2/CO		1.63			3.08		3.07			2.28		3.07	

NET CHANGE ON REACTION

	Carbon m/hr	Carbon a/hr	Carbon %	Hydrogen a/hr	Hydrogen %	Oxygen a/hr	Ultimate Oil #/hr	Ultimate Oil #/gal	Ultimate Oil gal/hr	Unsats. %
CO	- 9.44	- 9.44	17.84			- 9.44				
H2	-12.43			-24.86						
CO2	2.39	2.39	20.80			4.78				
N2	- .12									
CH4	1.15	1.15	10.01	4.60						
C2H4	.28	.56	4.87	1.12						
C2H6	.22	.44	3.83	.66						
C3H6	.31	.93	8.09	1.86			11.73	6.25	1.88	
C3H8	.07	.21	1.83	.56						
C4H8	.20	.80	6.96	1.60			10.60	6.10	1.74	
C4H10	.07	.28	2.44	.70			3.85	4.86	.79	
C5H10	.10	.50	4.35	1.00			6.97	5.40	1.29	
C6H12	.04	.24	2.09	.48			3.72	5.50	.68	
OIL		1.94	16.88	3.88			27.16	6.50	4.18	
WATER				8.40		(4.20) 4.66				
TOTAL	13.16		99.99				64.02		10.56	

ULTIMATE YIELDS	% C0 Fed	#/hr	H2 / C0 #/MCF	H2 / C0 g/M3	Gal/hr	H2 / C0 Gal/MCF	H2 / C0 cc/M3
C1+C2	18.71	32.80	2.86	48.36			
C3+	42.64	68.80	6.01	101.63			
C4+	32.72	52.86	4.62	78.12			
Ult. Oil		64.02	5.59	94.53	10.56	0.92	130.00
C02	20.80	105.28	9.19	155.40			
H20		83.88	7.33	123.95			

WEIGHT BALANCE	#/hr	%	#/hr
Wet Gas	271.5		300.8
Oil	21.4		21.4
Water	91.3		91.3
Total	384.2	93.0	413.5

EFFLUENT RATIOS	
H2/H20	7.61
C02/C0	1.53
(H2) (C02) / (H20) (C0)	11.64

CONTRACTION: 53.3

C0 Conversion: 82.2

H2 Conversion: 66.4

$H_2 + CO = 72.4$

Yield Calculations assume "oil" is CH2, and is found by difference on Carbon, and H20 by difference on Hydrogen. "Oil" figures therefore include hydrocarbon fraction of oxygenated compounds. Standard cubic feet measured at 60 F and 14.7 psig. Cubic Meters measured at O C. and 14.7 psig. g/M3 = 16.91 × #/MCF. cc/M3 = 141.3 × gal/MCF.

THE TEXAS COMPANY — MONTEBELLO LABORATORY

DATA SUMMARY SHEET

Synthesis Run Number 42 L From 6/23/48 Hr. 0800 to 6/24/48 Hr. 0700

FLOWS	SCFH	%
Oxygen	2820	
Nat. Gas	4300	
Total	7120	39.6
Fresh Feed	12800	
F. F. by C	12800	
Avg. F. F.		
Wet Gas	5360	
Contraction		49.6
Recycle	18050	
Bleed	13130	
Total	31180	
Total Feed	43980	
Recycle/F.F.	2.44	
Inlet Vel.		
Steam Flow		

RUN CONDITIONS	
Generator Press.	275
O_2 Preheat, °F	475
Gas Preheat, °F	780
Reactor Press.	230
Steam Back Press.	
Temperatures, °F	
Heater Outlet	
Catalyst #1	645
#2	655
#3	660
#4	635
#5	
Average	
Product Separator	

DISTILLATIONS			
	A S T M		
Prod.	Raw Oil	Gasoline	
A.P.I.	49.7		
I.B.P.		110	
5%			
10%		152	
20		178	
30		200	
40		220	
50		240	
60		260	
70		280	
80		302	
90		348	
95		374	
E.P.		398	
Rec.		98.0	
Res.		1.0	
Loss.		1.0	

Hempel Dist.		
°F	%	A.P.I.
to 400	80.0	54.0
400-550	14.2	34.1
550+	5.8	

WATER	
Temp.	%
200	
203	
208	
A.P.I.	10.5

CATALYST DATA	
In Reactor at Start of Period	488.0
Fresh Catalyst Charged	
Catalyst Recharged	
Total	488.0
Catalyst Taken Out	2.5
In Reactor at End of Period	485.5
Reactor d-P, H_2O	
Pounds in Reactor	
Density, lbs./cu. ft.	
Bed Height, Feet	
Space Vel. SCFH/lb. cat.	
Inventory Figures	90.7
From d-P Meters	

CATALYST ANALYSIS					
Particle Size					
Screen			Sedimentation		
Frac.	M	%	M	%	
On 40	420+	0.2	80+		
100	419-150	31.5	80-40		
150	149-105	17.7	40-20		
200	104-74	12.1	20-10		
250	73-62	3.8	10-0		
325	61-44	14.7			
<325	43-0	20.0			
Density, lbs./cu. ft			Chem. Anal.		
Aerated 118.0			% Fe		
Settled 123.0			% C		
Compacted 152.0			% Oil		
Sp. Grav. 3.6			Specific Surface		
			16.6		m^2 gm

NATURAL GAS	%
CO_2	1.66
CH_4	85.58
C_2H_6	8.47
C_3H_8	3.85
C_4H_{10}	.16
N_2	.28
O_2	

PRODUCT INSPECTION					
	Oil	Water	Product	Pour °F	SUS @ °F
Neut. No.	54.5	40.9			
Sap. No.	56.9	39.6			
Hydrox. No.	76.4				
Bromine No.	76.6				
% Fe					
% Alc		9.8			

GENERATOR ELEMENTAL BALANCE

IN	Mol %	SCFH m/hr	C	H	O
O_2	238.08	7.44			14.88
CO_2	8.36	.19	.19		.38
CH_4	155.36	9.71	9.71	38.84	
C_2H_6	28.80	.96	1.92	5.76	
C_3H_8	19.36	.44	1.32	3.52	
C_4H_{10}	1.16	.02	.08	.20	
N_2	.84	.03			
Total		18.79	13.22	48.32	15.26

OUT	Mol %	SCFH m/hr	C	H	O
CO_2	2.2	.74	.74		1.48
CO	33.1	11.18	11.18		11.18
CH_4	4.1	1.38	1.38	5.52	
H_2	60.3	20.36		40.72	
N_2	0.3	.10			
H_2O				5.20	2.60
Total		33.76	13.30	51.44	15.26

	FRESH FEED			WET GAS					RECYCLE	COMB. FEED		EFFLUENT		NET CHANGE ON REACTION										
					Measured		At Wt. Balance							Carbon			Hydrogen		Oxygen	Ultimate Oil			Unsats.
	%	m/hr	#/hr	%	m/hr	#/hr	m/hr	#/hr	m/hr	m/hr	%	m/hr	%	m/hr	a/hr	%	a/hr	%	a/hr	#/hr	#/gal	gal/hr	%
CO	33.1	11.18	313.04	13.07	1.85	51.80	2.23	62.47	12.49	23.67	18.34	14.72	12.63	- 8.95	- 8.95	19.95			- 8.95				
H2	60.3	20.36	40.72	44.30	6.26	12.52	7.55	15.10	42.34	62.70	48.59	49.89	42.80	-12.81			-25.62						
CO2	2.2	.74	32.56	19.61	2.77	121.88	3.34	146.99	18.74	19.21	14.89	22.08	18.94	2.60	2.60	23.26			5.20				
N2	0.3	.10	2.80	.31	.04	1.12	.05	1.35	.30	.40	.31	.35	.30	- .05									
CH4	4.1	1.38	22.08	15.27	2.16	34.56	2.60	41.68	14.59	15.97	12.37	17.19	14.75	1.22	1.22	10.91	4.88						
C2H4				1.52	.21	5.88	.25	7.09	1.45	1.45	1.12	1.70	1.46	.25	.50	4.47	1.00						
C2H6				1.34	.19	5.70	.23	6.87	1.28	1.28	.99	1.61	1.38	.23	.46	4.11	1.38						
C3H6				1.79	.25	10.50	.30	12.66	1.71	1.71	1.33	2.01	1.72	.30	.90	8.05	1.80			11.39	6.25	1.82	
C3H8				.37	.05	2.20	.06	2.65	.35	.35	.27	.41	.35	.06	.18	1.61	.48						
C4H8				1.12	.16	8.96	.19	10.80	1.07	1.07	.83	1.26	1.08	.19	.76	6.80	1.52			10.26	6.10	1.68	
C4H10				.42	.06	3.48	.07	4.20	.40	.40	.31	.47	.40	.07	.28	2.50	.70			4.20	4.86	.86	
C5H10				.60	.08	5.60	.10	6.75	.57	.57	.44	.67	.57	.10	.50	4.47	1.00			6.75	5.40	1.25	
C6H12				.28	.04	3.36	.05	4.05	.27	.27	.21	.32	.27	.05	.30	2.68	.60			4.06	5.50	.74	
OIL								(17.50)				.13	.11		1.25	11.18	2.50			17.50	6.50	2.69	
WATER												3.75	3.22				9.76		(4.88) 3.75				
TOTAL		33.77	411.20		14.14	267.56	17.02	322.66	95.57	129.05	100.00	116.56	99.98	16.74		99.99				54.15		9.04	
H2+CO		31.54			8.11		9.78																
H2/CO		1.82			3.38		3.39			2.65		3.39											

ULTIMATE YIELDS	% C0 Fed	#/hr	H2 / C0 #/MCF	H2 / C0 g/M3	Gal/hr	H2 / C0 Gal/MCF	H2 / C0 cc/M3
C1+C2	19.49	33.56	2.81	47.52			
C3+	37.29	58.61	4.90	82.86			
C4+	27.63	43.30	3.62	61.21			
Ult. Oil		54.15	4.53	76.60	9.04	0.76	107.39
C02	23.26	114.43	9.58	162.00			
H20		67.50	5.65	95.54			

WEIGHT BALANCE	#/hr	%	#/hr
Wet Gas	267.6		322.4
Oil	15.8		15.8
Water	73.0		73.0
Total	356.4	86.6	411.2

EFFLUENT RATIOS	
H2/H20	13.30
C02/C0	1.50
(H2) (C02) / (H20) (C0)	19.96

CONTRACTION:	49.6
C0 Conversion:	80.0
H2 Conversion:	62.9

$H_2 + CO = 68.9$

Yield Calculations assume "oil" is CH2, and is found by difference on Carbon, and H20 by difference on Hydrogen. "Oil" figures therefore include hydrocarbon fraction of oxygenated compounds. Standard cubic feet measured at 60 F and 14.7 psig. Cubic Meters measured at O C. and 14.7 psig. g/M3 = 16.91 × #/MCF. cc/M3 = 141.3 × gal/MCF.

THE TEXAS COMPANY — MONTEBELLO LABORATORY

DATA SUMMARY SHEET

Synthesis Run Number 42 M From 6/24/48 Hr. 0800 to 6/25/48 Hr. 0700

FLOWS	SCFH	%
Oxygen	2740	
Nat. Gas	4160	
Total	6900	39.7
Fresh Feed	11600	
F F by C	12000	
Avg. F. F.		
Wet Gas	5100	
Contraction		54.9
Recycle	17020	
Bleed	13039	
Total	30059	
Total Feed	41659	
Recycle/F.F.	2.59	
Inlet Vel.		
Steam Flow		

RUN CONDITIONS	
Generator Press.	275
O_2 Preheat, °F	460
Gas Preheat, °F	770
Reactor Press.	230
Steam Back Press.	
Temperatures, °F	
Heater Outlet	
Catalyst #1	640
#2	650
#3	665
#4	630
#5	
Average	
Product Separator	

DISTILLATIONS	ASTM	
	Raw Oil	Gasoline
Prod.		
A.P.I.	47.5	
I.B.P.		118
5%		
10%		156
20		186
30		208
40		228
50		248
60		268
70		288
80		312
90		348
95		376
E.P.		401
Rec.		97.5
Res.		1.3
Loss		1.2

Hempel Dist.	°F	%	A.P.I.
to 400		81.0	53.0
400-550		16.3	33.9
550+		3.7	

WATER	Temp.	%
	200	
	203	
	208	
A.P.I.	10.5	

CATALYST DATA	
In Reactor at Start of Period	485.5
Fresh Catalyst Charged	
Catalyst Recharged	
Total	485.5
Catalyst Taken Out	
In Reactor at End of Period	485.5
Reactor d-P, H_2O	
Pounds in Reactor	
Density, lbs./cu. ft.	
Bed Height, Feet	
Space Vel. SCFH./lb. cat.	
Inventory Figures	85.9
From d-P Meters	

CATALYST ANALYSIS	Particle Size				
	Screen			Sedimentation	
	Frac.	M	%	M	%
	On 40	420+	0.8	80+	
	100	419-150	50.7	80-40	
	150	149-105	21.4	40-20	
	200	104-74	9.0	20-10	
	250	73-62	2.2	10-0	
	325	61-44	5.2		
	<325	43-0	10.6		
	Density, lbs./cu. ft			Chem. Anal.	
	Aerated	128.0		% Fe	
	Settled	130.0		% C	
	Compacted	138.0		% Oil	
	Sp. Grav.	3.6		Specific Surface	
				18.7	m^2 gm

NATURAL GAS	%
CO_2	1.43
CH_4	85.31
C_2H_6	9.13
C_3H_8	3.48
C_4H_{10}	.16
N_2	.50
O_2	

PRODUCT INSPECTION						
		Oil	Water	Product	Pour °F	SUS @ °F
Neut. No.		57.2	41.1			
Sap. No.		56.9	39.0			
Hydrox. No.		81.7				
Bromine No.		69.8				
% Fe						
% Alc			10.6			

GENERATOR ELEMENTAL BALANCE — IN	Mol %	SCFH m/hr	C	H	O
O_2	231.36	7.23			14.46
CO_2	7.04	.16	.16		.32
CH_4	149.92	9.37	9.37	37.48	
C_2H_6	30.00	1.00	2.00	6.00	
C_3H_8	16.72	.38	1.14	3.04	
C_4H_{10}	1.16	.02	.08	.20	
N_2	1.40	.05			
Total		18.21	12.75	46.72	14.78

OUT	Mol %	SCFH m/hr	C	H	O
CO_2	2.1	.64	.64		1.28
CO	33.3	10.19	10.19		10.19
CH_4	4.8	1.47	1.47	5.88	
H_2	57.7	17.66		35.32	
N_2	2.1	.64			
H_2O				6.62	3.31
Total		30.60	12.30	47.82	14.78

	FRESH FEED			WET GAS					RECYCLE	COMB. FEED		EFFLUENT		NET CHANGE ON REACTION									
					Measured		At Wt. Balance							Carbon			Hydrogen		Oxygen	Ultimate Oil			Unsats.
	%	m/hr	#/hr	%	m/hr	#/hr	m/hr	#/hr	m/hr	m/hr	%	m/hr	%	m/hr	a/hr	%	a/hr	%	a/hr	#/hr	#/gal	gal/hr	%
CO	33.3	10.19	285.32	14.14	1.90	53.20	1.95	54.51	11.21	21.40	19.48	13.16	13.51	- 8.24	- 8.24	19.14			- 8.24				
H2	57.7	17.66	35.32	41.88	5.64	11.28	5.78	11.56	33.19	50.85	46.29	38.97	40.01	-11.88			-23.76						
CO2	2.1	.64	28.16	19.43	2.62	115.28	2.68	118.12	15.40	16.04	14.60	18.08	18.56	2.04	2.04	20.02			4.08				
N2	2.1	.64	17.92	.05	.01	.28	.01	.29	.04	.68	.62	.05	.05	- .63									
CH4	4.8	1.47	23.52	16.44	2.21	35.36	2.26	36.23	13.03	14.50	13.20	15.29	15.70	.79	.79	7.75	3.16						
C2H4				1.66	.22	6.16	.23	6.31	1.32	1.32	1.20	1.55	1.59	.23	.46	4.51	.92						
C2H6				1.33	.18	5.40	.18	5.53	1.05	1.05	.96	1.23	1.26	.18	.36	3.53	1.08						
C3H6				1.81	.24	10.08	.25	10.33	1.43	1.43	1.30	1.68	1.72	.25	.75	7.36	1.50			9.30	6.25	1.49	
C3H8				.35	.05	2.20	.05	2.25	.28	.28	.25	.33	.34	.05	.15	1.47	.40						
C4H8				1.53	.21	11.76	.22	12.05	1.21	1.21	1.10	1.43	1.47	.22	.88	8.64	1.76			11.45	6.10	1.88	
C4H10				.43	.06	3.48	.06	3.57	.34	.34	.31	.40	.41	.06	.24	2.36	.60			3.57	4.86	.73	
C5H10				.62	.08	5.60	.08	5.74	.49	.49	.45	.57	.59	.08	.40	3.93	.80			5.74	5.40	1.06	
C6H12				.33	.04	3.36	.04	3.44	.26	.26	.24	.30	.31	.04	.24	2.36	.48			3.44	5.50	.63	
OIL								(27.02)				.19	.20		1.93	18.94	3.86			27.02	6.50	4.16	
WATER												4.16	4.27				9.20		(4.60) 4.16				
TOTAL		30.60	390.24		13.46	263.4	13.79	269.93	79.25	109.85	100.00	97.39	99.99	16.81		100.01				60.52		9.95	
H2+CO		27.85			7.54		7.73																
H2/CO		1.73			2.97		2.96			2.38		2.96											

ULTIMATE YIELDS	% CO Fed	#/hr	H2/CO #/MCF	H2/CO g/M3	Gal/hr	H2/CO Gal/MCF	H2/CO cc/M3
C1+C2	15.79	24.55	2.32	39.23			
C3+	45.06	64.60	6.10	103.15			
C4+	36.23	51.82	4.91	83.03			
Ult. Oil		60.52	5.73	96.89	9.95	0.94	132.82
C02	20.02	89.96	8.52	144.07			
H20		74.88	7.09	119.89			

WEIGHT BALANCE	#/hr	%	#/hr
Wet Gas	263.4		269.9
Oil	21.4		21.4
Water	98.9		98.9
Total	383.7	98.3	390.2

EFFLUENT RATIOS	
H2/H20	9.37
C02/C0	1.37
(H2) (C02) / (H20) (C0)	12.87

CONTRACTION: 54.9

C0 Conversion: 80.8

H2 Conversion: 67.3

$H_2 + CO$ = 72.2

Yield Calculations assume "oil" is CH2, and is found by difference on Carbon, and H20 by difference on Hydrogen. "Oil" figures therefore include hydrocarbon fraction of oxygenated compounds. Standard cubic feet measured at 60 F and 14.7 psig. Cubic Meters measured at 0 C. and 14.7 psig. g/M3 = 16.91 × #/MCF. cc/M3 = 141.3 × gal/MCF.

THE TEXAS COMPANY — MONTEBELLO LABORATORY

DATA SUMMARY SHEET

Synthesis Run Number 42 N From 6/25/48 Hr. 0800 to 6/26/48 Hr. 0700

FLOWS	SCFH	%
Oxygen	2850	
Nat. Gas	4170	
Total	7020	40.6
Fresh Feed	11600	
F. F. by C	11650	
Avg. F. F.		
Wet Gas	5350	
Contraction		48.9
Recycle	17570	
Bleed	13102	
Total	30672	
Total Feed	42272	
Recycle/F.F.	2.64	
Inlet Vel.		
Steam Flow		

RUN CONDITIONS	
Generator Press.	275
O_2 Preheat, °F	440
Gas Preheat, °F	750
Reactor Press.	235
Steam Back Press.	
Temperatures, °F	
Heater Outlet	
Catalyst #1	635
#2	650
#3	665
#4	620
#5	
Average	
Product Separator	

DISTILLATIONS	A S T M		Hempel Dist.		
	Raw Oil	Gasoline	°F	%	A.P.I.
Prod.			to 400	77.6	54.6
A.P.I.	49.3		400-550	17.0	34.4
I.B.P.		110	550+		
5%					
10%		148			
20		166			
30		200			
40		220			
50		240			
60		260			
70		280			
80		310			
90		350			
95		378			
E.P.		400			
Rec.		98.0			
Res.		1.0			
Loss		1.0			

WATER	
Temp.	%
200	
203	
208	
A.P.I.	10.7

CATALYST DATA	
In Reactor at Start of Period	485.5
Fresh Catalyst Charged	
Catalyst Recharged	
Total	485.5
Catalyst Taken Out	1.0
In Reactor at End of Period	484.5
Reactor d-P, H_2O	
Pounds in Reactor	
Density, lbs./cu. ft.	
Bed Height, Feet	
Space Vel. SCFH/lb. cat.	
Inventory Figures	87.3
From d-P Meters	

CATALYST ANALYSIS	Particle Size				
	Screen			Sedimentation	
Frac.	M	%	M	%	
On 40	420+	0.2	80+		
100	419-150	66.0	80-40		
150	149-105	21.0	40-20		
200	104-74	6.2	20-10		
250	73-62	1.2	10-0		
325	61-44	2.2			
<325	43-0	3.2			
Density, lbs./cu. ft			Chem. Anal.		
Aerated 119.0			% Fe		
Settled 120.8			% C		
Compacted 123.0			% Oil		
Sp. Grav. 2.8			Specific Surface		
			18.3	m^2 gm	

NATURAL GAS	%
CO_2	1.65
CH_4	85.50
C_2H_6	9.36
C_3H_8	3.27
C_4H_{10}	.16
N_2	.06
O_2	

PRODUCT INSPECTION						
		Oil	Water	Product	Pour °F	SUS @ °F
Neut. No.		62.6	41.5			
Sap. No.		58.6	40.1			
Hydrox. No.		82.7				
Bromine No.		73.5				
% Fe						
% Alc			11.1			

GENERATOR ELEMENTAL BALANCE	IN					OUT					
	Mol %	SCFH m/hr	C	H	O		Mol %	SCFH m/hr	C	H	O
O_2	240.64	7.52			15.04	CO_2	2.0	.61	.61		1.22
CO_2	7.92	.18	.18		.36	CO	35.5	10.86	10.86		10.86
CH_4	150.56	9.41	9.41	37.64		CH_4	4.0	1.22	1.22	4.88	
C_2H_6	30.90	1.03	2.06	6.18		H_2	57.1	17.47		34.94	
C_3H_8	15.84	.36	1.08	2.88		N_2	1.4	.43			
C_4H_{10}	1.16	.02	.08	.20		H_2O				6.64	3.32
N_2	.28	.01				Total		30.59	12.69	46.46	15.40
Total		18.53	12.81	46.90	15.40						

	FRESH FEED			WET GAS					RECYCLE	COMB. FEED		EFFLUENT		NET CHANGE ON REACTION									
					Measured		At Wt. Balance							Carbon			Hydrogen		Oxygen	Ultimate Oil			Unsats.
	%	m/hr	#/hr	%	m/hr	#/hr	m/hr	#/hr	m/hr	m/hr	%	m/hr	%	m/hr	a/hr	%	a/hr	%	a/hr	#/hr	#/gal	gal/hr	%
CO	35.5	10.86	304.08	13.66	1.93	54.04	2.13	59.77	11.03	21.89	19.66	13.16	13.17	- 8.73	- 8.73	19.61			- 8.73				
H2	57.1	17.47	34.94	41.97	5.93	11.86	6.56	13.12	33.90	51.37	46.13	40.46	40.49	-10.91			-21.82						
CO2	2.0	.61	26.84	20.90	2.95	129.80	3.26	143.56	16.88	17.49	15.71	20.14	20.15	2.65	2.65	24.40			5.30				
N2	1.4	.43	12.04	.47	.07	1.96	.08	2.17	.38	.81	.73	.46	.46	- .35									
CH4	4.0	1.22	34.16	14.51	2.05	32.80	2.27	36.28	11.72	12.94	11.62	13.99	14.00	1.05	1.05	9.67	4.20						
C2H4				1.83	.26	7.28	.29	8.05	1.48	1.48	1.33	1.77	1.77	.29	.58	5.34	1.16						
C2H6				1.44	.20	6.00	.22	6.64	1.16	1.16	1.04	1.38	1.38	.22	.44	4.05	1.32						
C3H6				2.03	.29	12.18	.32	13.47	1.64	1.64	1.47	1.96	1.96	.32	.96	8.84	1.92			12.12	6.25	1.94	
C3H8				.47	.07	3.08	.08	3.41	.38	.38	.34	.46	.46	.08	.24	2.21	.64						
C4H8				1.33	.19	10.64	.21	11.77	1.07	1.07	.96	1.28	1.28	.21	.84	7.73	1.68			11.18	6.10	1.83	
C4H10				.43	.06	3.48	.07	3.85	.35	.35	.31	.42	.42	.07	.28	2.58	.70			3.85	4.86	.79	
C5H10				.68	.10	7.00	.11	7.74	.55	.55	.49	.66	.66	.11	.55	5.06	1.10			7.74	5.40	1.43	
C6H12				.29	.04	3.36	.04	3.72	.23	.23	.21	.27	.27	.04	.24	2.21	.48			3.72	5.50	.68	
OIL								(12.60)				.09	.09		.90	8.29	1.80			12.60	6.50	1.94	
WATER												3.43	3.43				6.82		(3.41) 3.43				
TOTAL		30.60	412.06		14.12	283.5	15.64	313.55	80.78	111.36	100.00	99.93	99.99	14.95		99.99				51.21		8.61	
H2+CO		28.33			7.86		8.79																
H2/CO		1.61			3.07		3.08			2.35		3.07											

ULTIMATE YIELDS	% CO Fed	#/hr	H2 / CO #/MCF	H2 / CO g/M3	Gal/hr	H2 / CO Gal/MCF	H2 / CO cc/M3
C1+C2	19.06	16.81	1.57	26.55			
C3+	36.92	56.56	5.27	89.12			
C4+	25.87	39.68	3.69	62.40			
Ult. Oil		51.21	4.77	80.66	8.61	0.80	113.04
C02	24.40	116.72	10.87	183.81			
H20		61.74	5.75	97.23			

WEIGHT BALANCE	#/hr	%	#/hr
Wet Gas	283.5		313.5
Oil	17.9		17.9
Water	80.6		80.6
Total	382.0	92.7	412.0

EFFLUENT RATIOS	
H2/H20	11.80
C02/C0	1.53
(H2) (C02) / (H20) (C0)	18.05

CONTRACTION: 48.9

C0 Conversion: 80.4

H2 Conversion: 62.4

$H_2 + CO = 69.3$

Yield Calculations assume "oil" is CH2, and is found by difference on Carbon, and H20 by difference on Hydrogen. "Oil" figures therefore include hydrocarbon fraction of oxygenated compounds. Standard cubic feet measured at 60 F and 14.7 psig. Cubic Meters measured at 0 C. and 14.7 psig. g/M3 = 16.91 × #/MCF. cc/M3 = 141.3 × gal/MCF.

THE TEXAS COMPANY — MONTEBELLO LABORATORY

DATA SUMMARY SHEET

Synthesis Run Number 42 0 From 6/26/48 Hr. 0800 to 6/27/48 Hr. 0700

FLOWS	SCFH	%
Oxygen	2780	
Nat. Gas	4200	
Total	6980	39.8
Fresh Feed	11550	
F. F. by C	11900	
Avg. F. F.		
Wet Gas	5350	
Contraction		50.2
Recycle	17740	
Bleed	13116	
Total	30856	
Total Feed	42406	
Recycle/F.F.	2.67	
Inlet Vel.		
Steam Flow		

RUN CONDITIONS	
Generator Press.	274
O_2 Preheat, °F	450
Gas Preheat, °F	790
Reactor Press.	235
Steam Back Press.	
Temperatures, °F	
Heater Outlet	
Catalyst #1	630
#2	655
#3	665
#4	630
#5	
Average	
Product Separator	

DISTILLATIONS	A S T M	
Prod.	Raw Oil	Gasoline
A.P.I.	49.6	
I.B.P.		114
5%		
10%		162
20		190
30		210
40		230
50		250
60		270
70		294
80		320
90		356
95		384
E.P.		408
Rec.		98.0
Res.		1.0
Loss.		1.0

Hempel Dist.		
°F	%	A.P.I.
to 400	82.6	53.1
400-550	12.0	35.7
550+		

WATER	
Temp.	%
200	
203	
208	
A.P.I.	10.7

CATALYST DATA	
In Reactor at Start of Period	484.5
Fresh Catalyst Charged	
Catalyst Recharged	
Total	484.5
Catalyst Taken Out	27.0
In Reactor at End of Period	457.5
Reactor d-P, H_2O	
Pounds in Reactor	
Density, lbs./cu. ft.	
Bed Height, Feet	
Space Vel. SCFH/lb. cat.	
Inventory Figures	92.8
From d-P Meters	

CATALYST ANALYSIS — Particle Size					
	Screen			Sedimentation	
Frac.	M	%	M	%
On 40	420+	0.2	80+	
100	419-150	34.1	80-40	
150	149-105	19.7	40-20	
200	104-74	13.7	20-10	
250	73-62	3.2	10-0	
325	61-44	7.8		
<325	43-0	21.3		

Density, lbs./cu. ft		Chem. Anal.	
Aerated	119.0	% Fe	
Settled	122.0	% C	
Compacted	143.0	% Oil	
Sp. Grav.	3.45	Specific Surface	
	17.3	m^2 gm	

NATURAL GAS.	%
CO_2	1.60
CH_4	84.83
C_2H_6	9.25
C_3H_8	3.88
C_4H_{10}	.17
N_2	.26
O_2	

PRODUCT INSPECTION					
	Oil	Water	Product	Pour °F	SUS @ °F
Neut. No.	57.2	41.9			
Sap. No.	54.2	39.1			
Hydrox. No.	81.7				
Bromine No.	79.5				
% Fe					
% Alc		12.0			

GENERATOR ELEMENTAL BALANCE

IN	Mol %	SCFH m/hr	C	H	O
O_2	234.88	7.34			14.68
CO_2	7.92	.18	.18		.36
CH_4	150.40	9.40	9.40	37.60	
C_2H_6	30.60	1.02	2.04	6.12	
C_3H_8	18.92	.43	1.29	3.44	
C_4H_{10}	1.16	.02	.08	.20	
N_2	.84	.03			
Total		18.42	12.99	47.36	15.04

OUT	Mol %	SCFH m/hr	C	H	O
CO_2	2.2	.67	.67		1.34
CO	34.2	10.42	10.42		10.42
CH_4	4.9	1.49	1.49	5.96	
H_2	58.3	17.76		35.52	
N_2	0.4	.12			
H_2O				6.56	3.28
Total		30.46	12.58	48.04	15.04

	FRESH FEED			WET GAS					RECYCLE	COMB. FEED		EFFLUENT		NET CHANGE ON REACTION									
					Measured		At Wt. Balance							Carbon			Hydrogen		Oxygen	Ultimate Oil			Unsats.
	%	m/hr	#/hr	%	m/hr	#/hr	m/hr	#/hr	m/hr	m/hr	%	m/hr	%	m/hr	a/hr	%	a/hr	%	a/hr	#/hr	#/gal	gal/hr	%
CO	34.2	10.42	291.76	14.59	2.06	57.68	2.21	62.02	11.87	22.29	19.93	14.08	14.00	- 8.21	- 8.21	21.21			- 8.21				
H2	58.3	17.76	35.52	43.60	6.16	12.32	6.62	13.25	35.47	53.23	47.60	42.09	41.86	-11.14			-22.28						
CO2	2.2	.67	29.48	18.79	2.65	116.60	2.85	125.37	15.29	15.96	14.27	18.14	18.04	2.18	2.18	20.92			4.36				
N2	0.4	.12	3.36	.38	.05	1.40	.05	1.51	.31	.43	.38	.36	.36	- .07									
CH4	4.9	1.49	23.84	15.59	2.20	35.20	2.37	37.85	12.68	14.17	12.67	15.05	14.97	.88	.88	8.45	3.52						
C2H4				1.35	.19	5.32	.20	5.72	1.10	1.10	.98	1.30	1.29	.20	.40	3.84	.80						
C2H6				1.37	.19	5.70	.20	6.13	1.11	1.11	.99	1.31	1.30	.20	.40	3.84	1.20						
C3H6				1.74	.25	10.50	.27	11.29	1.42	1.42	1.27	1.69	1.68	.27	.81	7.77	1.62			10.16	6.25	1.63	
C3H8				.37	.05	2.20	.05	2.37	.30	.30	.27	.35	.35	.05	.15	1.44	.40						
C4H8				1.09	.15	8.40	.16	9.03	.89	.89	.80	1.05	1.04	.16	.64	6.14	1.28			8.58	6.10	1.41	
C4H10				.35	.05	2.90	.05	3.12	.28	.28	.25	.33	.33	.05	.20	1.92	.50			3.12	4.86	.64	
C5H10				.55	.08	5.60	.09	6.02	.45	.45	.40	.54	.54	.09	.45	4.32	.90			6.02	5.40	1.11	
C6H12				.23	.03	2.52	.03	2.71	.19	.19	.17	.22	.22	.03	.18	1.73	.36			2.71	5.50	.49	
OIL								(26.88)				.19	.19		1.92	18.43	3.84			26.88	6.50	4.14	
WATER												3.85	3.82				7.86		(3.93) 3.85				
TOTAL		30.47	383.96		14.12	266.3	15.15	286.39	81.35	111.82	99.98	100.54	99.99	15.31		100.01				57.47		9.42	
H2+CO		28.18			8.22		8.83																
H2/CO		1.70			2.99		2.99			2.39		2.99											

ULTIMATE YIELDS	% C0 Fed	#/hr	H2 / C0 #/MCF	H2 / C0 g/M3	Gal/hr	H2 / C0 Gal/MCF	H2 / C0 cc/M3
C1+C2	16.13	25.86	2.42	40.92			
C3+	41.75	61.42	5.75	97.23			
C4+	32.54	47.76	4.47	75.59			
Ult. Oil		57.47	5.38	90.98	9.42	0.88	124.34
C02	20.92	95.89	8.98	151.85			
H20		69.30	6.49	109.75			

WEIGHT BALANCE	#/hr	%	#/hr
Wet Gas	266.3		286.7
Oil	16.7		16.7
Water	80.5		80.5
Total	363.5	94.8	383.9

EFFLUENT RATIOS	
H2/H20	10.93
C02/C0	1.29
(H2) (C02) / (H20) (C0)	14.08

CONTRACTION: 50.2

C0 Conversion: 78.8

H2 Conversion: 62.7

$H_2 + CO = 68.7$

Yield Calculations assume "oil" is CH2, and is found by difference on Carbon, and H20 by difference on Hydrogen. "Oil" figures therefore include hydrocarbon fraction of oxygenated compounds. Standard cubic feet measured at 60 F and 14.7 psig. Cubic Meters measured at 0 C. and 14.7 psig. g/M3 = 16.91 × #/MCF. cc/M3 = 141.3 × gal/MCF.

THE TEXAS COMPANY — MONTEBELLO LABORATORY

DATA SUMMARY SHEET

Synthesis Run Number 42 P From 6/27/48 Hr. 0800 to 6/28/48 Hr. 0100

FLOWS

	SCFH	%
Oxygen	2850	
Nat. Gas	4250	
Total	7100	40.1
Fresh Feed	12300	
F. F. by C	12400	
Avg. F. F.		
Wet Gas	5720	
Contraction		49.8
Recycle	17580	
Bleed	13093	
Total	30673	
Total Feed	42973	
Recycle/F.F.	2.49	
Inlet Vel.		
Steam Flow		

RUN CONDITIONS

Generator Press.	275
O_2 Preheat, °F	430
Gas Preheat, °F	780
Reactor Press.	245
Steam Back Press.	
Temperatures, °F	
Heater Outlet	
Catalyst #1	630
#2	655
#3	660
#4	630
#5	
Average	
Product Separator	

DISTILLATIONS

ASTM

Prod.	Raw Oil	Gasoline		
A.P.I.	49.0			
I.B.P.		110		
5%				
10%		150		
20		170		
30		208		
40		228		
50		248		
60		268		
70		292		
80		319		
90		352		
95		376		
E.P.		400		
Rec.		98.0		
Res.		1.0		
Loss.		1.0		

Hempel Dist.

°F	%	A.P.I.
to 400	76.6	52.5
400-550	15.6	36.1
550+		

WATER

Temp.	%
200	
203	
208	
A.P.I.	10.6

CATALYST DATA

In Reactor at Start of Period	457.5
Fresh Catalyst Charged	
Catalyst Recharged	
Total	457.5
Catalyst Taken Out	5.75
In Reactor at End of Period	451.75
Reactor d-P, H_2O	
Pounds in Reactor	
Density, lbs./cu. ft.	
Bed Height, Feet	
Space Vel. SCFH/lb. cat.	
Inventory Figures	95.1
From d-P Meters	

CATALYST ANALYSIS

Particle Size

Screen Frac.	Screen M	Screen %	Sedimentation M	Sedimentation %
On 40	420+	0.8	80+	
100	419-150	65.9	80-40	
150	149-105	22.6	40-20	
200	104-74	6.5	20-10	
250	73-62	1.2	10-0	
325	61-44	1.8		
<325	43-0	1.2		

Density, lbs./cu. ft.		Chem. Anal.	
Aerated	120.0	% Fe	
Settled	121.0	% C	
Compacted	128.0	% Oil	
Sp. Grav.	3.5	Specific Surface	
		13.3	m^2/gm

NATURAL GAS

	%
CO_2	1.60
CH_4	84.83
C_2H_6	9.25
C_3H_8	3.88
C_4H_{10}	.17
N_2	.26
O_2	

PRODUCT INSPECTION

	Oil	Water	Product	Pour °F	SUS @ °F
Neut. No.	76.9	42.7			
Sap. No.	77.6	39.1			
Hydrox. No.	83.8				
Bromine No.	73.4				
% Fe					
% Alc		11.1			

GENERATOR ELEMENTAL BALANCE

IN

	Mol %	SCFH m/hr	C	H	O
O_2	240.64	7.52			15.04
CO_2	7.92	.18	.18		.36
CH_4	152.16	9.51	9.51	38.04	
C_2H_6	31.20	1.04	2.08	6.24	
C_3H_8	18.92	.43	1.29	3.44	
C_4H_{10}	1.16	.02	.08	.20	
N_2	.84	.03			
Total		18.73	13.14	47.92	15.40

OUT

	Mol %	SCFH m/hr	C	H	O
CO_2	2.2	.71	.71		1.42
CO	34.2	11.10	11.10		11.10
CH_4	3.9	1.27	1.27	5.08	
H_2	58.9	19.11		38.22	
N_2	0.8	.26			
H_2O				5.76	2.88
Total		32.45	13.08	49.06	15.40

	FRESH FEED			WET GAS	Measured		At Wt. Balance		RECYCLE	COMB. FEED		EFFLUENT		NET CHANGE ON REACTION	Carbon			Hydrogen		Oxygen	Ultimate Oil			Unsats.
	%	m/hr	#/hr	%	m/hr	#/hr	m/hr	#/hr	m/hr	m/hr	%	m/hr	%	m/hr	a/hr	%	a/hr	%	a/hr	#/hr	#/gal	gal/hr	%
CO	34.2	11.10	310.80	14.39	2.17	60.76	2.34	65.58	11.63	22.73	20.07	13.97	13.82	- 8.76	- 8.76	21.08			- 8.76				
H2	58.9	19.11	38.22	43.82	6.61	13.22	7.13	14.27	35.41	54.52	48.14	42.54	42.09	-11.98			-23.96						
CO2	2.2	.71	31.24	19.47	2.94	129.36	3.17	139.62	15.73	16.44	14.52	18.90	18.70	2.46	2.46	22.16			4.92				
N2	0.8	.26	7.28	.65	.10	2.80	.11	3.02	.53	.79	.70	.64	.63	- .15									
CH4	3.9	1.27	20.32	13.98	2.11	33.76	2.28	36.44	11.30	12.57	11.10	13.58	13.44	1.01	1.01	9.10	4.04						
C2H4				1.45	.22	6.16	.24	6.65	1.17	1.17	1.03	1.41	1.40	.24	.48	4.32	.96						
C2H6				1.55	.23	6.90	.25	7.45	1.25	1.25	1.10	1.50	1.48	.25	.50	4.50	1.50						
C3H6				1.86	.28	11.76	.30	12.69	1.50	1.50	1.32	1.80	1.78	.30	.90	8.11	1.80			11.42	6.25	1.83	
C3H8				.55	.08	3.52	.09	3.80	.44	.44	.39	.53	.52	.09	.27	2.43	.72						
C4H8				.98	.15	8.40	.16	9.07	.79	.79	.70	.95	.94	.16	.64	5.77	1.28			8.62	6.10	1.41	
C4H10				.42	.06	3.48	.06	3.76	.34	.34	.30	.40	.40	.06	.24	2.16	.60			3.76	4.86	.77	
C5H10				.64	.10	7.00	.11	7.56	.52	.52	.46	.63	.62	.11	.55	4.95	1.10			7.56	5.40	1.40	
C6H12				.24	.04	3.36	.04	3.63	.19	.19	.17	.23	.23	.04	.24	2.16	.48			3.63	5.50	.66	
OIL								(20.58)				.15	.15		1.47	13.24	2.94			20.58	6.50	3.17	
WATER												3.84	3.80				8.54		(4.27) 3.84				
TOTAL		32.45	407.86		15.09	290.5	16.28	313.54	80.80	113.25	100.00	101.07	100.00	16.17		99.98				55.57		9.24	
H2+CO		30.21			8.78		9.47																
H2/CO		1.72			3.05		3.05			2.40		3.05											

ULTIMATE YIELDS

	% C0 Fed	#/hr	H2 / C0 #/MCF	H2 / C0 g/M3	Gal/hr	H2 / C0 Gal/MCF	H2 / C0 cc/M3
C1+C2	17.92	30.22	2.64	44.64			
C3+	38.82	61.09	5.34	90.30			
C4+	28.28	44.60	3.90	65.95			
Ult. Oil		55.57	4.85	82.01	9.24	0.81	114.45
C02	22.16	108.38	9.47	160.14			
H20		69.12	6.04	102.14			

WEIGHT BALANCE

	#/hr	%	#/hr
Wet Gas	290.5		313.9
Oil	14.8		14.8
Water	79.2		79.2
Total	384.5	94.3	407.9

EFFLUENT RATIOS

H2/H20	11.08
C02/C0	1.35
(H2) (C02) / (H20) (C0)	14.99

CONTRACTION: 49.8

C0 Conversion: 78.9

H2 Conversion: 62.7

$H_2 + CO = 68.7$

Yield Calculations assume "oil" is CH2, and is found by difference on Carbon, and H20 by difference on Hydrogen. "Oil" figures therefore include hydrocarbon fraction of oxygenated compounds. Standard cubic feet measured at 60 F and 14.7 psig. Cubic Meters measured at 0 C. and 14.7 psig. g/M3 = 16.91 × #/MCF. cc/M3 = 141.3 × gal/MCF.

SUMMARY OF YIELDS* OF RUN NO. 42
ON BASIS TO BE USED IN FORTHCOMING REPORTS

Period	C_3-C_6 in Gas		Recovered Oil		W.S. Chemicals		Total	
	#/MCF	Gal/MCF	#/MCF	Gal/MCF	#/MCF	Gal/MCF	#/MCF	Gal/MCF
A	3.09	0.648	4.16	0.621	0.63	0.079	7.88	1.349
B	3.32	0.690	3.61	0.543	0.77	0.097	7.71	1.340
C	3.51	0.720	3.20	0.478	0.90	0.087	7.40	1.285
D	3.26	0.670	2.84	0.427	0.71	0.089	6.81	1.186
E	3.18	0.653	2.28	0.344	0.74	0.093	6.20	1.090
F	3.56	0.735	2.76	0.418	0.60	0.075	6.92	1.228
G	3.94	0.817	2.07	0.318	0.98	0.122	6.99	1.258
H	3.86	0.804	1.97	0.304	1.06	0.133	6.89	1.241
I	4.61	0.951	1.83	0.279	0.62	0.079	7.06	1.309
J	3.86	0.805	1.77	0.270	0.78	0.097	6.41	1.172
K	3.64	0.760	1.87	0.288	0.76	0.096	6.27	1.144
L	3.44	0.717	1.29	0.198	0.60	0.074	5.33	0.990
M	3.54	0.734	2.03	0.308	0.99	0.124	6.56	1.166
N	4.09	0.855	1.67	0.256	0.83	0.104	6.59	1.215
O	3.23	0.670	1.56	0.146	0.91	0.113	5.70	0.929

*Yields of recovered oil and chemicals are measured. C_3-C_6 yields are adjusted by forcing wet gas figures to make 100 per cent weight recovery on reactor.

THE TEXAS COMPANY — MONTEBELLO LABORATORY

DATA SUMMARY SHEET

Synthesis Run Number 43 A From 7-16-48 Hr. 0800 to 7-17-48 Hr. 0700

FLOWS	SCFH	%
Oxygen	5440	
Nat. Gas	7850	
Total	13290	40.9
Fresh Feed	22800	
F. F. by C	21500	
Avg. F. F.		
Wet Gas	14200	
Contraction		31.9
Recycle	14730	
Bleed	5522	
Total	20252	
Total Feed	43052	
Recycle/F.F.	0.89	
Inlet Vel.		
Steam Flow		

RUN CONDITIONS	
Generator Press.	275
O_2 Preheat, °F	380
Gas Preheat, °F	710
Reactor Press.	250
Steam Back Press.	
Temperatures, °F	
Heater Outlet	
Catalyst #1	645
#2	650
#3	660
#4	650
#5	
Average	
Product Separator	

DISTILLATIONS	A S T M	
Prod.	Raw Oil	Gasoline
A.P.I.	42.6	
I.B.P.		126
5%		
10%		172
20		210
30		230
40		250
50		270
60		290
70		310
80		335
90		366
95		396
E.P.		415
Rec.		98.0
Res.		1.0
Loss.		1.0

Hempel Dist.	°F	%	A.P.I.
	to 400	61.6	50.5
	400-550	29.6	36.0
	550+	8.8	

WATER	
Temp.	%
200	
203	
208	
A.P.I.	10.1

CATALYST DATA	
In Reactor at Start of Period	800.0
Fresh Catalyst Charged	
Catalyst Recharged	
Total	800.0
Catalyst Taken Out	3.75
In Reactor at End of Period	796.25
Reactor d-P, H_2O	
Pounds in Reactor	
Density, lbs./cu. ft.	
Bed Height, Feet	
Space Vel. SCFH/lb. cat.	
Inventory Figures	54.07
From d-P Meters	

CATALYST ANALYSIS	Particle Size				
	Screen			Sedimentation	
	Frac.	M	%	M	%
	On 40	420+	15.8	80+	
	100	419-150	36.6	80-40	
	150	149-105	9.0	40-20	
	200	104-74	9.2	20-10	
	250	73-62	3.4	10-0	
	325	61-44	7.8		
	<325	43-0	18.2		
Density, lbs./cu. ft.				Chem. Anal.	
Aerated	189.0			% Fe	
Settled	191.0			% C	
Compacted	207.0			% Oil	
Sp. Grav.	5.2			Specific Surface	
				9.7	m^2/gm

NATURAL GAS	%
CO_2	1.51
CH_4	82.07
C_2H_6	11.38
C_3H_8	4.80
C_4H_{10}	.25
N_2	
O_2	

PRODUCT INSPECTION						
		Oil	Water	Product	Pour °F	SUS @ °F
Neut. No.		47.7	36.7			
Sap. No.		50.4	22.2			
Hydrox. No.		54.3				
Bromine No.		72.6				
% Fe						
% Alc			6.1			

GENERATOR ELEMENTAL BALANCE

IN	Mol %	SCFH m/hr	C	H	O
O_2	459.20	14.35			28.70
CO_2	13.64	.31	.31		.62
CH_4	272.00	17.00	17.00	68.00	
C_2H_6	70.80	2.36	4.72	14.16	
C_3H_8	43.56	.99	2.97	7.92	
C_4H_{10}	2.90	.05	.20	.50	
N_2					
Total		35.06	25.20	90.58	29.32

OUT	Mol %	SCFH m/hr	C	H	O
CO_2	2.1	1.26	1.26		2.52
CO	38.4	23.10	23.10		23.10
CH_4	4.1	2.47	2.47	9.88	
H_2	55.4	33.33		66.66	
N_2					
H_2O				7.40	3.70
Total		60.16	26.83	83.94	29.32

	FRESH FEED			WET GAS					RECYCLE	COMB. FEED		EFFLUENT		NET CHANGE ON REACTION									
					Measured		At Wt. Balance							Carbon			Hydrogen		Oxygen	Ultimate Oil			Unsats.
	%	m/hr	#/hr	%	m/hr	#/hr	m/hr	#/hr	m/hr	m/hr	%	m/hr	%	m/hr	a/hr	%	a/hr	%	a/hr	#/hr	#/gal	gal/hr	%
CO	38.4	23.10	646.80	17.77	6.66	186.48	7.29	204.09	9.51	32.61	28.68	16.80	16.82	-15.81	-15.81	31.56			-15.81				
H2	55.4	33.33	66.66	52.76	19.77	39.54	21.64	43.27	28.25	61.58	54.16	49.89	49.94	-11.69			-23.38						
CO2	2.1	1.26	55.44	16.46	6.17	271.48	6.75	297.12	8.81	10.07	8.86	15.56	15.58	5.46	5.46	23.64			10.92				
N2	-	-	-	.19	.07	1.96	.08	2.15	.10	.10	.09	.18	.18	.08									
CH4	4.1	2.47	39.52	9.41	3.53	56.48	3.86	61.82	5.04	7.51	6.61	8.90	8.91	1.39	1.39	6.02	5.56						
C2H4				.82	.31	8.68	.34	9.50	.44	.44	.39	.78	.78	.34	.68	2.94	1.36						
C2H6				.47	.18	5.40	.20	5.91	.25	.25	.22	.45	.45	.20	.40	1.73	1.20						
C3H6				.65	.24	110.08	.26	11.03	.35	.35	.31	.61	.61	.26	.78	3.38	1.56			9.93	6.25	1.59	
C3H8				.08	.03	1.32	.03	1.44	.04	.04	.04	.07	.07	.03	.09	.39	.24						
C4H8				.56	.21	11.76	.23	12.87	.30	.30	.26	.53	.53	.23	.92	3.98	1.84			12.23	6.10	2.00	
C4H10				.29	.11	6.38	.12	6.98	.16	.16	.14	.28	.28	.12	.48	2.08	1.20			6.98	4.86	1.44	
C5H10				.37	.14	9.80	.15	10.73	.20	.20	.18	.35	.35	.15	.75	3.25	1.50			10.73	5.40	1.99	
C6H12				.17	.06	5.04	.07	5.52	.09	.09	.08	.16	.16	.07	.42	1.82	.84			5.52	5.50	1.00	
OIL								(62.16)				.44	.44		4.44	19.22	8.88			62.16	6.50	9.56	
WATER												4.89	4.90				.20		4.89				
TOTAL		60.16	808.42		37.47	614.40	41.02	672.43	53.54	113.70	100.01	99.89	100.00	19.17		100.01				107.55		17.58	
H2+CO		56.43			26.43		28.93																
H2/CO		1.44			2.97		2.97			1.89		2.97											

ULTIMATE YIELDS	% C0 Fed	#/hr	H2 / C0 #/MCF	H2 / C0 g/M3	Gal/hr	H2 / C0 Gal/MCF	H2 / C0 cc/M3
C1+C2	10.69	37.71	1.76	29.76			
C3+	34.12	110.73	5.18	87.59			
C4+	30.35	98.26	4.59	77.62			
Ult. Oil		107.55	5.03	85.06	17.58	0.82	115.87
C02	23.64	241.68	11.30	191.08			
H20		88.02	4.12	69.67			

WEIGHT BALANCE	#/hr	%	#/hr
Wet Gas	614.4		671.8
Oil	34.9		34.9
Water	101.7		101.7
Total	751.0	92.9	808.4

EFFLUENT RATIOS	
H2/H20	10.20
C02/C0	.93
(H2) (C02) / (H20) (C0)	9.45

CONTRACTION: 31.9

C0 Conversion: 68.4

H2 Conversion: 35.1

H2+C0 = 48.7

Yield Calculations assume "oil" is CH2, and is found by difference on Carbon, and H20 by difference on Hydrogen. "Oil" figures therefore include hydrocarbon fraction of oxygenated compounds. Standard cubic feet measured at 60 F and 14.7 psig. Cubic Meters measured at 0 C. and 14.7 psig. g/M3 = 16.91 × #/MCF. cc/M3 = 141.3 × gal/MCF.

THE TEXAS COMPANY — MONTEBELLO LABORATORY

DATA SUMMARY SHEET

Synthesis Run Number 43 B From 7-17-48 Hr. 0800 to 7-18-48 Hr. 0700

FLOWS	SCFH	%
Oxygen	5500	
Nat. Gas	8050	
Total	13550	40.6
Fresh Feed	24200	
F. F. by C	24500	
Avg. F. F.		
Wet Gas	14100	
Contraction		33.7
Recycle	14580	
Bleed	5004	
Total	19584	
Total Feed	43784	
Recycle/F.F.	0.81	
Inlet Vel.		
Steam Flow		

RUN CONDITIONS	
Generator Press.	280
O_2 Preheat, °F	420
Gas Preheat, °F	780
Reactor Press.	250
Steam Back Press.	
Temperatures, °F	
Heater Outlet	
Catalyst #1	650
#2	660
#3	665
#4	650
#5	
Average	
Product Separator	

DISTILLATIONS	A S T M		Hempel Dist.		
	Raw Oil	Gasoline	°F	%	A.P.I.
Prod.					
A.P.I.	43.0		to 400	66.3	49.4
I.B.P.		130	400-550	26.6	34.1
5%			550+	7.8	
10%		176			
20		210			
30		232	WATER		
40		252	Temp.	%	
50		272	200		
60		290	203		
70		312	208		
80		336	A.P.I.	10.2	
90		366			
95		390			
E.P.		410			
Rec.		98.0			
Res.		1.0			
Loss.		1.0			

CATALYST DATA	
In Reactor at Start of Period	796.25
Fresh Catalyst Charged	
Catalyst Recharged	
Total	796.25
Catalyst Taken Out	97.50
In Reactor at End of Period	698.75
Reactor d-P, H_2O	
Pounds in Reactor	
Density, lbs./cu. ft.	
Bed Height, Feet	
Space Vel. SCFH/lb. cat.	
Inventory Figures	62.66
From d-P Meters	

CATALYST ANALYSIS — Particle Size				
	Screen		Sedimentation	
Frac.	M	%	M	%
On 40	420+	6.4	80+	
100	419-150	51.6	80-40	
150	149-105	10.2	40-20	
200	104-74	11.6	20-10	
250	73-62	4.8	10-0	
325	61-44	20.4		
<325	43-0	15.0		

Density, lbs./cu. ft.		Chem. Anal.	
Aerated	159.0	% Fe	
Settled	165.0	% C	
Compacted	188.0	% Oil	
Sp. Grav.	4.9	Specific Surface	
		14.0	m^2 'gm

NATURAL GAS	%
CO_2	1.73
CH_4	83.75
C_2H_6	10.29
C_3H_8	4.04
C_4H_{10}	
N_2	
O_2	

PRODUCT INSPECTION					
	Oil	Water	Product	Pour °F	SUS @ °F
Neut. No.	51.0	39.0			
Sap. No.	52.9	40.4			
Hydrox. No.	20.6				
Bromine No.	72.2				
% Fe					
% A		8.3			

GENERATOR ELEMENTAL BALANCE

IN	Mol %	SCFH m/hr	C	H	O
O_2	464.32	14.51			29.02
CO_2	16.28	.37	.37		.74
CH_4	294.64	17.79	17.79	71.16	
C_2H_6	65.70	2.19	4.38	13.14	
C_3H_8	37.84	.86	2.58	6.88	
C_4H_{10}	2.32	.04	.16	.40	
N_2					
Total		35.76	25.28	91.58	29.76

OUT	Mol %	SCFH m/hr	C	H	O
CO_2	2.1	1.34	1.34		2.68
CO	35.7	22.79	22.79		22.79
CH_4	4.6	2.94	2.94	11.76	
H_2	57.4	36.65		73.30	
N_2	0.1	.06			
H_2O				8.38	4.29
Total		63.78	27.07	93.44	29.76

	FRESH FEED			WET GAS					RECYCLE	COMB. FEED		EFFLUENT		NET CHANGE ON REACTION									
					Measured		At Wt. Balance							Carbon			Hydrogen		Oxygen	Ultimate Oil			Unsats.
	%	m/hr	#/hr	%	m/hr	#/hr	m/hr	#/hr	m/hr	m/hr	%	m/hr	%	m/hr	a/hr	%	a/hr	%	a/hr	#/hr	#/gal	gal/hr	%
CO	35.7	22.79	638.12	15.61	5.80	162.40	6.59	184.58	8.07	30.86	26.72	14.66	14.85	-16.20	-16.20	28.92			-16.20				
H2	57.4	36.65	73.30	52.34	19.47	38.94	22.13	44.26	27.07	63.72	55.17	49.20	49.85	-14.52			=29.04						
CO2	2.1	1.34	58.96	17.14	6.38	280.72	7.25	319.06	8.86	10.20	8.83	16.11	16.32	5.91	5.91	25.93			11.82				
N2	0.1	.06	1.68	.24	.09	2.52	.10	2.86	.12	.18	.16	.22	.22	.04									
CH4	4.6	2.94	47.04	10.63	3.95	63.20	4.49	71.83	5.50	8.44	7.31	9.99	10.12	1.55	1.55	6.80	6.20						
C2H4				1.06	.39	10.92	.44	12.41	.55	.55	.48	.99	1.00	.44	.88	3.86	1.76						
C2H6				.53	.20	6.00	.23	6.82	.27	.27	.23	.50	.51	.23	.46	2.02	1.38						
C3H6				.82	.31	13.02	.35	14.80	.42	.42	.36	.77	.78	.35	1.05	4.61	2.10			13.32	6.25	2.13	
C3H8				.08	.03	1.32	.03	1.50	.04	.04	.03	.07	.07	.03	.09	.39	.24						
C4H8				.65	.24	13.44	.27	15.28	.34	.34	.29	.61	.62	.27	1.08	4.74	2.16			14.52	6.10	2.38	
C4H10				.27	.10	5.80	.11	6.59	.14	.14	.12	.25	.25	.11	.44	1.93	1.10			6.59	4.86	1.36	
C5H10				.44	.16	11.20	.18	12.73	.23	.23	.20	.41	.42	.18	.90	3.95	1.80			12.73	5.40	2.36	
C6H12				.19	.07	5.88	.08	6.68	.10	.10	.09	.18	.18	.08	.48	2.11	.96			6.68	5.50	1.21	
OIL								(47.04)				.34	.34		3.36	14.74	6.72			47.04	6.50	7.24	
WATER												4.38	4.44				4.62		(2.31) 4.38				
TOTAL		63.85	819.10		37.20	615.36	42.25	699.40	51.72	115.49	99.99	98.68	99.97	21.53		100.00				100.88		16.68	
H2+CO		59.44			25.27		28.72																
H2/CO		1.61			3.36		3.36			2.06		3.36											

ULTIMATE YIELDS	% C0 Fed	#/hr	H2 / C0 #/MCF	H2 / C0 g/M3	Gal/hr	H2 / C0 Gal/MCF	H2 / C0 cc/M3
C1+C2	12.68	44.02	1.95	32.97			
C3+	32.47	104.62	4.64	78.46			
C4+	27.47	88.32	3.92	66.29			
Ult. Oil		100.88	4.48	75.76	16.68	0.74	104.56
C02	25.93	260.10	11.54	195.14			
H20		78.84	3.50	59.19			

WEIGHT BALANCE	#/hr	%	#/hr
Wet Gas	615.4		699.0
Oil	37.8		37.8
Water	82.3		82.3
Total	735.5	89.9	819.1

EFFLUENT RATIOS	
H2/H20	11.23
C02/C0	1.10
(H2) (C02) / (H20) (C0)	12.34

CONTRACTION: 33.7

C0 Conversion: 71.1

H2 Conversion: 39.6

$H_2 + CO = 51.7$

Yield Calculations assume "oil" is CH2, and is found by difference on Carbon, and H20 by difference on Hydrogen. "Oil" figures therefore include hydrocarbon fraction of oxygenated compounds. Standard cubic feet measured at 60 F and 14.7 psig. Cubic Meters measured at 0 C. and 14.7 psig. g/M3 = 16.91 × #/MCF. cc/M3 = 141.3 × gal/MCF.

THE TEXAS COMPANY — MONTEBELLO LABORATORY

DATA SUMMARY SHEET

Synthesis Run Number 43 C From 7-18-48 Hr. 0800 to 7-19-48 Hr. 0700

FLOWS	SCFH	%
Oxygen	5500	
Nat. Gas	8050	
Total	13550	40.6
Fresh Feed	24400	
F. F. by C	22200	
Avg. F. F.		
Wet Gas	15100	
Contraction		36.5
Recycle	14580	
Bleed	5141	
Total	19721	
Total Feed	44121	
Recycle/F.F.	0.81	
Inlet Vel.		
Steam Flow		

RUN CONDITIONS	
Generator Press.	285
O_2 Preheat, °F	440
Gas Preheat, °F	750
Reactor Press.	250
Steam Back Press.	
Temperatures, °F	
Heater Outlet	
Catalyst #1	645
#2	655
#3	670
#4	650
#5	
Average	
Product Separator	

DISTILLATIONS	A S T M			Hempel Dist.		
		Raw Gasoline	Gas-oil line	°F	%	A.P.I.
Prod.						
A.P.I.		41.8		to 400	62.6	49.2
I.B.P.			126	400-550	24.3	34.6
5%				550+	13.1	
10%			162			
20			204			
30			228	WATER		
40			248	Temp.	%	
50			268	200		
60			288	203		
70			308	208		
80			328	A.P.I.	10.2	
90			356			
95			382			
E.P.			396			
Rec.			98.0			
Res.			1.0			
Loss			1.0			

CATALYST DATA	
In Reactor at Start of Period	698.75
Fresh Catalyst Charged	122.0
Catalyst Recharged	
Total	820.75
Catalyst Taken Out	125.0
In Reactor at End of Period	695.75
Reactor d-P, H_2O	
Pounds in Reactor	
Density, lbs./cu. ft.	
Bed Height, Feet	
Space Vel. SCFH/lb. cat.	
Inventory Figures	63.42
From d-P Meters	

CATALYST ANALYSIS	Particle Size				
	Screen			Sedimentation	
	Frac.	M	%	M	%
	On 40	420+	11.5	80+	
	100	419-150	42.5	80-40	
	150	149-105	8.7	40-20	
	200	104-74	8.7	20-10	
	250	73-62	4.2	10-0	
	325	61-44	12.7		
	<325	43-0	11.7		
	Density, lbs./cu. ft			Chem. Anal.	
	Aerated	152.0		% Fe	
	Settled	156.0		% C	
	Compacted	179.0		% Oil	
	Sp. Grav.	4.1		Specific Surface	
				19.7	m^2/gm

NATURAL GAS	%
CO_2	1.66
CH_4	84.46
C_2H_6	10.12
C_3H_8	3.54
C_4H_{10}	
N_2	
O_2	

PRODUCT INSPECTION						
		Oil	Water	Product	Pour °F	SUS @ °F
Neut. No.		51.4	42.1			
Sap. No.		58.6	42.8			
Hydrox. No.		29.0				
Bromine No.		73.2				
% Fe						
% Alc			8.9			

GENERATOR ELEMENTAL BALANCE

IN	Mol %	SCFH m/hr	C	H	O
O_2	464.32	14.51			29.02
CO_2	15.40	.35	.35		.70
CH_4	287.04	17.94	17.94	71.76	
C_2H_6	64.50	2.15	4.30	12.90	
C_3H_8	33.00	.75	2.25	6.00	
C_4H_{10}	2.32	.04	.16	.40	
N_2					
Total		35.74	25.00	91.06	29.72

OUT	Mol %	SCFH m/hr	C	H	O
CO_2	2.1	1.35	1.35		2.70
CO	35.4	22.79	22.79		22.79
CH_4	5.1	3.28	3.28	13.12	
H_2	57.4	36.95		73.90	
N_2					
H_2O				8.46	4.23
Total		64.37	27.42	95.48	29.72

	FRESH FEED			WET GAS					RECYCLE	COMB. FEED		EFFLUENT		NET CHANGE ON REACTION								
					Measured		At Wt. Balance							Carbon			Hydrogen		Oxygen	Ultimate Oil			Unsats.
	%	m/hr	#/hr	%	m/hr	#/hr	m/hr	#/hr	m/hr	m/hr	%	m/hr	%	m/hr	a/hr	%	a/hr	%	a/hr	#/hr	#/gal	gal/hr	%
CO	35.4	22.79	638.12	18.60	7.41	207.48	7.70	215.58	9.70	32.49	27.89	17.40	17.52	-15.09	-15.09	33.79			-15.09				
H2	57.4	36.95	73.90	53.14	21.17	42.34	22.00	43.99	27.71	64.66	55.50	49.71	50.06	-14.95			-29.90						
CO2	2.1	1.35	59.40	15.12	6.02	264.88	6.26	275.23	7.88	9.23	7.92	14.14	14.24	4.91	4.91	21.54			9.82				
N2	-	-	-	-	-	-	-	-	-	-	-	-	-	-									
CH4	5.1	3.28	52.48	9.72	3.87	61.92	4.02	64.34	5.07	8.35	7.17	9.09	9.15	.74	.74	3.25	2.96						
C2H4				.85	.34	9.52	.35	9.89	.44	.44	.38	.79	.80	.35	.70	3.07	1.40						
C2H6				.50	.20	6.00	.21	6.23	.26	.26	.22	.47	.47	.21	.42	1.84	1.26						
C3H6				.55	.22	9.24	.23	9.60	.29	.29	.25	.52	.52	.23	.69	3.03	1.38			8.64	6.25	1.38	
C3H8				.04	.02	.88	.02	.91	.02	.02	.02	.04	.04	.02	.06	.26	.16						
C4H8				.57	.23	12.88	.24	13.38	.30	.30	.26	.54	.54	.24	.96	4.21	1.92			12.71	6.10	2.08	
C4H10				.23	.09	5.22	.09	5.42	.12	.12	.10	.21	.21	.09	.36	1.58	.90			5.42	4.86	1.12	
C5H10				.45	.18	12.60	.19	13.09	.23	.23	.20	.42	.42	.19	.95	4.17	1.90			13.09	5.40	2.42	
C6H12				.23	.09	7.56	.09	7.86	.12	.12	.10	.21	.21	.09	.54	2.37	1.08			7.86	5.50	1.43	
OIL								(66.64)				.48	.48		4.76	20.89	9.52			66.64	6.50	10.25	
WATER												5.27	5.31				7.42		(3.71) 5.27				
TOTAL		64.38	823.90		39.84	640.52	41.40	665.52	52.15	116.51	100.01	99.29	99.97	23.53		100.00				114.36		18.68	
H2+CO		59.74			28.58		29.70																
H2/CO		1.62			2.86		2.86			1.99		2.86											

ULTIMATE YIELDS	% C0 Fed	#/hr	H2 / C0 #/MCF	H2 / C0 g/M3	Gal/hr	H2 / C0 Gal/MCF	H2 / C0 cc/M3
C1+C2	8.16	27.98	1.24	20.97			
C3+	36.51	116.90	5.16	87.26			
C4+	33.22	106.39	4.70	79.48			
Ult. Oil		114.36	5.05	85.40	18.68	0.83	117.28
C02	21.54	215.75	9.53	161.15			
H20		94.86	4.19	70.85			

WEIGHT BALANCE	#/hr	%	#/hr
Wet Gas	640.5		665.2
Oil	33.7		33.7
Water	125.0		125.0
Total	799.2	97.1	823.9

EFFLUENT RATIOS	
H2/H20	9.43
C02/C0	.81
(H2) (C02) / (H20) (C0)	7.67

CONTRACTION: 36.5

C0 Conversion: 66.2

H2 Conversion: 40.5

$H_2 + CO = 50.3$

Yield Calculations assume "oil" is CH2, and is found by difference on Carbon, and H20 by difference on Hydrogen. "Oil" figures therefore include hydrocarbon fraction of oxygenated compounds. Standard cubic feet measured at 60 F and 14.7 psig. Cubic Meters measured at 0 C. and 14.7 psig. g/M3 = 16.91 × #/MCF. cc/M3 = 141.3 × gal/MCF.

THE TEXAS COMPANY — MONTEBELLO LABORATORY

DATA SUMMARY SHEET

Synthesis Run Number 43 D From 7-19-48 Hr. 0800 to 7-20-48 Hr. 0700

FLOWS	SCFH	%
Oxygen	4940	
Nat. Gas	7150	
Total	12090	40.9
Fresh Feed	18800	
F. F. by C	19700	
Avg. F. F.		
Wet Gas	11400	
Contraction		48.4
Recycle	23160	
Bleed	4891	
Total	28051	
Total Feed	46851	
Recycle/F.F.	1.49	
Inlet Vel.		
Steam Flow		

RUN CONDITIONS	
Generator Press.	285
O_2 Preheat, °F	450
Gas Preheat, °F	750
Reactor Press.	250
Steam Back Press.	
Temperatures, °F	
Heater Outlet	
Catalyst #1	685
#2	710
#3	720
#4	690
#5	
Average	
Product Separator	

DISTILLATIONS — A S T M	Raw Oil	Gasoline
Prod.		
A.P.I.	39.7	
I.B.P.		124
5%		
10%		177
20		214
30		236
40		256
50		276
60		296
70		316
80		346
90		374
95		400
E.P.		410
Rec.		98.0
Res.		1.0
Loss		1.0

Hempel Dist.	°F	%	A.P.I.
to 400	69.0		46.4
400-550	25.3		31.0
550+			

WATER	Temp.	%
	200	
	203	
	208	
A.P.I.	9.9	

CATALYST DATA	
In Reactor at Start of Period	695.75
Fresh Catalyst Charged	119.0
Catalyst Recharged	
Total	814.75
Catalyst Taken Out	173.50
In Reactor at End of Period	641.25
Reactor d-P, H_2O	
Pounds in Reactor	
Density, lbs./cu. ft.	
Bed Height, Feet	
Space Vel. SCFH/lb. cat.	
Inventory Figures	73.0
From d-P Meters	

CATALYST ANALYSIS — Particle Size	Screen			Sedimentation	
	Frac.	M	%	M	%
	On 40	420+	10.2	80+	
	100	419-150	65.2	80-40	
	150	149-105	5.3	40-20	
	200	104-74	5.1	20-10	
	250	73-62	1.8	10-0	
	325	61-44	3.9		
	<325	43-0	8.5		

Density, lbs./cu. ft		Chem. Anal.	
Aerated	142.0	% Fe	
Settled	144.0	% C	
Compacted	164.0	% Oil	
Sp. Grav.	4.0	Specific Surface	
		4.1	m^2 gm

NATURAL GAS	%
CO_2	1.58
CH_4	85.52
C_2H_6	9.41
C_3H_8	3.28
C_4H_{10}	.15
N_2	.06
O_2	

PRODUCT INSPECTION					
	Oil	Water	Product	Pour °F	SUS @ °F
Neut. No.	53.5	40.1			
Sap. No.	57.5	34.2			
Hydrox No.	23.4				
Bromine No.	79.3				
% Fe					
% Alc		6.6			

GENERATOR ELEMENTAL BALANCE

IN	Mol %	SCFH m/hr	C	H	O
O_2	416.96	13.03			26.06
CO_2	13.20	.30	.30		.60
CH_4	258.24	16.14	16.14	64.56	
C_2H_6	53.40	1.78	3.56	10.68	
C_3H_8	27.28	.62	1.86	4.96	
C_4H_{10}	1.74	.03	.12	.30	
N_2	.28	.01			
Total		31.91	21.98	80.50	26.66

OUT	Mol %	SCFH m/hr	C	H	O
CO_2	2.2	1.09	1.09		2.18
CO	35.5	17.61	17.61		17.61
CH_4	4.4	2.18	2.18	8.72	
H_2	57.5	28.52		57.04	
N_2	0.4	.20			
H_2O				13.74	6.87
Total		49.60	20.88	79.50	26.66

	FRESH FEED %	FRESH FEED m/hr	FRESH FEED #/hr	WET GAS %	WET GAS Measured m/hr	WET GAS Measured #/hr	WET GAS At Wt. Balance m/hr	WET GAS At Wt. Balance #/hr	RECYCLE m/hr	COMB. FEED m/hr	COMB. FEED %	EFFLUENT m/hr	EFFLUENT %
CO	35.5	17.61	493.08	15.62	4.58	128.24	4.18	116.97	11.31	28.92	23.70	15.49	14.66
H2	57.5	28.52	57.04	49.25	14.43	28.86	13.16	26.32	35.67	64.19	52.61	48.83	46.21
CO2	2.2	1.09	47.96	17.85	5.23	230.12	4.77	209.89	12.93	14.02	11.49	17.70	16.75
N2	0.4	.20	5.60	.16	.05	1.40	.05	1.28	.12	.32	.26	.17	.16
CH4	4.4	2.18	34.88	12.14	3.56	56.96	3.25	51.95	8.79	10.97	8.99	12.04	11.39
C2H4				1.17	.34	9.52	.31	8.68	.85	.85	.70	1.16	1.10
C2H6				.65	.19	5.70	.17	5.20	.47	.47	.39	.64	.61
C3H6				1.01	.30	12.60	.27	11.49	.73	.73	.60	1.00	.95
C3H8				.17	.05	2.20	.05	2.01	.12	.12	.10	.17	.16
C4H8				.86	.25	14.00	.23	12.77	.62	.62	.51	.85	.80
C4H10				.41	.12	6.96	.11	6.35	.30	.30	.25	.41	.39
C5H10				.51	.15	10.50	.14	9.58	.37	.37	.30	.51	.48
C6H12				.20	.06	5.04	.05	4.60	.14	.14	.11	.19	.18
OIL								(61.60)				.44	.42
WATER												6.07	5.74
TOTAL		49.60	638.56		29.29	512.10	26.74	467.09	72.42	122.02	100.01	105.67	100.00
H2+CO		46.13			19.01		17.34						
H2/CO		1.62			3.15		3.15			2.22		3.15	

NET CHANGE ON REACTION	Carbon m/hr	Carbon a/hr	Carbon %	Hydrogen a/hr	Hydrogen %	Oxygen a/hr	Ultimate Oil #/hr	Ultimate Oil #/gal	Ultimate Oil gal/hr	Unsats. %
CO	-13.43	-13.43	23.74			-13.43				
H2	-15.36			-30.72						
CO2	3.68	3.68	20.90			7.36				
N2	- .15									
CH4	1.07	1.07	6.08	4.28						
C2H4	.31	.62	3.52	1.24						
C2H6	.17	.34	1.93	1.02						
C3H6	.27	.81	4.60	1.62			10.34	6.25	1.65	
C3H8	.05	.15	.85	.40						
C4H8	.23	.92	5.22	1.84			12.13	6.10	1.99	
C4H10	.11	.44	2.50	1.10			6.35	4.86	1.31	
C5H10	.14	.70	3.97	1.40			9.58	5.40	1.77	
C6H12	.05	.30	1.70	.60			4.60	5.50	.84	
OIL		4.40	24.99	8.80			61.60	6.50	9.48	
WATER				8.42		(1.21) 6.07				
TOTAL	22.86		100.00				104.60		17.04	
H2+CO										
H2/CO										

ULTIMATE YIELDS	% C0 Fed	#/hr	H2/C0 #/MCF	H2/C0 g/M3	Gal/hr	H2/C0 Gal/MCF	H2/C0 cc/M3
C1+C2	11.53	30.95	1.77	29.93			
C3+	43.83	108.40	6.20	104.84			
C4+	38.38	94.90	5.43	91.82			
Ult. Oil		104.60	5.98	101.12	17.04	0.97	137.06
C02	20.90	161.93	9.26	156.59			
H20		109.26	6.25	105.69			

WEIGHT BALANCE	#/hr	%	#/hr
Wet Gas	512.3		467.8
Oil	39.4		39.4
Water	131.4		131.4
Total	682.9	106.9	638.6

EFFLUENT RATIOS	
H2/H20	8.04
C02/C0	1.14
(H2) (C02) / (H20) (C0)	9.19

CONTRACTION: 46.1

C0 Conversion: 76.3

H2 Conversion: 53.9

$H_2 - CO = 62.4$

Yield Calculations assume "oil" is CH2, and is found by difference on Carbon, and H20 by difference on Hydrogen. "Oil" figures therefore include hydrocarbon fraction of oxygenated compounds. Standard cubic feet measured at 60 F and 14.7 psig. Cubic Meters measured at 0 C. and 14.7 psig. g/M3 = 16.91 × #/MCF. cc/M3 = 141.3 × gal/MCF.

THE TEXAS COMPANY — MONTEBELLO LABORATORY

DATA SUMMARY SHEET

Synthesis Run Number 43 E From 7-20-48 Hr. 0800 to 7-21-48 Hr. 0700

FLOWS	SCFH	%
Oxygen	4880	
Nat. Gas	7100	
Total	11980	40.7
Fresh Feed	19600	
F. F. by C	out	
Avg. F. F.		
Wet Gas	13200	
Contraction		34.0
Recycle	23760	
Bleed	5100	
Total	28860	
Total Feed	48460	
Recycle/F.F.	1.47	
Inlet Vel.		
Steam Flow		

RUN CONDITIONS	
Generator Press.	285
O_2 Preheat, °F	450
Gas Preheat, °F	810
Reactor Press.	250
Steam Back Press.	
Temperatures, °F	
Heater Outlet	
Catalyst #1	620
#2	635
#3	650
#4	620
#5	
Average	
Product Separator	

DISTILLATIONS

ASTM Prod.	Raw Oil	Gasoline		
A.P.I.	41.8			
I.B.P.		134		
5%				
10%		190		
20		224		
30		244		
40		264		
50		284		
60		300		
70		320		
80		340		
90		370		
95		398		
E.P.		414		
Rec.		98.0		
Res.		1.0		
Loss.		1.0		

Hempel Dist. °F	%	A.P.I.
to 400	61.3	48.1
400-550	26.0	36.0
550+	12.7	

WATER Temp.	%
200	
203	
208	
A.P.I.	9.9

CATALYST DATA	
In Reactor at Start of Period	641.25
Fresh Catalyst Charged	153.0
Catalyst Recharged	
Total	794.25
Catalyst Taken Out	116.00
In Reactor at End of Period	678.25
Reactor d-P, H_2O	
Pounds in Reactor	
Density, lbs./cu. ft.	
Bed Height, Feet	
Space Vel. SCFH/lb. cat.	
Inventory Figures	71.4
From d-P Meters	

CATALYST ANALYSIS — Particle Size

Screen Frac.	M	%	Sedimentation M	%
On 40	420+	7.4	80+	
100	419-150	60.0	80-40	
150	149-105	8.0	40-20	
200	104-74	6.6	20-10	
250	73-62	2.6	10-0	
325	61-44	5.0		
<325	43-0	10.6		

Density, lbs./cu. ft		Chem. Anal.	
Aerated	147.0	% Fe	
Settled	149.0	% C	
Compacted	175.0	% Oil	
Sp. Grav.	4.0	Specific Surface	
		22.0	m^2 gm

NATURAL GAS	%
CO_2	1.75
CH_4	84.92
C_2H_6	9.03
C_3H_8	4.03
C_4H_{10}	.23
N_2	.03
O_2	

PRODUCT INSPECTION	Oil	Water	Product	Pour °F	SUS @ °F
Neut. No.	55.4	45.3			
Sap. No.	61.5	43.0			
Hydrox. No.	23.4				
Bromine No.	61.7				
% Fe					
% Alc		6.7			

GENERATOR ELEMENTAL BALANCE

IN	Mol %	SCFH m/hr	C	H	O
O_2	412.16	12.88			25.76
CO_2	14.52	.33	.33		.66
CH_4	254.56	15.91	15.91	63.64	
C_2H_6	50.70	1.69	3.38	10.14	
C_3H_8	33.00	.75	2.25	6.00	
C_4H_{10}	2.32	.04	.16	.40	
N_2	.28	.01			
Total		31.61	22.03	80.18	26.42

OUT	Mol %	SCFH m/hr	C	H	O
CO_2	2.0	1.03	1.03		2.06
CO	35.9	18.57	18.57		18.57
CH_4	4.4	2.28	2.28	9.12	
H_2	57.0	29.48		58.96	
N_2	0.7	.36			
H_2O				11.58	5.79
Total		51.72	21.88	79.66	26.42

	FRESH FEED %	FRESH FEED m/hr	FRESH FEED #/hr	WET GAS %	WET GAS Measured m/hr	WET GAS Measured #/hr	WET GAS At Wt. Balance m/hr	WET GAS At Wt. Balance #/hr	RECYCLE m/hr	COMB. FEED m/hr	COMB. FEED %	EFFLUENT m/hr	EFFLUENT %	NET CHANGE ON REACTION Carbon m/hr	Carbon a/hr	Carbon %	Hydrogen a/hr	Hydrogen %	Oxygen a/hr	Ultimate Oil #/hr	Ultimate Oil #/gal	Ultimate Oil gal/hr	Unsats. %
CO	35.9	18.57	519.96	21.40	7.45	208.60	7.30	204.45	16.27	34.84	27.27	23.57	20.71	-11.27	-11.27	39.31			-11.27				
H2	57.0	29.48	58.96	53.22	18.53	37.06	18.16	36.32	40.46	69.94	54.75	58.62	51.50	-11.32			-22.64						
CO2	2.0	1.03	45.32	13.13	4.57	201.08	4.48	197.08	9.98	11.01	8.62	14.40	12.65	3.45	3.45	18.58			7.90				
N2	0.7	.36	10.08	.51	.18	5.04	.18	4.94	.39	.75	.59	.57	.50	- .18									
CH4	4.4	2.28	36.48	8.49	2.96	47.36	2.90	46.42	6.45	8.73	6.83	9.35	8.21	.62	.62	3.34	2.48						
C2H4				.69	.24	6.72	.24	6.59	.52	.52	.41	.76	.67	.24	.48	2.58	.96						
C2H6				.43	.15	4.50	.15	4.41	.33	.33	.26	.48	.42	.15	.30	1.62	.90						
C3H6				.51	.18	7.56	.18	7.41	.39	.39	.31	.57	.50	.18	.54	2.91	1.08			6.67	6.25	1.07	
C3H8				.14	.05	2.20	.05	2.16	.11	.11	.09	.16	.14	.05	.15	.81	.40						
C4H8				.59	.21	11.76	.21	11.53	.45	.45	.35	.66	.58	.21	.84	4.52	1.68			10.95	6.10	1.80	
C4H10				.26	.09	5.22	.09	5.12	.20	.20	.16	.29	.25	.09	.36	1.94	.90			5.12	4.86	1.05	
C5H10				.44	.15	10.50	.15	10.29	.33	.33	.26	.48	.42	.15	.75	4.04	1.50			10.29	5.40	1.91	
C6H12				.19	.07	5.88	.07	5.76	.14	.14	.11	.21	.18	.07	.42	2.26	.84			5.76	5.50	1.05	
OIL								(47.04)				.34	.30		3.36	18.09	6.72			47.04	6.50	7.24	
WATER												3.37	2.96				5.18		(2.59) 3.37				
TOTAL		51.72	670.80		34.82	553.48	34.16	542.48	76.03	127.74	100.01	113.83	99.99	17.56		100.00				85.83		14.12	
H2+CO		48.05			25.98		25.46																
H2/CO		1.59			2.49		2.49			2.01		2.49											

ULTIMATE YIELDS	% CO Fed	#/hr	H2 / CO #/MCF	H2 / CO g/M3	Gal/hr	H2 / CO Gal/MCF	H2 / CO cc/M3
C1+C2	7.54	20.94	1.15	19.45			
C3+	34.57	89.31	4.90	82.86			
C4+	30.85	79.74	4.38	74.07			
Ult. Oil		85.83	4.71	79.65	14.12	0.78	110.21
C02	18.58	151.76	8.33	140.86			
H20		60.66	3.33	56.31			

WEIGHT BALANCE	#/hr	%	#/hr
Wet Gas	553.5		542.2
Oil	29.3		29.3
Water	99.3		99.3
Total	682.1	101.8	670.8

EFFLUENT RATIOS	
H2/H20	17.39
C02/C0	.61
(H2) (C02) / (H20) (C0)	10.63

CONTRACTION: 34.0

C0 Conversion: 60.7

H2 Conversion: 38.4

$H_2 + CO = 47.0$

Yield Calculations assume "oil" is CH2, and is found by difference on Carbon, and H20 by difference on Hydrogen. "Oil" figures therefore include hydrocarbon fraction of oxygenated compounds. Standard cubic feet measured at 60 F and 14.7 psig. Cubic Meters measured at O C. and 14.7 psig. g/M3 = 16.91 × #/MCF. cc/M3 = 141.3 × gal/MCF.

THE TEXAS COMPANY — MONTEBELLO LABORATORY

DATA SUMMARY SHEET

Synthesis Run Number 43 F From 7-21-48 Hr. 0800 to 7-22-48 Hr. 0700

FLOWS	SCFH	%
Oxygen	3120	
Nat. Gas	4050	
Total	7170	43.5
Fresh Feed	12700'	
F F by C	out	
Avg. F. F.		
Wet Gas	7340	
Contraction		53.3
Recycle	15040	
Bleed	7784	
Total	22820	
Total Feed	35520	
Recycle/F.F.	1.80	
Inlet Vel.		
Steam Flow		

RUN CONDITIONS	
Generator Press.	285
O_2 Preheat, °F	450
Gas Preheat, °F	780
Reactor Press.	250
Steam Back Press.	
Temperatures, °F	
Heater Outlet	
Catalyst #1	620
#2	645
#3	650
#4	615
#5	
Average	
Product Separator	

DISTILLATIONS — ASTM Prod.	Raw Oil	Gasoline
A.P.I.	46.4	
I.B.P.		116
5%		
10%		156
20		186
30		212
40		234
50		254
60		276
70		300
80		326
90		390
95		414
E.P.		98.0
Rec.		1.0
Res.		1.0
Loss.		

Hempel Dist. °F	%	A.P.I.
to 400	68.6	53.2
400-550	22.0	36.7
550+	9.4	

WATER Temp.	%
200	
203	
208	
A.P.I.	10.4

CATALYST DATA	
In Reactor at Start of Period	678.25
Fresh Catalyst Charged	165.00
Catalyst Recharged	
Total	843.25
Catalyst Taken Out	59.25
In Reactor at End of Period	784.00
Reactor d-P, H_2O	
Pounds in Reactor	
Density, lbs./cu. ft.	
Bed Height, Feet	
Space Vel. SCFH/lb. cat.	
Inventory Figures	45.3
From d-P Meters	

CATALYST ANALYSIS — Particle Size	Screen		Sedimentation	
Frac.	M	%	M	%
On 40	420+	17.9	80+	
100	419-150	46.6	80-40	
150	149-105	8.8	40-20	
200	104-74	7.3	20-10	
250	73-62	2.7	10-0	
325	61-44	4.6		
<325	43-0	12.1		
Density, lbs./cu. ft			Chem. Anal.	
Aerated	140.0		% Fe	
Settled	142.0		% C	
Compacted	152.0		% Oil	
Sp. Grav.	4.0		Specific Surface	
			8.3	m²/gm

NATURAL GAS	%
CO_2	1.71
CH_4	83.37
C_2H_6	10.40
C_3H_8	4.29
C_4H_{10}	.24
N_2	
O_2	

PRODUCT INSPECTION	Oil	Water	Product	Pour °F	SUS @ °F
Neut. No.	51.6	44.0			
Sap No.	55.5	38.9			
Hydrox. No.	53.5				
Bromine No.	67.5				
% Fe					
% Alc		8.9			

GENERATOR ELEMENTAL BALANCE

IN	Mol %	SCFH m/hr	C	H	O
O_2	263.36	8.23			16.46
CO_2	7.92	.18	.18		.36
CH_4	142.56	8.91	8.91	35.64	
C_2H_6	33.30	1.11	2.22	6.66	
C_3H_8	20.24	.46	1.38	3.68	
C_4H_{10}	1.74	.03	.12	.30	
N_2					
Total		18.92	12.81	46.28	16.82

OUT	Mol %	SCFH m/hr	C	H	O
CO_2	2.2	.74	.74		1.48
CO	36.3	12.16	12.16		12.16
CH_4	4.2	1.41	1.41	5.64	
H_2	56.9	19.07		38.14	
N_2	0.4	.13			
H_2O				6.36	3.18
Total		33.51	14.31	50.14	16.82

	FRESH FEED %	FRESH FEED m/hr	FRESH FEED #/hr	WET GAS %	WET GAS Measured m/hr	WET GAS Measured #/hr	WET GAS At Wt. Balance m/hr	WET GAS At Wt. Balance #/hr	RECYCLE m/hr	COMB. FEED m/hr	COMB. FEED %	EFFLUENT m/hr	EFFLUENT %
CO	36.3	12.16	340.48	13.18	2.55	71.40	2.06	57.65	7.95	20.11	21.43	10.01	12.26
H2	56.9	19.07	38.14	43.52	8.43	16.86	6.81	13.61	26.25	45.32	48.30	33.07	40.51
CO2	2.2	.74	32.56	19.89	3.85	169.40	3.11	136.79	12.00	12.74	13.58	15.11	18.51
N2	0.4	.13	3.64	.16	.03	.84	.02	.68	.10	.23	.25	.12	.15
CH4	4.2	1.41	22.56	15.33	2.97	47.52	2.40	38.37	9.25	10.66	11.36	11.65	14.27
C2H4				1.89	.37	10.36	.30	8.37	1.14	1.14	1.21	1.44	1.76
C2H6				1.03	.20	6.0[illegible]	.16	4.84	.62	.62	.66	.79	.97
C3H6				1.81	.35	14.70	.28	11.87	1.09	1.09	1.16	1.37	1.68
C3H8				.22	.04	1.76	.03	1.42	.13	.13	.14	.16	.20
C4H8				1.38	.27	15.12	.22	12.21	.83	.83	.88	1.05	1.29
C4H10				.39	.07	4.06	.06	3.28	.24	.24	.26	.30	.37
C5H10				.87	.17	11.90	.14	9.61	.52	.52	.55	.66	.81
C6H12				.33	.06	5.04	.05	4.07	.20	.20	.21	.25	.31
OIL								(38.78)				.28	.34
WATER												5.36	6.57
TOTAL		33.51	437.38		19.37	374.96	15.64	302.77	60.32	93.83	99.99	81.62	100.0
H2+CO		31.23			10.98		8.87						
H2/CO		1.57			3.31		3.31			2.25		3.30	

NET CHANGE ON REACTION	m/hr	Carbon a/hr	Carbon %	Hydrogen a/hr	Hydrogen %	Oxygen a/hr	Ultimate Oil #/hr	Ultimate Oil #/gal	Ultimate Oil gal/hr	Unsats. %
CO	-10.10	-10.10	16.94			-10.10				
H2	-12.26			-24.52						
CO2	2.37	2.37 (overtyped)	19.51			4.74				
N2	- .11									
CH4	.99	.99	8.15	3.96						
C2H4	.30	.60	4.94	1.20						
C2H6	.16	.32	2.63	.96						
C3H6	.28	.84	6.92	1.68			10.68	6.25	1.71	
C3H8	.03	.09	.74	.24						
C4H8	.22	.88	7.25	1.76			11.60	6.10	1.90	
C4H10	.06	.24	1.88	.60			3.28	4.86	.67	
C5H10	.14	.70	5.76	1.40			9.61	5.40	1.78	
C6H12	.05	.30	2.47	.60			4.07	5.50	.74	
OIL		2.77	22.81	5.54			38.78	6.50	5.97	
WATER				6.58		(3.29) 5.36				
TOTAL	17.87		100.01				78.02		12.77	
H2+CO										
H2/CO										

ULTIMATE YIELDS	% C0 Fed	#/hr	H2 / C0 #/MCF	H2 / C0 g/M3	Gal/hr	H2 / C0 Gal/MCF	H2 / C0 cc/M3
C1+C2	15.72	29.02	2.45	41.43			
C3+	47.83	81.24	6.86	116.00			
C4+	40.17	67.95	5.74	97.06			
Ult. Oil		78.02	6.59	111.44	12.77	1.08	152.60
C02	19.51	104.23	8.80	148.81			
H20		96.48	8.15	137.82			

WEIGHT BALANCE	#/hr	%	#/hr
Wet Gas	374.9		302.8
Oil	34.6		34.6
Water	100.0		100.0
Total	509.5	116.5	437.4

EFFLUENT RATIOS	
H2/H20	6.17
C02/C0	1.51
(H2) (C02) / (H20) (C0)	9.31

CONTRACTION: 53.3

C0 Conversion: 83.1

H2 Conversion: 64.3

$H_2 + CO = 71.6$

Yield Calculations assume "oil" is CH2, and is found by difference on Carbon, and H20 by difference on Hydrogen. "Oil" figures therefore include hydrocarbon fraction of oxygenated compounds. Standard cubic feet measured at 60 F and 14.7 psig. Cubic Meters measured at O C. and 14.7 psig. g/M3 = 16.91 × #/MCF. cc/M3 = 141.3 × gal/MCF.

THE TEXAS COMPANY — MONTEBELLO LABORATORY

DATA SUMMARY SHEET

Synthesis Run Number 43 G From 7-22-48 Hr. 0800 to 7-23-48 Hr. 0700

FLOWS	SCFH	%
Oxygen	3080	
Nat. Gas	3660	
Total	6740	45.7
Fresh Feed	10700	
F. F. by C	out	
Avg. F. F.		
Wet Gas	5350	
Contraction		58.9
Recycle	13500	
Bleed	7445	
Total	20945	
Total Feed	31645	
Recycle/F.F.	1.96	
Inlet Vel.		
Steam Flow		

RUN CONDITIONS	
Generator Press.	280
O_2 Preheat, °F	490
Gas Preheat, °F	810
Reactor Press.	250
Steam Back Press.	
Temperatures, °F	
Heater Outlet	
Catalyst #1	620
#2	640
#3	645
#4	620
#5	
Average	
Product Separator	

DISTILLATIONS	ASTM		Hempel Dist.		
	Raw Oil	Gasoline	°F	%	A.P.I.
Prod.					
A.P.I.	45.3		to 400	64.3	54.3
I.B.P.		118	400-550	14.0	36.8
5%			550+		
10%		158			
20		185			
30		208	WATER		
40		228	Temp.	%	
50		248	200		
60		268	203		
70		292	208		
80		216	A.P.I.	10.1	
90		360			
95		390			
E.P.		410			
Rec.		98.0			
Res.		1.0			
Loss		1.0			

CATALYST DATA	
In Reactor at Start of Period	784.0
Fresh Catalyst Charged	67.0
Catalyst Recharged	
Total	851.0
Catalyst Taken Out	65.5
In Reactor at End of Period	785.5
Reactor d-P, H_2O	
Pounds in Reactor	
Density, lbs./cu. ft.	
Bed Height, Feet	
Space Vel. SCFH/lb. cat.	
Inventory Figures	40.3
From d-P Meters	

CATALYST ANALYSIS	Particle Size				
	Screen			Sedimentation	
	Frac.	M	%	M	%
	On 40	420+	31.6	80+	
	100	419-150	39.8	80-40	
	150	149-105	6.4	40-20	
	200	104-74	5.4	20-10	
	250	73-62	2.1	10-0	
	325	61-44	5.0		
	<325	43-0	9.7		
	Density, lbs./cu. ft.			Chem. Anal.	
	Aerated	137.0		% Fe	
	Settled	141.0		% C	
	Compacted	152.0		% Oil	
	Sp. Grav.	3.7		Specific Surface	
				23.0	m^2/gm

NATURAL GAS	%
CO_2	1.51
CH_4	83.56
C_2H_6	10.21
C_3H_8	4.53
C_4H_{10}	.19
N_2	
O_2	

PRODUCT INSPECTION					
	Oil	Water	Product	Pour °F	SUS @ °F
Neut. No.	36.7	42.8			
Sap. No.	39.0	40.1			
Hydrox. No.	18.7				
Bromine No.	60.0				
% Fe					
% Alc		9.4			

GENERATOR ELEMENTAL BALANCE

IN	Mol %	SCFH m/hr	C	H	O
O_2	260.16	8.13			16.26
CO_2	6.60	.15	.15		.30
CH_4	129.12	8.07	8.07	32.28	
C_2H_6	22.70	.99	1.98	5.94	
C_3H_8	19.36	.44	1.32	3.52	
C_4H_{10}	1.16	.02	.08	.20	
N_2					
Total		17.80	11.60	41.94	16.56

OUT	Mol %	SCFH m/hr	C	H	O
CO_2	1.9	.54	.54		1.08
CO	34.6	9.77	9.77		9.77
CH_4	4.6	1.30	1.30	5.20	
H_2	58.8	16.60		33.20	
N_2	0.1	.03			
H_2O				11.42	5.71
Total		28.24	11.61	49.82	16.56

	FRESH FEED			WET GAS					RECYCLE	COMB. FEED		EFFLUENT	
					Measured		At Wt. Balance						
	%	m/hr	#/hr	%	m/hr	#/hr	m/hr	#/hr	m/hr	m/hr	%	m/hr	%
CO	34.6	9.77	273.56	12.99	1.83	51.24	1.51	42.18	7.19	16.96	20.29	8.70	12.10
H2	58.8	16.60	33.20	42.69	6.03	12.06	4.96	9.93	23.62	40.22	48.12	28.58	39.75
CO2	1.9	.54	23.76	20.13	2.84	124.96	2.34	102.85	11.14	11.68	13.97	13.48	18.75
N2	0.1	.03	.84	.05	.01	.28	.01	.23	.03	.06	.07	.04	.06
CH4	4.6	1.30	20.80	15.72	2.22	35.52	1.83	29.24	8.70	10.00	11.96	10.53	14.65
C2H4				1.93	.27	7.56	.22	6.22	1.07	1.07	1.28	1.29	1.79
C2H6				1.13	.16	4.80	.13	3.95	.63	.63	.75	.76	1.06
C3H6				1.94	.27	7.34	.22	9.33	1.07	1.07	1.28	1.29	1.79
C3H8				.24	.03	1.32	.02	1.09	.13	.13	.16	.15	.21
C4H8				1.44	.20	11.20	.16	9.22	.80	.80	.96	.96	1.34
C4H10				.53	.07	4.06	.06	3.34	.29	.29	.35	.35	.49
C5H10				.89	.13	9.10	.11	7.49	.49	.49	.59	.60	.83
C6H12				.32	.05	4.20	.04	3.46	.18	.18	.22	.22	.31
OIL								(39.76)				.28	.39
WATER												4.66	6.48
TOTAL		28.23	352.16		14.12	277.64	11.61	228.53	55.33	83.58	100.0	71.89	100.0
H2+CO		26.37			17.86		6.47						
H2/CO		1.70			3.30		3.28			2.37		3.28	

NET CHANGE ON REACTION	Carbon			Hydrogen		Oxygen	Ultimate Oil			Unsats.
	m/hr	a/hr	%	a/hr	%	a/hr	#/hr	#/gal	gal/hr	%
CO	- 8.26	- 8.26	15.46			- 8.26				
H2	-11.64			-23.28						
CO2	1.80	1.80	18.42			3.60				
N2	- .02									
CH4	.53	.53	5.42	2.12						
C2H4	.22	.44	4.50	.88						
C2H6	.13	.26	2.66	.78						
C3H6	.22	.66	6.76	1.32			8.40	6.25	1.34	
C3H8	.02	.06	.61	.16						
C4H8	.16	.64	6.55	1.28			8.76	6.10	1.44	
C4H10	.06	.24	2.46	.60			3.34	4.86	.69	
C5H10	.11	.55	5.63	1.10			7.49	5.40	1.39	
C6H12	.04	.24	2.46	.48			3.46	5.50	.63	
OIL		2.84	29.07	5.68			39.76	6.50	6.12	
WATER				8.88		(4.44) 4.66				
TOTAL	16.63		100.0				71.21		11.61	
H2+CO										
H2/CO										

ULTIMATE YIELDS	% C0 Fed	#/hr	H2 / C0 #/MCF	g/M3	Gal/hr	H2 / C0 Gal/MCF	cc/M3
C1+C2	12.58	18.61	1.86	31.45			
C3+	53.54	73.69	7.38	124.80			
C4+	46.17	63.27	6.33	107.04			
Ult. Oil		71.21	7.13	120.57	11.61	1.16	163.91
C02	18.42	79.09	7.92	133.93			
H20		83.88	8.40	142.04			

WEIGHT BALANCE	#/hr	%	#/hr
Wet Gas	277.6		228.6
Oil	24.3		24.3
Water	99.3		99.3
Total	411.2	116.8	352.2

EFFLUENT RATIOS	
H2/H20	6.13
C02/C0	1.55
(H2) (C02) / (H20) (C0)	9.50

CONTRACTION:	58.9
C0 Conversion:	84.5
H2 Conversion:	70.1

$H_2 + CO = 75.5$

Yield Calculations assume "oil" is CH2, and is found by difference on Carbon, and H20 by difference on Hydrogen. "Oil" figures therefore include hydrocarbon fraction of oxygenated compounds. Standard cubic feet measured at 60 F and 14.7 psig. Cubic Meters measured at O C. and 14.7 psig. g/M3 = 16.91 × #/MCF. cc/M3 = 141.3 × gal/MCF.