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THE TEXAS COMPANY

REFINING DEPARTMENT
TECHNICAL & RESEARCH DIVISION



REPORT ON

REVIEW OF SYNTHESIS DATA
MONTEBELLO RUNS No. 17, 18 AND 21 THRU 28

PERSONAL AND
CONFIDENTIAL

Laboratory MONTEBELLO
Report No. TDC-802-13-P
Date DECEMBER 21, 1948

STRICTLY CONFIDENTIAL

HYDROCARBON SYNTHESIS

PARTIAL REPORT NO. 13

Montebello Laboratory Experiment TDC-802
Report Approved October 21, 1948 Work Completed November 6, 1947

REVIEW OF SYNTHESIS DATA
MONTEBELLO RUNS 17, 18, AND 21 THRU 28

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I. INTRODUCTION

The following report presents a study of the yield data of Runs 17, 18, and 21 through 28. Run 22 was the first sustained synthesis operation at Montebello having high yields and conversion levels.

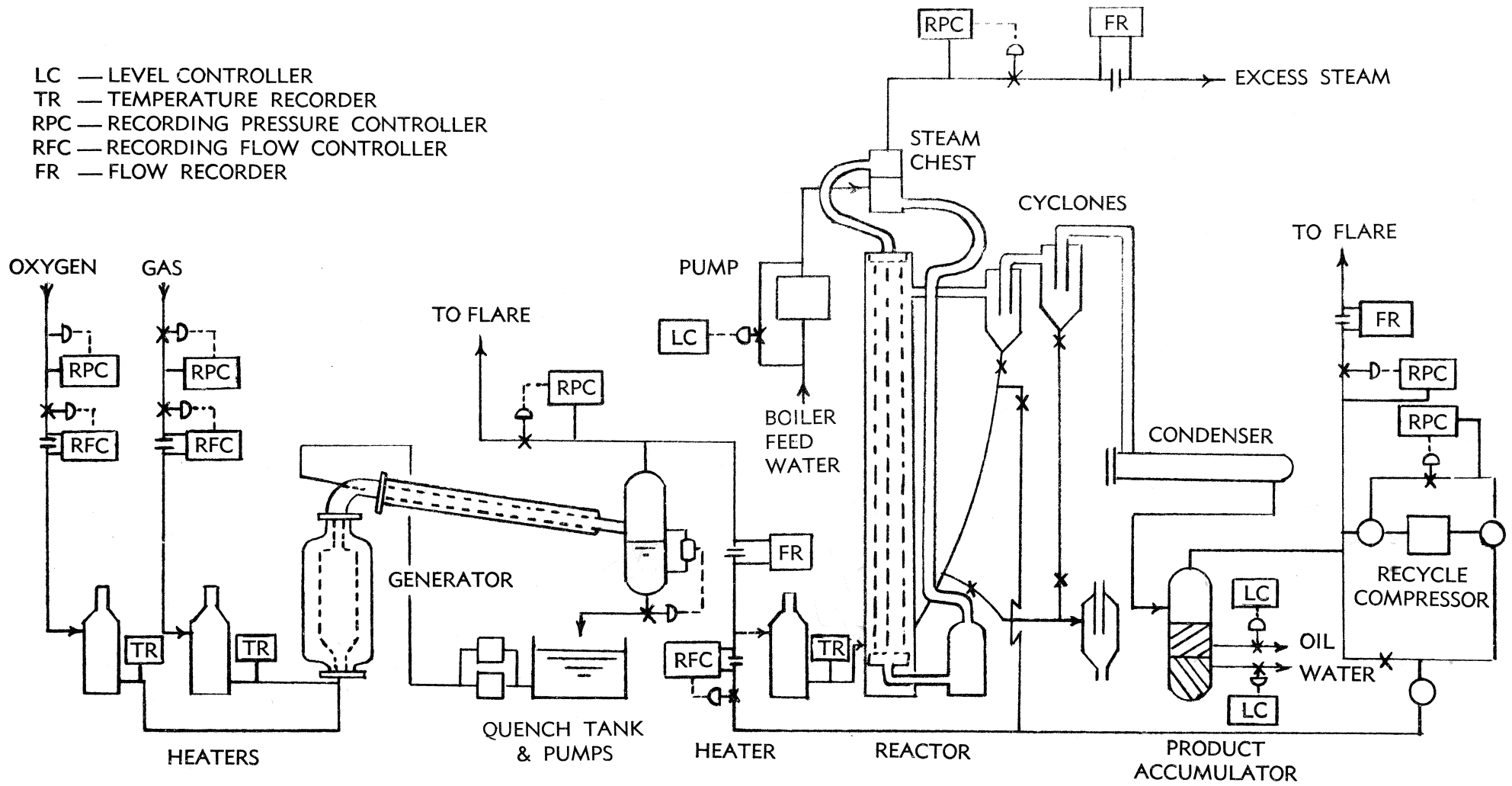
II. EQUIPMENT AND METHOD OF OPERATION

A. GENERATOR SYSTEM

The Montebello synthesis system consists of a generator in which natural gas and oxygen are reacted to produce a mixture of hydrogen and carbon monoxide, and a synthesis reactor where these gases are combined to produce hydrocarbons, water and carbon dioxide.

The generator is a vertical, internally insulated, cylindrical vessel 10" x 34" in cylindrical section, which is fitted with a conical burner block at the bottom which expands from 3" to 10" in diameter in a vertical distance of 12". The internal volume of the generator is 2.0 cu. ft. Preheated natural gas and oxygen are separately fed to the burner which is placed at the apex of the conical burner block. The burner consists of concentric 1" IPS and 3/4" O.D. tubing 18-8 and inconel tubes which carry the gas and oxygen respectively. Both tubes are swedged at the burner end to produce an annular gas jet which impinges on a central oxygen jet at the apex of the

LC — LEVEL CONTROLLER
 TR — TEMPERATURE RECORDER
 RPC — RECORDING PRESSURE CONTROLLER
 RFC — RECORDING FLOW CONTROLLER
 FR — FLOW RECORDER



**FLOW DIAGRAM OF GAS FIRED GENERATOR
 AND MONTEBELLO REACTOR**

burner block. A 1/8" IPS water cooling tube is wrapped around the burner tip to prevent overheating. Generator product gas is quenched with a water spray in a water jacketed transfer line which leads to an accumulator where the quench water is separated and discharged to a quench tank for recirculation. Gas from the accumulator is reheated in a steam jacketed transfer line where any entrained moisture is evaporated, and the dried gas is then sent to the synthesis system. In Run 25 no quench water was used, and the generator effluent gases were cooled only by the jacketed transfer line.

B. SYNTHESIS SYSTEM

The synthesis system consists of a vertical, cylindrical reactor constructed of 10" extra heavy pipe 30 ft. long which is fitted with three 2" extra heavy steam tubes which extend throughout the full length of the reactor. These tubes are connected with a steam drum at the top and a mud drum at the bottom, the boiler circuit being completed by an external downcommer. Fresh feed and recycle gas are combined, preheated and fed to the bottom of the reactor. Effluent gases leaving the top of the reactor pass through two cyclone separators to remove entrained catalyst, and then flow to a condenser and a separator where water, oil, and gas are separated. Oil and water are discharged separately to storage, while the gas is compressed and recycled, sufficient gas being released to the flare to maintain the desired reactor pressure.

C. DESCRIPTION OF OPERATION

In Runs 17 and 18 none of the catalyst fines, collected from the reactor effluent in two cyclones, was returned to the

reactor. In Run 21, both new catalyst and some overhead catalyst were charged to the reactor, but there were no appreciable changes in yields. There did not appear to be any induction period in these runs and the conversion levels remained consistently low. This may have been due to the permanent removal of catalyst fines from the reactor.

In Runs 22 through 26, provision was made so that, periodically, the catalyst fines from the first cyclone either could be returned to the bottom of the reactor, or could be blown out of the system as was done in Runs 17 to 21. The second cyclone system remained unchanged.

In Runs 27 and 28, the first cyclone system was changed back to the same type as used previous to Run 22.

Run 22 was started with 255 pounds of reduced catalyst in the reactor and a bottom bed temperature of 655°F. For the first two days the conversion remained low; and in an attempt to raise the conversion level, the bed temperatures were raised slowly, reaching 710 - 720°F. for eight hours on the third day of operation. At this time the particle size distribution of the catalyst changed abruptly, the 80-plus micron fraction dropping from 60 - 70 per cent of the charge to 35 per cent; at the same time the conversion and yields increased. These high conversions and yields were maintained with an average bed temperature of 620 - 645°F. for the next seven days, during which fresh reduced catalyst was added from time to time to maintain the catalyst inventory in the reactor and keep the conversion at the desired level. At the end of this week of high-conversion operation the supply of freshly reduced catalyst had been exhausted and it was,

therefore, impossible to maintain the catalyst inventory and activity by adding fresh catalyst. Some used catalyst, which had been blown down from the cyclones during the first part of the run, was added; but the yields and conversions declined steadily. The carry-over of catalyst to the cyclones increased steadily, and although the contraction could be brought back to its previous high value for a short time by recharging used catalyst, the catalyst carried out of the reactor so rapidly that operation became steadily more difficult. After three days of declining yields, the unit was shut down.

Run 23 was an attempt to duplicate Run 22, essentially the only difference being a higher linear inlet velocity, 1.5 - 1.6 feet per second as against 1.0 feet per second for Run 22. The catalyst carry-over from the reactor was several times as great in this run as in Run 22.

An attempt to condition the catalyst as in Run 22 was made by slowly raising the bottom bed temperature to 700 - 720°F. but the conversions remained low and the desired activity was never achieved. Because of mechanical difficulties, this run lasted only 77 hours.

In Run 24 an attempt was made to approximate Beacon Laboratory's start-up procedure, in which the catalyst is treated with synthesis gas at atmospheric pressure and the bed temperature is increased gradually for an extended period. Starting with 302 pounds of catalyst in the reactor, the catalyst was treated with synthesis gas at 100 psi pressure, and the bed temperature was steadily raised from 480°F. to 612°F. over a period of 17 hours. Then over a 24-hour period the pressure was raised slowly,

and the reactor was lined out at 300 psi pressure and 700°F. with a 1/1 recycle ratio. The conversions and yields were low throughout this run; raising the recycle ratio to 1.5, raising the bed temperatures as high as 720°F., and removing 100 pounds of catalyst from the reactor and recharging 100 pounds of catalyst from Run 23 all failed to improve the conversion. Although the catalyst became increasingly finer as the run progressed, the conversions and yields never approached those of Run 22. The run ended because of mechanical difficulties.

Run 25 was started by reducing the catalyst with hydrogen in the usual manner, but the catalyst was not allowed to come in contact with natural gas before cutting in the fresh feed. In all previous runs, natural gas had been used to maintain pressure on the system before introducing the synthesis gas. The effluent from the generator was cooled by a line-cooler, rather than by a direct quench, to eliminate the possibility of poisoning of the catalyst with the quench water. The fresh feed was cut into the hydrogen atmosphere in the reactor at 200 psi pressure, and the pressure on the system was raised to 400 pounds during the first 24 hours of operation. The conversion level increased during the first 24 hours, but steadily declined thereafter.

In Run 26 the synthesis gas was introduced into the reactor while the reduced catalyst was under hydrogen pressure of 200 psi. The pressure was raised to 400 psi within an hour. No quench water was used at first to cool the generator gas; but after ten hours of operation, it was necessary to reduce the pressure on the system to 300 psi in order to cut in quench water,

because the generator effluent gas was not being cooled sufficiently by the water-jacketed transfer line. These conditions were maintained until the run was terminated by mechanical failure.

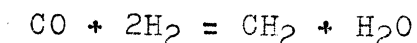
The conditions for Run 27 and 28 were similar to those for Run 26, except that the reactor pressure was maintained at 400 psi. The catalyst charged in Runs 27 and 28 was from the same batch reduced for Run 26. Run 28 was in reality a continuation of Run 27 since the used catalyst was not removed from the reactor at the end of Run 27.

III. METHODS OF CALCULATION

The yields 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 difference on carbon balances, and the water yields were calculated by difference on both hydrogen and oxygen balances.

The yield data are expressed in terms of the percentage of the carbon, contained in the carbon monoxide of the fresh feed, which appeared in the various products. They are also expressed in quantities of product obtained for a given quantity of hydrogen plus carbon monoxide in the fresh feed.

According to the following equations, the highest theoretical yield of hydrocarbons is 12.32 pounds per thousand cubic feet of hydrogen plus carbon monoxide:



The term "contraction" has been used to express overall conversion levels. This figure is the difference in flow rates of



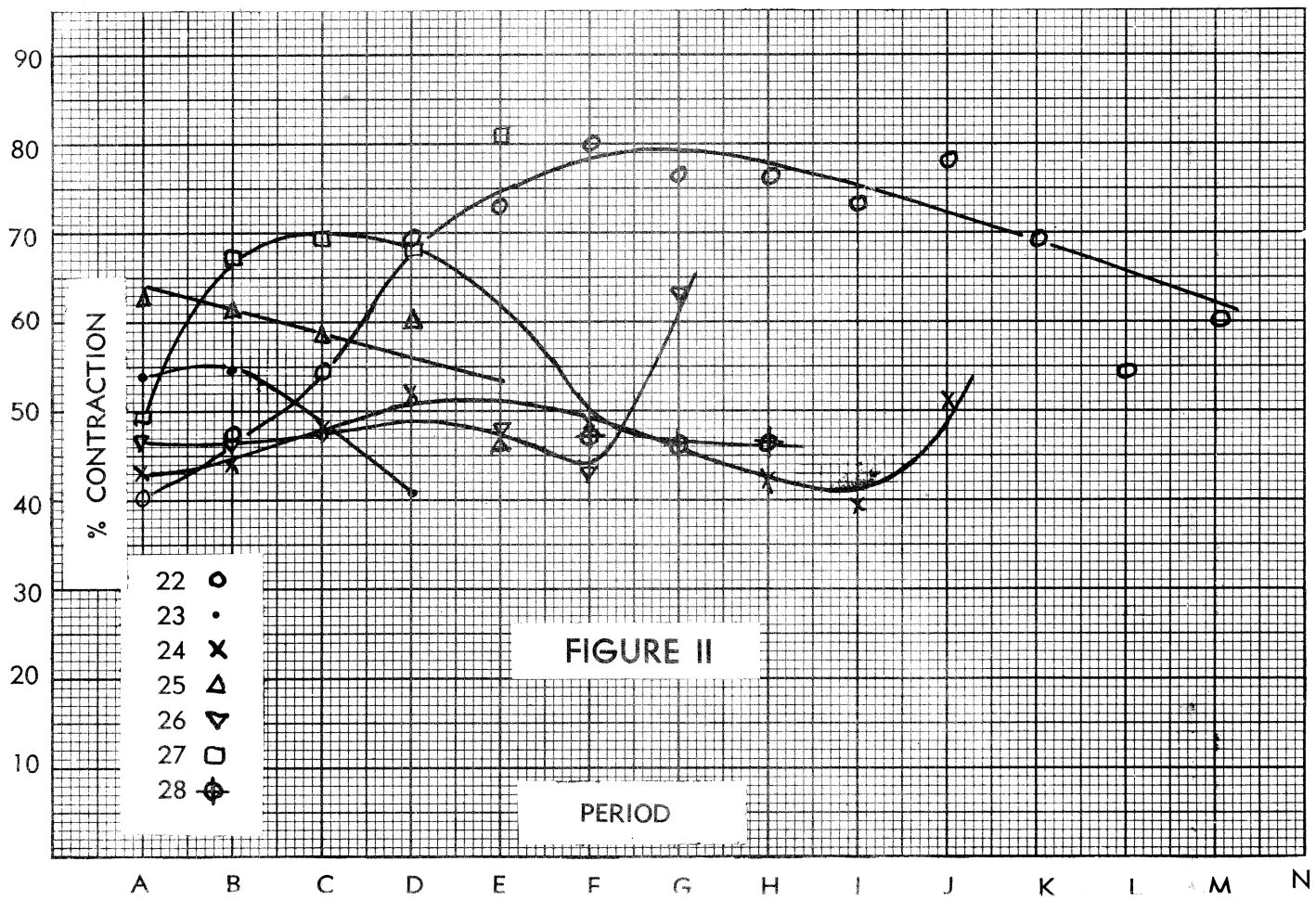
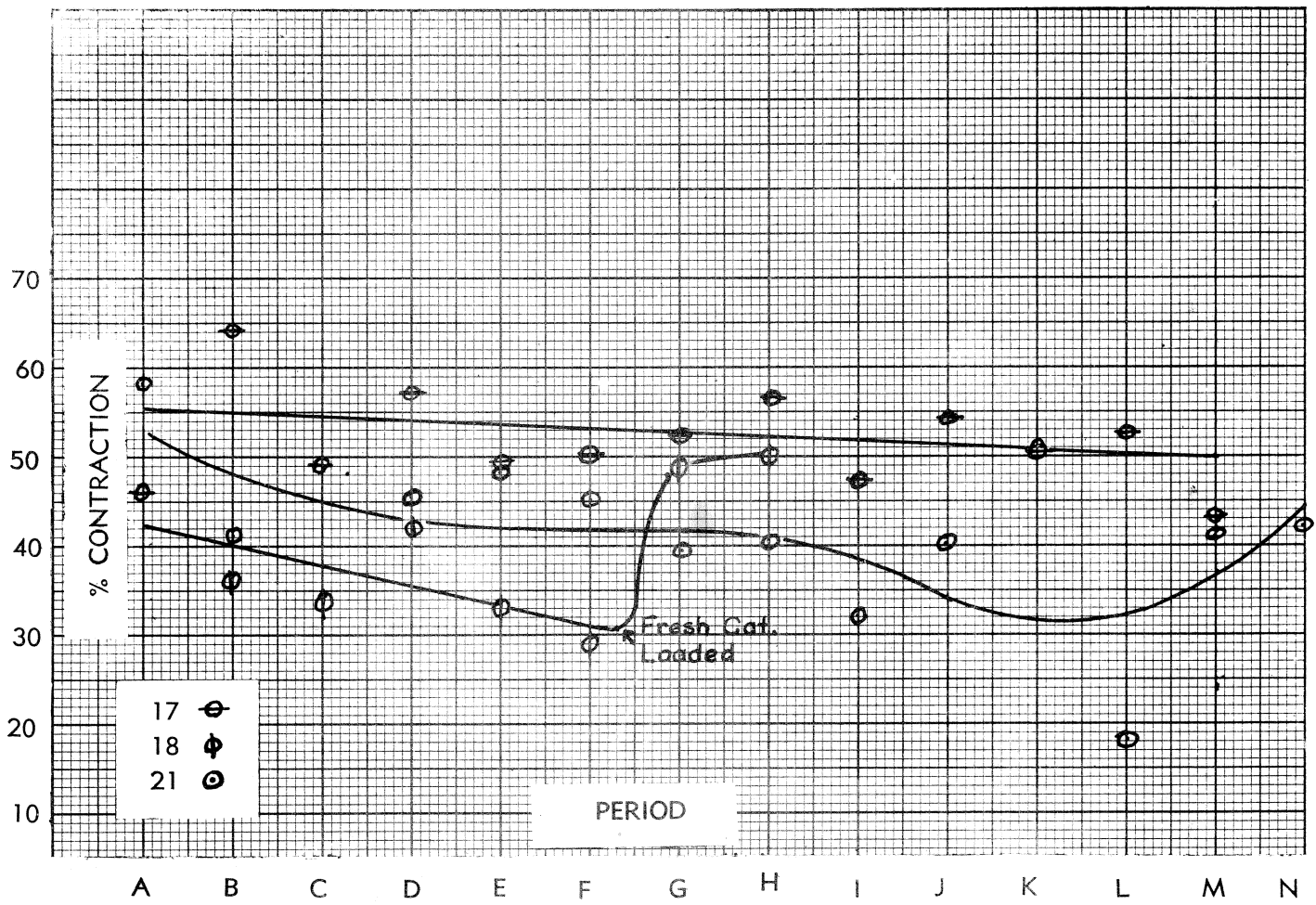


FIGURE II

wet gas and of fresh feed expressed as a percentage of the fresh feed flow rate.

IV. RESULTS AND DISCUSSION

A. CONTRACTION

The contractions for the ten runs being considered are plotted against time in the opposite Figure II. Run 28 is plotted as a continuation of Run 27. In all of the runs the contractions were low throughout except in Runs 22 and 27. These two runs had gradual increases in contraction and, after reaching peaks, had gradual decreases.

B. HYDROGEN AND CARBON MONOXIDE CONVERSION

The conversion of hydrogen and carbon monoxide has been compared with contraction in Figure III, following. The hydrogen conversion was more consistent with contraction than was the carbon monoxide conversion. When compared with the data from Runs 12, 15, and 16 as reported in Partial Report 5, the plots for hydrogen conversion versus contraction fall one above the other. The carbon monoxide conversion plots, however, are not quite coincident.

C. REACTOR EFFLUENT

In Figures IV and V, pages 11 and 12, the hydrogen, carbon monoxide, carbon dioxide, water, and methane concentrations have been plotted as mol per cent appearing in the effluent compared with contraction. Some of the data were very erratic, particularly in the case of carbon monoxide, but there were enough consistent points to obtain fairly reliable plots. The ratios of hydrogen to water and of carbon dioxide to carbon mon-

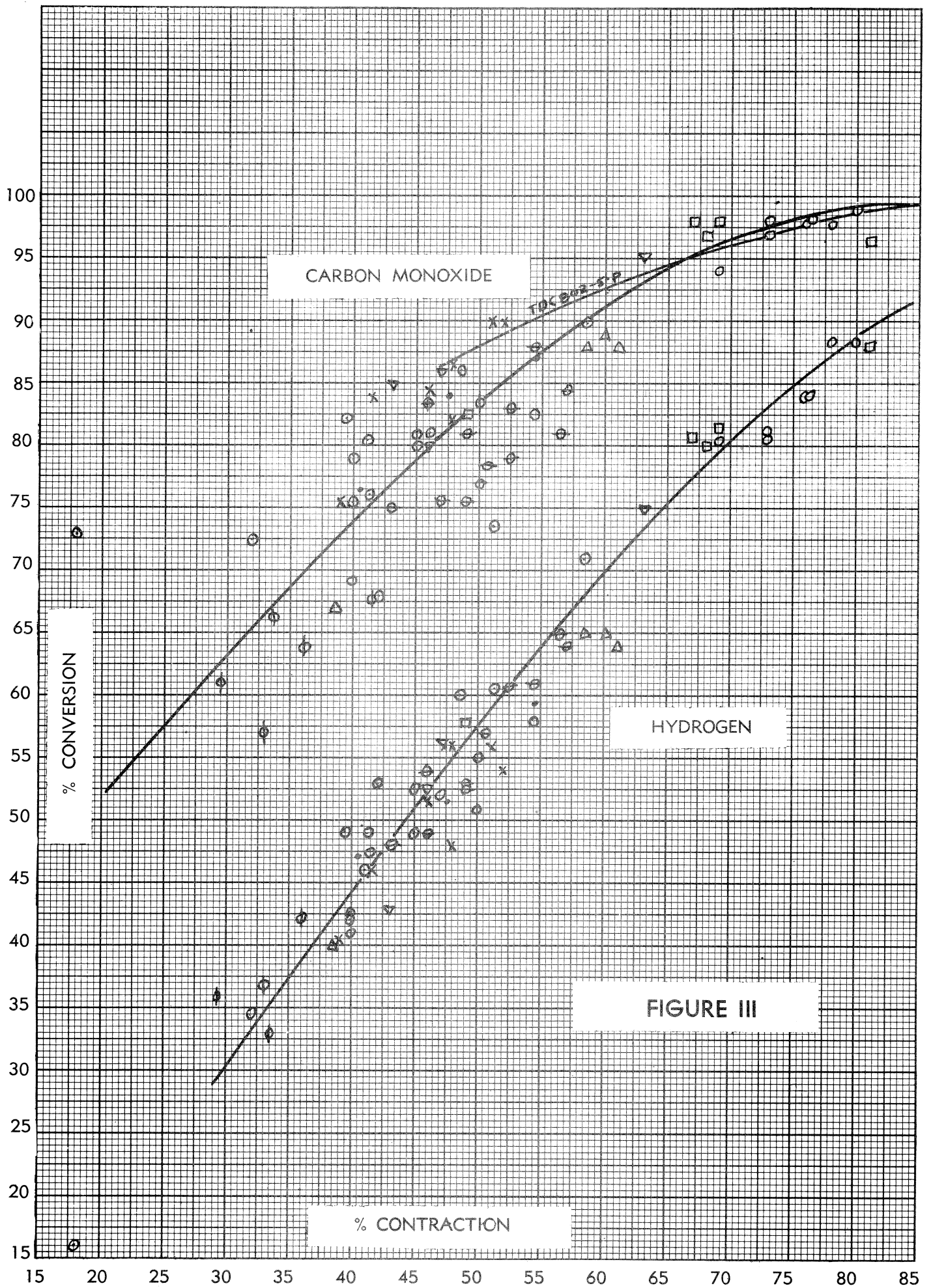
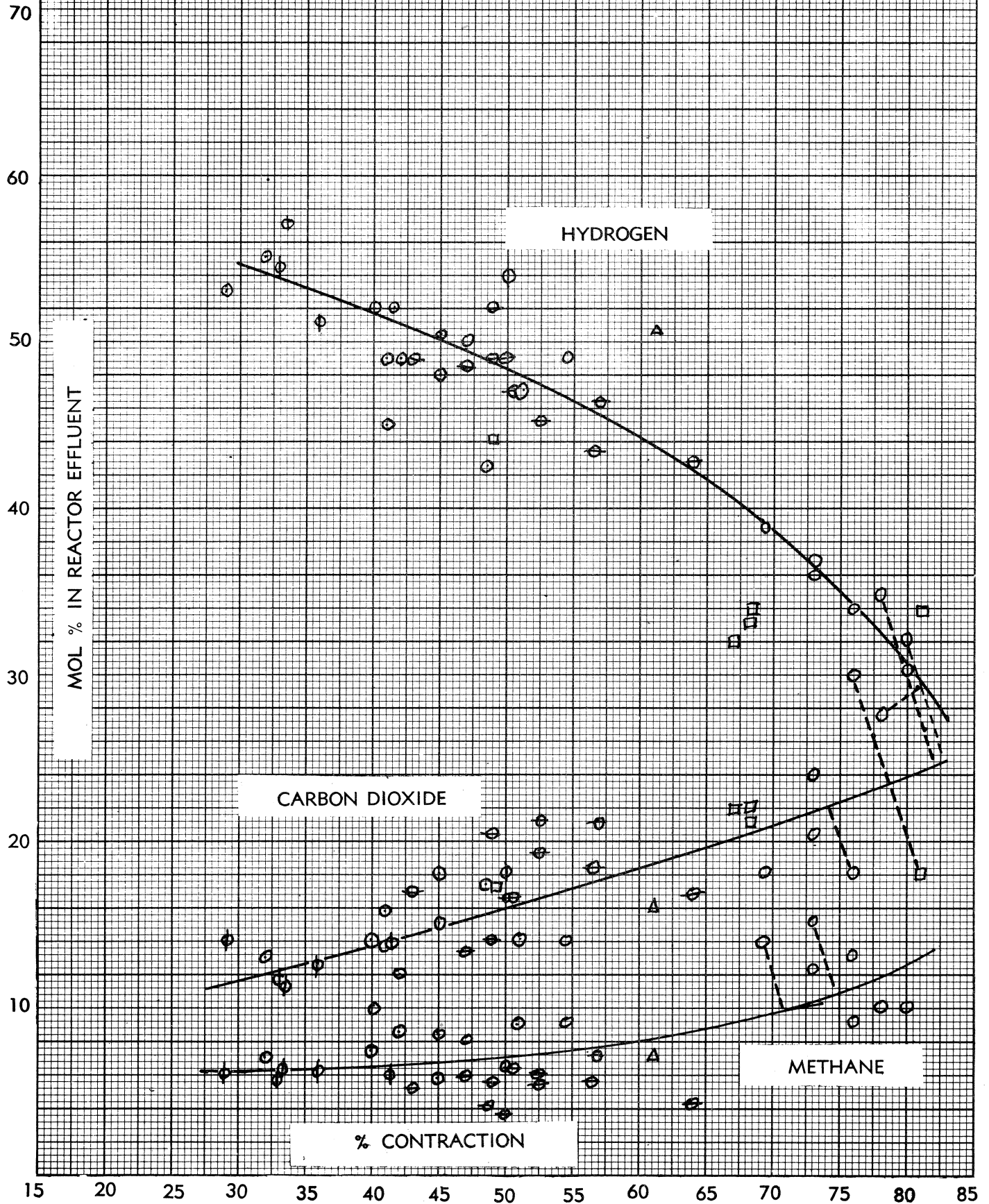


FIGURE IV



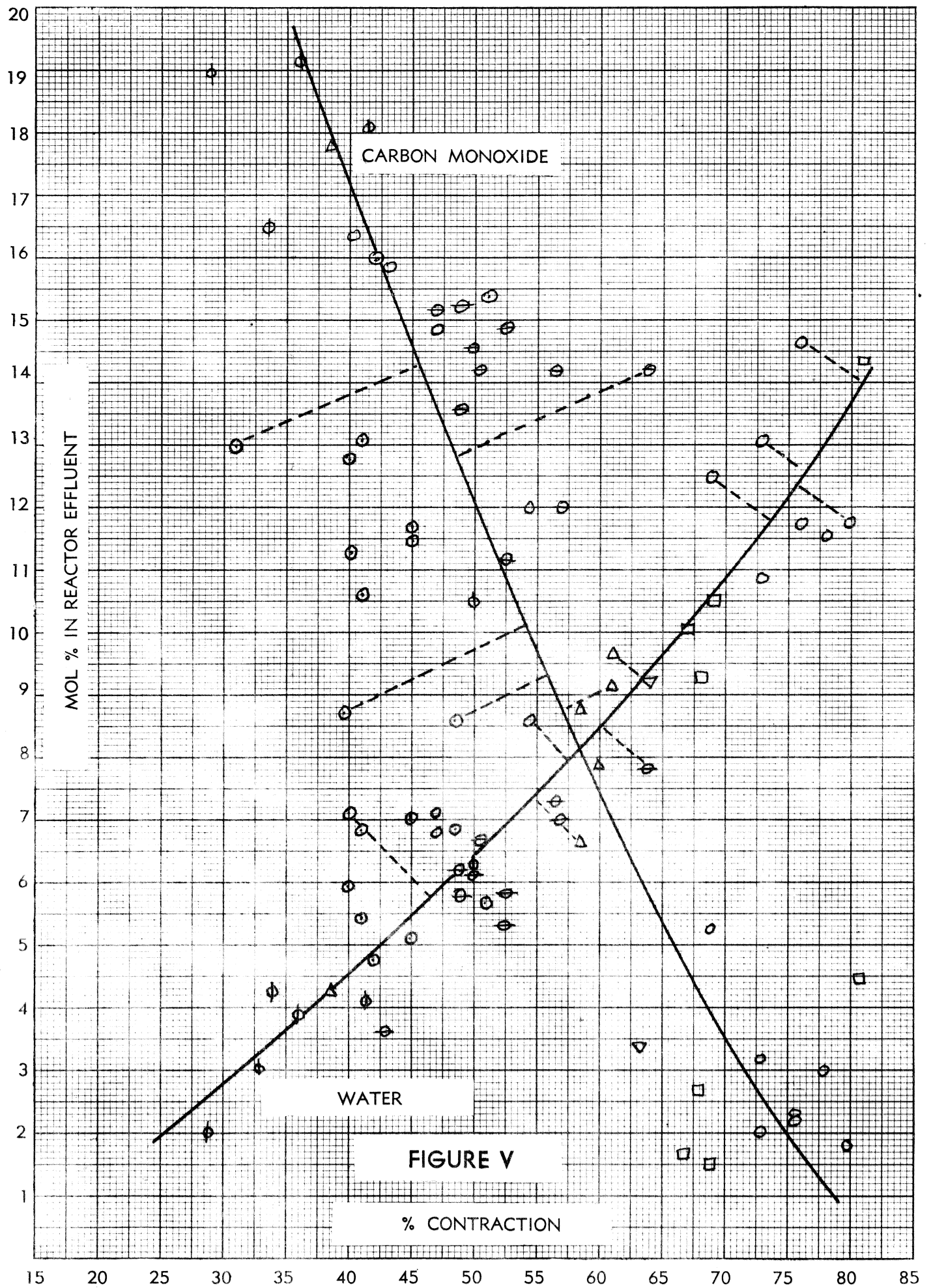
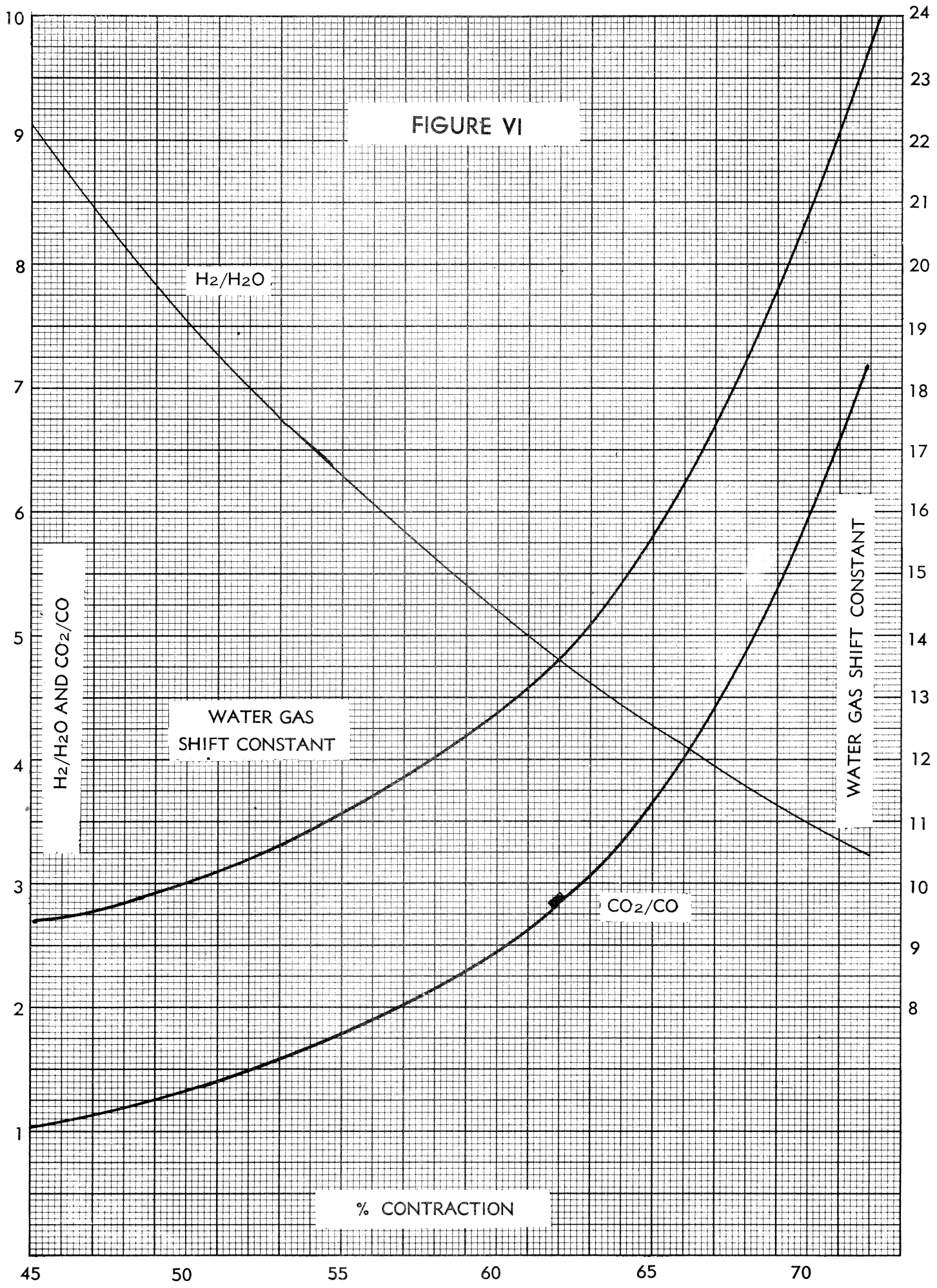


FIGURE VI



H₂/H₂O

CO₂/CO

WATER GAS
SHIFT CONSTANT

% CONTRACTION

H₂/H₂O AND CO₂/CO

WATER GAS SHIFT CONSTANT

oxide were plotted against contraction in the opposite Figure VI. The product of these two ratios represents the water gas shift constant and has been plotted in this same Figure. Since the temperatures in the reactor usually varied between 610°F. and 675°F., the shift constant values should be between 20 and 30; but as can be seen from the plot, the figures actually obtained were between 10 and 23. It appears that equilibrium was approached only under conditions that gave high contractions.

D. YIELDS BASIS CARBON MONOXIDE FED

The yield of carbon dioxide on the basis of carbon monoxide fed is plotted against contraction in the following Figure VII. The plot for the runs reported in Partial Report 5 is also shown in the same Figure. The yield of carbon dioxide increased with contraction up to about 57% contraction; then decreased steadily. This initial increase tends to confirm the theory that equilibrium was not approached except at the higher contraction levels.

The yields of methane, C₃ plus, C₄ plus, and total hydrocarbons have been presented in Figures VIII, IX, X, and XI. The yields of all components increased with conversion levels except in the case of methane. The methane data were so erratic that no plot was justified.

E. YIELDS OF ULTIMATE OIL

Yield data for ultimate oil obtained in Runs 17, 22, and 27 have been tabulated below. Both instantaneous and cumulative yields, expressed as gallons of ultimate oil per thousand cubic feet of hydrogen plus carbon monoxide, have been plotted against cumulative gallons of ultimate oil per pound of catalyst charged.

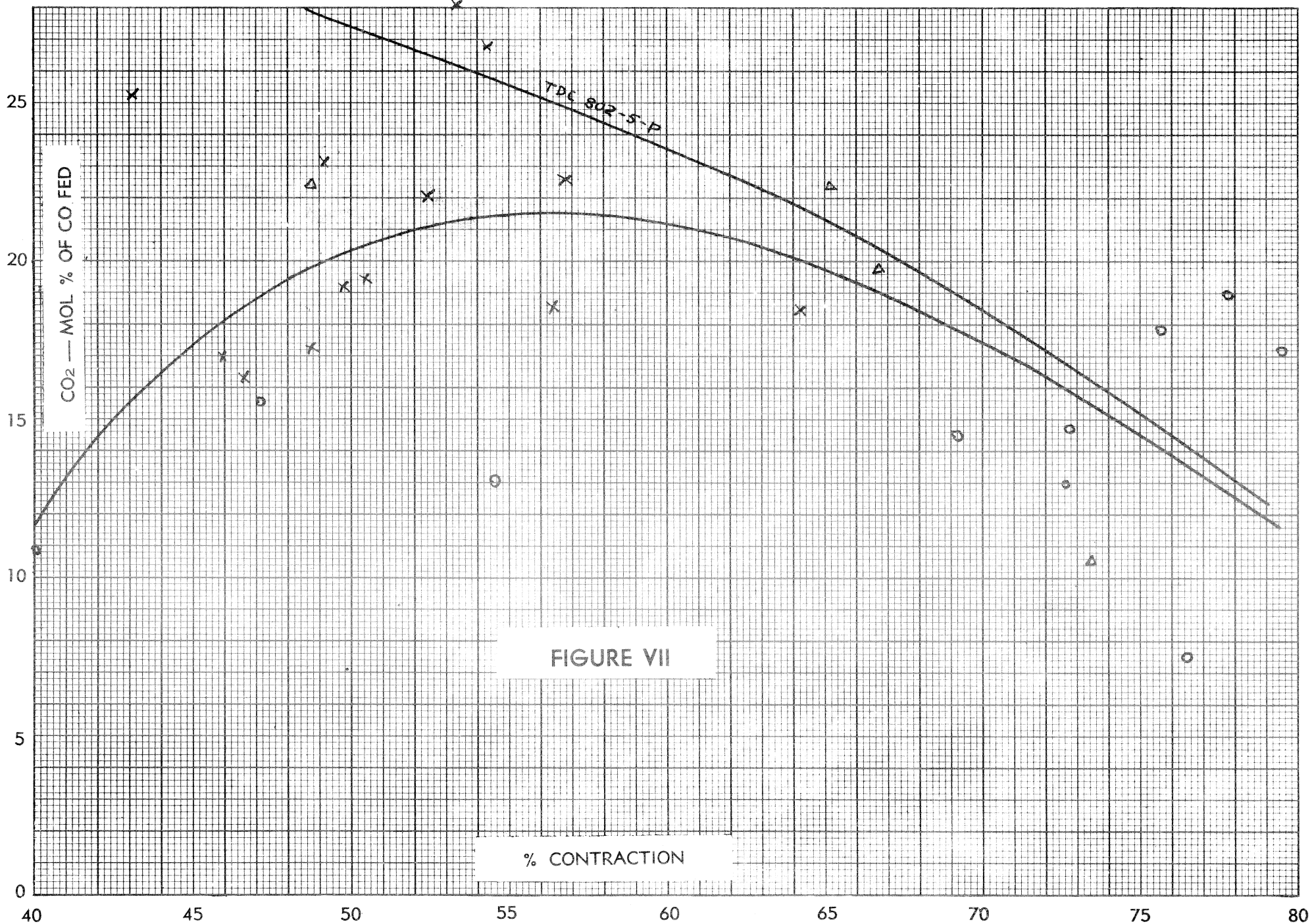


FIGURE VII

% CONTRACTION

CO₂ — MOL % OF CO FED

FIGURE VIII

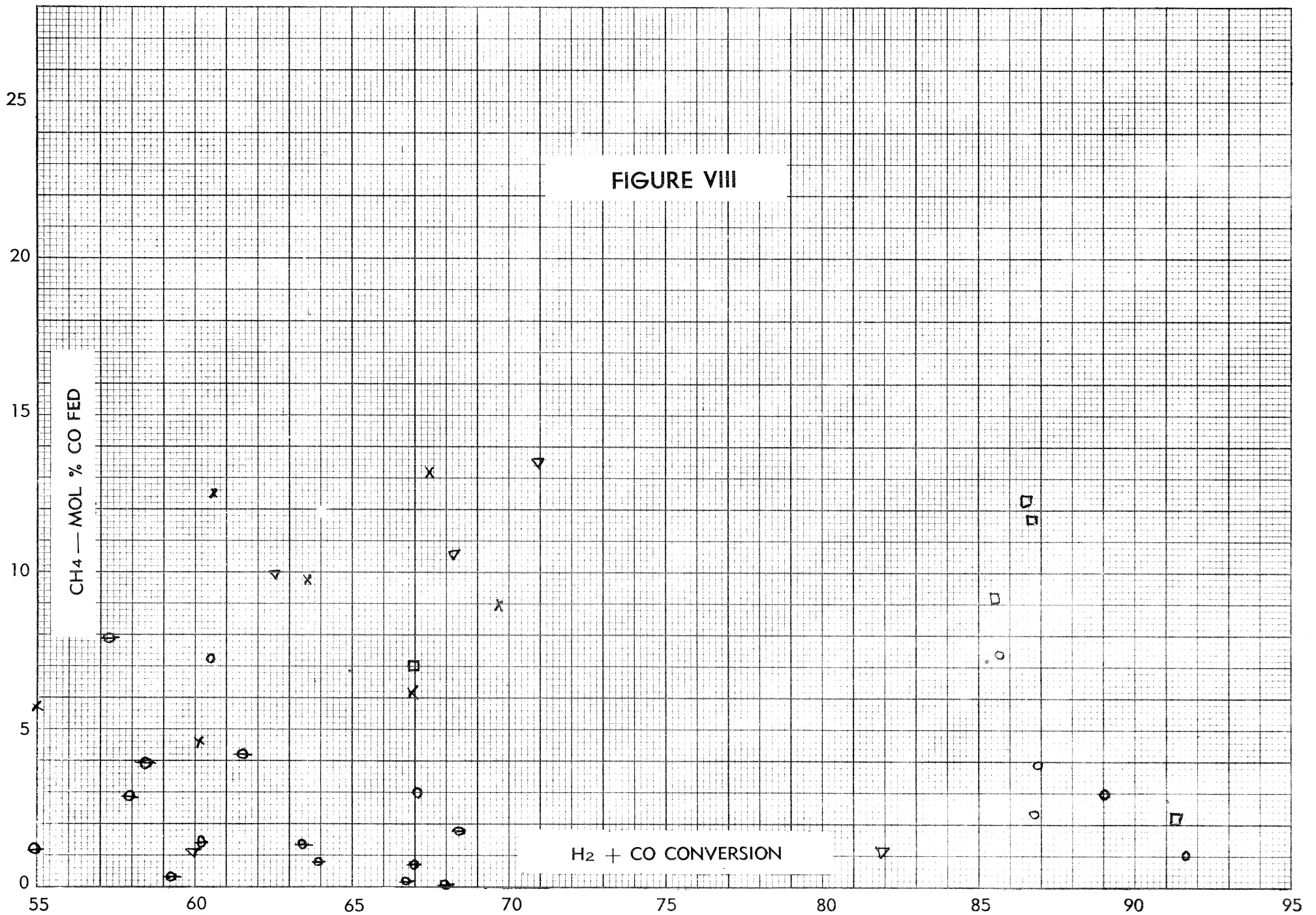


FIGURE IX

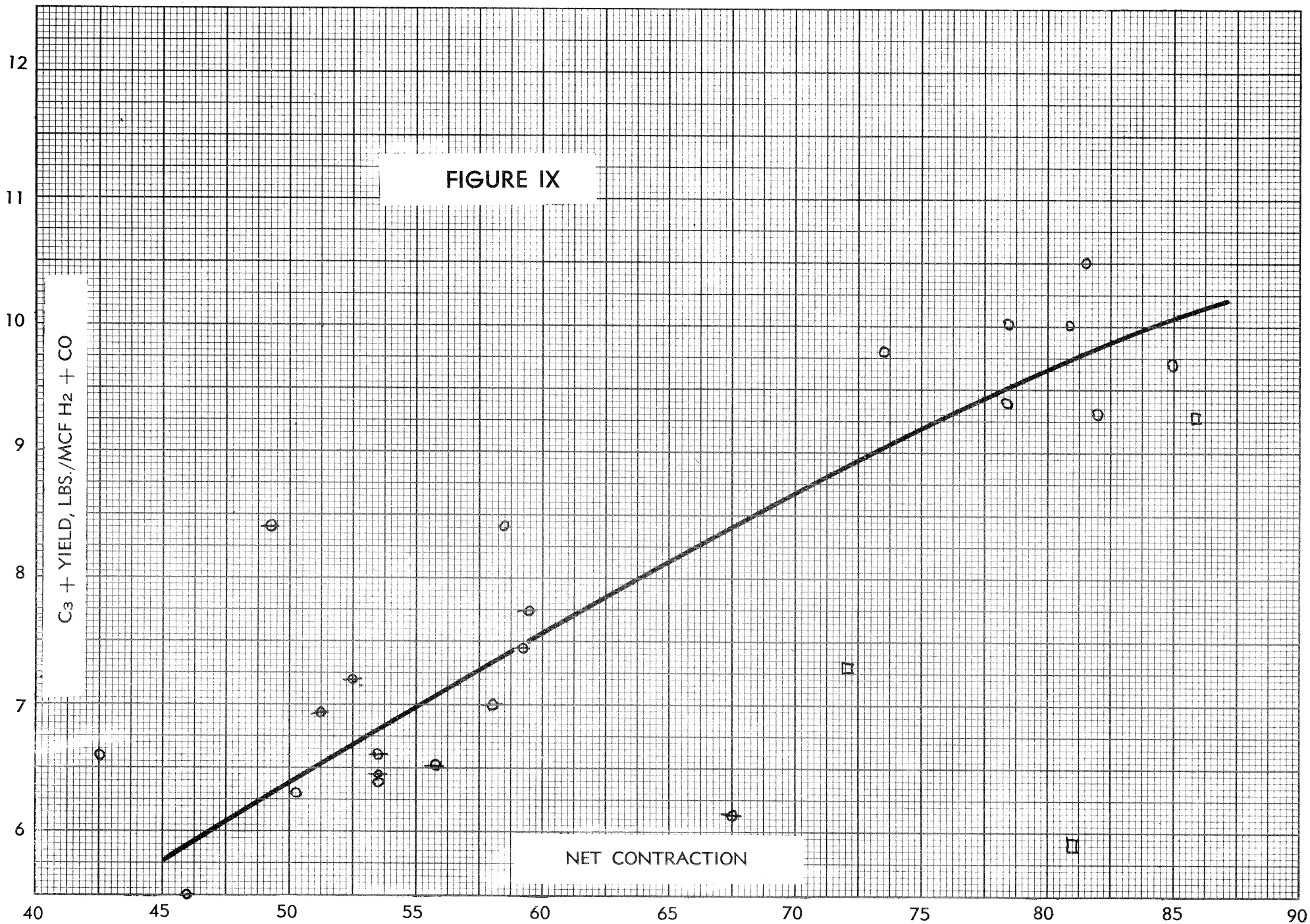


FIGURE X

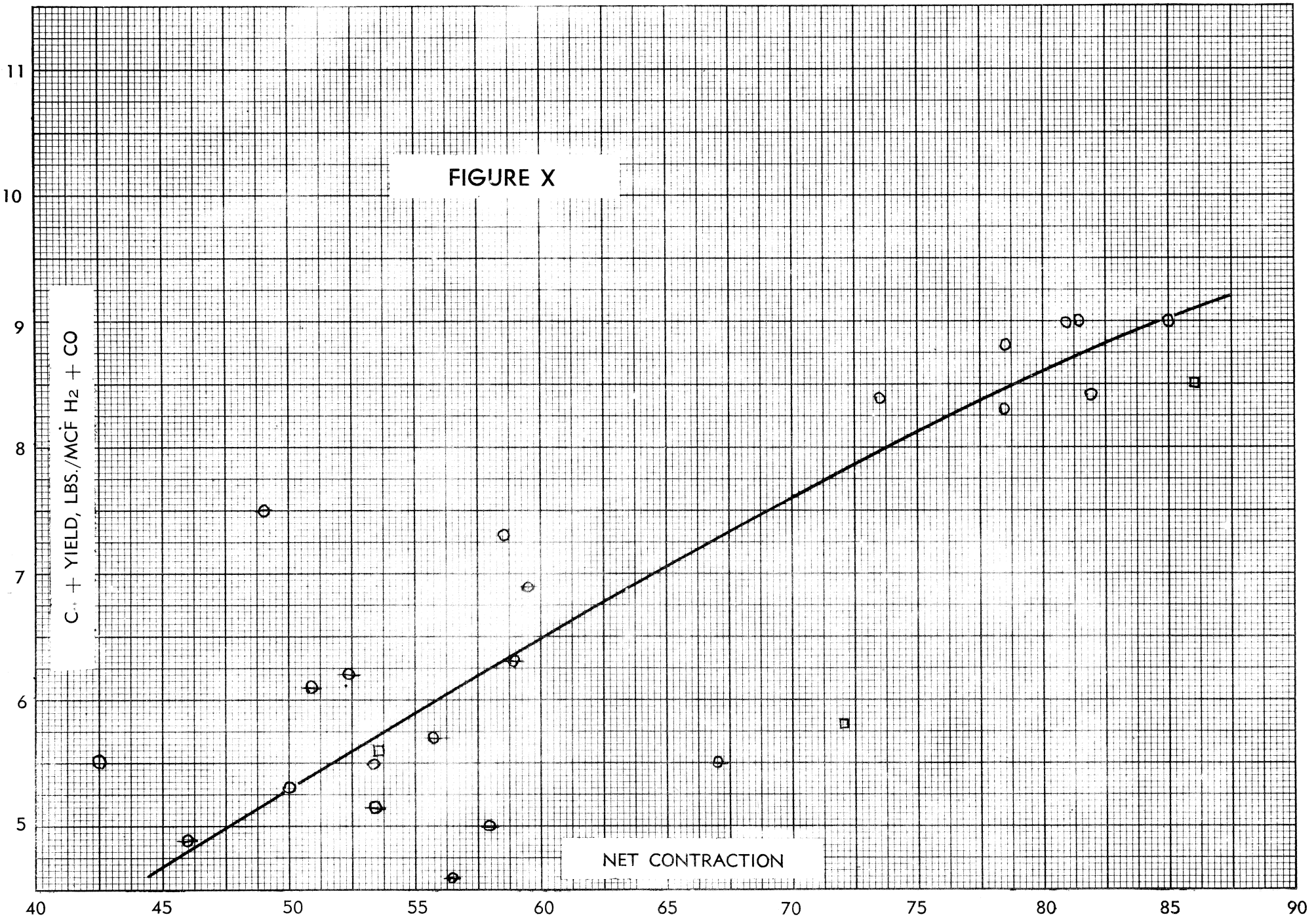
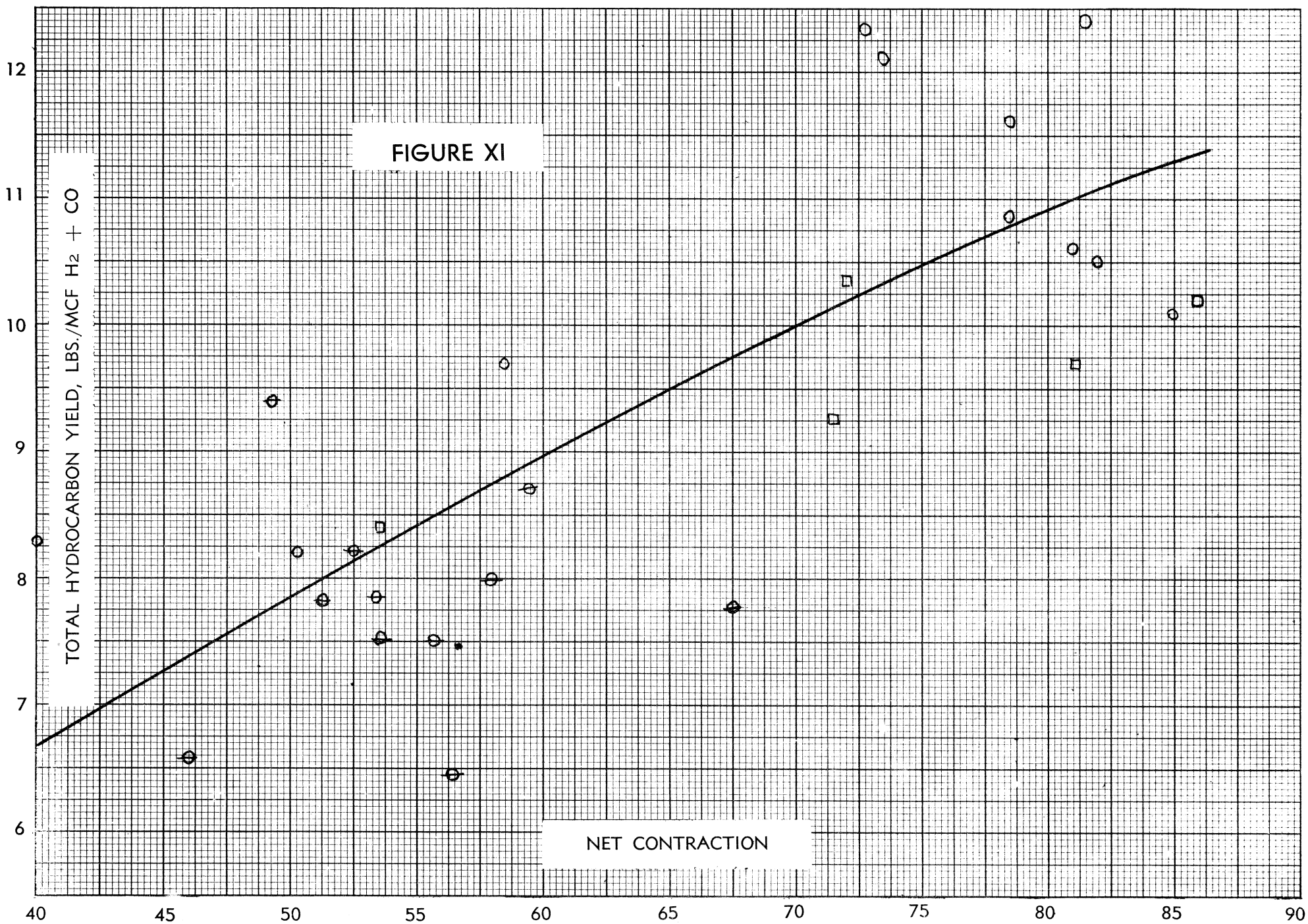


FIGURE XI



These data give some indication of catalyst life; but because of other variables such as catalyst carry-over rate, catalyst recharge rate, bed height, and physical condition of catalyst, no reliable conclusion can be made concerning catalyst life.

Run No.	Yield-gal/MCF H ₂ & CO		Production-gal/# Cat. Chgd.	
	Instantaneous	Cumulative	Instantaneous	Cumulative
17A	1.082	1.082	0.129	0.129
17B	0.950	0.980	0.382	0.511
17C	1.028	1.001	0.429	0.940
17D	1.081	1.026	0.441	1.380
17E	1.023	1.025	0.432	1.812
17F	1.016	1.023	0.403	2.215
17G	1.021	1.023	0.394	2.610
17H	1.151	1.040	0.454	3.064
17I	1.303	1.071	0.517	3.580
17J	0.976	1.061	0.378	3.958
17K	0.965	1.052	0.382	4.341
17L	0.895	1.038	0.355	4.695
17M	0.832	1.022	0.329	5.025
22A	0.990	0.990	0.488	0.488
22B	0.959	0.973	0.561	1.049
22C	1.280	1.080	0.595	1.439
22D	1.414	1.170	0.548	1.693
22E	1.533	1.243	0.447	1.784
22F	1.507	1.289	0.424	2.108
22G	1.583	1.399	0.411	2.520
22H	1.513	1.413	0.402	2.921
22I	1.431	1.415	0.354	3.012
22J	1.428	1.417	0.342	3.216
27A	0.981	0.981	0.361	0.361
27B	1.09	1.05	0.638	0.886
27C	1.00	1.03	0.603	1.492
27D	1.04	1.04	0.611	2.10
27E	1.40	1.08	0.439	2.542

V. CONCLUSIONS

1. The results obtained in these runs were not as consistent as those obtained in previous runs at Montebello. Some of the later runs were longer, but the yields and conversion levels of some of the runs were sometimes poorer and sometimes better than previously experienced.

2. The maximum yield level reached in any run was in

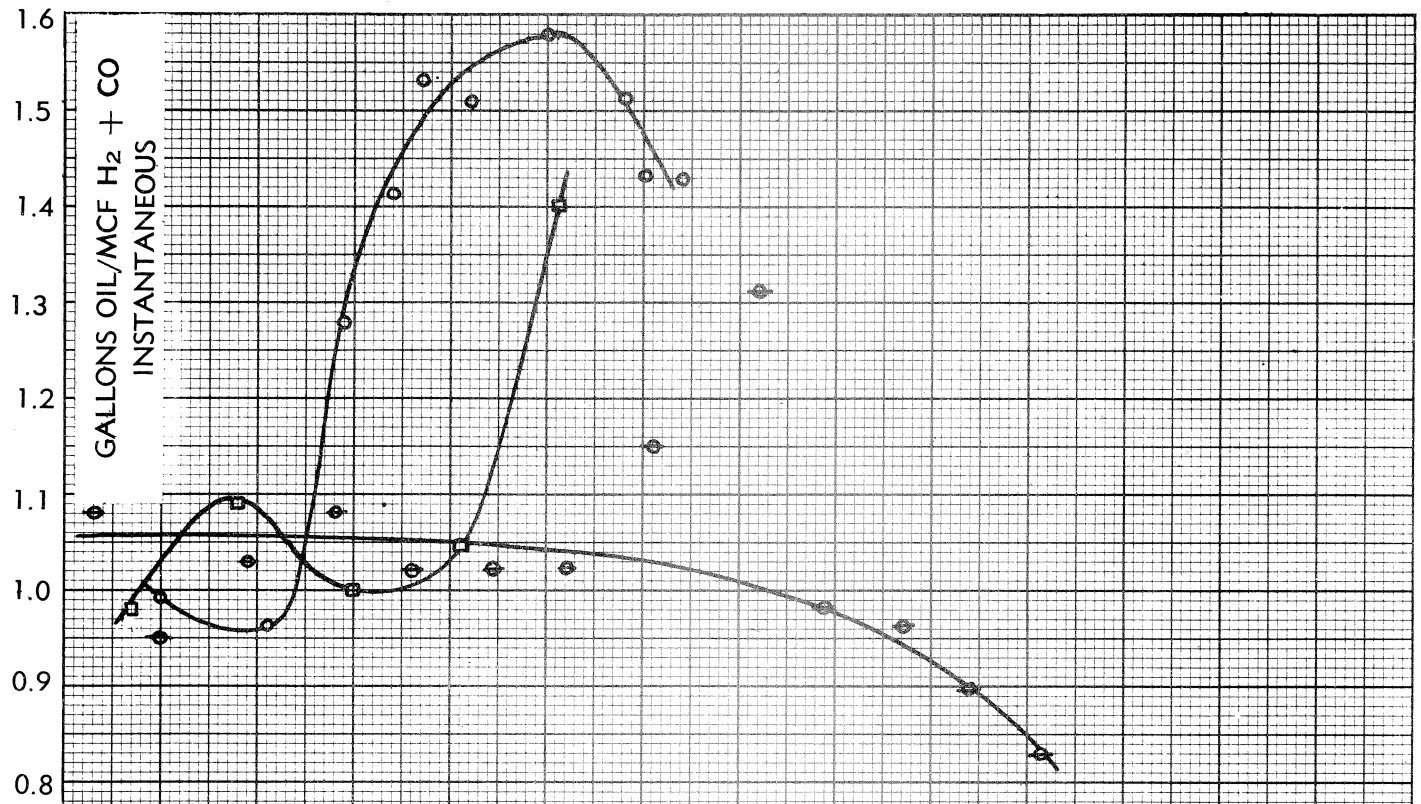
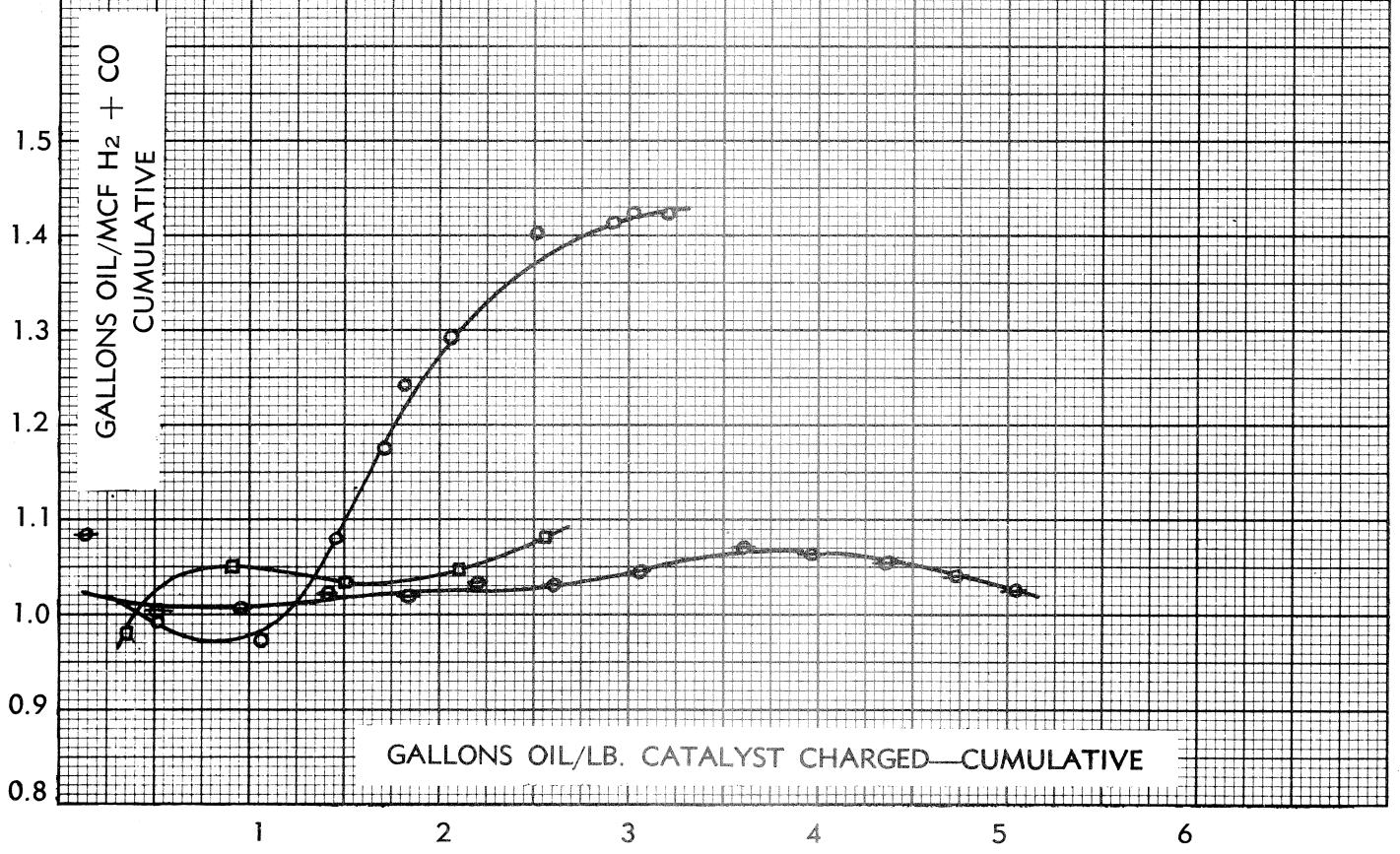


FIGURE XII



Run 22G. This was 1.58 gal./MCF of H₂ & CO as compared to 1.60 gal./MCF in Run 16D as reported in Partial Report 5. There were four twenty-four hour periods during Run 22 when the yield was better than 1.50 gal./MCF of H₂ & CO.

3. The water gas equilibrium was approached only during periods of higher contraction. This may explain the low contraction periods, if it may be assumed that the contact time of the synthesis gas was insufficient to attain equilibrium during the periods of low contraction.

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VI. APPENDIX

**THE TEXAS COMPANY — MONTEBELLO LABORATORY
DATA CALCULATION and SUMMARY SHEET**

Synthesis Run Number 17B From 5/19/47 Hr. 0200 to 5/19/47 Hr. 0700

FRESH FEED							LIQUID YIELDS										CATALYST DATA			
	Orsat	Corr. Fac.	Cor. Orsat	M. S.	M. W.	Calc. M.W	C. N.	Oil Tank #			Water Tank #				In Reactor at Start of Period					
								Gauges, INCHES												
CO ₂			1.7		44	75	38.2	Total	10/W	Oil	Gals.	Corr.	Total Gals.	Gauge	Gals.	Corr.	Total Gals.	Fresh Catalyst Charged	354.5	
CO			34.4		28	26.2		At End of Period	32.8				53.8					Catalyst Recharged		
CH ₄			2.1		16	3.4		At Start of Period	11.5				22.5					Total	354.5	
H ₂			61.4		2	1.23		Production	22.3			2.3	100.1	31.3	6.8	144.3		Catalyst Taken Out	24.0	
N ₂			0.4		28	.11		Samples					5					In Reactor at End of Period	330.5	
Mol. Wt.						140.5		Uncorrected Production					105.1					Reactor d-P, H ₂ O	3.0	
						1.55		G. P. H.				4.35						Density, lbs./cu. ft.	1.26	
								Temperature, °F										Bed Height, Feet	5.1	
								G.P.H. at 60°F				4.35						Space Vel. SCFH/lb. cat.		
								A.P.I. at 60°F				4.76						Inventory Figures		
								Pounds Per Hour				28.6						From d-P Meters		
FLOW CALCULATIONS							RUN CONDITIONS					DISTILLATIONS					CATALYST ANALYSIS			
								Generator Press.	210	ASTM			WATER		Particle Size					
Oxygen								O ₂ Preheat, °F	468	Prod.			Temp.	%	Screen					
Nat. Gas								Gas Preheat, °F	807	A.P.I.					Sedimentation					
Total								Reactor Press.	300	I.B.P.				Frac.						
Fresh Feed								Steam Back Press.	700	10%				On 40						
F. F. by C								Temperatures, °F						100						
Avg. F. F.								Heater Outlet	411					150						
Wet Gas								Catalyst #1						200						
Contraction								#2	610					250						
Recycle								#3	605					325						
Bleed								#4	575					430						
Total								#5	571					Aerated						
Total Feed								Average	570					Settled						
Recycle/F.F.								Product Separator						Compacted						
Inlet Vel.														Sp. Grav.						
Steam Flow														Specific Surface						
% CO → CO ₂														m ² /gm						
CO ₂ → Wt. 14.0	WEIGHT BALANCE							PRODUCT INSPECTION					PHYSICAL TESTS							
In	F. F. = SCFH x MW/379 =							Hempel Dist.		Chemicals	Loss.	Product	Pour °F	SUS @ °F	SFS @ °F	Sp. Grav.				
Out	Wet Gas							°F	%	A.P.I.										
	Oil							to 400												
	Water							400-550												
	Loss							550+												
	Total																			

	FRESH FEED				WET GAS				RECYCLE	COMB. FEED	EFFLUENT		NET CHANGE ON REACTION											
	%	m/hr	#/hr	%	Measured	At Wt. Balance	m/hr	m/hr			%	m/hr	%	Carbon			Hydrogen			Oxygen	Ultimate Oil		Unsat.	
					m/hr	#/hr	#/hr					m/hr	a/hr	%	a/hr	%	a/hr	%	a/hr	#/hr	#/gal	gal/hr	%	
CO	24.4	6.749	189.776	16.25	1.381	38.668	1.353	37.884	3.944	10.666	24.26	5.217	14.23	-3.314	-5.389	200.7								
H ₂	61.4	12.034	24.068	4.154	8.308	4.071	8.412	11.161	23.895	5.444	15.922	42.18	-7.963											
CO ₂	1.7	.319	14.916	1.08	1.623	71.368	1.589	69.916	4.631	4.870	11.33	6.220	4.10	1.250	1.250	18.54								
N ₂	0.4	.078	3.144	1.76	.150	4.200	.147	4.116	.427	.565	1.15	.574	1.54	.064										
CH ₄	2.1	4.12	6.582	4.83	.411	6.578	.403	6.448	1.172	1.584	3.61	1.575	4.23	.009	.009	.01	.036							
C ₂ H ₄				4.77	.405	11.340	.347	11.116	1.158	1.158	2.64	3.130	8.40	.397	.794	11.18	1.584							90.51
C ₂ H ₆				.50	.042	1.260	.071	1.230	.121	.121	.28	.162	.143	.041	.042	1.22	.246							
C ₃ H ₆				1.21	.103	4.326	.101	4.242	.244	.244	.67	.395	1.06	.101	.203	4.49	16.06							38.2
C ₃ H ₈				.23	.020	.880	.019	.876	.056	.056	.13	.075	.20	.019	.057	.85	1.52							6.70
C ₄ H ₈				1.52	.129	2.224	.126	2.026	.369	.369	.84	.485	1.37	.126	.504	7.48	1.008							6.10
C ₄ H ₁₀				.24	.020	1.160	.019	1.102	.058	.058	.13	.077	.21	.019	.076	1.13	.190							1.09
C ₅ H ₁₀				.51	.019	3.010	.042	2.940	.124	.124	.28	.166	.45	.042	.210	3.11	.420							4.66
C ₆ H ₁₂				.17	.014	1.204	.013	1.118	.041	.041	.09	.054	.14	.013	.018	1.16	.156							.23
OIL								(28.280)				.202	.54	2.026	30.05	4.052								4.55
WATER												2.889	7.76											6.50
TOTAL	19.6	246.524		8.5	158.524	8.221		24.27	43.861	99.99	37.243	99.99	12.585	100.00										7.09
H ₂ +CO	16.7					54.24																		
H ₂ /CO	1.78					3.01																		
ULTIMATE YIELDS				WEIGHT BALANCE				EFFLUENT RATIOS				CONTRACTION: 66.2												
	% CO Fed	#/hr	H ₂ /CO		#/hr	%	#/hr	H ₂ /H ₂ O																
C1+C2	13.12	12.20	1.64	27.73				5.51																
C3+	48.27	45.57	6.13	103.66				1.17																
C4+	42.92	40.50	5.45	92.16				6.47																
Ult. Oil		4296	5.92	100.11	7.02	.945	139.53																	
CO ₂	18.54	55.00	7.40	125.13																				
H ₂ O	52.00	7.00	118.37																					

Yield Calculations assume "oil" is CH₂, and is found by difference on Carbon, and H₂O 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 CALCULATION and SUMMARY SHEET**

Synthesis Run Number 17C From 5/10/47 Hr. 0700 to 5/10/47 Hr. 0700

FRESH FEED									LIQUID YIELDS										CATALYST DATA			
Orsat	Corr. Fac.	Cor. Orsat	M. S.	M. W.	Calc. M.W	C. N.	Oil Tank #			Water Tank #			In Reactor at Start of Period									
CO ₂		1.8		44	.79	38.2	GAUGES, INCHES			Gauge			330.5									
CO		36.2		28	9.60		Total	O/W	Oil	Gals.	Corr.	Total	Fresh Catalyst Charged									
CH ₄		2.1		16	.32		At End of Period					8.54	Catalyst Recharged									
H ₂		60.6		2	1.21		At Start of Period					23.74	Total 330.5									
N ₂		1.2		28	.34		Production					18.6	Catalyst Taken Out 17									
Mol. Wt.					12.27		Samples					5	In Reactor at End of Period 313.5									
					1.54		Uncorrected Production					9.2	Reactor d-P, H ₂ O									
							G. P. H.					3.93	Pounds in Reactor 448.5									
							Temperature, °F						Density, lbs./cu. ft. 131.5									
							G.P.H. at 60°F					3.90	Bed Height, Feet 5.2									
							A.P.I. at 60°F					48.3										
							Pounds Per Hour					25.6										
												50.0										
FLOW CALCULATIONS									RUN CONDITIONS					DISTILLATIONS								
Coeff	Chart	Fp	Ft	F m.w.	SCFH	%	Generator Press.	O ₂ Preheat, °F	Gas Preheat, °F	Reactor Press.	Steam Back Press.	Temperatures, °F	Heater Outlet	Catalyst #1	ASTM	WATER	Space Vel. SCFH/lb. cat.					
Oxygen					1860		213	476	805	200	20	20	447	40				Inventory Figures				
Nat. Gas					2480									50				From d-P Meters				
Total					4340	43.0								60								
Fresh Feed					6890									70								
F. F. by C					7790									80								
Avg. F. F.														90								
Wet Gas					3410									10%								
Contraction						56.3																
Recycle					10040																	
Bleed					359																	
Total					10394																	
Total Feed					18184																	
Recycle/F.F.					1.34																	
Inlet Vel.					1.56																	
Steam Flow					191.7%																	
96.60 → 80						11.5																
WEIGHT BALANCE									PRODUCT INSPECTION					PHYSICAL TESTS								
In	F. F. = SCFH x MW/379 =				251.5		Hempel Dist.	Chemicals	Oil	Water	Res.	Loss.	Product	Pour °F	SUS @ °F	SFS @ °F	Density, lbs./cu. ft.	Chem. Anal.				
Out	Wet Gas				172.5		°F	%	A.P.I.	Neut. #							Aerated	% Fe				
	Oil				20.6		to 400			Sup.							Settled	% C				
	Water				50.0		400-550			Hydrox							Compacted	% Oil				
	Loss						550+			% Fe							Sp. Grav.	Specific Surface				
	Total				248.4	99.0				% Alc								m ² /gm				

FRESH FEED				WET GAS				RECYCLE		COMB. FEED		EFFLUENT		NET CHANGE ON REACTION											
%	m/hr	#/hr	%	Measured		At Wt. Balance		m/hr	m/hr	%	m/hr	%	Carbon			Hydrogen			Oxygen	Ultimate Oil		Unsat.			
				m/hr	#/hr	m/hr	#/hr						m/hr	a/hr	%	a/hr	%	a/hr	#/hr	#/gal	gal/hr	%			
CO	34.3	7.05	197.40	16.78	1.588	42.294	1.719	48.132	5.452	12.502	23.16	7.171	13.27	-5.331	-2.731	2.438									
H ₂	60.6	12.45	24.90	57.03	5.126	10.352	5.844	11.688	18.529	30.979	57.379	24.373	37.91	-6.606											
CO ₂	1.8	.37	16.28	15.43	1.387	6.1028	1.581	69.564	5.013	5.383	9.97	6.574	14.05	1.211	1.211	1.718									
N ₂	1.2	.25	7.00	1.42	.128	3.584	.146	4.088	.461	.711	1.32	.607	1.29	.104											
CH ₄	2.1	.43	6.88	6.22	.559	8.944	.637	10.192	2.021	2.451	4.53	3.658	5.06	.207	.207	2.74	1.928								
C ₂ H ₄				1.22	.110	3.080	.125	3.500	.396	.396	.73	.521	1.11	.125	.250	3.55	.500								65.25
C ₂ H ₆				.63	.057	1.710	.065	1.950	.205	.205	.38	.270	.38	.065	.130	1.84	.320								
C ₃ H ₆				1.23	.120	5.040	.137	5.754	.432	.432	.80	.569	1.21	.137	.411	5.83	.822								83.13
C ₃ H ₈				.27	.024	1.056	.027	1.188	.088	.088	.16	.115	.23	.027	.081	1.15	.216								
C ₄ H ₈				1.06	.085	5.320	.108	6.048	.344	.344	.64	.452	.96	.108	.432	6.13	.864								57.55
C ₄ H ₁₀				.72	.065	3.770	.074	4.292	.234	.234	.43	.308	.66	.074	.286	4.20	.740								
C ₅ H ₁₀				.37	.033	3.310	.038	3.660	.120	.120	.22	.152	.34	.038	.140	2.20	.380								
C ₆ H ₁₂				.10	.009	.774	.010	.860	.032	.032	.06	.042	.09	.010	.060	.85	.120								
OIL							(28.849)					.206	.44	2.063	29.26	4.126									
WATER												2.909	6.20			4.226									
TOTAL		2055	246.46		899	149.11	10.511		72.49	53.58	100.01	46.953	99.99	10.039	100.00										
H ₂ +CO		19.50					7.563																		
H ₂ /CO		1.77					3.40		2.48		3.40														
ULTIMATE YIELDS												WEIGHT BALANCE		EFFLUENT RATIOS		CONTRACTION: 4 F. 8									
% CO Fed	#/hr	H ₂ /CO #/MCF	g/M3	Gal/hr	H ₂ /CO Gal/MCF	cc/M3	Wet Gas	Oil	Water	Total	H ₂ /H ₂ O	CO ₂ /CO	(H ₂)(CO ₂)/(H ₂ O)(CO)	CO Conversion:	H ₂ Conversion:										
C1+C2	8.33	8.76	1.12	18.94			142.11	25.6	50.0	224.7	8.40	9.19	7.68	75.6	53.1										
C3+	50.12	49.04	6.37	107.72																					
C4+	43.14	42.70	5.48	92.67																					
Ult. Oil		47.14	6.05	102.31	7.61	1.00																			
C0 ₂	17.18	52.28	6.84	115.66																					
H ₂ O		52.36	6.72	113.64																					

Yield Calculations assume "oil" is CH₂, and is found by difference on Carbon, and H₂O 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 x #/MCF. cc/M3 = 141.3 x gal/MCF.

**THE TEXAS COMPANY — MONTEBELLO LABORATORY
DATA CALCULATION and SUMMARY SHEET**

Synthesis Run Number 17F From 5/12/47 Hr. 0700 to 5/13/47 Hr. 0200

FRESH FEED								LIQUID YIELDS										CATALYST DATA			
Orsat	Corr. Fac.	Cor. Orsat	M. S.	M. W.	Calc. M.W.	C. N.		Oil Tank #					Water Tank #					In Reactor at Start of Period			
CO ₂		2.3		44	1.01	39.6		GAUGES, INCHES					Total					24734			
CO		84.4		28	8.62			O/W					Gauge					Fresh Catalyst Charged			
CH ₄		2.4		16	.46			Oil					Corr.					Catalyst Recharged			
H ₂		58.2		2	1.18			Gals.					Total Gals.					Total 24734			
N ₂		1.2		28	.34			Gals.					Corr. Gals.					Catalyst Taken Out 3416			
Mol. Wt.					12.61			Samples					Uncorrected Production					In Reactor at End of Period 21314			
					1.52			G. P. H.					Temperature, °F					Reactor d-P, H ₂ O 22			
								At End of Period 24.5					G.P.H. at 60°F 3.85					Pounds in Reactor 306			
								At Start of Period 5					A.P.I. at 60°F 48.8					Density, lbs./cu. ft. 104			
								Production 19.5					Pounds Per Hour 25.0					Bed Height, Feet 46			
								Samples 5					RUN CONDITIONS					CATALYST ANALYSIS			
								Uncorrected Production 40.7					Generator Press. 220					Particle Size			
								G. P. H. 3.77					O ₂ Preheat, °F 450					Screen			
								Temperature, °F 6.3					Gas Preheat, °F 805					Sedimentation			
								A.P.I. at 60°F 48.8					Reactor Press. 200					Frac. M % M %			
								Pounds Per Hour 25.0					Steam Back Press. 700					On 40 420+ 80+			
								Temperature, °F 20					Heater Outlet 496					100 419-150 80-40			
								Catalyst #1 40					Catalyst #2 616					150 149-105 40-20			
								Catalyst #3 612					Catalyst #4 631					200 104-74 20-10			
								Catalyst #4 631					Catalyst #5 637					250 73-62 10-0			
								Average 623					Average 623					325 61-44			
								Product Separator					E.P.					<325 43-0			
								Rec.					Res.					Density, lbs./cu. ft. Chem. Anal.			
								Loss.					Loss.					Aerated % Fe			
								Loss.					Loss.					Settled % C			
								Loss.					Loss.					Compacted % Oil			
								Loss.					Loss.					Sp. Grav. Specific Surface m ² /gm			
								Loss.					Loss.					Sp. Grav. Specific Surface m ² /gm			

FRESH FEED				WET GAS				RECYCLE		COMB. FEED		EFFLUENT		NET CHANGE ON REACTION									
%	m/hr	#/hr	%	Measured		At Wt. Balance		m/hr	m/hr	%	m/hr	%	Carbon		Hydrogen		Oxygen	Ultimate Oil		Unsat.			
				m/hr	#/hr	m/hr	#/hr						m/hr	a/hr	%	a/hr	%	a/hr	#/hr		#/gal	gal/hr	%
CO	34.4	6.41	180.68	15.44	1.24	36.19	1.56	42.40	4.68	11.44	22.06	6.23	14.36	-5.26	-5.26	22.26							
H ₂	58.2	11.72	23.44	58.24	4.37	8.74	5.24	10.48	15.82	27.34	55.27	21.06	48.21	-6.48		-12.76							
CO ₂	2.3	.46	20.24	17.64	1.47	6.48	1.76	17.44	5.94	5.80	11.64	7.10	16.34	1.30	1.30	17.07							
N ₂	1.2	.24	6.72	1.25	.10	2.80	.12	3.36	.38	.62	1.24	.50	1.17	-1.12									
CH ₄	2.4	.57	9.18	5.91	.49	7.44	.59	7.44	1.74	2.76	4.74	2.38	3.36	.02	.02	.27	.08						
C ₂ H ₄				1.44	.12	3.36	.14	3.92	.45	.45	.90	.57	1.38	.14	.24	4.11	.56			0.14			
C ₂ H ₆				.70	.06	1.80	.07	2.10	.21	.21	.42	.28	.65	.07	.14	2.06	.42						
C ₃ H ₆				1.85	.15	6.30	.18	7.56	.36	.56	1.12	.74	1.73	.18	.54	7.93	1.08			6.80			
C ₃ H ₈				.45	.04	1.76	.05	2.20	.13	.13	.26	.18	.42	.05	.15	2.20	.40			6.25			
C ₄ H ₈				1.13	.04	5.04	.11	6.16	.34	.34	.68	.45	1.05	.11	.44	6.46	.88			5.85			
C ₄ H ₁₀				.45	.04	2.32	.05	2.90	.14	.14	.28	.19	.44	.05	.20	2.94	.50			4.86			
C ₅ H ₁₀				.56	.03	2.10	.04	2.80	.11	.11	.22	.15	.35	.04	.20	2.96	.40			5.40			
C ₆ H ₁₂				.25	.02	1.76	.02	1.72	.08	.08	.16	.10	.23	.02	.12	1.76	.24			5.30			
OIL								(26.18)				.19	.44	1.87	27.46	3.74				6.50			
WATER												2.66	6.21		4.66					4.03			
TOTAL	128	252.20		8.36	144.62			30.26	47.83	100.01	42.80	100.00	7.58		100.01					4.25			
H ₂ +CO	18.5					6.79																	
H ₂ /CO	1.72					3.38			2.40		3.38												

Yield Calculations assume "oil" is CH₂, and is found by difference on Carbon, and H₂O 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 CALCULATION and SUMMARY SHEET

Synthesis Run Number 174 From 5/14/47 Hr. 0700 to 5/15/47 Hr. 0700

FRESH FEED								LIQUID YIELDS								CATALYST DATA					
Orsat	Corr. Fac.	Cor. Orsat	M. S.	M. W.	Calc. M.W.	C. N.		Oil Tank #	GAUGES, INCHES			Water Tank #				In Reactor at Start of Period					
CO ₂		2.1		44	22	298		Total	O/W	Oil	Gals.	Corr.	Total Gals.	Gauge	Gals.	Corr.	Total Gals.	187.5			
CO		35.5		28	9.94			At End of Period						79.5				Fresh Catalyst Charged			
CH ₄		2.2		16	2.5			At Start of Period										Catalyst Recharged			
H ₂		57.1		2	1.18			Production										Total 187.5			
N ₂		1.1		28	.31			Samples										Catalyst Taken Out 11.5			
Mol. Wt.					12.70			Uncorrected Production										In Reactor at End of Period 176.0			
					6.51			G. P. H.										Reactor d-P, H ₂ O			
FLOW CALCULATIONS								RUN CONDITIONS								DISTILLATIONS					
	Coef	Chart	Fp	Ft	F.m.w.	SCFH	%	Generator Press.	209	ASTM				WATER							
Oxygen						1740		O ₂ Preheat, °F	540	Prod.			Temp	%	Inventories						
Nat. Gas						2450		Gas Preheat, °F	510	A.P.I.			200	From d-P Meters							
Total						4240	42.2	Reactor Press.	200	I.B.P.			203	CATALYST ANALYSIS							
Fresh Feed						1130		Steam Back Press.	860	10%			208	Particle Size							
F. F. by C						1370		Temperatures, °F						Screen							
Avg. F. F.						3015		Heater Outlet	460					Sedimentation							
Wet Gas						582		Catalyst #1	40					Frac.	M	%	M	%			
Recycle						11200		#2	620					On 40	420+		80+				
Bleed						340		#3	618					100	419-150		80-40				
Total						11540		#4	625					150	149-105		40-20				
Total Feed						12730		#5	630					200	104-74		20-10				
Recycle/F.F.						1.58		Average	62					250	73-62		10-0				
Inlet Vel.						1.62		Product Separator						325	61-44						
Steam Flow						14.4								<325	43-0						
CO ₂ 7.0						14.4															
WEIGHT BALANCE								PRODUCT INSPECTION								PHYSICAL TESTS					
In	F. F. = SCFH x MW/379 =					2.7		Hempel Dist.		°F	%	A.P.I.	Oil	Water	Product	Pour °F	SUS @ °F	SFS @ °F			
Out	Wet Gas					15.4		Chemicals		to 400			Neut.								
	Oil					42.4				400-550			Sap.								
	Water					57.4				550+			Hydrox.								
	Loss												% Fe								
	Total					228.8	94.5						% Alc								
76.00 7.0m							23.9														
				Aerated				Settled				Density, lbs./cu. ft.				Chem. Anal.					
				Compacted				Sp. Grav.				Specific Surface				m ² /gm					

FRESH FEED				WET GAS				RECYCLE		COMB. FEED		EFFLUENT		NET CHANGE ON REACTION											
%	m/hr	#/hr	%	Measured		At Wt. Balance		m/hr	m/hr	%	m/hr	%	Carbon			Hydrogen			Oxygen	Ultimate Oil		Unsat.			
				m/hr	#/hr	m/hr	#/hr						m/hr	a/hr	%	a/hr	%	a/hr	#/hr	#/gal	gal/hr	%			
CO	35.5	6.42	193.76	13.02	1.20	336.0	1.32	36.46	4.58	11.50	23.21	5.70	14.22	-5.60	5.40	1.24			-2.60						
H ₂	57.1	11.52	230.4	45.97	3.66	7.52	4.03	8.06	14.60	25.52	56.86	18.00	43.71	-7.77					-14.28						
CO ₂	2.1	1.41	18.04	2.84	1.25	6.44	.25	7.00	5.90	6.21	12.89	1.07	13.20	1.28	1.25	1.20			2.56						
N ₂	1.1	1.21	5.88	2.84	1.25	6.44	.25	7.00	.86	1.07	2.17	1.11	1.05	-0.57											
CH ₄	2.2	1.45	6.88	5.49	1.44	1.04	.48	2.68	1.67	2.10	4.27	2.12	2.68	.05	.25	.12	.25								
C ₂ H ₄				1.78	1.14	3.92	.15	4.20	.54	.54	1.10	.07	1.04	.15	.25	.27	.40						17.47		
C ₂ H ₆				.61	.05	1.50	.06	1.80	.19	.19	.37	.25	.40	.06	.12	1.15	.36								
C ₃ H ₆				1.21	.10	4.20	.11	4.62	.37	.37	.75	.48	1.14	.11	.22	4.77	.66						4.16	6.25	
C ₃ H ₈				.32	.03	1.32	.03	1.45	.10	.10	.20	.13	.21	.03	.07	1.20	.24						1.77		
C ₄ H ₈				3.69	.39	16.24	.32	17.92	1.12	1.19	2.28	1.44	3.47	.32	1.28	8.50	2.56						11.02	6.10	
C ₄ H ₁₀				.37	.03	1.74	.03	1.91	.11	.11	.22	.14	.34	.03	.13	1.73	.20						1.71	4.80	
C ₅ H ₁₀				.70	.06	4.20	.07	4.90	.21	.21	.42	.28	.68	.07	.25	5.06	.70						4.70	5.40	
C ₆ H ₁₂				.22	.02	1.72	.02	1.89	.07	.07	.14	.09	.22	.02	.12	1.15	.34						1.87	5.20	
OIL								(21.84)				.16	.37		1.56	22.54	3.12							31.44	4.50
WATER												3.04	7.33				6.00							(3.00)	3.04
TOTAL	19.50	24.760		7.96	13.700	8.56	172.75	30.45	49.21	100.00	41.48	100.01	11.01		100.00								57.72	8.11	
H ₂ +CO	18.44					5.35																			
H ₂ /CO	1.66					3.05			2.22		3.06														
ULTIMATE YIELDS				WEIGHT BALANCE				EFFLUENT RATIOS				CONTRACTION: 26.5													
%	CO Fed	#/hr	#/MCF	g/M3	Gal/hr	H ₂ /CO	Gal/MCF	cc/M3	Wet Gas	#/hr	%	#/hr	H ₂ /H ₂ O	5.43	CO Conversion:	80.7									
C1+C2	6.79	6.80	.97	16.40					Oil	23.4		23.4	CO ₂ /CO	1.29	H ₂ Conversion:	65.0									
C3+	55.63	54.06	7.73	130.71					Water	51.4		51.4	(H ₂)/(CO ₂)	7.64	N ₂ +CO = 67.1										
C4+	49.56	48.12	6.88	116.34					Total	231.8	93.5	247.6	(H ₂)/(CO)												
Ult. Oil		51.72	7.40	125.13	8.11	1.16	162.91																		
CO ₂	18.50	56.32	8.06	136.29																					
H ₂ O		54.72	7.83	132.41																					

Yield Calculations assume "oil" is CH₂, and is found by difference on Carbon, and H₂O 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 1.47 psig. g/M3 = 16.91 x #/MCF. cc/M3 = 141.3 x gal/MCF.

**THE TEXAS COMPANY — MONTEBELLO LABORATORY
DATA CALCULATION and SUMMARY SHEET**

Synthesis Run Number 174 From 5/16/47 Hr. 0700 to 5/17/47 Hr. 0700

FRESH FEED								LIQUID YIELDS										CATALYST DATA			
	Orsat	Corr. Fac.	Cor. Orsat	M. S.	M. W.	Calc. M. W.	C. N.	Oil Tank #				Water Tank #				In Reactor at Start of Period					
CO ₂			2.0		44	188	40.0	GAUGES, INCHES								160.5					
CO			24.8		28	975		Total	O/W	Oil	Gals.	Corr.	Total	Gauge	Gals.	Corr.	Total	Fresh Catalyst Charged			
CH ₄			3.2		16	57		At End of Period	29.74	9			59.5					Catalyst Recharged			
H ₂			59.0		2	118		At Start of Period	75	7			24.0					Total 160.5			
N ₂			1.0		28	28		Production	14.34	2			72.8	30.5	4.5	128.8		Catalyst Taken Out			
Mol. Wt.						1260		Samples					5			5		In Reactor at End of Period 160.5			
						652		Uncorrected Production					78.8			143.8		Reactor d-P, H ₂ O			
								G. P. H.					3.26			6.0		Pounds in Reactor 147			
								Temperature, °F					49.5			59.8		Density, lbs./cu. ft. 66.0			
								G.P.H. at 60°F					49.5			10.7		Bed Height, Feet 5.3			
								A.P.I. at 60°F					21.3			49.6					
								Pounds Per Hour													
FLOW CALCULATIONS								RUN CONDITIONS				DISTILLATIONS				CATALYST ANALYSIS					
	Coeff	Chart	Fp	Ft	F.m.w.	SCFH	%	Generator Press.	210	ASTM				WATER				Space Vel. SCFH/lb. cat.			
Oxygen						1803		O ₂ Preheat, °F	410	Prod.			Temp.	%	Inventory Figures						
Nat. Gas						2440		Gas Preheat, °F	815	A.P.I.			200	From d-P Meters							
Total						4243	42.6	Reactor Press.	200	I.B.P.			203								
Fresh Feed						6820		Steam Back Press.	900	10%			208								
F. F. by C						7320		Temperatures, °F		20											
Avg. F. F.						3120		Heater Outlet	480	30											
Wet Gas						11050		Catalyst #1		40											
Contraction						57.3		#2	622	50											
Recycle						57.3		#3	626	60											
Bleed						11050		#4	642	70											
Total						18222		#5	652	80											
Total Feed						136		Average	655	90											
Recycle/F.F.						1.6		Product Separator		E.P.											
Inlet Vel.						240				Rec.											
Steam Flow						20.5				Loss.											
WEIGHT BALANCE								PRODUCT INSPECTION				PHYSICAL TESTS				CATALYST ANALYSIS					
In	F. F. = SCFH x MW/379 =							245	Hempel Dist.								Density, lbs./cu. ft.				
Out	Wet Gas							160.8	Chemicals								Chem. Anal.				
	Oil							21.3	Oil								Aerated				
	Water							79.0	Water								Settled				
	Loss								Neut. Sap.								Compacted				
	Total							241.7	550+								Sp. Grav.				
								22.6	Hydrox. % Fe % Alc								Specific Surface m ² /gm				

	FRESH FEED			WET GAS				RECYCLE	COMB. FEED	EFFLUENT	NET CHANGE ON REACTION													
	%	m/hr	#/hr	%	Measured	At Wt. Balance					Carbon	Hydrogen		Oxygen		Ultimate Oil		Unsat.						
					m/hr	#/hr	m/hr	#/hr	m/hr	%	m/hr	%	m/hr	a/hr	%	a/hr	%	a/hr	#/hr	#/gal	gal/hr	%		
CO	24.8	6.72	188.16	9.07	.75	21.00	.80	22.40	2.73	9.45	19.12	25.3	7.21	-5.92	-5.42	11.40								
H ₂	59.0	11.37	22.18	49.85	4.12	8.24	4.41	8.82	14.99	26.38	53.38	29.40	60.07	-6.88										
CO ₂	2.0	.37	17.16	24.65	2.07	89.76	2.18	95.92	7.41	7.80	15.18	9.57	14.60	1.79	1.77	20.64								
N ₂	1.0	.19	5.32	.26	.02	.56	.02	.60	.08	.27	.55	.10	.20	.17										
CH ₄	3.2	.62	9.92	7.14	.59	9.44	.63	10.08	2.15	2.77	5.61	2.18	8.68	.01	.01	.15	.04							
C ₂ H ₄					.22	.18	5.04	.19	5.32	.66	.66	1.84	.85	1.74	.19	.38	5.65	.14					7.466	
C ₂ H ₆					.15	.06	1.80	.06	1.93	.23	.23	.47	.29	.59	.06	.12	1.79	.36						
C ₃ H ₆					2.07	.17	7.14	.18	7.56	.62	.62	1.25	.80	1.62	.18	.54	8.04	1.08	6.80	2.25	1.09		55.20	
C ₃ H ₈					1.68	.14	6.16	.15	6.60	.51	.51	1.03	.66	1.35	.15	.45	6.70	1.20						
C ₄ H ₈					1.05	.07	5.04	.10	5.40	.32	.32	.65	.42	.86	.10	.40	5.95	.80	5.22	6.10	.31		76.64	
C ₄ H ₁₀					.32	.03	1.74	.03	1.86	.10	.10	.20	.13	.27	.03	.12	1.19	.30	1.74	4.86	.36			
C ₅ H ₁₀					.77	.06	4.20	.06	4.49	.23	.23	.47	.29	.59	.06	.30	4.46	.60	4.20	5.40	.18			
C ₆ H ₁₂					.25	.02	1.72	.02	1.84	.08	.08	.16	.10	.20	.02	.12	1.79	.24	1.72	5.50	.31			
OIL								(23.66)				.17	.35		1.64	25.15	3.38							
WATER												2.34	4.78			5.20								
TOTAL		19.31	243.34		8.26	161.44			30.08	49.47	100.01	44.94	100.00	10.48		100.00			42.44		7.05			
H ₂ +CO		18.11																						
H ₂ /CO		1.69																						
ULTIMATE YIELDS								WEIGHT BALANCE				EFFLUENT RATIOS				CONTRACTION: 54.3								
	% CO Fed	#/hr	H ₂ /CO		GAL/hr		H ₂ /CO		Wet Gas				H ₂ /H ₂ O				CO Conversion: 83.1							
C1+C2	75.9	7.28	.94	16.74					Oil				C ₂ /CO				H ₂ Conversion: 61.3							
C3+	57.88	51.08	6.88	118.03					Water				(H ₂)(CO ₂)(H ₂ O)(CO)				H ₂ +CO = 66.8							
C4+	38.14	36.92	5.04	85.23					Total															
Ult. Oil		42.44	5.93	100.28	7.05	.96	135.65																	
CO ₂	26.64	76.76	10.76	181.75																				
H ₂ O		42.12	5.75	47.23																				

Yield Calculations assume "oil" is CH₂, and is found by difference on Carbon, and H₂O 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/MCF = 16.91 x #/MCF. cc/M₃ = 141.3 x gal/MCF.

THE TEXAS COMPANY — MONTEBELLO LABORATORY
DATA CALCULATION and SUMMARY SHEET

Synthesis Run Number 17K From 5/17/47 Hr. 0700 to 5/18/47 Hr. 0700

FRESH FEED								LIQUID YIELDS										CATALYST DATA			
	Orsat	Corr. Fac.	Cor. Orsat	M. S.	M. W.	Calc. M.W.	C. N.	Oil Tank #			Water Tank #				In Reactor at Start of Period						
								GAUGES, INCHES			Gauge				Total						
								Total	O/W	Oil	Gals.	Corr.	Total	Gauge	Gals.	Corr.	Total	Gals.			
CO ₂			2.0		44	.88	29.4											160.5			
CO			35.4		28	9.21		At End of Period	22.5					85				Fresh Catalyst Charged			
CH ₄			2.0		16	.32		At Start of Period	9.0					54.5				Catalyst Recharged			
H ₂			58.2		2	1.18		Production	18.5					81.3	30.5	134		Total			
N ₂			1.4		28	.74		Samples						5		5		Catalyst Taken Out			
Mol. Wt.								Uncorrected Production						86.3		139		In Reactor at End of Period			
								G. P. H.						3.6		5.8		Reactor d-P, H ₂ O			
								Temperature, °F										Pounds in Reactor			
								G.P.H. at 60°F	3.5							5.7		Density, lbs./cu. ft.			
								A.P.I. at 60°F	44.8							10.5		Bed Height, Feet			
								Pounds Per Hour	23.6							48.0					
FLOW CALCULATIONS								RUN CONDITIONS				DISTILLATIONS				CATALYST ANALYSIS					
	Coef	Chart	Fp	Ft	F m.w.	SCFH	%	Generator Press.	211	ASTM		WATER		Particle Size							
Oxygen						1783		O ₂ Preheat, °F	525	Prod.		Temp.	%	Screen							
Nat. Gas						2440		Gas Preheat, °F	805	A.P.I.		200		Sedimentation							
Total						4223	42.2	Reactor Press.	200	I.B.P.		203		Frac. M % M %							
Fresh Feed						6880		Steam Back Press.	900	10%		208		On 40 420+ 80+							
F. F. by C						7430		Temperatures, °F		20				100 419-150 80-40							
Avg. F. F.								Heater Outlet	440	30				150 149-105 40-20							
Wet Gas						3170		Catalyst #1		40				200 104-74 20-10							
Contraction							57.4	#2	621	50				250 73-62 10-0							
Recycle						10620		#3	627	60				325 61-44							
Bleed						336		#4	620	70				<325 43-0							
Total						10756		#5	628	80				Density, lbs./cu. ft.							
Total Feed						18886		Average	634	90				Chem. Anal.							
Recycle/F.F.						1.48		Product Separator		E.P.				Aerated % Fe							
Inlet Vel.						1.63				Res.				Settled % C							
Steam Flow						235 4/16				Loss				Compacted % Oil							
% CO → CO ₂						20.0								Sp. Grav.							
														Specific Surface m ² /gm							
WEIGHT BALANCE								PRODUCT INSPECTION				PHYSICAL TESTS									
In	F. F. = SCFH x MW/379 =							Hempel Dist.	Chemicals	Oil	Water	Product Pour °F SUS @ °F SFS @ °F									
Out	Wet Gas					248.5		% F	% A.P.I.	Neut. #											
	Oil					23.6		to 400		Sap. #											
	Water					48.0		400-550		Hydrox.											
	Loss							550+		% Fe											
Total						236.8	95.4			% Alc											
% CO → CH ₄							24.9														

FRESH FEED				WET GAS				RECYCLE	COMB. FEED	EFFLUENT	NET CHANGE ON REACTION												
	%	m/hr	#/hr	Measured	At Wt. Balance						Carbon			Hydrogen			Oxygen	Ultimate Oil		Unsat.			
				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	6.94	194.32	15.22	1.28	35.84	1.50	42.00	4.40	11.34	23.42	5.70	14.18	-5.44	-21.61			-5.44					
H ₂	58.2	11.60	23.20	50.42	4.24	8.48	4.96	9.92	14.58	26.18	54.07	19.54	46.97	-6.64									
CO ₂	2.0	.39	17.16	17.67	1.48	65.12	1.73	76.12	5.11	5.50	11.36	6.84	16.44	1.34	19.31								
N ₂	1.4	.27	1.56	3.32	.28	7.84	.33	9.24	.96	1.23	2.54	1.29	3.10	.06									
CH ₄	2.0	.39	6.24	6.85	.58	9.28	.68	10.88	1.98	2.37	4.87	2.66	6.39	.29	.27	4.18	1.16						
C ₂ H ₄				1.49	.13	3.64	.15	4.20	.43	.43	.87	.58	1.39	.15	.30	4.32	.60						68.85
C ₂ H ₆				.84	.05	1.50	.06	1.80	.19	.19	.39	.25	.60	.06	.12	1.73	.36						
C ₃ H ₆				1.18	.10	4.20	.12	5.04	.34	.34	.70	.46	1.11	.12	.36	5.19	.72						4.54 6.21 .75 60.20
C ₃ H ₈				.28	.07	3.08	.08	3.52	.23	.23	.48	.31	.75	.04	.24	3.46	.64						
C ₄ H ₈				1.19	.10	5.60	.12	6.72	.34	.34	.70	.46	1.11	.12	.48	6.92	.96						6.38 6.10 1.05 85.61
C ₄ H ₁₀				.20	.02	1.16	.02	1.36	.06	.06	.12	.08	.19	.02	.08	1.15	.20						1.16 4.86 .24
C ₅ H ₁₀				.54	.05	2.50	.06	4.20	.16	.16	.33	.22	.53	.06	.30	4.32	.60						4.20 5.40 .78
C ₆ H ₁₂				.16	.01	.86	.01	1.01	.05	.05	.10	.06	.14	.01	.06	.86	.12						.86 5.50 .16
OIL								(26.15)				.19	.46		1.87	26.95	3.74						(2.07) 26.18 6.50 4.03
WATER												2.16	6.63				4.18						(2.16) 2.16
TOTAL		19.59	248.48			8.39	150.10		28.92	44.42	100.00	41.60	100.00	88.9		100.01							43.32 6.99
H ₂ +CO		18.54					6.46																
H ₂ /CO		1.67					3.31																
ULTIMATE YIELDS				WEIGHT BALANCE				EFFLUENT RATIOS				CONTRACTION: 50.5											
	CO Fed	#/hr	H ₂ /CO	Gal/hr	H ₂ /CO	Gal/MCF	cc/M3	Wet Gas	Oil	Water	Total	H ₂ /H ₂ O	CO ₂ /CO	(H ₂) (CO ₂)	(H ₂ O) (CO)	CO Conversion:	H ₂ Conversion:						
C1+C2	10.23	10.64	1.43	24.18				150.1	23.6	48.0	221.7	7.08	1.16	8.20	8.20	78.4	57.7						
C3+	48.85	47.68	6.43	106.73																			
C4+	40.20	39.12	5.27	89.12																			
Ult. Oil		43.32	5.84	98.75	6.99	.94	132.82																
CO ₂	19.31	58.96	7.95	134.43																			
H ₂ O		49.68	6.70	113.30																			

Yield Calculations assume "oil" is CH₂, and is found by difference on Carbon, and H₂O 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 x #/MCF. cc/M3 = 141.3 x gal/MCF.

**THE TEXAS COMPANY — MONTEBELLO LABORATORY
DATA CALCULATION and SUMMARY SHEET**

Synthesis Run Number 17L From 5/16/47 Hr. 0700 to 5/16/47 Hr. 0700

FRESH FEED								LIQUID YIELDS										CATALYST DATA								
	Orsat	Corr. Fac.	Cor. Orsat	M. S.	M. W.	Calc. M.W	C. N.	Oil Tank #					Water Tank #					In Reactor at Start of Period								
								GAUGES, INCHES										Fresh Catalyst Charged								
								Total	O/W	Oil	Gals.	Corr.	Total	Gauge	Gals.	Corr.	Total	Catalyst Recharged								
CO ₂			2.1		44	72	28.9	At End of Period					93					28								
CO			26.0		28	9.53		At Start of Period					85					64								
CH ₄			2.8		16	4.5		Production					4.5					76					8			
H ₂			59.1		2	1.68		Samples					5					130					14.0			
N ₂			2.0		28	5.6		Uncorrected Production					81					135					In Reactor at End of Period			
Mol. Wt.						12.64		G. P. H.					3.28					5.6					19			
						1.52		Temperature, °F					3.26					5.6					48			
								G.P.H. at 60°F					48.8					10.7					9.5			
								A.P.I. at 60°F					21.9					46.5								
								Pounds Per Hour															Space Vel. SCFH/lb. cat.			
FLOW CALCULATIONS								RUN CONDITIONS										DISTILLATIONS				CATALYST ANALYSIS				
	Coeff	Chart	Fp	Ft	F m.w.	SCFH	%	Generator Press.	A S T M					WATER				Inventory Figures								
Oxygen						1780		O ₂ Preheat, °F	Prod.					Temp. %				From d-P Meters								
Nat. Gas						2445		Gas Preheat, °F	A.P.I.					200												
Total						4225	42.1	Reactor Press.	I.B.P.					203												
Fresh Feed						6400		Steam Back Press.	10%					208												
F. F. by C						7550		Temperatures, °F	20																	
Avg. F. F.								Heater Outlet	30																	
Wet Gas						3100		Catalyst #1	40																	
Contraction							59.0	#2	625																	
Recycle						10950		#3	629																	
Bleed						340		#4	618																	
Total						11290		#5	520																	
Total Feed						16840		Average	610																	
Recycle/F.F.						1.5		Product Separator	E.P.																	
Inlet Vel.						1.6		Rec.																		
Steam Flow						238		Res.																		
76.00 → 70.2							19.2	Loss.																		
WEIGHT BALANCE								PRODUCT INSPECTION										PHYSICAL TESTS				CATALYST ANALYSIS				
In	F. F. = SCFH x MW/379 =					252		Hempel Dist.	Chemicals					Oil				Water				Density, lbs./cu. ft.				
Out	Wet Gas					157.5		°F	%	A.P.I.	Neut.					Product				Pour °F						
	Oil					21.9		400-550	Sap.					SUS @ °F				SFS @ °F				Settled				
	Water					46.5		550+	Hydrox.													Sp. Grav.				
	Loss								% Fe													Compacted				
	Total					227.9	90.5		% Alc													Specific Surface				
76.00 → 70.2							23.2															m ² /gm				

FRESH FEED				WET GAS				RECYCLE		COMB. FEED		EFFLUENT		NET CHANGE ON REACTION														
%	m/hr	#/hr	%	Measured		At Wt. Balance		m/hr	m/hr	%	m/hr	%	Carbon			Hydrogen			Oxygen			Ultimate Oil			Unsat.			
				m/hr	#/hr	m/hr	#/hr						m/hr	a/hr	%	a/hr	%	a/hr	%	#/hr	#/gal	gal/hr	%					
CO	39.0	6.77	18.56	11.60	.97	2.716	1.13	31.64	3.52	10.29	20.75	4.65	11.19	-5.64	-5.64	16.69												
H ₂	59.1	11.76	23.52	46.15	3.95	7.90	4.58	9.16	14.34	26.10	52.64	18.92	43.54	-7.18			-14.36											
CO ₂	2.1	.42	18.48	22.04	1.84	8.946	2.13	9.272	6.68	7.10	14.32	8.81	21.21	1.71	1.71	28.54												
N ₂	2.0	.40	11.20	3.99	.33	9.24	.38	10.64	1.19	1.59	3.21	1.57	3.18	.02														
CH ₄	2.8	.56	8.96	6.49	.53	8.48	.61	9.26	1.93	2.49	5.02	2.34	6.11	.05	.05	.82	.20											
C ₂ H ₄				1.89	.15	4.20	.17	4.76	.56	.56	1.13	.73	1.76	.17	.34	5.68	.68											75.30
C ₂ H ₆				.62	.05	1.50	.06	1.80	.18	.18	.36	.24	.58	.06	.12	2.00	.36											
C ₃ H ₆				1.36	.11	4.62	.13	5.46	.41	.41	.82	.54	1.30	.13	.27	6.71	.78											4.91
C ₃ H ₈				.33	.03	1.32	.03	1.32	.10	.10	.20	.13	.31	.03	.07	1.50	.24											
C ₄ H ₈				1.19	.10	5.60	.12	.07	.35	.35	.71	.47	1.13	.18	4.68	8.01	.96											.06
C ₄ H ₁₀				.87	.02	1.16	.02	1.16	.08	.08	.16	.10	.24	.02	.04	1.24	.20											1.16
C ₅ H ₁₀				.95	.08	5.60	.09	6.20	.28	.28	.56	.27	.89	.09	.45	7.37	.80											6.30
C ₆ H ₁₂				.16	.01	.86	.01	.86	.05	.05	.10	.06	.14	.01	.06	1.00	.12											.86
OIL								(26.18)				.19	.46		1.87	31.21	3.74											26.12
WATER												2.22	5.24				6.18											2.22
TOTAL	18.91	25.72				8.20	15.60		22.79	49.58	100.01	41.54	99.99	10.45		100.00												40.08
H ₂ +CO	18.53							5.71																				
H ₂ /CO	1.73							40.5				1.54		4.07														
ULTIMATE YIELDS				WEIGHT BALANCE				#/hr				EFFLUENT RATIOS				CONTRACTION: 52.5												
	% CO Fed	#/hr	H ₂ /CO		Gal/hr		H ₂ /CO		Wet Gas		#/hr		H ₂ /H ₂ O		CO Conversion:		H ₂ Conversion:											
			#/MCF	g/M ³	Gal/hr	Gal/MCF	cc/M ³		158.6		163.3		8.52		83.3		6.1											
C ₁ +C ₂	8.57	7.36	.97	16.40																								
C ₃ +	57.08	41.35	5.48	92.67																								
C ₄ +	49.07	34.57	4.58	77.45																								
Ult. Oil	40.08	5.31	89.79	6.38	.85	120.11																						
CO ₂	28.54	75.24	9.97	168.59																								
H ₂ O	39.96	8.29	89.45																									

Yield Calculations assume "oil" is CH₂, and is found by difference on Carbon, and H₂O 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 1.01325 bar. g/M³ = 16.91 x #/MCF. cc/M³ = 141.3 x gal/MCF.

THE TEXAS COMPANY — MONTEBELLO LABORATORY
DATA CALCULATION and SUMMARY SHEET

Synthesis Run Number 17M From 5/10/47 Hr. 0700 to 5/10/47 Hr. 0700

FRESH FEED								LIQUID YIELDS								CATALYST DATA					
Orsat	Corr. Fac.	Cor. Orsat	M. S.	M. W.	Calc. M.W.	C. N.		Oil Tank #			Water Tank #				In Reactor at Start of Period						
CO ₂			44	44	36	39.6		Total	O/W	Oil	Gals.	Corr.	Total Gals.	Gauge	Gals.	Corr.	Total Gals.	141.5			
CO		1.9		28	9.71			At End of Period						57.5				Fresh Catalyst Charged			
CH ₄		3.0		16	4.8			At Start of Period	57					28				Catalyst Recharged			
H ₂		59.0		2	1.18			Production	43.34					58.3	24.5	4.5	113.5	Total			141.5
N ₂		1.4		28	.39			Samples						5				Catalyst Taken Out			99.0
Mol. Wt.					12.12			Uncorrected Production						63.3			117.5	In Reactor at End of Period			< 42.5
					1.55			G. P. H.						3.68			4.9	Reactor d-P, H ₂ O			16.5
FLOW CALCULATIONS								RUN CONDITIONS								DISTILLATIONS					
	Coeff	Chart	Fp	Ft	F m.w.	SCFH	%	Generator Press.	212	ASTM				WATER							
Oxygen						1800		O ₂ Preheat, °F	485	Prod.			Temp.		%			Pounds in Reactor			192
Nat. Gas						2470		Gas Preheat, °F	830	A.P.I.			200				Density, lbs./cu. ft.				40
Total						4270	42.1	Reactor Press.	200	I.B.P.			203				Bed Height, Feet				9.0
Fresh Feed						6800		Steam Back Press.	650	10%			208				Space Vel. SCFH/lb. cat.				
F. F. by C						7490		Temperatures, °F									Inventory Figures				
Avg. F. F.								Heater Outlet	340								From d-P Meters				
Wet Gas						3530		Catalyst #1									CATALYST ANALYSIS				
Contraction							53.0	#2	621								Particle Size				
Recycle						11700		#3	408								Screen				
Bleed						370		#4	590								Sedimentation				
Total						12010		#5	505								Frac.	M	%	M	%
Total Feed						19560		Average	576								On 40	420+		80+	
Recycle/F.F.						1.6		Product Separator									100	419-150		80-40	
Inlet Vel.						1.67											150	149-105		40-20	
Steam Flow						2387/100											200	104-74		20-10	
						21.0											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

FRESH FEED				WET GAS				RECYCLE	COMB. FEED	EFFLUENT	NET CHANGE ON REACTION									
%	m/hr	#/hr	%	Measured	At Wt. Balance	m/hr	m/hr	%	m/hr	%	Carbon		Hydrogen		Oxygen	Ultimate Oil		Unsat.		
				m/hr	#/hr	m/hr					m/hr	a/hr	%	a/hr	%	a/hr	#/hr	#/gal	gal/hr	%
CO	36.7	6.87	192.36	14.80	1.38	33.10	1.71	41.04	4.71	11.58	22.33	7.94	15.88	-5.16	-5.16	24.54				
H ₂	59.0	11.68	23.36	57.84	4.91	9.82	6.07	12.18	16.83	28.51	54.46	22.72	42.05	-5.57		-11.18				
CO ₂	1.9	.38	16.72	18.26	1.10	74.80	2.11	12.15	5.82	6.40	12.34	7.93	16.97	1.73	1.10	27.14				
N ₂	1.4	.28	7.44	8.57	.33	9.84	.41	11.46	1.14	1.42	2.74	1.55	3.32	.13						
CH ₄	3.0	.59	9.44	6.11	.57	9.12	.71	11.31	1.95	2.54	4.90	3.66	5.64	.12	.12	1.15	.44			
C ₂ H ₄				1.40	.13	3.64	.16	4.51	.45	.45	.87	.61	1.31	.16	.22	4.66	.64			71.07
C ₂ H ₆				.57	.05	1.50	.06	1.86	.18	.18	.35	.24	.51	.06	.12	1.75	.36			
C ₃ H ₆				.84	.08	2.36	.10	4.17	.28	.28	.54	.38	.81	.10	.30	4.37	.60			3.15
C ₃ H ₈				.12	.01	.44	.01	.55	.04	.04	.08	.05	.11	.01	.03	.44	.08			
C ₄ H ₈				.03					.01	.01	.02	.01	.02							12.10
C ₄ H ₁₀				.21	.02	1.16	.02	1.44	.07	.07	.13	.09	.19	.02	.08	1.16	.20			1.24
C ₅ H ₁₀				.90	.08	5.60	.10	6.84	.29	.29	.56	.39	.83	.10	.50	7.28	1.00			6.84
C ₆ H ₁₂				.30	.03	2.58	.04	3.20	.10	.10	.19	.14	.30	.04	.24	3.44	.44			2.20
OIL								(24.08)				.17	.36	1.72	25.04	3.44				2.00
WATER												1.70	3.64			3.90				1.95
TOTAL				19.10	24.72		9.30	158.36		191.41	31.85	57.87	100.00	46.26	100.00	8.54				29.41
H ₂ +CO				18.55				7.80												
H ₂ /CO				1.70				3.56												
ULTIMATE YIELDS				WEIGHT BALANCE				EFFLUENT RATIOS				CONTRACTION: 4.21								
%	CO Fed	#/hr	H ₂ /CO	#/MCF	g/M ³	Gal/hr	H ₂ /CO	Gal/MCF	cc/M ³	Wet Gas	#/hr	%	#/hr	H ₂ /H ₂ O	CO Conversion: 75.7					
C1+C2	8.16	8.24	1.09	18.43						154.36			191.72	1.348	H ₂ Conversion: 4.79					
C3+	41.78	41.10	5.48	92.67						1700			1700	1.07	H ₂ +CO = 54.3					
C4+	36.87	36.38	4.85	82.01						41.00			41.00	14.42						
Ult. Oil		39.41	4.25	71.87	645	.86	181.52													
CO ₂	25.78	76.03	10.17	171.97																
H ₂ O		30.60	4.08	68.99																

Yield Calculations assume "oil" is CH₂, and is found by difference on Carbon, and H₂O 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 CALCULATION and SUMMARY SHEET**

Synthesis Run Number 18C From 6/6/47 Hr. 0700 to 6/7/47 Hr. 0700

FRESH FEED								LIQUID YIELDS										CATALYST DATA			
	Orsat	Corr. Fac.	Cor. Orsat	M. S.	M. W.	Calc. M.W.	C. N.	OIL Tank #					Water Tank #					In Reactor at Start of Period			
CO ₂			1.9		44	.84	40.1	GAUGES, INCHES										233			
CO			34.1		28	9.55		Total	O/W	Oil	Gals.	Corr.	Total	Gauge	Gals.	Corr.	Total	Fresh Catalyst Charged			
CH ₄			4.1		16	.66		At End of Period					56					Catalyst Recharged			
H ₂			59.2		2	1.18		At Start of Period					37.5					Total			
N ₂			0.7		28	.19		Production					66.2	18.5	1.2	82.6		Catalyst Taken Out			
Mol. Wt.						12.42		Samples					5			10		In Reactor at End of Period			
						1.53		Uncorrected Production					66.7			82.6		231			
								G. P. H.					2.75			2.9		Reactor d-P, H ₂ O			
FLOW CALCULATIONS								RUN CONDITIONS										DISTILLATIONS			
	Coeff	Chart	Fp	Ft	F.m.w.	SCFH	%	Generator Press.					ASTM					WATER			
Oxygen						1793		209					Prod.					Temp. %			
Nat. Gas						2445		405					A.P.I.					200			
Total						4238	42.4	820					I.B.P.					203			
Fresh Feed						6920		200					10%					208			
F. F. by C						7325		870					20								
Avg. F. F.								Temperatures, °F													
Wet Gas						4500		Heater Outlet					30								
Contraction							38.5	Catalyst #1					40								
Recycle						12450		#2					50								
Bleed						402		#3					60								
Total						12852		#4					70								
Total Feed						20177		#5					80								
Recycle/F.F.						1.75		Average					90								
Inlet Vel.						1.84		Product Separator					E.P.								
Steam Flow								Rec.					Res.								
%CO → G ₂						20.6		Loss.					PHYSICAL TESTS								
CO ₂ → W. G. 14.5								to 400					Product					Pour °F			
WEIGHT BALANCE								PRODUCT INSPECTION										CATALYST ANALYSIS			
In	F. F. = SCFH x MW/379 =							Hempel Dist.					Chemicals					Particle Size			
Out	Wet Gas							°F					Oil					Screen			
	Oil							to 400					Water					Sedimentation			
	Water							400-550					Product					Frac. M % M %			
	Loss							550+					SUS @ °F					On 40 420+ 80+			
	Total												SFS @ °F					100 419-150 80-40			
%CO → G ₂																		150 149-105 40-20			
																		200 104-74 20-10			
																		250 73-62 10-0			
																		325 61-44			
																		430			
																		Density, lbs./cu. ft.			
																		Chem. Anal.			
																		Aerated % Fe			
																		Settled % C			
																		Compacted % Oil			
																		Sp. Grav. Specific Surface			
																		m ² /gm			

NAME GAS	FRESH FEED				WET GAS				RECYCLE	COMB. FEED	EFFLUENT				NET CHANGE ON REACTION				Ultimate Oil	Unsat.
	%	m/hr	#/hr	%	Measured	At Wt. Balance	m/hr	m/hr			%	m/hr	%	Carbon		Hydrogen		Oxygen		
CO	34.1	637	1852	17.25	2.05	57.40	2.22	62.11	5.84	12.43	2.01	8.06	16.50	-4.37	-4.37	33.69		-4.37		
H ₂	59.2	11.44	22.88	39.79	7.10	14.20	7.68	15.36	20.23	37.67	63.66	27.91	57.13	-3.76		-7.52				
CO ₂	1.9	.37	16.28	11.84	1.41	6.204	1.53	6.713	4.01	4.38	7.40	5.54	11.74	1.16	1.16	12.60			2.32	
N ₂	0.7	.14	3.92							.14	.24									
CH ₄	4.1	.79	12.64	6.65	.79	12.64	.85	13.68	2.25	3.04	5.14	3.10	6.35	.06	.06	.91	.24			
C ₂ H ₄				.66	.08	2.24	.09	2.42	.22	.22	.37	.31	.63	.07	.18	2.73	.36			
C ₂ H ₆				.56	.07	3.10	.08	2.27	.19	.19	.32	.27	.55	.08	.16	2.43	.48			
C ₃ H ₆																				
C ₃ H ₈				.36	.04	1.76	.04	1.90	.12	.12	.20	.16	.33	.04	.13	1.82	.32			
C ₄ H ₈				1.14	.14	7.84	.15	8.48	.39	.39	.66	.54	1.11	.15	.60	9.10	1.20		8.06 6.10 1.32	
C ₄ H ₁₀				.30	.04	2.32	.04	2.57	.10	.10	.17	.14	.29	.04	.16	2.73	.40		2.51 4.66 .52	
C ₅ H ₁₀				.98	.12	8.40	.13	9.09	.33	.33	.56	.46	.94	.13	.65	9.66	1.30		9.09 5.40 1.68	
C ₆ H ₁₂				.46	.05	4.20	.05	4.54	.16	.16	.27	.21	.43	.05	.30	4.55	.60		4.54 5.50 .83	
OIL								(12.72)				.10	.20		.08	14.87	1.96		13.72 6.50 2.11	
WATER												2.05	4.20			.66			(0.33) 2.05	
TOTAL		19.33	240.24		11.87	175.14	12.86	189.49	32.84	59.17	100.00	49.85	100.00	6.47	99.99				37.92 6.76	
H ₂ +CO		19.03				9.90														
H ₂ /CO		1.74				2.46														

ULTIMATE YIELDS						WEIGHT BALANCE			EFFLUENT RATIOS		CONTRACTION: 33.5	
	% CO Fed	#/hr	H ₂ /CO		Gal/hr	Wet Gas	#/hr	%	#/hr	H ₂ /H ₂ O	C ₂ O/CO	C ₀ Conversion: 66.3
			#/MCF	g/M ³								
C ₁ +C ₂	6.07	5.73	.78	12.19		175.14	10.82	189.54	13.61			
C ₃ +	42.63	10.24	5.49	92.84		18.10		18.10	0.69			
C ₄ +	40.81	38.34	5.23	88.44		32.60		32.60	7.36			12.40 = 42.1
Un. Oil		37.92	5.17	87.42	6.46	0.88	124.34					
CO ₂	17.60	50.85	6.94	117.36								
H ₂ O		26.90	5.03	85.06								

Yield Calculations assume "oil" is CH₂, and is found by difference on Carbon, and H₂O 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 CALCULATION and SUMMARY SHEET

Synthesis Run Number 18F From 6/9/47 Hr. 0700 to 6/10/47 Hr. 0720

FRESH FEED								LIQUID YIELDS								CATALYST DATA					
Orsat	Corr. Fac.	Cor. Orsat	M. S.	M. W.	Calc. M. W.	C. N.		Oil Tank #	GAUGES, INCHES			Water Tank #			In Reactor at Start of Period						
								Total	O/W	Oil	Gals.	Corr.	Total	Gauge	Gals.	Corr.	Total	286.5			
CO ₂		1.7		44	1.75	286												Fresh Catalyst Charged			
CO		25.1		28	2.65		At End of Period	62.4						75.4				Catalyst Recharged			
CH ₄		2.8		16	1.45		At Start of Period	51.4						36				Total			
H ₂		58.8		2	1.19		Production	10.4						46.2	19.1		84.9	Catalyst Taken Out			
N ₂		0.6		28	1.17		Samples							5				In Reactor at End of Period			
Mol. Wt.					12.41		Uncorrected Production							51.2			89.9	Reactor d-P, H ₂ O			
					1.53		G. P. H.							2.1			2.75	Pounds in Reactor			
FLOW CALCULATIONS								DISTILLATIONS								CATALYST ANALYSIS					
	Coef	Chart	Fp	Ft	F. m. w.	SCFH	%	Generator Press.	213	ASTM			WATER			Inventory Figures					
Oxygen						1820		O ₂ Preheat, °F	460				Temp.	%	From d-P Meters						
Nat. Gas						2570		Gas Preheat, °F	770	A.P.I.											
Total						4390	42.0	Reactor Press.	200	I.B.P.											
Fresh Feed						7090		Steam Back Press.	610	10%											
F. F. by C						7610		Temperatures, °F													
Avg. F. F.								Heater Outlet	605												
Wet Gas						4500		Catalyst #1													
Contraction							40.9	#2	657												
Recycle						11220		#3	605												
Bleed						260		#4	663												
Total						11580		#5	602												
Total Feed						19190		Average	629												
Recycle/F.F.						1.52		Product Separator		E.P.											
Inlet Vel.						1.75				Rec.											
Steam Flow						101.4				Res.											
WEIGHT BALANCE								PRODUCT INSPECTION								CATALYST ANALYSIS					
In	F. F. = SCFH x MW/379 =						249.5	Hempel Dist.				Chemicals				Loss.					
Out	Wet Gas						208	°F % A.P.I.				Oil				Water					
	Oil						14.1	to 400				Neut. #				Product					
	Water						31.1	400-550				Sap. #				Pour °F					
	Loss							550+				Hydrox. #				SUS @ °F					
	Total						283.2					% Fe				SFS @ °F					
												% Fe				Specific Surface					
												% Alc				m ² /gm					

ORSAT	FRESH FEED				WET GAS				RECYCLE	COMB. FEED	EFFLUENT	NET CHANGE ON REACTION									
	%	m/hr	#/hr	%	Measured		At Wt. Balance					Carbon		Hydrogen		Oxygen		Ultimate Oil		Unsat.	
					m/hr	#/hr	m/hr	#/hr				m/hr	a/hr	%	a/hr	%	a/hr	%	#/hr		#/gal
CO	25.1	2.05	197.40	19.40	2.30	41.40	2.75	49.51	5.92	12.97	25.63	8.67	19.00	-4.30	-4.30	39.01					
H ₂	58.8	12.01	24.02	24.84	6.94	12.88	7.70	15.40	16.55	28.56	54.43	24.25	52.13	-4.31		-8.62					
CO ₂	1.7	.34	14.86	14.37	1.71	7.52	2.04	8.97	4.39	4.73	9.35	6.93	14.09	1.70	1.70	24.11					
N ₂	0.6	.12	3.36	1.36	.16	4.48	.19	5.36	.42	.54	1.07	.61	1.34	.07							
CH ₄	2.8	.36	8.56	6.28	.75	12.00	.90	14.35	1.92	2.48	4.90	2.82	6.18	.74	.74	4.82	1.36				
C ₂ H ₄				.86	.10	2.80	.12	3.35	.26	.26	.51	.38	.83	.12	.24	3.40	.48				
C ₂ H ₆				.75	.09	2.70	.11	3.23	.23	.23	.45	.34	.74	.11	.22	3.12	.66				
C ₃ H ₆				.68	.08	3.32	.09	3.97	.21	.21	.41	.30	.66	.09	.27	3.83	.54				
C ₃ H ₈				.11	.01	1.44	.01	.53	.03	.03	.06	.04	.09	.01	.03	.43	.08				
C ₄ H ₈				.75	.09	5.04	.11	6.03	.27	.23	.45	.34	.74	.11	.44	6.24	.88				
C ₄ H ₁₀				.36	.04	3.22	.05	3.77	.11	.11	.22	.16	.35	.05	.20	2.84	.50				
C ₅ H ₁₀				.53	.06	4.20	.07	5.02	.16	.16	.32	.23	.50	.07	.35	4.86	.70				
C ₆ H ₁₂				.32	.04	3.36	.05	4.02	.10	.10	.20	.15	.33	.05	.30	4.26	.60				
OIL								(2.94)				.02	.04		.21	2.98	.42				
WATER												.90	1.97			2.40					
TOTAL		20.08	248.70		16.87	170.18	14.14	203.51	20.52	50.61	100.00	45.64	99.99	5.89		100.00					
H ₂ +CO		17.06					10.45														
H ₂ /CO		1.70				2.80															
ULTIMATE YIELDS										WEIGHT BALANCE		EFFLUENT RATIOS		CONTRACTION: 29.3							
	%	#/hr	#/MCF	g/M ³	Gal/hr	Gal/MCF	cc/M ³	Wet Gas	170.18	203.50	H ₂ /H ₂ O	26.94	C ₀ Conversion: 60.99								
C ₁ +C ₂	11.34	11.97	1.57	26.55				Oil	14.10	14.10	CO ₂ /CO	.74	H ₂ Conversion: 35.9								
C ₃ +	25.54	25.28	3.32	56.14				Water	31.10	31.10	(H ₂)(CO ₂)/ (H ₂ O)(CO)	19.99	H ₂ +CO = 42.9								
C ₄ +	21.28	20.78	2.73	46.16				Total	215.38	246.60											
Ult. Oil		24.05	3.16	53.44	4.19	.55	77.72														
CO ₂		24.11	75.01	9.86	166.73																
H ₂ O		16.20	2.13	36.02																	

Yield Calculations assume "oil" is CH₂, and is found by difference on Carbon, and H₂O 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 x #/MCF. cc/M³ = 141.3 x gal/MCF.

**THE TEXAS COMPANY — MONTEBELLO LABORATORY
DATA CALCULATION and SUMMARY SHEET**

Synthesis Run Number 18B From 6/10/47 Hr. 0700 to 6/11/47 Hr. 0700

FRESH FEED								LIQUID YIELDS										CATALYST DATA			
Orsat	Corr. Fac.	Cor. Orsat	M. S.	M. W.	Calc. M.W.	C. N.		Oil Tank #			Water Tank #				In Reactor at Start of Period						
CO ₂		17		44	74	38.3		GAUGES, INCHES							287						
CO		35.1		28	284			Total	O/W	Oil	Gals.	Corr.	Total Gals.	Gauge	Gals.	Corr.	Total Gals.	Fresh Catalyst Charged			
CH ₄		25		16	180			At End of Period						92.5	15			114			
H ₂		60.1		2	1.20			At Start of Period						75.25	5.5			Catalyst Recharged			
N ₂		0.6		28	17			Production						71.5	17.25	9.5	117.7	Total			
Mol. Wt.					12.35			Samples						5			5	Catalyst Taken Out			
					1.53			Uncorrected Production										249.4			
								G. P. H.										In Reactor at End of Period			
								Temperature, °F										151.7			
								G.P.H. at 60°F										7			
								A.P.I. at 60°F										Pounds in Reactor			
								Pounds Per Hour										5.12			
																		Density, lbs./cu. ft.			
																		Bed Height, Feet			
																		Space Vel. SCFH/lb. cat.			
																		Inventory Figures			
																		From d-P Meters			
																		CATALYST ANALYSIS			
																		Particle Size			
																		Screen Sedimentation			
																		Frac. M % M %			
																		On 40 420+			
																		100 419-150			
																		150 149-105			
																		200 104-74			
																		250 73-62			
																		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			

FRESH FEED				WET GAS				RECYCLE	COMB. FEED	EFFLUENT	NET CHANGE ON REACTION												
%	m/hr	#/hr	%	Measured		At Wt. Balance		m/hr	m/hr	%	m/hr	%	Carbon			Hydrogen			Oxygen	Ultimate Oil		Unsat.	
				m/hr	#/hr	m/hr	#/hr						m/hr	a/hr	%	a/hr	%	a/hr	#/hr	#/gal	gal/hr	%	
CO																							
H ₂																							
CO ₂																							
N ₂																							
CH ₄																							
C ₂ H ₄																							
C ₂ H ₆																							
C ₃ H ₆																							
C ₃ H ₈																							
C ₄ H ₈																							
C ₄ H ₁₀																							
C ₅ H ₁₀																							
C ₆ H ₁₂																							
OIL																							
WATER																							
TOTAL																							
H ₂ +CO																							
H ₂ /CO																							
ULTIMATE YIELDS				WEIGHT BALANCE				#/hr	%	#/hr	EFFLUENT RATIOS		CONTRACTION:										
%	CO Fed	#/hr	%	H ₂ /CO		H ₂ /CO		Wet Gas	Oil	Water	Total	H ₂ /H ₂ O	CO ₂ /CO	C ₀ Conversion:									
				#/MCF	g/M ³	Gal/hr	Gal/MCF								cc/M ³	H ₂ Conversion:							
C ₁ +C ₂																							
C ₃ +																							
C ₄ +																							
Ult. Oil																							
CO ₂																							
H ₂ O																							

Yield Calculations assume "oil" is CH₂, and is found by difference on Carbon, and H₂O 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 CALCULATION and SUMMARY SHEET**

Synthesis Run Number 184 From 6/11/47 Hr. 0700 to 6/11/47 Hr. 1200

FRESH FEED								LIQUID YIELDS								CATALYST DATA				
Orsat	Corr. Fac.	Cor. Orsat	M. S.	M. W.	Calc. M.W.	C. N.		Oil Tank #	GAUGES, INCHES			Water Tank #			In Reactor at Start of Period					
CO ₂		1.6		44	.71	40.6		Total	O/W	Oil	Gals.	Corr.	Total	Gauge	Gals.	Corr.	Total	Gals.	151.75	
CO		34.7		28	9.72			At End of Period	83.5					21.75					Fresh Catalyst Charged	18.5
CH ₄		4.3		16	1.69			At Start of Period	78.5					15.0					Catalyst Recharged	56.5
H ₂		59.2		2	1.18			Production	4.0					17.6	6.75		29.7		Total	226.75
N ₂		0.2		28	.06			Samples						5			5		Catalyst Taken Out	150.50
Mol. Wt.					12.76			Uncorrected Production						22.6			24.7		In Reactor at End of Period	76.25
					1.53			G. P. H.						4.52			6.94		Reactor d-P, H ₂ O	8
FLOW CALCULATIONS								RUN CONDITIONS								DISTILLATIONS				
	Coef	Chart	Fp	Ft	F.m.w.	SCFH	%	Generator Press.	218	ASTM			WATER			Space Vel. SCFH/lb. cat.				
Oxygen						1830		O ₂ Preheat, °F	470	Prod.			Temp.	%	Inventory Figures					
Nat. Gas						2500		Gas Preheat, °F	830	A.P.I.			200	From d-P Meters						
Total						4320	42.3	Reactor Press.	200	I.B.P.			203	CATALYST ANALYSIS						
Fresh Feed						6700		Steam Back Press.	750	10%			208	Particle Size						
F. F. by C						7400		Temperatures, °F		20				Screen						
Avg. F. F.								Heater Outlet	520	30				Frac.	M	%	M	%		
Wet Gas						3860		Catalyst #1		40				On 40	420+		80+			
Contraction							46.3	#2	655	50				100	419-150		80-40			
Recycle						9750		#3	660	60				150	149-105		40-20			
Bleed						370		#4	655	70				200	104-74		20-10			
Total						10120		#5	650	80				250	73-62		10-0			
Total Feed						17520		Average	652	90				325	61-44					
Recycle/F.F.						1.37		Product Separator		E.P.				<325	43-0					
Inlet Vel.						1.63				Rec.										
Steam Flow										Res.										
CO ₂ → CO ₂						301				Loss.										
CO ₂ → W.G. 23.0								PRODUCT INSPECTION				PHYSICAL TESTS								
In	F. F. = SCFH x MW/379 =					241		Hempel Dist.		Chemicals				Product	Pour °F	SUS @ °F	SFS @ °F	Compacted	Chem. Anal.	
Out	Wet Gas					189		°F	%	A.P.I.	Oil	Water						Aerated	% Fe	
	Oil					30.5		to 400										Settled	% C	
	Water					578		400-550		Neut. Sap.								Sp. Grav.	% Oil	
	Loss							550+		Hydrox									Specific Surface	
	Total					2673	111			% Fe									m ² /gm	
CO ₂ → O ₂										% Alc										

NAME GAS	FRESH FEED				WET GAS				RECYCLE	COMB. FEED		EFFLUENT		NET CHANGE ON REACTION									
	%	m/hr	#/hr	%	Measured	At Wt. Balance	m/hr	#/hr		m/hr	%	m/hr	%	Carbon		Hydrogen		Oxygen	Ultimate Oil		Unsat.		
ORSAT																							
CO	34.7	678	189.84	11.35	116	32.48	1.12	31.40	3.04	9.82	2.17	4.16	10.36	-5.66	-5.66	16.52		-5.66					
H ₂	59.2	1156	23.12	57.97	589	11.78	5.69	11.39	15.49	27.05	58.32	21.18	52.77	-5.87		-11.74							
CO ₂	1.6	.31	13.64	19.37	1.97	86.68	1.90	83.80	5.18	5.49	11.84	7.09	17.97	1.59	1.59	23.45			3.18				
N ₂	0.2	.12	3.36	.77	.08	2.24	.08	2.17	.21	.33	.71	.29	.74	-.04									
CH ₄	4.3	.84	12.44	6.88	.70	11.20	.68	10.83	1.84	2.68	5.78	2.52	6.40	-.16	-.16	2.36		-.64					
C ₂ H ₄				.98	.10	2.80	.10	2.71	.26	.26	.56	.26	.91	.10	.20	2.95		.40					
C ₂ H ₆				.34	.03	.90	.03	.87	.09	.09	.19	.12	.30	.03	.06	.88		.18					
C ₃ H ₆				.90	.09	3.78	.09	3.65	.24	.24	.52	.33	.84	.09	.27	3.98		.54		3.29	6.25	.53	
C ₃ H ₈				.14	.01	.44	.01	.43	.04	.04	.09	.05	.13	.01	.03	1.44		.08					
C ₄ H ₈				.70	.07	3.92	.07	3.79	.19	.19	.41	.26	.66	.07	.28	4.13		.56		3.60	6.10	.59	
C ₄ H ₁₀				.12	.01	.58	.01	.56	.03	.03	.06	.04	.10	.01	.04	1.59		.10		.56	4.16	1.19	
C ₅ H ₁₀				.43	.04	2.80	.04	2.71	.12	.12	.26	.16	.41	.04	.20	2.95		.40		2.71	5.40	.50	
C ₆ H ₁₂				.14	.01	.84	.01	.81	.04	.04	.09	.05	.13	.01	.06	.88		.12		.81	5.50	.15	
OIL								(38.78)				.31	.78		2.77	40.86		5.54		(2.23)	38.78	6.50	5.97
WATER												2.48	6.30					4.46		(2.48)			
TOTAL		19.53	243.40		1218	160.44	9.83	155.12	26.77	46.36	100.00	39.99	100.00	9.78		99.99				49.75		7.86	
H ₂ +CO		18.34					6.81																
H ₂ /CO		1.70					5.08				2.75		5.09										
ULTIMATE YIELDS				WEIGHT BALANCE				EFFLUENT RATIOS				CONTRACTION: 50.1											
% CO Fed	#/hr	H ₂ /CO #/MCF	H ₂ /CO g/M3	Gal/hr	H ₂ /CO Gal/MCF	H ₂ /CO cc/M3	Wet Gas	#/hr	%	#/hr	H ₂ /H ₂ O	CO Conversion:	83.5										
C1+C2	6.19	.97	.13	2.20			Oil	160.44	155.10	30.50	1.70	H ₂ Conversion:	50.8										
C3+	53.83	50.73	6.66	116.00			Water	57.80	57.80	57.80	14.53	H ₂ +CO = 59.0											
C4+	49.41	46.65	6.21	106.70			Total	248.74	102.2	243.90													
Ult. Oil		49.75	6.72	113.64	7.86	1.06																	
CO ₂	23.45	70.16	9.48	160.31																			
H ₂ O		44.64	6.03	101.97																			

Yield Calculations assume "oil" is CH₂, and is found by difference on Carbon, and H₂O 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 x #/MCF. cc/M3 = 141.3 x gal/MCF.

**THE TEXAS COMPANY — MONTEBELLO LABORATORY
DATA CALCULATION and SUMMARY SHEET**

Synthesis Run Number 214 From 7/24/47 Hr. 1800 to 7/24/47 Hr. 0700

FRESH FEED								LIQUID YIELDS								CATALYST DATA					
	Orsat	Corr. Fac.	Cor. Orsat	M. S.	M. W.	Calc. M.W.	C. N.	Oil Tank #				Water Tank #				In Reactor at Start of Period					
CO ₂			2.0		44	.88	40.8	GAUGES, INCHES				Total				Fresh Catalyst Charged					
CO			34.9		28	8.78		Total	O/W	Oil	Gals.	Corr.	Total	Gauge	Gals.	Corr.	Total	Catalyst Recharged			
CH ₄			2.9		16	1.63		At End of Period					5.16				Catalyst Recharged				
H ₂			58.0		2	1.16		At Start of Period	6.76				7.6				Total				
N ₂			1.2		28	.24		Production	12.14				4.9	22.4%		9.9	Catalyst Taken Out				
Mol. Wt.								Samples									In Reactor at End of Period				
								Uncorrected Production					4.9			9.9	Reactor d-P, H ₂ O				
								G. P. H.					3.77			7.6	Pounds in Reactor				
								Temperature, °F					6.5			7.5	Density, lbs./cu. ft.				
								G.P.H. at 60°F					3.76			7.6	Bed Height, Feet				
								A.P.I. at 60°F					4.81			9.1					
								Pounds Per Hour					24.6			63.6					
FLOW CALCULATIONS								RUN CONDITIONS				DISTILLATIONS				CATALYST ANALYSIS					
	Coeff	Chart	Fp	Ft	F.m.w.	SCFH	%	Generator Press.	317	ASTM				WATER				Space Vel. SCFH/lb. cat.			
Oxygen						1750		O ₂ Preheat, °F	382	Prod.			Temp.	%	Inventory Figures						
Nat. Gas						2260		Gas Preheat, °F	770	A.P.I.			200	From d-P Meters							
Total						4010	43.9	Reactor Press.	249	I.B.P.			203	CATALYST ANALYSIS							
Fresh Feed						7350		Steam Back Press.	610	10%			208	Particle Size							
F. F. by C						6650		Temperatures, °F						Screen							
Avg. F. F.						7000		Heater Outlet	571					Sedimentation							
Wet Gas						2830		Catalyst #1	675					Frac.	M	%	M	%			
Contraction							5.96	#2	675					On 40	420+		80+				
Recycle						9750		#3	591					100	419-150		80-40				
Bleed						530		#4	584					150	149-105		40-20				
Total						10100		#5	532					200	104-74		20-10				
Total Feed						16750		Average	605					250	73-62		10-0				
Recycle/F.F.						145		Product Separator						325	61-44						
Inlet Vel.						110								<325	43-0						
Steam Flow																					
2000 → 200																					
200 → 200																					
WEIGHT BALANCE								PRODUCT INSPECTION				PHYSICAL TESTS				CATALYST ANALYSIS					
In	F. F. = SCFH × MW/379 =							236	Hempel Dist.				Chemicals				Loss.				
Out	Wet Gas							144	°F				Neut.				Product				
	Oil							24.6	%				A.P.I.				SUS @ °F				
	Water							63.6	Oil				Water				SFS @ °F				
	Loss								to 400				Hydrox.				Sp. Grav.				
	Total							232.2	400-550				% Fe				Specific Surface				
								98.5	550+				% Alc				m ² /gm				

MAKE GAS	FRESH FEED				WET GAS				RECYCLE	COMB. FEED	EFFLUENT	NET CHANGE ON REACTION											
	%	m/hr	#/hr	%	Measured	At Wt. Balance	m/hr	m/hr				%	m/hr	%	Carbon			Hydrogen		Oxygen	Ultimate Oil	Unsat.	
ORSAT					m/hr	#/hr	#/hr					m/hr	a/hr	%	a/hr	%	a/hr	#/hr	#/gal	gal/hr	%		
CO	34.9	6.77	18.956	8.26	6.2	17.36	.68	19.04	2.32	9.09	19.12	3.00	7.72	-6.09	-6.09	10.04							
H ₂	58.0	11.25	22.50	29.89	2.98	5.96	3.27	6.54	11.22	22.47	47.28	14.49	37.38	-7.98		-15.96							
CO ₂	2.0	.39	17.16	20.75	1.55	6.20	1.70	7.47	5.83	6.22	13.09	7.53	19.37	1.31	1.31	19.35							
N ₂	1.2	.23	6.44	.79	.06	1.68	.07	1.84	.22	.45	.95	.29	.75	.16									
CH ₄	3.9	.76	12.16	21.85	1.63	26.08	1.79	28.60	6.14	6.90	14.52	7.93	20.40	1.03	1.03	15.21	4.12						
C ₂ H ₄					1.69	.13	3.64	.14	3.99	.48	.48	1.01	.62	1.60	.14	.28	4.14	.56				48.42	
C ₂ H ₆					1.80	.13	3.90	.14	4.28	.51	.51	1.07	.65	1.67	.14	.28	4.14	.84					
C ₃ H ₆					2.19	.16	6.72	.18	7.37	.62	.62	1.30	.80	2.06	.18	.54	7.98	1.08			6.63	6.25	1.06
C ₃ H ₈					.73	.05	2.20	.05	2.41	.21	.21	.44	.26	.67	.05	.15	2.22	.40					
C ₄ H ₈					1.46	.11	6.16	.12	6.75	.41	.41	.86	.53	1.36	.12	.48	7.09	.96			6.41	6.10	1.05
C ₅ H ₁₀					.62	.05	3.50	.05	3.84	.17	.17	.36	.22	.57	.05	.25	3.69	.50			3.84	5.40	.71
C ₆ H ₁₂																							
OIL								(24.78)				.08	.21		1.77	26.14	3.54				24.78	6.50	3.81
WATER												2.97	6.35		3.96						(7.98)		
TOTAL					19.39	24.78		7.47	14.54	8.19	15.44	28.12	47.53	100.00	38.87	100.01	11.31				41.66	6.63	
H ₂ +CO					18.02			3.95															
H ₂ /CO					1.66			4.81															
ULTIMATE YIELDS								WEIGHT BALANCE				EFFLUENT RATIOS				CONTRACTION: 58.3							
	%	#/hr	H ₂ /CO		H ₂ /CO		H ₂ /CO		Wet Gas				H ₂ /H ₂ O				CO Conversion: 89.9						
	CO Fed	#/hr	#/MCF	g/M ³	Gal/hr	Gal/MCF	cc/M ³	Oil				CO ₂ /CO				H ₂ Conversion: 70.9							
C ₁ +C ₂	23.49	24.71	3.67	61.21				Water				(H ₂)/CO ₂				H ₂ +CO = 72.6							
C ₃ + C ₄ + Ult. Oil	47.12 36.92 41.66	45.15 35.37 6.10	6.61 5.18 6.10	111.78 87.59 103.15	6.63 9.77 137.06			Total				(H ₂)(CO ₂)(H ₂ O)(CO)											
CO ₂	19.35	57.62	8.44	142.72																			
H ₂ O	62.46	9.14	154.56																				

Yield Calculations assume "oil" is CH₂, and is found by difference on Carbon, and H₂O 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 CALCULATION and SUMMARY SHEET**

Synthesis Run Number 21C From 7/10/47 Hr. 0700 to 7/11/47 Hr. 0700

FRESH FEED								LIQUID YIELDS										CATALYST DATA					
	Orsat	Corr. Fac.	Cor. Orsat	M. S.	M. W.	Calc. M.W.	C. N.	Oil Tank #					Water Tank #					In Reactor at Start of Period					
CO ₂			1.8		44	179	384	GAUGES, INCHES					Gauge					284.5					
CO			24.0		28	254		Total	O/W	Oil	Gals.	Corr.	Total	Gals.	Corr.	Total	Fresh Catalyst Charged						
CH ₄			2.6		16	57		At End of Period						80.6	26.7		Catalyst Recharged						
H ₂			60.0		2	120		At Start of Period						85.6	6		Total						
N ₂			0.6		28	16		Production	16			2.2	72.6	5	20.4	113	Catalyst Taken Out						
Mol. Wt.						12.26		Samples					5		5	In Reactor at End of Period							
						1.54		Uncorrected Production					77.6		118	Reactor d-P, H ₂ O							
								G. P. H.					3.2		46.7	Pounds in Reactor							
								Temperature, °F					64		66	Density, lbs./cu. ft.							
								G.P.H. at 60°F					3.2		4.85	Bed Height, Feet							
								A.P.I. at 60°F					46.5		10.7								
								Pounds Per Hour					21.8		39.8								
FLOW CALCULATIONS								RUN CONDITIONS					DISTILLATIONS					CATALYST ANALYSIS					
	Coef	Chart	Fp	Ft	F.m.w.	SCFH	%	Generator Press.	312	ASTM					WATER					Space Vel. SCFH/lb. cat.			
Oxygen						1790		O ₂ Preheat, °F	517	Prod.				Temp.	%	Inventory Figures							
Nat. Gas						2240		Gas Preheat, °F	258	A.P.I.				200		From d-P Meters							
Total						4080	44.0	Reactor Press.	285	I.B.P.				203		CATALYST ANALYSIS							
Fresh Feed						6280		Steam Back Press.	450	10%				208		Particle Size							
F. F. by C						6970		Temperatures, °F		20						Screen							
Avg. F. F.						3600		Heater: Outlet	455	30						Sedimentation							
Wet Gas						483		Catalyst #1	630	40						Frac.	M	%	M	%			
Contraction						7700		#2	612	50						On 40	420+		80+				
Recycle						310		#3	540	60						100	419-150		80-40				
Bleed						18010		#4	517	70						150	149-105		40-20				
Total						16980		#5	497	80						200	104-74		20-10				
Recycle/F.F.						1.44		Average	559	90						250	73-62		10-0				
Inlet Vel.						1.03		Product Separator		E.P.						325	61-44						
Steam Flow						131.7 lb				Rec.						<325	43-0						
2.00 → 0.2						25.6				Loss.						Density, lbs./cu. ft.				Chem. Anal.			
2.00 → U.G. 19.1																Aerated				% Fe			
WEIGHT BALANCE								PRODUCT INSPECTION					PHYSICAL TESTS					CATALYST ANALYSIS					
In	F. F. = SCFH x MW/379 =							Hempel I ...	Chemicals	Oil	Water	Product					Aerated						
Out <td>Wet Gas</td> <td colspan="6">224</td> <td>°F</td> <td>%</td> <td>A.P.I.</td> <td></td> <td></td> <td colspan="5">Pour °F</td> <td colspan="4">Settled</td>	Wet Gas	224						°F	%	A.P.I.			Pour °F					Settled					
	Oil	168						to 400				SUS @ °F					% C						
	Water	21.8						400-550		Neut. #		SFS @ °F					% Oil						
	Loss	348						550+		Sop. #							Sp. Grav.						
	Total	2296								Hydrox							Specific Surface						
		102								% Fe							m ² /gm						
										% Alc													

FRESH FEED				WET GAS				RECYCLE	COMB. FEED	EFFLUENT	NET CHANGE ON REACTION											
	%	m/hr	#/hr	%	Measured	At Wt. Balance	m/hr	m/hr	%	m/hr	%	Carbon			Hydrogen			Oxygen	Ultimate Oil		Unsat.	
					m/hr	#/hr	m/hr					m/hr	a/hr	%	a/hr	%	a/hr	#/hr	#/gal	gal/hr	%	
CO																						
H ₂																						
CO ₂																						
N ₂																						
CH ₄																						
C ₂ H ₄																						
C ₂ H ₆																						
C ₃ H ₆																						
C ₃ H ₈																						
C ₄ H ₈																						
C ₄ H ₁₀																						
C ₅ H ₁₀																						
C ₆ H ₁₂																						
OIL																						
WATER																						
TOTAL																						
H ₂ +CO																						
H ₂ /CO																						
ULTIMATE YIELDS											WEIGHT BALANCE		EFFLUENT RATIOS		CONTRACTION:							
	%	CO Fed	#/hr	H ₂ / CO		H ₂ / CO		Wet Gas	#/hr	%	#/hr	H ₂ /H ₂ O	C ₀ Conversion:									
				#/MCF	g/M ³	Gal/hr	Gal/MCF	cc/M ³				C ₀ /C ₀	H ₂ Conversion:									
C ₁ +C ₂												(H ₂) (C ₀)	(H ₂) (C ₀)									
C ₃ +																						
C ₄ +																						
Ult. Oil																						
CO ₂																						
H ₂ O																						

Yield Calculations assume "oil" is CH₂, and is found by difference on Carbon, and H₂O 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 CALCULATION and SUMMARY SHEET**

Synthesis Run Number 216 From 7/12/47 Hr. 0700 to 7/13/47 Hr. 0700
SHUT DOWN FOR THREE (3) HOURS

FRESH FEED								LIQUID YIELDS										CATALYST DATA				
Orsat	Corr. Fac.	Cor. Orsat	M. S.	M. W.	Calc. M.W.	C. N.		Oil Tank #					Water Tank #					In Reactor at Start of Period				
CO ₂		1.8		44	1.79	39.6		GAUGES, INCHES										226				
CO		35.2		28	3.85			Total	O/W	Oil	Gals.	Corr.	Total	Gauge	Gals.	Corr.	Total	Gals.	Fresh Catalyst Charged			
CH ₄		2.6		16	4.2			At End of Period						85.2					Catalyst Recharged			
H ₂		59.1		2	1.18			At Start of Period						59.34					Total			
N ₂		1.3		28	1.36			Production						54			11.3		Catalyst Taken Out			
Mol. Wt.					12.60			Samples						5			5		In Reactor at End of Period			
					1.57			Uncorrected Production						59			11.8		Reactor d-P, H ₂ O			
								G. P. H.						2.8			5.6		Pounds in Reactor			
								Temperature, °F						68			70		Density, lbs./cu. ft.			
								G.P.H. at 60°F						2.8			5.6		Bed Height, Feet			
								A.P.I. at 60°F						49.2			10.7		Space Vel. SCFH/lb. cat.			
								Pounds Per Hour						15.4			46.5		Inventory Figures			
																			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			

	FRESH FEED			WET GAS				RECYCLE	COMB. FEED	EFFLUENT	NET CHANGE ON REACTION														
	%	m/hr	#/hr	Measured		At Wt. Balance					m/hr	m/hr	%	m/hr	%	Carbon			Hydrogen			Oxygen	Ultimate Oil	Unsat.	
				m/hr	#/hr	m/hr	#/hr									m/hr	a/hr	%	a/hr	%	a/hr				%
CO	33.8	6.34	177.52	9.25	1.83	23.24	1.89	24.92	2.58	8.72	17.07	2.47	8.58	-2.75	-5.45	14.04									
H ₂	58.4	10.96	21.92	45.56	4.11	8.22	4.70	8.80	12.74	23.70	53.73	12.14	42.59	6.56											
CO ₂	2.5	.47	22.28	16.71	1.07	74.20	1.41	79.67	5.23	5.70	12.20	7.24	17.41	1.34	1.24	21.14									
N ₂	3.1	.58	16.24	1.78	.16	4.48	.17	4.76	.50	1.08	3.31	.47	1.46	-1.41											
CH ₄	2.7	.41	6.56	16.36	1.48	23.68	1.58	25.28	4.57	4.78	10.66	6.15	15.21	1.17	1.17	18.45	4.08								
C ₂ H ₄				1.87	.17	4.76	.19	5.24	.57	.57	1.11	.70	1.13	.18	.56	5.68	.14							57.69	
C ₂ H ₆				1.26	.12	3.00	.13	3.90	.38	.28	.81	.51	1.26	.15	.26	4.10	.18								
C ₃ H ₆				2.26	.19	7.98	.20	8.40	.58	.58	1.24	.78	1.73	.20	.40	7.94	1.20							7.56	
C ₃ H ₈				.57	.05	2.20	.05	2.35	.16	.16	.24	.21	.52	.05	.15	3.27	.12							78.33	
C ₄ H ₈				1.30	.12	6.72	.13	7.28	.36	.36	.77	.49	1.21	.15	.52	8.20	1.04							6.92	
C ₄ H ₁₀				.22	.02	1.16	.02	1.24	.26	.26	.52	.20	.20	.08	1.26	.20								1.24	
C ₅ H ₁₀				.70	.06	4.20	.06	4.49	.20	.20	.43	.26	.44	.06	.20	4.73	.20							4.49	
C ₆ H ₁₂				.29	.03	2.52	.03	2.70	.08	.08	.17	.11	.27	.05	.18	2.84	.26							2.70	
OIL								(6.86)				.05	.12		.47	7.75	.78							6.86	
WATER												2.77	6.85				2.16							1.06	
TOTAL	18.76	242.92		9.02	16.712	9.65	178.80	27.46	46.72	99.99	40.43	99.98	9.11		100.00									29.77	
H ₂ +CO	17.30						5.29																		4.98
H ₂ /CO	1.73						4.94		2.66		4.94														

	ULTIMATE YIELDS				WEIGHT BALANCE		#/hr	%	#/hr	EFFLUENT RATIOS		CONTRACTION: 46.6	
	% CO Fed	#/hr	#/MCF	g/M3	Gal/hr	Gal/MCF				cc/M3	H ₂ /H ₂ O	CO ₂ /CO	CO Conversion: 85.9
C ₁ +C ₂	28.23	27.66	4.22	71.36			16.71		178.0	6.19	2.03		
C ₃ +	36.59	32.62	4.97	84.04			18.4		18.4				
C ₄ +	24.76	22.02	3.36	56.82			46.5		46.5				
Ult. Oil	29.77	4.54	76.77	4.98	.76	107.39	232.0	95.9	242.9	12.57			H ₂ +CO = 64.6
CO ₂	21.14	58.96	8.99	152.02									
H ₂ O	49.86	7.60	128.52										

Yield Calculations assume "oil" is CH₂, and is found by difference on Carbon, and H₂O 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 CALCULATION and SUMMARY SHEET

Synthesis Run Number 21F From 7/13/47 Hr. 0200 to 7/14/47 Hr. 0200

FRESH FEED								LIQUID YIELDS								CATALYST DATA					
Orsat	Corr. Fac.	Cor. Orsat	M. S.	M. W.	Calc. M.W.	C. N.		Oil Tank #	GAUGES, INCHES			Water Tank #			In Reactor at Start of Period						
CO ₂		2.7		44	118	29.9		Total	O/W	Oil	Gals.	Corr.	Total	Gauge	Gals.	Corr.	Total	Fresh Catalyst Charged			
CO		34.2		28	95.4			At End of Period						90.74	26.74			Catalyst Recharged			
CH ₄		3.0		16	1.8			At Start of Period	76.74									Total			
H ₂		59.0		2	1.18			Production	12.44					57.4	37.4	17	98.0	Catalyst Taken Out			
N ₂		1.1		28	1.28			Samples						5			5	In Reactor at End of Period			
Mol. Wt.					13.66			Uncorrected Production						8.9			103.0	Reactor d-P, H ₂ O			
					1.51			G. P. H.						3.8			4.3	Pounds in Reactor			
FLOW CALCULATIONS								RUN CONDITIONS								DISTILLATIONS					
	Coef	Chart	Fp	Ft	Fm.w.	SCFH	%	Generator Press.	31.2	ASTM			WATER			Inventory Figures					
Oxygen						1780		O ₂ Preheat, °F	52.9	Prod.		Temp.	%	From d-P Meters							
Nat. Gas						2240		Gas Preheat, °F	770	A.P.I.		200									
Total						4060	43.9	Reactor Press.	2.79	I.B.P.		203									
Fresh Feed						6850		Steam Back Press.	7.00	10%		208									
F. F. by C						6850		Temperatures, °F													
Avg. F. F.								Heater Outlet	4.7												
Wet Gas						3520		Catalyst #1	6.40												
Contraction							46.7	#2	6.30												
Recycle						10300		#3	3.35												
Bleed						584		#4	5.60												
Total						10638		#5	5.22												
Total Feed						17488		Average	5.29												
Recycle/F.F.						1.15		Product Separator													
Inlet Vel.						1.11															
Steam Flow						102.74															
						22.4															
WEIGHT BALANCE								PRODUCT INSPECTION								CATALYST ANALYSIS					
In	F. F. = SCFH x MW/379 =							22.8	Hempel Dist.				Chemicals				Particle Size				
Out	Wet Gas							16.5	°F % A.P.I.				Oil				Screen				
	Oil							11.4	to 400				Water				Sedimentation				
	Water							35.6	400-550				Neut. Sap.				On 40 420+				
	Loss								550+				Hydrox.				100 419-150				
	Total							218.0	75.5				% Fe				150 149-105				
													% C				200 104-74				
													% Oil				250 73-62				
													m ² /gm				325 61-44				
																	<325 43-0				
																	Density, lbs./cu. ft.				
																	Chem. Anal.				
																	Aerated				
																	Settled				
																	Compacted				
																	Sp. Grav.				

ORSAT	FRESH FEED				WET GAS				RECYCLE	COMB. FEED	EFFLUENT	NET CHANGE ON REACTION												
	MAKING GAS		FRESH FEED		Measured		At Wt. Balance					Carbon				Hydrogen				Oxygen		Ultimate Oil		Unsat.
	%	m/hr	#/hr	%	m/hr	#/hr	m/hr	#/hr				m/hr	a/hr	%	a/hr	%	a/hr	%	a/hr	#/hr	#/gal	gal/hr	%	
CO	34.2	6.27	175.56	12.41	1.15	32.20	1.25	34.91	3.53	9.80	20.95	4.78	11.72	-5.02	-5.02	19.94					-5.02			
H ₂	59.0	10.82	216.4	58.83	4.72	9.44	5.12	10.24	14.45	25.27	54.03	19.57	47.98	-5.70		-11.40								
CO ₂	2.7	.50	22.00	19.64	1.82	80.08	1.47	86.83	3.58	6.08	13.00	7.55	18.57	1.47	1.47	23.44					2.94			
N ₂	1.1	.20	5.60	1.62	.15	4.20	.16	4.55	.46	.66	1.41	.62	1.52	- .04										
CH ₄	3.0	.55	8.80	8.84	.82	13.12	.84	14.23	2.57	3.06	6.54	3.40	8.34	.34	.34	5.42	1.36							
C ₂ H ₄				1.49	.14	3.92	.15	4.25	.42	.42	.90	.67	1.64	.15	.36	4.78	.60					38.42		
C ₂ H ₆				1.06	.10	3.00	.11	3.25	.30	.30	.64	.41	1.01	.11	.23	3.57	.66							
C ₃ H ₆				1.68	.16	6.72	.17	7.29	.48	.48	1.03	.65	1.54	.17	.57	8.13	1.02					6.56		
C ₃ H ₈				.33	.03	1.32	.03	1.43	.09	.09	.19	.12	.29	.03	.09	1.44	.24							
C ₄ H ₈				1.06	.10	3.60	.11	6.07	.30	.30	.64	.41	1.01	.11	.44	7.02	.88					5.77		
C ₄ H ₁₀				.30	.03	1.74	.03	1.89	.09	.09	.19	.12	.29	.03	.12	1.91	.30					1.89		
C ₅ H ₁₀				.53	.05	3.50	.05	3.80	.15	.15	.32	.20	.44	.05	.25	3.44	.50					3.80		
C ₆ H ₁₂				.23	.02	1.68	.02	1.80	.07	.07	.15	.09	.22	.02	.12	1.91	.24					1.78		
OIL								(16.24)				.12	.29		1.16	18.50	2.32					(1.64)		
WATER												2.08	5.10			3.28						16.24		
TOTAL		18.34	233.60		9.29	166.48	10.06	180.52	28.43	46.77	99.99	40.74	100.00	9.28		99.99						36.04		
H ₂ +CO		17.09					6.37															3.91		
H ₂ /CO		1.73					4.10																	
ULTIMATE YIELDS											WEIGHT BALANCE			EFFLUENT RATIOS				CONTRACTION: 4.51						
% CO Fed		#/hr		H ₂ /CO #/MCF		g/M ³		Gal/hr		Gal/MCF		cc/M ³		Wet Gas		#/hr		% H ₂ /H ₂ O		C ₂ /C ₁		C ₃ /C ₁		
13.71		13.93		1.99		33.65								166.5		180.6		9.41		1.58		15.46		
C ₃ +		42.90		38.50		5.94		100.45						17.4		17.4								
C ₄ +		32.33		29.78		4.60		77.79						35.6		35.6								
Ult. Oil		36.04		5.56		94.02		5.91		.91		128.58												
CO ₂		23.44		64.83		10.00		169.10																
H ₂ O		37.44		5.78		97.74																		

Yield Calculations assume "oil" is CH₂, and is found by difference on Carbon, and H₂O 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 x #/MCF cc/M³ = 141.3 x gal/MCF.

THE TEXAS COMPANY — MONTEBELLO LABORATORY
DATA CALCULATION and SUMMARY SHEET

Synthesis Run Number 21X From 7/16/47 Hr. 0700 to 7/19/47 Hr. 0700

FRESH FEED								LIQUID YIELDS										CATALYST DATA			
	Orsat	Corr. Fac.	Cor. Orsat	M. S.	M. W.	Calc. M.W.	C. N.	Oil Tank #					Water Tank #					In Reactor at Start of Period		359.5	
CO ₂			2.2		44	1.97	27.7	GAUGES INCHES					Total					Fresh Catalyst Charged			
CO			34.5		28	2.65		Total	O/W	Oil	Gals.	Corr.	Total Gals.	Gauge	Gals.	Corr.	Total Gals.	Catalyst Recharged		207.0	
CH ₄			3.0		16	4.8		At End of Period	67.5					61.94				Total		286.5	
H ₂			59.2		2	1.18		At Start of Period	55.5									Catalyst Taken Out		202.0	
N ₂			1.1		28	.31		Production	12.0				52.8	29.34		1.28		In Reactor at End of Period		259.5	
Mol. Wt.						12.57		Samples					5			5		Reactor d-P, H ₂ O		24	
						1.57		Uncorrected Production					37.8			135.8		Pounds in Reactor		259.6	
								G. P. H.					2.41			5.6		Density, lbs./cu. ft.		67.7	
								Temperature, °F										Bed Height, Feet		2.7	
								G.P.H. at 60°F					2.40			5.6					
								A.P.I. at 60°F					48.6			10.8					
								Pounds Per Hour					15.7			46.6					
FLOW CALCULATIONS								RUN CONDITIONS					DISTILLATIONS					CATALYST ANALYSIS			
	Coeff	Chart	Fp	Ft	F.m.w.	SCFH	%	Generator Press.	313	ASTM					WATER		Particle Size				
Oxygen						1783		O ₂ Preheat, °F	480	Prod.	ASTM	Temp.	%	Inventory Figures		Screen		Sedimentation			
Nat. Gas						2328		Gas Preheat, °F	845	A.P.I.		200		From d-P Meters		28.7 <th>Frac.</th> <th>M</th> <th>%</th> <th>M</th> <th>%</th>	Frac.	M	%	M	%
Total						4111	42.4	Reactor Press.	248	I.B.P.		203					On 40	420+		80+	
Fresh Feed						7320		Steam Back Press.	674	10%		208					100	419-150		80-40	
F. F. by C						7040		Temperatures, °F									150	149-105		40-20	
Avg. F. F.						7640		Heater Outlet	467								200	104-74		20-10	
Wet Gas						7640		Catalyst #1	407								250	73-62		10-0	
Contraction							50.3	#2	402								325	61-44			
Recycle						9680		#3	405								<325	43-0			
Bleed						328		#4	405								Density, lbs./cu. ft.	Chem. Anal.			
Total						10008		#5	400								Aerated	% Fe			
Total Feed						11048		Average	400								Settled	% C			
Recycle/F.F.						14.3		Product Separator									Compacted	% Oil			
Inlet Vel.						1.07											Sp. Grav.	Specific Surface			
Steam Flow						122.2												m ² /gm			
1600 → 60						248															
WEIGHT BALANCE								PRODUCT INSPECTION					PHYSICAL TESTS					CATALYST ANALYSIS			
In	F. F. = SCFH x MW/379 =					243		Hempel Dist.		Chemicals	Loss.	PHYSICAL TESTS					Particle Size				
Out	Wet Gas					151.6		°F	%	A.P.I.	Oil	Water	Product	Pour °F	SUS @ °F	SFS @ °F	Screen		Sedimentation		
	Oil					15.7		to 400									On 40	420+		80+	
	Water					46.6		400-550									100	419-150		80-40	
	Loss							550+									150	149-105		40-20	
	Total					243.7	100.3										200	104-74		20-10	
1600 → 60							16.7										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			

	FRESH FEED				WET GAS				RECYCLE	COMB. FEED	EFFLUENT	NET CHANGE ON REACTION															
	%	m/hr	#/hr	%	Measured	At Wt. Balance	Measured	At Wt. Balance				m/hr	m/hr	%	m/hr	%	Carbon			Hydrogen			Oxygen			Ultimate Oil	
					m/hr	#/hr	m/hr	#/hr							m/hr	a/hr	%	a/hr	%	a/hr	%	#/hr	#/gal	gal/hr	%		
CO	30.4	5.87	164.36	16.41	1.58	44.24	1.55	42.40	4.32	10.20	22.21	5.88	15.42	-4.32	-4.32	26.41											
H ₂	62.5	12.07	241.4	50.87	4.88	9.16	4.78	9.56	13.43	25.50	55.79	16.21	41.76	-7.29													
CO ₂	1.8	.35	15.40	15.15	1.45	63.80	1.42	62.48	4.00	4.35	9.52	5.42	14.21	1.07	1.07	14.23											
N ₂	1.3	.25	7.00	1.43	.14	2.42	.14	2.24	.38	.63	1.38	.52	1.36	-.11													
CH ₄	4.0	.77	12.32	9.66	.93	14.88	.91	14.56	2.55	2.32	7.26	2.46	9.07	.14	.14	2.39	.56										
C ₂ H ₄				1.43	.14	2.42	.14	2.24	.38	.63	1.38	.52	1.36														
C ₂ H ₆				.80	.08	2.40	.08	2.35	.21	.21	4.6	.29	.76	.08	.08	1.6	2.73	1.48									
C ₃ H ₆				1.72	.17	7.14	.17	7.00	1.45	.45	9.8	.62	1.63	.17	.51	4.67	1.62										
C ₃ H ₈				.46	.04	1.76	.04	1.72	.12	.12	2.6	.16	1.42	.04	.12	2.04	.22										
C ₄ H ₈				1.43	.14	7.84	.14	7.68	.38	.38	8.3	.52	1.36	.14	.56	9.54	1.12										
C ₄ H ₁₀																											
C ₅ H ₁₀				.63	.06	4.20	.06	4.12	.17	.17	3.7	.23	.60	.06	.30	5.11	.60										
C ₆ H ₁₂																											
OIL								(16.52)				.12	.31		1.18	20.10	2.36										
WATER												2.18	5.72				7.56										
TOTAL	19.21	223.2		9.60	163.9	9.42	160.55	26.40	45.71	99.99	38.13	94.8	9.88		100.01												
H ₂ +CO	17.94						6.33																				
H ₂ /CO	2.06						3.08					2.50	3.10														
ULTIMATE YIELDS								WEIGHT BALANCE				EFFLUENT RATIOS		CONTRACTION: 57.2													
	% CO Fed	#/hr	H ₂ /CO #/MCF	g/M ³	Gal/hr	H ₂ /CO Gal/MCF	cc/M ³	Wet Gas	#/hr	%	#/hr	H ₂ /H ₂ O	C ₀ Conversion: 73.6														
C ₁ +C ₂	9.89	8.56	1.26	21.31				163.9			160.9	8.35	H ₂ Conversion: 60.4														
C ₃ +	45.48	37.46	5.57	93.17				15.7			15.7	.92															
C ₄ +	24.75	28.56	4.20	71.02				46.6			46.6	(H ₂)(CO ₂)(H ₂ O)(CO)	42+10=60.1														
Ult. Oil		34.24	5.04	85.23	5.57	.81	114.45																				
CO ₂	18.23	47.08	6.92	117.02																							
H ₂ O		39.24	5.77	97.57																							

Yield Calculations assume "oil" is CH₂, and is found by difference on Carbon, and H₂O 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 x #/MCF. cc/M³ = 141.3 x gal/MCF.

**THE TEXAS COMPANY — MONTEBELLO LABORATORY
DATA CALCULATION and SUMMARY SHEET**

Synthesis Run Number 211 From 7/19/47 Hr. 0700 to 7/20/47 Hr. 0700

FRESH FEED								LIQUID YIELDS										CATALYST DATA			
Orsat	Corr. Fac.	Cor. Orsat	M. S.	M. W.	Calc. M.W.	C. N.		OIL TANK #					WATER TANK #					In Reactor at Start of Period			
CO ₂		2.1		44	.95	99.7		GAUGES, INCHES								359.5					
CO		34.6		28	9.68			Total	O/W	Oil	Gals.	Corr.	Total Gals.	Gauge	Gals.	Corr.	Total Gals.	Fresh Catalyst Charged	99.0		
CH ₄		3.0		16	.48			At End of Period						91.74	2.3			Catalyst Recharged			
H ₂		59.0		2	1.18			At Start of Period						80.74	4			Total	458.5		
N ₂		1.3		28	.36			Production						38.5	10	19	12.75	Catalyst Taken Out	107.0		
Mol. Wt.					12.63			Samples						5				In Reactor at End of Period	357.5		
					1.52			Uncorrected Production						43.5			13.25	Reactor d-P, H ₂ O	1.5		
FLOW CALCULATIONS								RUN CONDITIONS										DISTILLATIONS			
Coef	Chart	Fp	Ft	F m.w.	SCFH	%		Generator Press.	313	ASTM			WATER		Space Vel. SCFH/lb. cat.						
Oxygen					1795			O ₂ Preheat, °F	523	Prod.		Temp.	%	Inventory Figures							
Nat. Gas					2320			Gas Preheat, °F	829	A.P.I.		200	From d-P Meters				445				
Total					4115	436		Reactor Press.	299	I.B.P.		203	CATALYST ANALYSIS								
Fresh Feed					7550			Steam Back Press.	707	10%		208	Particle Size								
F. F. by C					7020			Temperatures, °F	20				Screen								
Avg. F. F.					4170			Heater Outlet	494	30			Sedimentation								
Wet Gas						40.7		Catalyst #1	673	40			Frac.	M	%	M	%				
Recycle					10130			#2	651	50			On 40	420+		80+					
Bleed					344			#3	575	60			100	419-150		80-40					
Total					10414			#4	588	70			150	149-105		40-20					
Total Feed					17494			#5	534	80			200	104-74		20-10					
Recycle/F.F.					1.47			Average	604	90			250	73-62		10-0					
Inlet Vel.					1.14			Product Separator		E.P.			325	61-44							
Steam Flow					21.8	46				Res.			<325	43-0							
7600 → 7002					23.4					Loss.			Density, lbs./cu. ft.								
100 → 185								PRODUCT INSPECTION				PHYSICAL TESTS									
WEIGHT BALANCE								Hempel Dist.				Chemicals				Loss.					
In	F. F. = SCFH x MW/379 =				252			°F	%	A.P.I.	Oil	Water	Product	Pour °F	SUS @ °F	SFS @ °F	Sp. Grav.	Specific Surface			
Out	Wet Gas				203			to 400			Neut. #							Chem. Anal.			
	Oil				11.9			400-550			Sop. #							% Fe			
	Water				45.7			550+			Hydrox. #							% C			
	Loss										% Fe							% Oil			
	Total				200.6	103.3					% Alc							m ² /gm			
7600 → 7002																					
100 → 185																					

	FRESH FEED				WET GAS				RECYCLE	COMB. FEED	EFFLUENT	NET CHANGE ON REACTION													
	%	m/hr	#/hr	%	Measured		At Wt. Balance					m/hr	m/hr	%	m/hr	%	Carbon		Hydrogen		Oxygen		Ultimate Oil		Unsat.
					m/hr	#/hr	m/hr	#/hr									m/hr	a/hr	%	a/hr	%	a/hr	#/hr	#/gal	
CO	32.9	6.55	182.40	11.47	1.26	352.8	1.76	49.28	3.17	9.72	20.84	4.93	11.18	-4.19	-4.19	26.87									
H ₂	57.3	11.41	22.82	62.25	6.85	12.70	9.59	19.18	17.21	28.62	61.36	26.80	60.19	-1.82		-3.64									
CO ₂	2.9	.58	25.52	12.75	1.40	61.60	1.96	56.24	3.52	4.10	9.79	5.48	12.43	1.38	1.38	21.07							3.76		
N ₂	4.8	.96	26.88																						
CH ₄	2.2	.44	7.04	8.71	.86	15.36	1.24	21.44	2.41	2.85	6.11	3.25	9.57	.90	.90	13.74	3.60								
C ₂ H ₄				1.14	.13	3.64	.18	5.04	.32	.32	.69	.50	1.13	.18	.36	5.50	.72						66.67		
C ₂ H ₆				.57	.06	1.80	.08	2.40	.16	.16	.34	.24	.54	.08	.16	2.44	.48								
C ₃ H ₆				1.21	.13	5.46	.18	7.56	.33	.33	.71	.51	1.16	.18	.54	8.24	1.08						6.80 6.25 1.09 93.21		
C ₃ H ₈				.21	.02	.88	.03	1.32	.06	.06	.13	.09	.20	.03	.09	1.37	.24								
C ₄ H ₈				1.14	.13	7.28	.18	10.08	.32	.32	.69	.50	1.13	.18	.72	10.99	1.44						9.58 6.10 1.57		
C ₄ H ₁₀																									
C ₅ H ₁₀				.57	.06	4.20	.08	5.60	.16	.16	.34	.24	.54	.08	.40	6.11	.80						5.60 5.40 1.04		
C ₆ H ₁₂																									
OIL								(3.36)				1.02	2.34		.24	3.66	.48						3.36 6.50 .52		
WATER																							1.03		
TOTAL	19.93	265.7		11.00	149.2	15.38	208.14	27.66	46.64	100.00	44.09	99.44	3.60		99.99								25.34 4.22		
H ₂ +CO	17.96						11.35																		
H ₂ /CO	1.74						5.45				2.94	5.44													
ULTIMATE YIELDS												WEIGHT BALANCE		#/hr		%		#/hr		EFFLUENT RATIOS		CONTRACTION: 18.1			
% CO Fed		#/hr		H ₂ /CO		g/M3		Gal/hr		Gal/MCF		cc/M3		Wet Gas		149.2		208.1		H ₂ /H ₂ O		26.02		C ₀ Conversion: 73.1	
C1+C2		21.68 21.84		3.21 54.28										Oil		11.9		11.9		CO ₂ /CO		1.11		H ₂ Conversion: 15.9	
C3+		30.37 27.92		4.10 69.33										Water		45.7		45.7		(H ₂)(CO ₂)/(H ₂)(CO)		28.80		H ₂ +CO = 33.2	
C4+		20.76 19.04		2.80 47.35										Total		206.8		77.7		265.7					
Ult. Oil		25.34 3.72		62.91 4.22		.62 87.61																			
CO ₂		21.07 60.72		9.92 150.84																					
H ₂ O		18.54 2.72		46.00																					

Yield Calculations assume "oil" is CH₂, and is found by difference on Carbon, and H₂O 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 x #/MCF. cc/M3 = 141.3 x gal/MCF.

THE TEXAS COMPANY — MONTEBELLO LABORATORY

DATA SUMMARY SHEET

Synthesis Run Number 22 A From 8-6-47 Hr. 1000 to 8-7-47 Hr. 0700

FLOWS		RUN CONDITIONS				DISTILLATIONS				CATALYST DATA		CATALYST ANALYSIS						
	SCFH	%	Generator Press.	506	A S T M				Hempel Dist.		In Reactor at Start of Period	255.0	Particle Size					
Oxygen	1760		O ₂ Preheat, °F	505	Prod.	Rev	Gasoline		°F	%	A.P.I.	Fresh Catalyst Charged		Screen		Sedimentation		
Nat. Gas	2220		Gas Preheat, °F	755	A.P.I.	48.0			to 400			Catalyst Recharged		Frac.	M	%	M	%
Total	3980	44.3	Reactor Press.	300	I.B.P.	121			400-550			Total	255.0	On 40	420+	3.6	80+	82.0
Fresh Feed	6280		Steam Back Press.	900	5%				550+			Catalyst Taken Out		100	419-150	19.2	80-40	21.0
F.F. by C	6600		Temperatures, °F	10%	162							In Reactor at End of Period	255.0	150	149-105	24.4	40-20	15.0
Avg. F.F.	6440		Heater Outlet	490	20	202								200	104-74	18.6	20-10	2.0
Wet Gas	3480		Catalyst #1	655	30	233								250	73-62	5.0	10-0	
Contraction		45.9	#2	645	40	264								325	61-44	10.8		
Recycle	9700		#3	625	50	296			200			Reactor d-P. H ₂ O		<325	43-0	18.4		
Bleed	336		#4	595	60	334			203			Pounds in Reactor	208.0					
			#5	565	70	375			208			Density, lbs./cu. ft.	98.0					
Total	10036		Average	617	80	470						Bed Height, Feet	2.8					
Total Feed	16636		Product Separator	90	90	620												
Recycle/F.F.	1.52			95														
Inlet Vel.	1.09			E.P.	650							Space Vel. SCFH/lb. cat.						
Steam Flow	80#/hr			Rec.	93.0							Inventory Figures	25.2					
				Res.								From d-P Meters	31.0					
				Loss														

GENERATOR ELEMENTAL BALANCE

NATURAL GAS		PRODUCT INSPECTION						IN					OUT					
%		Oil	Water	Product	Pour °F	SUS @ °F		Mol %	SCFH m/hr	C	H	O		Mol %	SCFH m/hr	C	H	O
CO ₂	1.01	Neut. No. 43.3	48.5	011	-45			O ₂	146.61	4.644		9.268	CO ₂	2.6	4.40	4.40		.880
CH ₄	85.71	Sop. No. 52.5	49.2					CO ₂	2.60	.059	.059	.118	CO	34.9	5.905	5.905		5.905
C ₂ H ₆	9.58	Hydrox. No. 61.0						CH ₄	80.34	5.0215	.021	20.084	CH ₄	3.0	.508	.508		2.032
C ₃ H ₈	3.70	Bromine No. 58.5						C ₂ H ₆	16.83	.5611	.122	3.366	H ₂	58.0	9.814			19.628
C ₄ H ₁₀		% Fe						C ₃ H ₈	9.55	.217	.651	1.736	N ₂	1.5	.254			
N ₂		% Alc						C ₄ H ₁₀					H ₂ O					3.5262.621
O ₂								N ₂					Total					
								Total	257.93	10.502	6.853	25.186	9.406		16.921	6.853	25.18	9.406

Less H₂O 210.75

	FRESH FEED		WET GAS				RECYCLE	COMB. FEED	EFFLUENT		NET CHANGE ON REACTION						Ultimate Oil	Unsat.		
	%	m/hr	#/hr	%	Measured m/hr	At Wt. Balance #/hr			m/hr	m/hr	%	m/hr	%	Carbon		Hydrogen			Oxygen	
CO	34.9	5.93	166.04	17.66	1.62	45.36	1.82	50.91	4.56	10.49	24.51	6.38	16.35	- 4.11	- 4.11	30.69			- 4.11	
H ₂	58.0	9.85	19.70	56.37	5.17	10.34	5.80	11.60	14.55	24.40	57.02	20.35	52.14	- 4.05						- 8.10
CO ₂	2.6	.44	19.36	10.45	.96	42.24	1.08	47.41	2.70	3.14	7.34	3.78	9.68	.64	.64	10.79				1.28
N ₂	1.5	.25	7.00	1.21	.11	3.08	.12	3.46	.31	.56	1.31	.83	1.10	- .13						
CH ₄	3.0	.51	8.16	8.22	.75	12.00	.84	13.47	2.12	2.63	6.15	2.96	7.58	.33	.33	5.56				1.32
C ₂ H ₄				.92	.08	2.24	.09	2.51	.24	.24	.56	.33	.85	.09	.18	3.04				.36
C ₂ H ₆				.63	.06	1.80	.07	2.02	.16	.16	.37	.23	.59	.07	.14	2.36				.42
C ₃ H ₆				1.11	.10	4.20	.11	4.71	.29	.29	.68	.40	1.02	.11	.33	5.56				.66
C ₃ H ₈				.39	.04	1.76	.04	1.98	.10	.10	.23	.14	.36	.04	.12	2.02				.32
C ₄ H ₈				2.56	.24	13.44	.27	15.08	.66	.66	1.54	.93	2.38	.27	1.08	18.21				2.16
C ₄ H ₁₀				-	-	-	-	-	-	-	-	-	-	-	-	-				-
C ₅ H ₁₀				.48	.04	2.80	.04	3.14	.12	.12	.28	.16	.41	.04	.20	3.37				.40
C ₆ H ₁₂				-	-	-	-	-	-	-	-	-	-	-	-	-				-
OIL								(15.26)				.11	.28		1.09	18.38				2.18
WATER												2.83	7.25							2.83
TOTAL		16.99	220.26		9.18	139.26	10.28	156.29	25.82	42.79	99.99	39.03	99.99	6.70		99.98				36.97
H ₂ +CO		15.78			6.79		7.62													
H ₂ /CO		1.66			3.19		3.19													

ULTIMATE YIELDS				WEIGHT BALANCE			EFFLUENT RATIOS		CONTRACTION: 39.4	
%	#/hr	H ₂ /C ₀ #/MCF	g/M ³	Wet Gas	#/hr	%	#/hr	H ₂ /H ₂ O	7.19	C ₀ Conversion: 69.3
C ₁ +C ₂	10.96	9.84	1.65	27.90	139.3		156.1	C ₀ /C ₀	0.59	H ₂ Conversion: 41.1
C ₃ +	47.54	40.17	6.72	113.64	Oil		13.4	(H ₂)/C ₀	4.26	H ₂ + C ₀ = 51.7
C ₄ +	39.96	33.48	5.60	94.70	Water		50.8	(H ₂)/C ₀		
Ult. Oil	36.97	6.18	104.50	5.96	Total	203.5	92.3	(H ₂)/C ₀		
CO ₂	10.79	28.05	4.69	79.31						
H ₂ O	50.94	8.52	144.07							

Yield Calculations assume "oil" is CH₂, and is found by difference on Carbon, and H₂O 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 22 B From 8/7/47 Hr. 0700 to 8/8/47 Hr. 0700

FLOWS		RUN CONDITIONS			DISTILLATIONS			CATALYST DATA			CATALYST ANALYSIS							
SCFH	%	Generator Press.			A S T M			Hempel Dist.			Particle Size							
Oxygen	1740	O ₂ Preheat, °F	309	440	Prod.	6000			°F	%	A.P.I.	Fresh Catalyst Charged	255	Screen		Sedimentation		
Nat. Gas	2000	Gas Preheat, °F	790	790	A.P.I.	444			to 400	64.3	55.1	Catalyst Recharged		Frac.	M	%	M	%
Total	3740	Reactor Press.	295	295	I.B.P.	122			400-550	21.3	36.9	Total	255	On 40	420+	28.6	80+	70.0
Fresh Feed	6500	Steam Back Press.	900	900	5%				550+	14.4		Catalyst Taken Out	1.5	100	419-150	28.6	80-40	23.0
F.F. by C	6740	Temperatures, °F			10%	154						In Reactor at End of Period	254.5	150	149-105	25.4	40-20	6.0
Avg. F.F.	6620	Heater Outlet	434	179	20	179								200	104-74	23.2	20-10	1.0
Wet Gas	3500	Catalyst #1	680	30	218				WATER					250	73-62	3.8	10-0	—
Contraction	46.2	#2	650	40	228				Temp.	%		Reactor d-P, H ₂ O	40.0	325	61-44	13.6		
Recycle	10000	#3	645	50	248				200			Pounds in Reactor	165.0	<325	43-0	7.9		
Bleed	340	#4	620	60	268				203			Density, lbs./cu. ft.	84.0	Density, lbs./cu. ft.			Chem. Anal.	
Total	10340	#5	630	70	290				208			Bed Height, Feet	3.1	Aerated			% Fe	
Total Feed	17060	Average	645	80	318									Settled			% C	
Recycle/F.F.	1.49	Product Separator		90	348							Space Vel. SCFH/lb. cat.		Sp. Grav.	4.7		Specific Surface	
Inlet Vel.	1.07 ft/sec			95	368							Inventory Figures	26.0				m ² /gm	
Steam Flow	78 ft/hr			Rec.	98.5							From d-P Meters	40.1					
				Res.	0.6													
				Loss.	0.9													

NATURAL GAS										PRODUCT INSPECTION										GENERATOR ELEMENTAL BALANCE									
		Oil		Water		Product		Pour °F		SUS @ °F		IN		OUT		IN		OUT		IN		OUT							
%	Neut. No.	%	Oil	%	Water	%	Product	%	Pour °F	%	SUS @ °F	SCFH m/hr	Mal %	SCFH m/hr	Mal %	SCFH m/hr	Mal %	SCFH m/hr	Mal %	SCFH m/hr	Mal %	SCFH m/hr	Mal %						
CO ₂	1.30	370										O ₂	146.91	4.591	9.182	CO ₂	2.4	4.49	4.49	1.828									
CH ₄	85.34	35.9										CO ₂	3.30	.075	.075	CO	34.7	6.061	6.061	6.061									
C ₂ H ₆	9.23	4.70										CH ₄	79.26	4.954	4.954	19.816	CH ₄	2.2	3.84	3.84	1.576								
C ₃ H ₈	4.13	2.11										C ₂ H ₆	16.08	.536	1.072	3.216	H ₂	59.2	10.341	20.682									
C ₄ H ₁₀												C ₃ H ₈	10.56	.240	.720	1.920	N ₂	1.5	.262										
N ₂												C ₄ H ₁₀					H ₂ O				2.734	2.633							
O ₂												N ₂					Total												
												Total	256.11	10.396	6.621	24.962	9.332												

4.95 4.2 8.12, 3.2

	FRESH FEED		WET GAS				RECYCLE	COMB. FEED	EFFLUENT	NET CHANGE ON REACTION														
	%	m/hr	Measured	At Wt. Balance	Measured	At Wt. Balance				Carbon	Hydrogen	Oxygen	Ultimate Oil	Unsat.										
	%	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	34.7	6040	16268	1609	1486	4161	2486	4161	4.390	10.450	23.34	5.876	14.93	-4.574	-4.574	24.52								
H ₂	59.2	10339	2067	53.89	4977	985	4977	985	14.702	25.041	55.83	19.679	50.00	-5.362	-10.724									
CO ₂	2.4	419	1844	1464	1352	5849	1352	5849	3.994	4.413	8.85	5.746	12.83	.943	.943	15.56							1.886	
N ₂	1.5	262	734	1.5	106	297	106	297	314	576	1.30	420	1.07	.156										
CH ₄	2.2	384	614	8.88	820	1312	820	1312	2.423	2.807	6.28	3.243	8.24	.436	.436	7.19	1.744							
C ₂ H ₆				1.33	123	344	123	344	.363	.363	.80	1.486	1.23	.123	.246	4.06	4.92							6.29
C ₃ H ₈				.63	588	1.74	.63	1.74	.172	.172	.38	.230	.58	.058	.116	1.91	3.48							
C ₄ H ₁₀				1.27	117	4.91	1.17	4.91	.346	.346	.78	.463	1.18	.117	.357	5.79	7.02							4.42
C ₃ H ₈				.33	280	1.32	.33	1.32	.090	.090	.20	.120	.30	.030	.150	2.48	2.40							
C ₄ H ₁₀				.82	876	4.26	.82	4.26	.224	.224	.49	.300	.76	.076	.304	5.02	6.08							4.05
C ₄ H ₁₀				.21	189	1.10	.21	1.10	.057	.057	.13	.076	.19	.019	.076	1.25	1.90							1.10
C ₅ H ₁₂				.47	402	3.01	.47	3.01	.128	.128	.29	.171	.43	.043	.215	3.55	4.30							3.01
C ₆ H ₁₄				.27	225	2.10	.27	2.10	.074	.074	.16	.089	.23	.025	.150	2.47	3.00							2.10
OIL									22.22			1.57	140	1.587	26.19	3.174								22.22
WATER												2.688	6.83		2.496									12.668
TOTAL		17.467	222.27		9.235	149.02			27.282	44.744		39.356		-8.222										36.90
H ₂ +CO		16.399																						5.96
H ₂ /CO		76.5	1.50						3.34			2.40		3.35										

ULTIMATE YIELDS				WEIGHT BALANCE				EFFLUENT RATIOS		CONTRACTION: 4.207	
% CO Fed	#/hr	H ₂ /CO #/MCF	g/M3	Gal/hr	H ₂ /CO Gal/MCF	cc/M3	Wet Gas	H ₂ /H ₂ O	CO ₂ /CO	CO Conversion:	H ₂ Conversion:
C1+C2	13.16	13.16	1.956	33.08			149.02	7.221	0.910	75.48	51.86
C3+	44.76	3892	6.262	105.19			23.2		6.66		
C4+	38.49	32.69	5.260	88.95			58.0				
Ult. Oil		36.90	5.887	100.4	5.96	9.959	222.22				
CO ₂	15.56	41.49	6.676	113.9			100				
H ₂ O		48.38	7.784	131.6			222.27				

Yield Calculations assume "oil" is CH₂, and is found by difference on Carbon, and H₂O 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 x #/MCF. cc/M3 = 141.3 x gal/MCF.

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THE TEXAS COMPANY — MONTEBELLO LABORATORY

DATA SUMMARY SHEET

Synthesis Run Number 22C From 8/8/47 Hr. 0700 to 8/9/47 Hr. 0700

FLOWS		RUN CONDITIONS		DISTILLATIONS				CATALYST DATA		CATALYST ANALYSIS									
	SCFH	%	Generator Press.	304	A S T M				Hempel Dist.		Particle Size								
Oxygen	1735		O ₂ Preheat, °F	400	Prod.	6450			°F	%	A.P.I.	Fresh Catalyst Charged		256.5	Screen :		Sedimentation		
Nat. Gas	2230		Gas Preheat, °F	783	A.P.I.	447			to 400	65.6	57.6	Catalyst Recharged		117.5	Frac.	M	%	M	%
Total	3965	43.7	Reactor Press.	295	I.B.P.	122			400-550	15.6	33.9	Total		432.0	On 40	420+	2.8	80+	61.0
Fresh Feed	6645		Steam Back Press.	838	5%				550+	18.8		Catalyst Taken Out		132.5	100	419-150	19.3	80-40	22.0
F. F. by C	6530		Temperatures, °F		10%	164						In Reactor at End of Period		301.5	150	149-105	22.7	40-20	14.0
Avg. F.F.	6587		Heater Outlet	492	20	174									200	104-74	20.6	20-10	3.0
Wet Gas	7400		Catalyst #1	703	30	188			WATER										
Contraction		48.4	#2	702	40	234			Temp.	%	Reactor d-P, H ₂ O		18.0	250	73-62	44.4	10-0	—	
Recycle	10300		#3	661	50	258			200		Pounds in Reactor		256.0	325	61-44	11.5			
Bleed	388		#4	614	60	276			203		Density, lbs./cu. ft.		90.0	<325	43-0	18.7			
Total	10658		#5	590	70	296			208		Bed Height, Feet		6.6	Density, lbs./cu. ft.		Chem. Anal.			
Total Feed	17245		Average	654	80	322								Aerated		% Fe			
Recycle/F.F.	1.57		Product Separator		90	378								Settled		% C			
Inlet Vel.	110 f/Sec				95	386					Space Vel. SCFH/lb. cat.			Compacted		% Oil			
Steam Flow	110.30 m/hr				E.P.	406					Inventory Figures		21.8	Sp. Grav.		4.5	Specific Surface		
					Rec.	98.0					From d-P Meters		25.8			m ² /gm			
					Res.	0.8													
					Loss.	1.2													

GENERATOR ELEMENTAL BALANCE

NATURAL GAS		PRODUCT INSPECTION						IN					OUT				
%		Oil	Water	Product	Pour °F	SUS @ °F	#/hr	Mol %	SCFH	C	H	O	Mol %	SCFH	C	H	O
CO ₂	1.15	Neur. No.	44.0				O ₂	146.50	4.578			9.156	CO ₂	2.6	.452	.452	.904
CH ₄	85.55	Sp. No.	32.11				CO ₂	2.99	.068	.068		.136	CO	349	6.060	6.060	6.060
C ₂ H ₆	9.06	Hydrax. No.	36.0				CH ₄	80.34	5.034	5.034	20.136		CH ₄	3.5	.608	.608	2.432
C ₃ H ₈	4.24	Bromine No.	29.14				C ₂ H ₆	15.99	.533	1.066	3.198		H ₂	58.3	10.132		20.264
C ₄ H ₁₀		% Fe					C ₃ H ₈	10.96	.249	.747	1.992		N ₂	0.7	.122		
N ₂		% Alc					C ₄ H ₁₀						H ₂ O				2.630
O ₂							Total	266.98	10.462	6.918	25.326	9.292	Total	17.380	7.126	25.326	9.292

Loss 420 215.18

FRESH FEED		WET GAS				RECYCLE	COMB. FEED	EFFLUENT		NET CHANGE ON REACTION									
%	m/hr	#/hr	%	Measured	At Wt. Balance	m/hr	m/hr	%	m/hr	%	Carbon			Hydrogen		Oxygen	Ultimate Oil	Unsat.	
				m/hr	#/hr	m/hr	m/hr	%	m/hr	%	m/hr	a/hr	%	a/hr	%	a/hr	#/gal	gal/hr	%
CO	249	6.866	12.24	1.197	32.53	1.053	29.48	3.757	-9.82	21.57	4.804	12.10	-5.013	-5.013	12.36				
H ₂	58.3	10.132	20.26	5.871	4.841	9.68	4.257	8.57	15.177	25.31	55.43	19.432	48.96	-5.875	-11.750				
CO ₂	2.6	.452	1.99	15.78	1.416	62.30	1.245	54.79	4.437	4.89	10.71	5.682	14.31	.793	.793	12.07			1.586
N ₂	0.7	.122	3.42	.89	.079	2.21	.069	1.94	.247	.37	.81	.316	.80	-.053					
CH ₄	3.5	.608	9.73	10.03	.900	14.40	.792	12.66	2.821	3.43	7.51	3.613	9.10	.184	.184	3.02	.716		
C ₂ H ₆				1.57	.163	4.00	.126	3.87	.447	.45	.99	.573	1.44	.126	.252	4.15	.504		
C ₃ H ₈				.71	.061	1.92	.056	1.69	.200	.20	.44	.256	.44	.056	.112	1.85	.336		
C ₄ H ₁₀																			6.12
C ₂ H ₄																			
C ₃ H ₆																			
C ₃ H ₈																			
C ₄ H ₈																			
C ₄ H ₁₀																			
C ₅ H ₁₀																			
C ₆ H ₁₂																			
OIL							36.36				.260	.66	2.577	42.81	5.194		36.36	6.5	5.59
WATER											3.427	8.63			2.748				
TOTAL	17380	205.25		8.971	145.26			26.121	45.801		39.694	9.491							
H ₂ +CO	14.188																		
H ₂ /CO	1.67					4.06		2.58			4.05								

ULTIMATE YIELDS				WEIGHT BALANCE		EFFLUENT RATIOS		CONTRACTION: 54.61	
%	#/hr	#/MCF	g/M ³	#/hr	%	#/hr	%	H ₂ /M ₂ O	CO Conversion: 82.64
C1+C2	9.03	8.13	1.324	82.39				5.672	H ₂ Conversion: 57.98
C3+	60.53	57.52	8.390	141.9				1.182	
C4+	53.01	45.07	7.340	124.1				6.708	
Ult. Oil	49.62	9.051	136.6	7.86	1.280	180.86			
CO ₂	17.07	52.80	8.600	145.4					
H ₂ O		61.69	10.047	170.6					

Yield Calculations assume "oil" is CH₂, and is found by difference on Carbon, and H₂O 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 1.01325 bar. g/M³ = 16.91 x #/MCF. cc/M³ = 141.3 x gal/MCF.

THE TEXAS COMPANY — MONTEBELLO LABORATORY

DATA SUMMARY SHEET

Synthesis Run Number 220 From 8/4/47 Hr. 0700 to 8/10/47 Hr. 0700

FLOWS		RUN CONDITIONS			DISTILLATIONS			CATALYST DATA			CATALYST ANALYSIS				
SCFH	%	Generator Press.			A S T M		Hempel Dist.		In Reactor at Start of Period		Particle Size				
Oxygen	1805	O ₂ Preheat, °F	320	612	Prod.	Gas		°F % A.P.I.	Fresh Catalyst Charged	501.5	Screen				
Nat. Gas	2300	Gas Preheat, °F	807		A.P.I.			to 400	Catalyst Recharged	198.0	Frac.	M	%		
Total	4105	44.0	Reactor Press.	245	I.B.P.			400-550	Total	580.5	On 40	420+	2.8	80+	34.0
Fresh Feed	7030	Steam Back Press.	834	5%				550+	Catalyst Taken Out	178.5	100	419-150	9.8	80-40	13.0
F. F. by C	6640	Temperatures, °F		10%					In Reactor at End of Period	402.0	150	149-105	12.5	40-20	15.0
Avg. F. F.	6815	Heater Outlet	650	20							200	104-74	10.9	20-10	34.0
Wet Gas	2285	Catalyst #1	665	30					WATER						
Contraction		#2	650	40					Temp.	%	Reactor d-P, H ₂ O	28.0	325	61-44	4.1
Recycle	8820	#3	618	50					200		Pounds in Reactor	301.0	<325	43-0	54.8
Bleed	297	#4	578	60					203		Density, lbs./cu. ft.	34.0			
Total	8817	#5	542	70					208		Bed Height, Feet	17.5			
Total Feed	15632	Average	561	80											
Inlet Vel.	1.30	Product Separator		90											
Steam Flow	1.03 ft ³ /sec			95							Space Vel. SCFH/lb. cat.		Sp. Grav.	4.0	Specific Surface
	249 #/hr			E.P.							Inventory Figures	17.0			m ² /gm
				Rec.							From d-P Meters	22.6			
				Res.											
				Loss.											

GENERATOR ELEMENTAL BALANCE

NATURAL GAS		PRODUCT INSPECTION						IN					OUT				
%		Oil	Water	Product	Pour °F	SUS @ °F	%	Mol-%	SCFH m/hr	C	H	O	Mol %	SCFH m/hr	C	H	O
CO ₂	2.35						O ₂	152.42	4763			9.526	CO ₂	2.2	376	376	772
CH ₄	84.98						CO ₂	6.29	143	143		266	CO	36.2	6509	6509	6509
C ₂ H ₆	9.06						CH ₄	82.51	5157	5157	20628		CH ₄	2.2	575	575	2300
C ₃ H ₈	3.59						C ₂ H ₆	16.53	537	1102	3706		H ₂	58.0	10430		20860
C ₄ H ₁₀							C ₃ H ₈	9.59	218	654	1744		N ₂	0.4	272		
N ₂							C ₄ H ₁₀						H ₂ O				2518
O ₂							N ₂						Total				2511
							Total	267.34	10.832	7.052	25.678	9.812		17.982	7480	25.678	9.812

222.14

FRESH FEED				WET GAS				RECYCLE	COMB. FEED	EFFLUENT	NET CHANGE ON REACTION												
%	m/hr	#/hr	%	Measured		At Wt. Balance		m/hr	m/hr	%	m/hr	%	Carbon			Hydrogen			Oxygen	Ultimate Oil		Unsat.	
				m/hr	#/hr	m/hr	#/hr						m/hr	a/hr	%	a/hr	%	a/hr	#/hr	#/gal	gal/hr	%	
CO	36.2	6509	162.35	6.04	364	1.02	28	1405	7.92	1920	1.79	5.25	-6.129	-6.129	5.54				7.6129				
H ₂	58.0	10430	22.86	4474	2697	5.40	2.83	5.66	10408	20.84	52.53	13.24	38.50	-9.400				-16.800					
CO ₂	2.2	376	17.42	31.07	1270	55.88	1.33	58.52	4.902	5.30	12.88	6.23	18.26	934	934	14.35			1.868				
N ₂	0.4	272	3.02	1.12	268	1.90	.07	1.96	1261	88	2.38	.33	.97	.002									
CH ₄	2.2	575	9.20	16.72	1008	16.13	1.06	16.96	3.890	4.47	10.84	4.95	14.51	485	485	7.45	1.940						
C ₂ H ₆				2.75	166	465	.17	4.76	1640	64	1.55	.81	2.37	170	340	5.22	780						71.61
C ₃ H ₈				1.09	266	1.98	.07	3.10	254	25	.61	.32	.84	270	140	2.15	420						
C ₄ H ₁₀				2.92	176	7.39	.18	7.56	678	68	1.65	.84	2.46	180	1540	9.30	1080			6.60	6.25	1.09	85.13
C ₃ H ₈				.57	231	1.36	.03	1.32	119	12	.29	.15	.44	230	290	1.38	240						
C ₄ H ₁₀				1.70	102	5.71	.11	6.16	395	40	.97	.51	1.49	110	1440	6.76	880			5.85	6.1	.96	82.87
C ₅ H ₁₂				.20	212	170	.01	5.8	246	25	.62	.36	1.18	210	240	1.67	100			.58	4.86	.12	
C ₆ H ₁₄				.88	253	3.71	.06	4.20	205	21	.51	.27	.79	260	300	4.61	600			4.20	5.4	.78	
C ₇ H ₁₆				.27	266	1.38	.02	1.72	163	16	.45	.08	.23	220	120	1.84	240			1.72	5.5	.31	
OIL								37.50				.27	.79	3.700	41.48	5.400			37.80	6.5	5.82		
WATER												4.26	12.49			5.220							
TOTAL		17.982	231.75		6.029	107.21	6.32		23.264	41.246	34.115		12.462										
H ₂ +CO		16.939																					
H ₂ /CO		1.60					7.45																

ULTIMATE YIELDS						WEIGHT BALANCE		EFFLUENT RATIOS		CONTRACTION: 68.3	
% CO Fed	#/hr	H ₂ /CO #/MCF	g/M ³	Gal/hr	H ₂ /CO Gal/MCF	cc/M ³	Wet Gas	#/hr	%	H ₂ /H ₂ O	CO ₂ /CO
C1+C2	14.62	14.62	2.277	38.50			107.2		112.3	3.11	3.48
C3+	65.00	63.02	9.876	166.0			33.1				
C4+	55.32	54.14	8.433	142.6			86.4			(H ₂)(CO ₂)(H ₂ O)(CO)	10.82
Ult. Oil		56.93	8.871	150.0	208	1.414	226.7	97.8	231.75		85.772
CO ₂	14.35	41.10	6.400	108.0							
H ₂ O		76.70	11.950	202.1							

Yield Calculations assume "oil" is CH₂, and is found by difference on Carbon, and H₂O 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 22E From 8/10/47 Hr. 0700 to 8/11/47 Hr. 0700

FLOWS		RUN CONDITIONS		DISTILLATIONS				CATALYST DATA		CATALYST ANALYSIS							
SCFH	%	Generator Press	318	A S T M				Hempel Dist.		In Reactor at Start of Period		Particle Size					
Oxygen	1655	O ₂ Preheat, °F	534	Prod.	6460			°F	%	A.P.I.	Fresh Catalyst Charged	402.0	Screen Sedimentation				
Nat. Gas	2120	Gas Preheat, °F	817	A.P.I.	490			to 400	663	584	Catalyst Recharged		Frac.	M	%	M	%
Total	3775	Reactor Press.	502	I.B.P.	118			400-550	846	424	Total	508.0	On 40	420+	3.2	80+	34.0
Fresh Feed	6750	Steam Back Press	900					550+	151		Catalyst Taken Out	59.0	100	419-150	11.6	80-40	11.0
F.F. by C	6450	Temperatures, °F		10%	146						In Reactor at End of Period	449.0	150	149-105	10.4	40-20	15.0
Avg. F.F.	4600	Heater Outlet	181	20	172								200	104-74	10.8	20-10	35.0
Wet Gas	2170	Catalyst #1	640	30	196			WATER					250	73-62	4.0	10-0	5.0
Contraction	68.0	#2	639	40	220			Temp.	%	Reactor d-P, H ₂ O	126.0	325	61-44	3.0			
Recycle	8500	#3	594	50	240			200		Pounds in Reactor	305.0	<325	43-0	57.0			
Bleed	327	#4	580	60	262			203		Density, lbs./cu. ft.	29.0						
Total	8827	#5	545	70	284			208		Bed Height, Feet	22.2						
Total Feed	15317	Average	604	80	312												
Recycle/F.F.	1.36	Product Separator		90	343					Space Vel. SCFH/lb. cat.							
Inlet Vel.	1.03 ft/sec			95	364					Inventory Figures	1.44						
Steam Flow	242 ft ³ /hr			E.P.	344					From d-P Meters	21.6						
				Rec.	48.0												
				Res.	0.5												
				Loss	1.5												

NATURAL GAS										PRODUCT INSPECTION										GENERATOR ELEMENTAL BALANCE									
		Oil		Water		Product		Pour °F		SUS @ °F		IN		OUT															
%	Neut. No.	%	Water	%	Product	%	Pour °F	%	SUS @ °F	%	SCFH m/hr	C	H	O	Mol %	SCFH m/hr	C	H	O	Mol %	SCFH m/hr	C	H	O					
CO ₂	2.12	20.0									O ₂	139.74	4.367	8.734	CO ₂	2.1	366	366	732										
CH ₄	80.77	48.0									CO ₂	5.72	130	130	260	CO	33.9	5,903	5,903	5,903									
C ₂ H ₆	11.83	41.0									CH ₄	72.30	4,519	4,519	18,076	CH ₄	3.5	609	1,609	2,436									
C ₃ H ₈	4.96	92.6									C ₂ H ₆	20.01	1,027	1,134	4,002	H ₂	58.9	10,257	20,514										
C ₄ H ₁₀											C ₃ H ₈	12.19	277	871	2,216	N ₂	1.6	279											
N ₂											C ₄ H ₁₀					H ₂ O				1.344	2,357								
O ₂											N ₂					Total					17,414	6,878	24,292	8,994					
											Total	249.96	9,960	6,814	24,294														

Loss 4.0 207.50

FRESH FEED		WET GAS				RECYCLE	COMB. FEED	EFFLUENT	NET CHANGE ON REACTION													
%	m/hr	#/hr	%	Measured	At Wt. Balance	m/hr	m/hr	%	m/hr	%	Carbon		Hydrogen		Oxygen	Ultimate Oil		Unsat.				
				m/hr	#/hr	m/hr	m/hr	%	m/hr	%	m/hr	a/hr	%	a/hr	%	a/hr	#/hr	#/gal	gal/hr	%		
CO	33.9	5,903	165.28	230	132	370	1.29	3.06	536	6.44	15.12	6,45	109	-5.794	-5.794	1.45						
H ₂	58.9	10,257	20.51	41.91	2,460	4.3	1,989	3.48	9,761	20.02	42.19	11,749	3,602	-8.269	-8.269	16,538						
CO ₂	2.1	366	16.10	23.81	1,363	59.97	1,129	4.966	5,545	5.42	14.55	6,674	20,846	763	763	12.85					1,526	
N ₂	1.6	279	7.81	2.37	136	2.81	1.13	3.16	552	.83	2.04	1,665	2,04	166								
CH ₄	3.5	609	9.74	17.71	1,014	16.22	8.40	13.43	4,125	4.74	11.65	4,965	15,22	231	231	3.91						
C ₂ H ₆				3.43	196	5.47	163	4.55	779	.80	1.97	761	2,25	162	324	5.49						70.0
C ₃ H ₈				1.47	154	2.52	170	2.09	342	.34	.84	412	1.26	170	140	3.77						
C ₄ H ₁₀				3.00	172	2.22	142	5.98	699	.70	1.72	841	2.58	172	426	7.22						538
C ₃ H ₈				.37	1.21	.92	.217	.16	286	.09	.22	103	.32	217	651	.86						
C ₄ H ₁₀				2.20	136	1.26	104	2.85	572	.51	1.25	410	1.89	204	416	7.05						5.56
C ₅ H ₁₂				.60	103	1.97	128	1.63	140	.14	.34	161	.52	228	112	180						163
C ₆ H ₁₄				.67	109	2.24	121	2.20	156	.16	.39	187	.57	231	152	243						2.20
C ₇ H ₁₆				.17	110	1.44	122	1.13	840	.04	.10	248	.15	208	241	.81						.70
OIL							42.79					313	96		7,128	52.99	6,256					42.79
WATER												4,268	1309			5,784						
TOTAL																						
H ₂ +CO																						
H ₂ /CO																						

ULTIMATE YIELDS				WEIGHT BALANCE		EFFLUENT RATIOS		CONTRACTION: 72.77	
%	CO Fed	#/hr	H ₂ /CO	#/hr	%	#/hr	H ₂ /H ₂ O	CO Conversion:	H ₂ Conversion:
			#/MCF	g/M3	Gal/hr	Gal/MCF	cc/M3		
C1+C2	11.17	1533	1,387	2,203			2.753	98.15	80.62
C3+	71.46	6,231	9,944	14,115			12.347		
C4+	15.18	2,117	8,744	14,955	8.79	1,332	148.2		
Ult. Oil		2,926	9,275	12,346	9.39	1,533	216.6		
CO ₂	12.33	1,725	5,279	7,227			28.49		
H ₂ O		76,12	12,579	212.1					

Yield Calculations assume "oil" is CH₂, and is found by difference on Carbon, and H₂O 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 1.01325 bar. g/M3 = 16.91 x #/MCF. cc/M3 = 141.3 x gal/MCF.

THE TEXAS COMPANY — MONTEBELLO LABORATORY

DATA SUMMARY SHEET

Synthesis Run Number 22 F From 8/11/47 Hr. 0700 to 8/12/47 Hr. 0700

FLOWS		RUN CONDITIONS			DISTILLATIONS				CATALYST DATA		CATALYST ANALYSIS				
SCFH	%	Generator Press.	325	A S T M		Hempel Dist.		In Reactor at Start of Period		Particle Size					
Oxygen	1575	O ₂ Preheat, °F	502	Prod.	660	°F	%	A.P.I.	Fresh Catalyst Charged	449.0	Screen		Sedimentation		
Nat. Gas	2040	Gas Preheat, °F	810	A.P.I.	48.9	to 400	700	57.4	Catalyst Recharged	30.0	Frac.	M	%	M	%
Total	3615	Reactor Press.	294	I.B.P.	112	400-550	16.3	37.3	Total	479.0	On 40	420+	30	80+	36.0
Fresh Feed	4680	Steam Back Press.	900	5%		550+	15.7		Catalyst Taken Out	41.5	100	149-150	16.7	80-40	13.0
F F by C	4650	Temperatures, °F		10%	144				In Reactor at End of Period	437.5	150	149-105	14.3	40-20	12.0
Avg. F. F.	4645	Heater Outlet	352	20	168						200	104-74	5.1	20-10	31.0
Wet Gas	1690	Catalyst #1	660	30	186	WATER					250	73-62	2.5	10-0	8.0
Contraction	74.5	#2	664	40	208	Temp.	%	Reactor d-P, H ₂ O			325	61-44	3.5		
Recycle	8350	#3	612	50	238	200		Pounds in Reactor	294.0		<325	43-0	55.0		
Bleed	243	#4	600	60	262	203		Density, lbs./cu. ft.	36.4						Chem. Anal.
Total	8843	#5	555	70	288	208		Bed Height, Feet	13.5						
Total Feed	15393	Average	618	80	318			Settled							% Fe
Recycle/F.F.	1.30	Product Separator		90	356			Aerated							% C
Inlet Vel.	1.05 ft/sec			95	386			Compacted							% Oil
Steam Flow	111 #/hr			E.P.	407			Space Vel. SCFH/lb. cat.							Sp. Grav. 3.9
				Rec.	98.0			Inventory Figures	15.2						Specific Surface
				Res.	1.0			From d-P Meters	22.6						m ² /gm
				Loss.	1.0										

GENERATOR ELEMENTAL BALANCE

NATURAL GAS		PRODUCT INSPECTION						IN				OUT				
%		Oil	Water	Product	Pour °F	SUS @ °F	Wt %	SEFH m/hr	C	H	O	Mol %	SEFH m/hr	C	H	O
CO ₂	1.51	Neut. No. 26.0	30.95				O ₂	132.99	4.156		2.312	CO ₂	2.1	369	361	738
CH ₄	72.92	Sap. No. 30.3	132.44				CO ₂	3.56	0.81	0.81	1.62	CO	32.1	5.645	5.645	5.645
C ₂ H ₆	15.07	Hydrox. No. 36.0					CH ₄	67.10	4.194	4.194	16.776	CH ₄	3.3	5.80	5.80	2.320
C ₂ H ₄	5.54	Bromine No. 84.16					C ₂ H ₆	24.27	1.809	1.618	4.854	H ₂	61.9	10.886		21.778
C ₂ H ₂		% Fe					C ₂ H ₄	13.11	2.28	1.894	2.384	N ₂	0.6	1.06		
N ₂		% Alc	9.3				C ₂ H ₁₀					H ₂ O				-78
O ₂							N ₂					Total				17.586
							Total	241.03	9.538	6.787	24.014	8.474				6.574

Loss H₂O 203.39

FRESH FEED		WET GAS				RECYCLE	COMB. FEED	EFFLUENT		NET CHANGE ON REACTION									
%	m/hr	#/hr	%	Measured m/hr	At Wt. Balance #/hr	m/hr	m/hr	%	m/hr	%	Carbon		Hydrogen		Oxygen	Ultimate Oil		Unsat.	
CO	22.1	5.62	158.94	2.10	0.94	2.63	0.75	2.11	4.90	4.14	15.00	565	1.83	-5.570	-5.570	1.33			
H ₂	61.9	15.86	21.77	35.01	1.861	3.12	1.253	2.50	8.169	19.06	46.58	9.421	30.84	-9.634		-19.268			
CO ₂	2.1	3.28	16.24	37.31	1.663	33.17	1.334	58.68	8.705	9.08	23.19	10.039	32.49	3.65	3.65	17.09			1.930
N ₂	5.4	1.26	2.97	2.90	1.29	3.61	1.03	3.40	1.677	7.9	1.93	7.80	2.52	-0.03					
CH ₄	3.3	5.80	9.28	11.84	5.28	8.45	4.23	6.78	2.763	3.34	8.16	3.186	10.31	-1.57	-1.57	-2.78			-6.28
C ₂ H ₄				5.50	1.56	4.37	1.25	3.50	1.17	1.82	2.00	9.42	3.05	1.25	2.50	4.48			5.00
C ₂ H ₆				1.20	0.84	1.62	0.43	1.30	2.80	2.8	1.08	3.23	1.05	0.43	0.86	1.52			2.58
C ₃ H ₆				2.85	1.27	5.33	1.02	4.27	1.65	1.67	1.64	7.67	2.48	1.02	3.00	6.42			6.12
C ₃ H ₈																			
C ₄ H ₈				1.90	0.85	3.74	2.68	3.00	4.43	1.4	1.08	5.11	1.65	2.68	2.72	4.82			5.44
C ₄ H ₁₀				0.75	0.33	1.85	0.27	1.48	1.75	1.8	1.44	2.02	1.65	1.27	1.08	1.91			2.70
C ₅ H ₁₀				0.80	0.22	1.28	0.18	1.53	1.17	1.2	0.29	1.25	1.40	1.08	1.54	1.10			1.53
C ₆ H ₁₂				1.15	0.07	0.59	0.06	0.47	0.35	0.04	1.0	0.41	1.3	0.06	0.36	0.64			0.72
OIL								50.54				3.61	1.17		3.614	64.02			7.228
WATER												3.640	11.78			10.233			
TOTAL		17.586	206.32			4.458	109.76		88.02	23.332	40.918		30.903		14.010				
H ₂ +CO		16.521																	
H ₂ /CO		1.93																	

ULTIMATE YIELDS						WEIGHT BALANCE		EFFLUENT RATIOS		CONTRACTION: 79.67	
% CO Fed	#/hr	#/MCF	g/M3	H ₂ /CO Gal/hr	H ₂ /CO Gal/MCF	#/hr	%	#/hr	H ₂ /H ₂ O	CO Conversion:	88.67
C1+C2	2.17	2.30	3.67	6.20		109.76		88.02	2.588		
C3+	74.46	60.85	9.712	104.2		31.1			17.77	H ₂ Conversion:	88.50
C4+	72.98	56.38	9.031	102.7		89.2			(H ₂)(CO ₂)(H ₂ O)(CO)	42.98	
Ult. Oil		60.21	8.620	102.7	9.44	230.06	110.44	208.32			91.972
CO ₂	12.29	42.44	6.774	114.5							
H ₂ O		65.5	10.45	176.7							

Yield Calculations assume "oil" is CH₂, and is found by difference on Carbon, and H₂O 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 1.01325 bar. g/M³ = 16.91 × #/MCF. cc/M³ = 141.3 × gal/MCF.

THE TEXAS COMPANY — MONTEBELLO LABORATORY

DATA SUMMARY SHEET

Synthesis Run Number 286 From 8/12/47 Hr. 0700 to 8/13/47 Hr. 0700

FLOWS		RUN CONDITIONS			DISTILLATIONS			CATALYST DATA			CATALYST ANALYSIS						
SCFH	%	Generator Press.			A S T M			Hempel Dist.			Particle Size						
Oxygen	1640	O ₂ Preheat, °F	319	Prod.				°F	%	A.P.I.	In Reactor at Start of Period	437.5	Screen		Sedimentation		
Nat. Gas	2110	Gas Preheat, °F	809	A.P.I.				to 400			Fresh Catalyst Charged	-	Frac.	M	%	M	%
Total	3750	Reactor Press.	290	I.B.P.				400-550			Catalyst Recharged	-	On 40	420+	3.5	80+	42.0
Fresh Feed	5900	Steam Back Press.	900	5%				550+			Total	437.5	100	149-150	18.7	80-40	7.0
F. F. by C	6400	Temperatures, °F		10%							Catalyst Taken Out	72.0	150	149-105	15.1	40-20	7.0
Avg. F. F.	6400	Heater Outlet	385	20							In Reactor at End of Period	365.5	200	104-74	6.3	20-10	33.0
Wet Gas	1540	Catalyst #1	666	30				WATER				250	73-62	1.2	10-0	11.0	
Contraction		#2	656	40				Temp.	%		Reactor d-P, H ₂ O		325	61-44	2.1		
Recycle	8350	#3	611	50				200			Pounds in Reactor	299.8	<325	43-0	53.1		
Bleed	300	#4	597	60				203			Density, lbs./cu. ft.	23.8	Density, lbs./cu. ft.				Chem. Anal.
Total	8650	#5	561	70				208			Bed Height, Feet	29.0	Aerated			% Fe	
Total Feed	13850	Average	618	80							Space Vel. SCFH/lb. cat.		Settled			% C	
Recycle/F.F.	1.35	Product Separator		90							Inventory Figures	17.5	Compacted			% Oil	
Inlet Vel.	1.06 ft/sec			95							From d-P Meters	20.9	Sp. Grav.	3.8		Specific Surface	
Steam Flow	128 #/hr			E.P.													m ² gm
				Rec.													
				Res.													
				Loss.													

GENERATOR ELEMENTAL BALANCE

NATURAL GAS		PRODUCT INSPECTION						IN						OUT					
%		Oil	Water	Product	Pour °F	SUS @ °F		wt-%	Mol-%	SCFH m/hr	C	H	O		Mol %	SCFH m/hr	C	H	O
CO ₂	4.95	Neut. No.	28.32				O ₂	138.46	4.327				8.654	CO ₂	2.4	389	389		.778
CH ₄	78.49	Sap. No.	170.76				CO ₂	3.70	.075	.075			.150	CO	34.5	5.598	5.598		5.598
C ₂ H ₆	13.57	Hydrox. No.					CH ₄	68.02	4.714	4.314	17.256			CH ₄	2.7	.438	.438	1.752	
C ₃ H ₈	7.09	Bromine No.					C ₂ H ₆	22.65	.755	1.570	4.530			H ₂	57.5	9.635		19.310	
C ₄ H ₁₀		% Fe					C ₃ H ₈	18.61	.423	1.269	3.384			N ₂	0.9	.146			
N ₂		% Alc					C ₄ H ₁₀							H ₂ O				4.108	2.428
O ₂							N ₂							Total					
							Total	252.04	9.694	7.668	25.170	8.804			16.226	6.425	25.170	8.804	

2025 #40 208.34

	FRESH FEED		WET GAS				RECYCLE	COMB. FEED	EFFLUENT	NET CHANGE ON REACTION										
	%	m/hr	#/hr	%	Measured m/hr	At Wt. Balance #/hr				Carbon m/hr	Hydrogen a/hr	Oxygen %	Ultimate Oil #/hr	Unsat. %						
CO	34.5	5.598	156.74	2.63	.107	3.00	.101	2.84	.000	6.30	15.86	.701	2.22	-5.497	5.497	1.80				
H ₂	59.5	9.656	19.31	40.63	1.052	3.30	1.865	3.18	9.273	18.93	48.44	10.838	34.25	-8.071						
CO ₂	2.4	.389	17.12	2.100	.854	37.58	.809	38.59	4.793	5.18	13.25	5.602	17.70	.420	.420	7.50				.840
N ₂	0.9	.146	4.09	3.70	.150	4.20	.142	3.98	.844	.99	2.53	.986	3.12	-.004						
CH ₄	2.7	.438	7.01	15.81	.642	10.27	.608	9.73	3.606	4.05	10.36	4.214	13.32	.170	.170	3.04				.680
C ₂ H ₆				5.30	.215	6.03	.204	5.70	1.210	1.21	3.10	1.414	4.467	.240	.408	7.29				.816
C ₃ H ₈				2.39	.077	2.91	.073	2.76	.545	.58	1.41	.637	2.01	.092	.184	3.29				.552
C ₄ H ₁₀				4.59	.186	7.81	.176	7.40	1.048	1.05	2.69	1.224	3.87	.176	.528	9.43				1.056
C ₅ H ₁₂				.71	.029	1.28	.027	1.21	.162	.16	.41	.189	.60	.027	.091	1.45				.216
C ₆ H ₁₄				2.31	.092	5.26	.089	4.98	.527	.53	1.36	.616	1.95	.089	.376	4.36				7.12
C ₇ H ₁₆				.43	.017	.99	.016	.94	.088	.10	.26	.114	.36	.016	.064	1.14				.160
C ₈ H ₁₈				.50	.020	1.40	.019	1.30	.114	.11	.28	.133	.43	.019	.075	1.70				.180
C ₉ H ₂₀																				
OIL							44.67					.319	1.01			5.418				
WATER												4.657	14.72							
TOTAL		16.227	204.27			4.063	84.02	3.849				22.823	39.075			31.644				12.779
H ₂ +CO		15.254																		
H ₂ /CO		1.72						15.50					3.05			15.46				

ULTIMATE YIELDS				WEIGHT BALANCE				EFFLUENT RATIOS		CONTRACTION: 76.29	
%	#/hr	H ₂ /CO		Wet Gas	#/hr	%	#/hr	H ₂ /H ₂ O	CO ₂ /CO	CO Conversion:	
C1+C2	13.62	11.18	1.934	32.70	84.02		79.57	2.327	2.991	98.20	
C3+	77.08	62.50	10.465	176.96	38.3					82.79	
C4+	66.20	51.89	8.976	151.78	89.4						
Ult. Oil	58.30	10.084	170.45	9.85	208.72	10.218	204.27				89.078
CO ₂	7.50	18.47	3.185	54.03							
H ₂ O		63.83	14.500	245.80							

Yield Calculations assume "oil" is CH₂, and is found by difference on Carbon, and H₂O 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 x #/MCF. cc/M³ = 141.3 x gal/MCF.

THE TEXAS COMPANY — MONTEBELLO LABORATORY

DATA SUMMARY SHEET

Synthesis Run Number 22 H From 8/14/47 Hr. 0200 to 8/14/47 Hr. 0200

FLOWS		RUN CONDITIONS		DISTILLATIONS			CATALYST DATA		CATALYST ANALYSIS										
SCFH	%	Generator Press.		A S T M			Hempel Dist.		In Reactor at Start of Period										
Oxygen	1620	O ₂ Preheat, °F	328	Prod.	6460		°F	%	A.P.I.	Fresh Catalyst Charged	765.5	Particle Size							
Nat. Gas	2080	Gas Preheat, °F	800	A.P.I.			to 400			Catalyst Recharged		Frac.	M	%	M	%			
Total	3700	Reactor Press.	287	I.B.P.			400-550			Total	765.5	On 40	420+	1.5	80+	28.0			
Fresh Feed	6150	Steam Back Press.	900	5%			550+			Catalyst Taken Out	166.5	100	419-150	9.1	80-40	5.0			
F. F. by C	6340	Temperatures, °F		10%						In Reactor at End of Period	199.0	150	149-105	8.2	40-20	21.0			
Avg. F. F.		Heater Outlet	327	20								200	104-74	11.2	20-10	44.0			
Wet Gas	1860	Catalyst #1	646	30			WATER					250	73-62	0.9	10-0	2.0			
Contraction	70.8	#2	649	40			Temp.	%		Reactor d-P, H ₂ O		325	61-44	1.1					
Recycle	8100	#3	618	50			200			Pounds in Reactor	101.8	<325	43-0	68.0					
Bleed	312	#4	600	60			203			Density, lbs./cu. ft.	9.8					Chem. Anal.			
Total	8412	#5	538	70			208			Bed Height, Feet	68.0								
Total Feed	14752	Average	614	80													Settled	% C	
Recycle/F.F.	1.30	Product Separator		90													Compacted	% Oil	
Inlet Vel.	1.03 ft/sec			95						Space Vel. SCFH/lb. cat.							Sp. Grav.	3.2	Specific Surface
Steam Flow	109 #/hr			E.P.						Inventory Figures	71.8								m ² /gm
				Rec.						From d-P Meters	61.5								
				Res.															
				Loss.															

GENERATOR ELEMENTAL BALANCE

NATURAL GAS		PRODUCT INSPECTION					IN					OUT				
%		Oil	Water	Product	Pour °F	SUS @ °F	SCFH	C	H	O	Mol %	SCFH	C	H	O	
CO ₂	1.73	Neut. No.	29.42				O ₂	136.77	4.274	8.548	CO ₂	2.3	385	385	770	
CH ₄	77.60	Sap. No.	131.32				CO	4.18	1.095	1.90	CO	33.9	5.671	5.671	5.671	
C ₂ H ₆	15.18	Hydrox. No.					CH ₄	68.14	4.259	17.036	CH ₄	3.1	.579	.579	2.076	
C ₃ H ₈	5.50	Bromine No.					C ₂ H ₆	24.99	8.33	4.998	H ₂	593	9.920	19.840		
C ₄ H ₁₀		% Fe					C ₃ H ₈	13.29	3.02	2.446	N ₂	1.2	.201			
N ₂		% Alc					C ₄ H ₁₀				H ₂ O			2.534	2.77	
O ₂							N ₂				Total	16.646	6.575	24.452	8.738	
							Total	247.37	9.763	6.926	24.452	8.738				

Losses 206.02

	FRESH FEED		WET GAS				RECYCLE	COMB. FEED	EFFLUENT		NET CHANGE ON REACTION					Ultimate Oil	Unsat.				
	%	m/hr	#/hr	%	Measured	At Wt. Balance			m/hr	%	m/hr	%	Carbon	Hydrogen	Oxygen			Ultimate Oil			
CO	32.9	5.671	158.74	2.68	132	370	1.09	3.05	.595	6.27	16.11	7.04	2.34	-5.562	-5.562	1.92					
H ₂	593	9.920	19.84	38.90	1.909	3.82	1.572	3.15	8.634	18.55	47.66	10.206	33.86	-8.348		16.696					
CO ₂	2.5	.418	18.34	35.24	1.730	76.48	1.426	6.201	7.823	8.24	21.17	9.248	30.68	1.008	1.008	17.77					
N ₂	1.2	.201	5.67	1.80	.089	2.46	1.072	2.03	1.400	.60	1.59	.472	1.57	-.129							
CH ₄	3.1	.578	8.29	10.52	.516	8.24	1.425	6.80	2.335	2.64	7.35	2.760	9.16	-.093	-.093	-1.64					
C ₂ H ₆					3.49	1.71	4.79	1.41	3.95	.772	.77	1.98	.913	3.03	1.41	2.82	4.97				70.88
C ₃ H ₈					1.43	1.070	2.10	1.73	3.17	.32	.82	3.75	1.24	.058	.116	8.05	3.48				
C ₄ H ₁₀					2.84	1.39	5.84	1.14	4.91	.630	.63	1.62	7.44	2.47	.114	3.42	6.02	6.84			933
C ₅ H ₁₂					.34	.017	.75	.014	.62	.075	.08	.21	.089	.30	.104	.272	.74	1.13			
C ₆ H ₁₄					1.68	.082	4.59	.068	3.78	.371	.37	.95	4.39	1.45	.068	2.72	4.80	5.44			3.39
C ₇ H ₁₆					.49	.024	.23	.020	.19	.109	.11	.28	.129	.43	.020	.080	1.40	2.00			.19
C ₈ H ₁₈					.46	.022	1.61	.019	1.33	.102	.10	.27	.121	.40	.019	.075	1.68	1.90			1.33
C ₉ H ₂₀					.15	.007	.59	.006	.49	.033	.03	.08	.049	.16	.006	.026	.64	.026			.44
OIL							47.35					.338	1.12		2.382	59.64	6.764				47.35
WATER												2.556	11.80			7.626					
TOTAL		16.728	210.94		4.208	115.22	4.044		22.195	38.823		30.143			12.664						
H ₂ +CO		15.391																			
H ₂ /CO		1.75																			

	ULTIMATE YIELDS				WEIGHT BALANCE		EFFLUENT RATIOS		CONTRACTION: 75.82	
	% CO Fed	#/hr	H ₂ /CO #/MCF	g/M ³	Gal/hr	H ₂ /CO Gal/MCF	cc/M ³	H ₂ /H ₂ O	CO Conversion: 99.08	
C1+C2	5.38	4.19	7.09	11.89				2.870	H ₂ Conversion: 84.15	
C3+	74.93	58.57	9.912	167.61				13.136		
C4+	68.16	53.14	8.993	152.07				37.70		
Ult. Oil		57.28	9.694	163.86	8.94	1.573	213.8			
CO ₂	17.77	44.62	7.501	127.69						
H ₂ O		64.01	10.833	183.20						

Yield Calculations assume "oil" is CH₂, and is found by difference on Carbon, and H₂O 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 238 From 8/30/47 Hr. 0700 to 8/31/47 Hr. 0700

FLOWS		RUN CONDITIONS		DISTILLATIONS				CATALYST DATA		CATALYST ANALYSIS					
	SCFH	%	Generator Press	313	A S T M				Hempel Dist.		Particle Size				
Oxygen	2910		O ₂ Preheat, °F	555	Prod.	640		°F	%	A.P.I.	Fresh Catalyst Charged 220				
Nat Gas	3855		Gas Preheat, °F	767	A.P.I.	389		to 400	663		Fresh Catalyst Charged 109				
Total	6765	42.0	Reactor Press.	303	I.B.P.	138		400-550	25.0		Catalyst Recharged 56				
Fresh Feed	4880		Steam Back Press	1000	5%			550+			Total 385				
F.F. by C	11320		Temperatures, °F		10%	166					Catalyst Taken Out 155				
Avg F.F.			Heater Outlet	332	20	200					In Reactor at End of Period 260				
Wet Gas	5780		Catalyst #1	718	30	218		WATER				On 40 420+ 2.1 80+ 23.0			
Contraction		54.2	#2	733	40	236		Temp	%		Reactor d-P, H ₂ O 30				
Recycle	11400		#3	659	50	254		200			Pounds in Reactor 325				
Bleed	381		#4	617	60	274		203			Density, lbs./cu. ft. 98				
Total	11781		#5	585	70	292		208			Bed Height, Feet 6.7				
Total Feed	23101		Average	661	80	320					Aerated % Fe				
Recycle:F.F.	1.04		Product Separator		90	354					Settled % C				
Inlet Vel	1.58 ft/sec				95	382					Compacted % Oil				
Steam Flow					E.P.	406					Space Vel. SCFH/lb. cat.				
					Rec	985					Inventory Figures 43.6				
					Res.	0.8					From d-P Meters 35.0				
					Loss	0.7					Sp. Grav.				
											Specific Surface				
											m ² gm				

NATURAL GAS		PRODUCT INSPECTION						GENERATOR ELEMENTAL BALANCE								
%		Oil	Water	Product	Pour °F	SUS @ °F	IN			OUT						
							% Mol	SCFH	C	H	O	Mol %	SCFH	C	H	O
CO ₂	1.65	Neut No. 41.6					O ₂	246.696	7.678		15.356	CO ₂	2.4	.717	.717	1.434
CH ₄	80.09	Sap No. 62.6					CO ₂	7.392	.168	.168	.336	CO	34.1	10.185	10.185	10.185
C ₂ H ₆	10.96	Hydrox No.					CH ₄	130.352	8.147	8.147	32.588	CH ₄	3.7	1.105	1.105	4.420
C ₃ H ₈	7.30	Bromine No.					C ₂ H ₆	33.453	1.115	2.230	6.690	H ₂	59.2	17.682		35.364
C ₄ H ₁₀		% Fe					C ₃ H ₈	32.692	.743	2.229	5.944	N ₂	0.6	.179		
N ₂		% Alc					C ₄ H ₁₀					H ₂ O				5.438
O ₂							N ₂					Total				29.868
							Total	449.582	17.851	12.774	45.222	15.692				12.007
																45.222
																15.692

less H₂O 376.268

	FRESH FEED		WET GAS				RECYCLE	COMB. FEED	EFFLUENT		NET CHANGE ON REACTION													
	%	m/hr	#/hr	%	Measured	At Wt. Balance			m/hr	m/hr	%	m/hr	%	Carbon			Hydrogen		Oxygen	Ultimate Oil		Unsat.		
					m/hr	#/hr	#/hr					m/hr	a/hr	%	a/hr	%	a/hr	%	#/hr	#/gal	gal/hr	%		
CO	34.1	10.185	285.18	9.57	1.708	36.62	1.308	36.62	2.879	13.064	21.79	4.187	8.50	-8.977	-8.877	12.84								
H ₂	59.2	17.682	35.36	28.91	7.231	14.46	7.231	14.46	15.915	33.597	56.05	23.146	46.89	-10.451			-20.902							
CO ₂	2.4	.717	31.55	19.89	2.574	114.14	2.574	114.14	5.709	6.426	10.72	9.303	16.86	1.877	1.877	18.43								
N ₂	0.6	.179	5.01	1.60	.219	6.13	.219	6.13	4.81	10.60	1.10	.700	1.42	-.040										
CH ₄	3.7	1.105	17.68	10.57	1.445	23.12	1.445	23.12	3.179	5.624	7.15	4.624	9.39	.240	.340	3.34	1.360							
C ₂ H ₆				1.47	.201	5.63	.201	5.63	4.42	4.42	.74	1.643	1.31	.201	4.02	3.95	.804							
C ₃ H ₈				.72	.098	2.94	.098	2.94	2.17	2.17	.36	.315	.64	.098	1.96	1.92	.588							
C ₄ H ₁₀				1.44	.197	8.27	.197	8.27	4.33	4.33	.72	.630	1.28	.197	1.591	5.80	1.182							
C ₅ H ₁₂				.53	.072	3.17	.072	3.17	1.59	1.59	.27	.231	.47	.072	2.16	2.12	.576							
C ₆ H ₁₄				1.16	.189	8.90	.189	8.90	3.49	3.49	.58	.588	1.03	.189	.636	6.24	1.272							
C ₇ H ₁₆				.22	.030	1.74	.030	1.74	.066	.066	.11	.096	.19	.030	.120	1.18	.300							
C ₈ H ₁₈				.66	.090	6.30	.090	6.30	1.99	1.99	.33	1.289	.59	.090	1.450	4.42	.900							
C ₉ H ₂₀				.16	.022	1.89	.022	1.89	.048	.048	.08	.070	.14	.022	.132	1.30	.264							
OIL							54.84					.391	.74		3.917	38.46	7.834							
WATER												8.123	10.40		5.829									
TOTAL																								
H ₂ +CO																								
H ₂ /CO																								

ULTIMATE YIELDS				WEIGHT BALANCE				EFFLUENT RATIOS		CONTRACTION: 54.5	
%	CO Fed	#/hr	H ₂ /CO	#/hr	%	#/hr	%	H ₂ /H ₂ O	CO ₂ /CO	CO Conversion:	H ₂ Conversion:
			#/MCF	g/M3							
C1+C2	9.21	1401	1.32	22.32	Wet Gas	233.3	234.3	4.878	1.983	87.16	59.1
C3+	59.52	85.11	8.03	135.79	Oil	36.2					
C4+	57.60	73.67	6.95	117.52	Water	104.3					
Ult. Oil		80.67	7.61	128.69	Total	373.8	99.7	374.8			
CO ₂	18.43	82.59	7.79	131.73							
H ₂ O		82.21	8.70	147.12							

Yield Calculations assume "oil" is CH₂, and is found by difference on Carbon, and H₂O 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 x #/MCF. cc/M3 = 141.3 x gal/MCF.

THE TEXAS COMPANY — MONTEBELLO LABORATORY

DATA SUMMARY SHEET

Synthesis Run Number 23C From 8/31/47 Hr. 0800 to 9/1/47 Hr. 0800

FLOWS		RUN CONDITIONS				DISTILLATIONS				CATALYST DATA				CATALYST ANALYSIS			
SCFH	%	Generator Press	A S T M			Hempel Dist.		In Reactor at Start of Period		Particle Size							
Oxygen	2960	O ₂ Preheat, °F	308	Prod.	6450	°F	%	A.P.I.	Fresh Catalyst Charged	Screen				Sedimentation			
Nat Gas	3950	Gas Preheat, °F	780	A.P.I.	425	to 400	673		Catalyst Recharged	493	Frac.	M	%	M	%		
Total	6910	Reactor Press	300	I.B.P.	130	400-550	203		Total	753	On 40	420+	1.4	80+	60.0		
Fresh Feed	9540	Steam Back Press	1000	5%		550+	1.1		Catalyst Taken Out	423.5	100	419-150	12.4	80-40	20.0		
F F by C	11800	Temperatures, °F		10%	166				In Reactor at End of Period	329.5	150	149-105	24.7	40-20	19.0		
Avg F F		Heater Outlet	331	20	190						200	104-74	25.2	20-10	1.0		
Wet Gas	5520	Catalyst #1	695	30	210	WATER					250	73-62	5.1	10-0			
Contraction		#2	704	40	230	Temp.	%		Reactor d-P, H ₂ O		325	61-44	9.4				
Recycle	11600	#3	647	50	248	200			Pounds in Reactor	249	<325	43-0	21.8				
Bleed	382	#4	614	60	268	203			Density, lbs./cu. ft.	84				Density, lbs./cu. ft.	Chem Anal.		
Total	11982	#5	589	70	286	208			Bed Height, Feet	4.6				Aerated	% Fe		
Total Feed	23782	Average	649	80	312									Settled	% C		
Recycle/F F	1.01	Product Separator		90	348				Space Vel. SCFH/lb. cat.					Compacted	% Oil		
Inlet Vel.	157 ft/sec			95	378				Inventory Figures	35.8				Sp. Grav.	4.7	Specific Surface	
Steam Flow				E.P.	401				From d-P Meters	47.4						m ² gm	
				Rec	98.0												
				Res	0.7												
				Loss	1.3												

NATURAL GAS		PRODUCT INSPECTION						IN					OUT				
%		Oil	Water	Product	Pour °F	SUS @ °F	#/hr	Mol %	SCFH m/hr	C	H	O	Mol %	SCFH m/hr	C	H	O
CO ₂	1.37	Neut No.	44.09				O ₂	249.920	7810			15.620	CO ₂	2.1	654	654	1.308
CH ₄	78.82	Sap No.	62.6				CO ₂	4.292	143	143		286	CO	35.6	11.084	11.084	11.084
C ₂ H ₆	11.42	Hydrox No.					CH ₄	131.440	8.215	8.215	22.860		CH ₄	2.3	716	716	2.864
C ₃ H ₈	8.39	Bromine No.	59.9				C ₂ H ₆	35.700	1.190	2.380	7.140		H ₂	59.5	18.525		37.050
C ₄ H ₁₀		% Fe					C ₃ H ₈	38.456	.874	2.622	6.992		N ₂	0.5	856		
N ₂		% Alc					C ₄ H ₁₀						H ₂ O				7.078
O ₂							N ₂						Total				31.135
							Total	461.808	18.232	13.360	46.992	15.906					12.458
																	46.992

Loss H₂O 398.856

FRESH FEED		WET GAS				RECYCLE	COMB. FEED	EFFLUENT	NET CHANGE ON REACTION															
%	m/hr	#/hr	%	Measured	At Wt. Balance	m/hr	m/hr	%	m/hr	%	Carbon			Hydrogen			Oxygen	Ultimate Oil		Unsat.				
				m/hr	#/hr	m/hr	m/hr				m/hr	a/hr	%	a/hr	%	a/hr	%	a/hr	#/hr	#/gal	gal/hr	%		
CO	35.6	11.084	310.35	10.51	1.531	42.87	1.776	49.729	3.322	14.406	22.96	5.098	9.45	-9.308	-7.308	16.02								
H ₂	59.5	18.525	37.05	53.14	7.740	15.48	8.978	17.956	16.798	35.323	40.36	25.776	47.69	-9.547	-19.094									
CO ₂	2.1	654	28.78	19.01	2.769	12.84	3.212	14.328	4.009	6.663	10.62	9.221	17.06	2.558	2.558	23.08								
N ₂	0.5	156	4.37	2.44	.355	9.84	.412	11.536	.771	.927	1.48	1.183	2.19	-.256										
CH ₄	2.3	716	11.46	8.46	1.232	19.71	1.429	22.864	2.674	3.390	5.40	4.103	7.59	.713	7.13	6.43	2.852							
C ₂ H ₆				1.166	.242	6.78	.281	7.968	.525	.525	.84	.806	1.49	.281	.562	5.07	1.124							
C ₃ H ₈				.81	.118	3.54	.137	4.110	.256	.256	.41	.393	.73	.137	.274	2.47	.822							
C ₄ H ₁₀				1.59	.232	9.74	.269	11.298	.503	.503	.80	.772	1.43	.269	.807	7.28	1.614							
C ₅ H ₁₂				.57	.083	3.65	.096	4.224	.180	.180	.29	.276	.51	.096	.288	2.60	.768							
C ₆ H ₁₄				.88	.128	7.17	.148	8.288	.278	.278	.44	.426	.79	.148	.492	5.34	1.184							
C ₇ H ₁₆				.14	.020	1.16	.023	1.334	.044	.044	.07	.067	.12	.023	.092	.83	.230							
C ₈ H ₁₈				.57	.083	5.81	.096	6.720	.180	.180	.29	.276	.51	.096	.480	4.33	.960							
C ₉ H ₂₀				.21	.031	2.67	.036	3.096	.066	.066	.11	.102	.19	.036	.216	1.95	.432							
OIL								38.220				.273	.151		2.726	24.69	5.452							
WATER												4.192	7.76		3.656									
TOTAL																								
H ₂ +CO																								
H ₂ /CO																								

ULTIMATE YIELDS				WEIGHT BALANCE				EFFLUENT RATIOS		CONTRACTION: 47.4	
%	CO Fed	#/hr	H ₂ /CO	%	#/hr	%	#/hr	H ₂ /H ₂ O	CO Conversion:	H ₂ Conversion:	
			#/MCF	g/M3	Gal/hr	Gal/MCF	cc/M3				
C1+C2	13.97	23.38	2.08	75.17				6.149	83.98	51.5	
C3+	46.92	73.18	6.72	110.25				1.809			
C4+	37.04	57.66	5.14	86.92				11.153			
Ult. Oil		67.41	6.01	101.63	10.31	0.919	129.85				
CO ₂	23.08	112.58	10.03	169.61							
H ₂ O		75.46	6.73	113.80							

Yield Calculations assume "oil" is CH₂, and is found by difference on Carbon, and H₂O 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 x #/MCF. cc/M3 = 141.3 x gal/MCF.

THE TEXAS COMPANY — MONTEBELLO LABORATORY

DATA SUMMARY SHEET

Synthesis Run Number 23 D From 9/1/47 Hr. 0700 to 9/1/47 Hr. 1900

FLOWS		RUN CONDITIONS				DISTILLATIONS				CATALYST DATA				CATALYST ANALYSIS				
	SCFH	%	Generator Press.			A S T M		Hempel Dist.		In Reactor at Start of Period		Particle Size						
Oxygen	2950		O ₂ Preheat, °F	306	Prod	6480		°F	%	A.P.I.	Fresh Catalyst Charged	50	Screen :		Sedimentation			
Nat. Gas	3830		Gas Preheat, °F	844	A.P.I.	43.4		to 400	76.3		Catalyst Recharged	193	Frac.	M	%	M	%	
Total	6780	43.6	Reactor Press.	298	I.B.P.	122		400-550	18.0		Total	572.5	On 40	420+	1.0	80+	41.0	
Fresh Feed	9150		Steam Back Press	950	5%			550+			Catalyst Taken Out	378.5	100	419-150	9.9	80-40	22.0	
F.F. by C	12100		Temperatures, °F		10%	168					In Reactor at End of Period	194.0	150	149-105	14.9	40-20	25.0	
Avg F.F.			Heater Outlet	372	20	182							200	104-74	19.8	20-10	10.0	
Wet Gas	5760		Catalyst #1	685	30	216		WATER										
Contraction		52.3	#2	653	40	234		Temp	%	Reactor d-P, H ₂ O			250	73-62	3.7	10-0	2.0	
Recycle	11000		#3	602	50	256		200		Pounds in Reactor	234.0	<325	61-44	11.8				
Bleed	364		#4	578	60	278		203		Density, lbs./cu. ft.	86.8		43-0	39.0				Chem. Anal.
Total	11364		#5	580	70	298		208		Bed Height, Feet	4.0							
Total Feed	22464		Average	615	80	322												
Recycle/F.F.	1.07		Product Separator		90	356												
Inlet Vel.	1.52 ft/sec				95	380				Space Vel. SCFH/lb. cat.			Sp. Grav.	4.6				Specific Surface
Steam Flow					E.P.	405				Inventory Figures	62.3							m ² /gm
					Rec	98.0				From d-P Meters	51.8							
					Res	2.8												
					Loss	1.8												

NATURAL GAS		PRODUCT INSPECTION						GENERATOR ELEMENTAL BALANCE										
%		Oil	Water	Product	Pour °F	SUS @ °F	IN		OUT				Mol %		SCFH/hr	C	H	O
CO ₂	1.59	Neut No. 53.14					O ₂	249.086	7.784			15.368	CO ₂	1.0	3.19	3.19	6.38	
CH ₄	81.44	Sap No. 63.1					CO ₂	7.084	.161	.161		.322	CO	34.0	10.856	10.856	10.856	
C ₂ H ₆	10.53	Hydrox No.					CH ₄	131.680	8.230	8.230	32.920		CH ₄	1.3	.415	.415	1.660	
C ₃ H ₈	6.44	Bromine No. 36.1					C ₂ H ₆	31.920	1.064	2.128	6.384		H ₂	61.6	19.669	39.338		
C ₄ H ₁₀		% Fe					C ₃ H ₈	25.644	.651	1.953	5.208		N ₂	2.1	.671			
N ₂		% Alc					C ₄ H ₁₀						H ₂ O				3.574	
O ₂							N ₂						Total				31.930	
							Total	448.416	17.890	124.72	44.512	15.890						11.590

Less H₂O 369.288

FRESH FEED		WET GAS				RECYCLE	COMB. FEED	EFFLUENT		NET CHANGE ON REACTION									
%	m/hr	#/hr	%	Measured m/hr	At Wt. Balance #/hr	m/hr	m/hr	%	m/hr	%	Carbon		Hydrogen		Oxygen	Ultimate Oil		Unsat.	
CO	34.0	10.86	304.08	13.5	2.05	57.40	2.56	71.68	4.05	14.91	24.08	6.61	12.76	-8.30	23.57	-8.30			
H ₂	61.6	19.67	39.34	54.6	8.30	16.60	10.38	20.76	16.37	36.04	58.19	26.75	51.63	-9.29	-18.58				
CO ₂	1.0	.32	14.08	17.3	2.63	115.72	3.29	144.76	5.19	5.51	8.90	8.48	16.37	2.97	2.97	27.35			5.74
N ₂	2.1	.67	18.76	1.4	.21	5.88	.26	8.12	.42	1.09	1.16	.68	1.31	-.41					
CH ₄	1.3	.42	6.72	7.1	1.08	17.28	1.35	21.60	2.13	3.55	4.12	3.48	6.72	.93	.93	9.56	3.72		
C ₂ H ₆				1.4	.21	5.88	.26	7.28	.42	.42	.68	.68	1.31	.26	.52	4.79	1.04		53.85
C ₃ H ₈				1.2	.18	5.40	.23	6.90	.36	.36	.88	.59	1.14	.23	.46	4.24	1.38		
C ₄ H ₁₀				1.1	.17	7.14	.21	8.82	.33	.33	.83	.54	1.04	.21	.63	5.80	1.26	7.94	1.27
C ₅ H ₁₂				0.5	.08	3.52	.10	4.40	.15	.15	.24	.25	.48	.10	.30	2.76	.80		68.75
C ₆ H ₁₄				0.8	.12	6.72	.15	8.40	.24	.24	.39	.39	.75	.15	.60	5.52	1.20	7.98	1.31
C ₇ H ₁₆				0.4	.06	3.48	.08	4.64	.12	.12	.19	.20	.39	.08	.32	2.95	.80	4.64	.95
C ₈ H ₁₈				0.5	.08	5.60	.10	7.00	.15	.15	.24	.25	.48	.10	.50	4.60	1.00	7.00	1.30
C ₉ H ₂₀				0.2	.03	2.58	.04	3.44	.06	.06	.10	.10	.19	.04	.24	2.21	.48	3.44	
OIL							11.62					.08	.15		.83	7.64	1.66		1.79
WATER												2.36	4.56		5.24				
TOTAL		31.93	382.98			15.20	253.20			61.93		51.44				12.36			
H ₂ +CO		30.53														2.62		42.62	6.62
H ₂ /CO		1.81				4.05			2.42		4.05								

ULTIMATE YIELDS				WEIGHT BALANCE		#/hr		EFFLUENT RATIOS		CONTRACTION: 40.5	
% CO Fed	#/hr	#/MCF	g/M3	Gal/hr	Gal/MCF	cc/M3	Wet Gas	Oil	H ₂ /H ₂ O	CO ₂ /CO	H ₂ Conversion:
C1+C2	17.59	29.06	2.51	42.44			253.2	10.6	11.33	1.28	76.43
C3+	31.48	48.33	4.17	70.51							47.2
C4+	22.92	35.10	3.03	51.24			56.5	56.5	(H ₂)(CO ₂)		
Ult. Oil		42.62	3.67	62.06	6.62	0.571	320.3	83.8	(H ₂)(CO)		
CO ₂	27.35	130.68	11.27	190.58							
H ₂ O		42.48	3.66	61.89							

Yield Calculations assume "oil" is CH₂, and is found by difference on Carbon, and H₂O 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 1.01325 bar. g/M3 = 16.91 x #/MCF. cc/M3 = 141.3 x gal/MCF.

THE TEXAS COMPANY — MONTEBELLO LABORATORY

DATA SUMMARY SHEET

Synthesis Run Number 248 From 9/13/47 Hr. 0700 to 9/14/47 Hr. 0700

FLOWS		RUN CONDITIONS			DISTILLATIONS			CATALYST DATA			CATALYST ANALYSIS			
	SCFH	%	Generator Press.	201	A S T M			Hempel Dist.			Particle Size			
Oxygen	1260		O ₂ Preheat, °F	521	Prod.	6950	°F	%	A.P.I.	Fresh Catalyst Charged	Screen			
Nat. Gas	1657		Gas Preheat, °F	761	A.P.I.		to 400			Catalyst Recharged	Frac.	M	%	
Total	2917		Reactor Press.	171	I.B.P.		400-550			Total	300	On 40	420+	80+
Fresh Feed	4160		Steam Back Press.	970	5%		550+			Catalyst Taken Out	10	100	419-150	80-40
F. F. by C	4730		Temperatures, °F		10%					In Reactor at End of Period	290	150	149-105	20-10
Avg. F. F.			Heater Outlet	705	20							200	104-74	20-10
Wet Gas	2640		Catalyst #1	654	30		WATER					250	73-62	10-0
Contraction		443	#2	658	40		Temp.	%		Reactor d-P, H ₂ O	17	325	61-44	
Recycle	4980		#3	585	50		200			Pounds in Reactor	203	<325	43-0	
Bleed	228		#4	560	60		203			Density, lbs./cu. ft.	94			Chem. Anal.
			#5	533	70		208			Bed Height, Feet	3.3			
Total	5208		Average	594	80									Settled
Total Feed	9938		Product Separator		90									Compacted
Recycle/F.F.	1.10				95					Space Vel. SCFH/lb. cat.				Sp. Grav.
Inlet Vel.	1.10 ft/sec				E.P.					Inventory Figures	163			Specific Surface
Steam Flow					Rec.					From d-P Meters	23.3			m ² /gm
					Res.									
					Loss									

NATURAL GAS		PRODUCT INSPECTION						GENERATOR ELEMENTAL BALANCE									
%		Oil	Water	Product	Pour °F	SUS @ °F	IN			OUT							
							#/hr	Mol-%	SCFH	C	H	O	Mol %	SCFH	C	H	O
CO ₂	1.25						O ₂	106.40	3.325			6650	CO ₂	3.0	.974	.974	.748
CH ₄	83.57	Neut. No.					CO ₂	2.42	.055	.055		.110	CO	32.2	4.019	4.019	4.019
C ₂ H ₆	9.10	Sap. No.					CH ₄	58.46	3.654	3.654	14.616		CH ₄	8.7	1.086	1.086	4.344
C ₃ H ₈	6.08	Hydrox. No.					C ₂ H ₆	11.94	.398	.796	2.388		H ₂	55.4	6.914		13.828
C ₄ H ₁₀		Bromine No.					C ₃ H ₈	11.70	.266	.798	2.128		N ₂	0.7	.087		
N ₂		% Fe					C ₄ H ₁₀						H ₂ O				.960
O ₂		% Alc					N ₂						Total				12.480
							Total	190.92	7.698	5.303	19.132	6.760					5.479
																	19.132
																	6.760

10% H₂O 158.05

FRESH FEED				WET GAS				RECYCLE	COMB. FEED	EFFLUENT	NET CHANGE ON REACTION												
%	m/hr	#/hr	%	Measured	At Wt. Balance						Carbon			Hydrogen		Oxygen	Ultimate Oil		Unsat.				
				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	32.2	4.02	112.53	8.67	.60	16.91																	
H ₂	55.4	6.91	13.83	51.78	3.61	7.21																	
CO ₂	3.0	.37	16.46	22.41	1.56	68.68																	
N ₂	.7	.09	2.44	1.25	.09	2.44																	
CH ₄	8.7	1.09	17.38	11.41	.80	12.72																	
C ₂ H ₆				1.09	.08	2.13																	
C ₂ H ₄					.53	1.11																	
C ₃ H ₆					1.28	3.74																	
C ₃ H ₈					.44	1.36																	
C ₄ H ₈					.84	3.30																	
C ₄ H ₁₀																							
C ₅ H ₁₀					.31	1.54																	
C ₆ H ₁₂																							
OIL																							
WATER																							
TOTAL		12.48	162.64		6.97	121.11																	
H ₂ +CO		10.93																					
H ₂ /CO																							

ULTIMATE YIELDS						WEIGHT BALANCE		#/hr		EFFLUENT RATIOS		CONTRACTION:	
% CO Fed		#/hr		H ₂ /CO		H ₂ /CO		#/hr		#/hr		#/hr	
		#/MCF	g/M3	Gal/hr	Gal/MCF	cc/M3					H ₂ /H ₂ O	C ₀ Conversion:	
C1+C2		NO YIELD					Wet Gas					H ₂ Conversion:	
C3+							Oil	NO WEIGHT BALANCE					
C4+							Water						
Ult. Oil							Total						
CO ₂													
H ₂ O													

Yield Calculations assume "oil" is CH₂, and is found by difference on Carbon, and H₂O 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 24C From 9/14/47 Hr. 0700 to 9/15/47 Hr. 0700

FLOWS		RUN CONDITIONS				DISTILLATIONS				CATALYST DATA				CATALYST ANALYSIS				
SCFH	%	Generator Press.				A S T M		Hempel Dist.		In Reactor at Start of Period		Particle Size						
Oxygen	2100	O ₂ Preheat, °F	309	489	Prod.	640		°F	%	A.P.I.	Fresh Catalyst Charged	290	Screen		Sedimentation			
Nat. Gas	2710	Gas Preheat, °F	758	434	A.P.I.	434		to 400	650		Catalyst Recharged	199.5	Frac.	M	%	M	%	
Total	4810	Reactor Press.	304	132	I.B.P.	132		400-550	186		Total	489.5	On 40	420+	16	80+	55.0	
Fresh Feed	8450	Steam Back Press.	1000	5%				550+			Catalyst Taken Out	53.5	100	419-150	18.8	80-40	16.0	
F.F. by C	8000	Temperatures, °F		10%	170						In Reactor at End of Period	436.0	150	149-105	20.2	40-20	29.0	
Avg. F.F.	8225	Heater Outlet	465	20	200								200	104-74	17.4	20-10	-	
Wet Gas	4600	Catalyst #1	700	30	218			WATER										
Contraction	43.5	#2	679	40	240			Temp.	%	Reactor d-P, H ₂ O	75.6		250	73-62	3.0	10-0	-	
Recycle	8050	#3	608	50	260			200		Pounds in Reactor	261.0		325	61-44	7.8			
Bleed	328	#4	585	60	280			203		Density, lbs./cu. ft.	96.0		<325	43-0	31.2			
Total	8408	#5	560	70	304			208		Bed Height, Feet	4.2							
Total Feed	16633	Average	626	80	330													
Recycle/F.F.	1.02	Product Separator		90	362													
Inlet Vel.	1.08 ft/sec			95	394					Space Vel. SCFH/lb. cat.								
Steam Flow	97 #/hr			E.P.	418					Inventory Figures	18.8							
				Rec.	98.0					From d-P Meters	31.4							
				Res.	0.7													
				Loss	1.3													

NATURAL GAS		PRODUCT INSPECTION						GENERATOR ELEMENTAL BALANCE									
%		Oil	Water	Product	Pour °F	SUS @ °F	IN			OUT							
							#/hr	Mol-%	SCFH	C	H	O	Mol %	SCFH	C	H	O
CO ₂	2.04	Neut. No. 45.5	34.7				O ₂	177.31	5.541			11.082	CO ₂	2.2	.491	.491	.982
CH ₄	82.70	Sap No. 59.2	128.51				CO ₂	6.42	.446	.146		.292	CO	34.2	7.627	7.627	7.627
C ₂ H ₆	9.36	Hydrox. No.					CH ₄	94.61	5.913	5.913	23.652		CH ₄	2.0	.446	.446	1.754
C ₃ H ₈	5.89	Bromine No. 60.2					C ₂ H ₆	20.07	.669	1.338	4.014		H ₂	60.9	13.581		27.162
C ₄ H ₁₀		% Fe					C ₃ H ₈	15.52	.421	1.263	3.368		N ₂	0.7	.156		
N ₂		% Alc	6.7				C ₄ H ₁₀						H ₂ O				2.088
O ₂							N ₂						Total				22.300
							Total	31693	12.690	8.660	31.034	11.374					8.564
																	31.034

Loss No 267.16

FRESH FEED		WET GAS				RECYCLE	COMB. FEED	EFFLUENT		NET CHANGE ON REACTION											
%	m/hr	#/hr	%	m/hr	#/hr	m/hr	m/hr	%	m/hr	%	Carbon		Hydrogen		Oxygen	Ultimate Oil		Unsat.			
				Measured	At Wt. Balance						m/hr	a/hr	%	a/hr	%	a/hr	#/hr	#/gal	gal/hr	%	
CO	34.2	7.63	213.64	11.58	1.41	39.48	1.37	38.25	2.57	10.20	22.93	3.93	10.37	-6.26	-6.26	17.90					
H ₂	60.9	13.58	27.16	60.12	7.30	14.60	7.07	14.15	13.34	26.92	60.52	20.41	53.84	-6.51		-13.02					
CO ₂	2.2	.49	21.56	15.34	1.86	81.84	1.80	79.29	3.40	3.89	8.75	5.20	13.72	1.31	1.31	17.17					
N ₂	.7	.15	4.20	1.97	.24	66.72	.23	65.52	.44	.59	1.33	.67	1.77	- .08			2.62				
CH ₄	2.0	.45	7.20	6.81	.83	13.28	.80	12.86	1.51	1.96	4.41	2.31	6.09	.35	.35	4.59	1.40				
C ₂ H ₆				1.05	.13	3.64	.13	3.53	.23	.23	.52	.36	.95	.13	.26	3.41	.52			66.04	
C ₃ H ₈				.54	.07	2.10	.07	2.04	.12	.12	.27	.19	.50	.07	.14	1.83	.42				
C ₄ H ₁₀				.98	.12	5.04	.12	4.87	.22	.22	.29	.34	.90	.12	.36	4.72	.72	4.38	6.25	.70	72.26
C ₅ H ₁₂				.36	.05	2.20	.05	2.11	.08	.08	.18	.13	.34	.05	.15	1.97	.40				
C ₆ H ₁₄				.76	.09	5.04	.09	4.87	.17	.17	.38	.26	.69	.09	.36	4.72	.72	4.63	6.1	.76	85.39
C ₇ H ₁₆				.13	.02	1.16	.02	1.10	.03	.03	.07	.05	.13	.02	.08	1.05	.20	1.10	4.86	.23	
C ₈ H ₁₈				.32	.04	2.80	.04	2.73	.07	.07	.16	.11	.29	.04	.20	2.62	.40	2.73	5.4	.51	
C ₉ H ₂₀																					
OIL								42.70				.31	.82		3.05	39.97	6.10	42.70	6.5	6.57	
WATER												3.64	9.60		2.14		3.64				
TOTAL	22.30	273.76		12.14	177.90				44.48		37.91		10.67				1.07	55.54		8.77	
H ₂ +CO	21.21																				
H ₂ /CO	1.78					5.16			2.64		5.19										

ULTIMATE YIELDS				WEIGHT BALANCE				EFFLUENT RATIOS		CONTRACTION:	
%	#/hr	g/M3	Gal/hr	#/hr	%	#/hr	%	H ₂ /H ₂ O	CO Conversion:	H ₂ Conversion:	
C1+C2	9.83	11.23	1.40	23.67	Wet Gas	177.9	172.3	5.61	82.10	47.9	
C3+	55.05	58.38	7.26	122.77	Oil	18.3	18.3	1.32			
C4+	48.36	51.40	6.39	108.05	Water	83.2	85.2	7.42			
Ult. Oil	55.54	6.91	116.85	8.77	Total	279.4	97.9	273.8			
CO ₂	17.17	57.73	7.18	121.41							
H ₂ O	65.52	8.15	137.82								

Yield Calculations assume "oil" is CH₂, and is found by difference on Carbon, and H₂O 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 24D From 9/15/47 Hr. 0700 to 9/16/47 Hr. 0700

FLOWS		RUN CONDITIONS		DISTILLATIONS			CATALYST DATA		CATALYST ANALYSIS									
	SCFH	%	Generator Press.	311	A S T M			Hempel Dist.		In Reactor at Start of Period		Particle Size						
Oxygen	2120		O ₂ Preheat, °F	440	Prod.	6850		°F	%	A.P.I.	Fresh Catalyst Charged		Screen					
Nat. Gas	2640		Gas Preheat, °F	756	A.P.I.	433		to 400	700		Catalyst Recharged		73.0	Frac.	M	%	M	%
Total	4760	49.6	Reactor Press.	303	I.B.P.	138		400-550	193		Total		509.0	On 40	420+	1.2	80+	42.0
Fresh Feed	8480		Steam Back Press.	1000	5%			550+	10.7		Catalyst Taken Out		70.5	100	419-150	14.5	80-40	26.0
F.F. by C	8450		Temperatures, °F		10%	168					In Reactor at End of Period		438.5	150	149-105	13.6	40-20	31.0
Avg. F.F.	8430		Heater Outlet	858	20	196								200	104-74	16.3	20-10	1.0
Wet Gas	4300		Catalyst #1	686	30	218		WATER						250	73-62	2.2	10-0	-
Contraction		491	≠2	653	40	238		Temp.	%		Reactor d-P, H ₂ O		10.9	325	61-44	18.1		
Recycle	7600		≠3	627	50	258		200			Pounds in Reactor		275.0	<325	43-0	34.1		
Bleed	322		≠4	593	60	272		203			Density, lbs./cu. ft.		72.8				Density, lbs./cu. ft.	Chem. Anal.
Total	7922		≠5	563	70	296		208			Bed Height, Feet		33				Aerated	% Fe
Total Feed	16370		Average	654	80	321											Settled	% C
Recycle/F.F.	1.07		Product Separator		90	352											Compacted	% Oil
Inlet Vel.	1.05 ft/sec				95	380					Space Vel. SCFH/lb. cat.			Sp. Grav.	4.3			Specific Surface
Steam Flow	122 #/hr				E.P.	403					Inventory Figures		193					m ² gm
					Rec.	98.0					From d-P Meters		32.8					
					Res.	0.7												
					Loss	1.3					GENERATOR ELEMENTAL BALANCE							

NATURAL GAS		PRODUCT INSPECTION						GENERATOR ELEMENTAL BALANCE									
	%	Oil	Water	Product	Pour °F	SUS @ °F	IN					OUT					
							#/hr	Mol-%	SCFH	C	H	O	Mol %	SEFH	C	H	O
CO ₂	1.31	Neut. No.	54.4	39.2			O ₂	179.01	5594			11188	CO ₂	2.1	468	468	936
CH ₄	83.28	Sap. No.	57.0	126.83			CO ₂	4.00	.091	.091		.182	CO	35.3	7872	7872	7872
C ₂ H ₆	10.07	Hydrox. No.					CH ₄	92.83	5.801	5.801	23.204		CH ₄	1.2	268	268	1072
C ₃ H ₈	5.34	Bromine No.	20.0				C ₂ H ₆	21.03	.701	1.402	4.206		H ₂	61.2	13,648		27,296
C ₄ H ₁₀		% Fe					C ₃ H ₈	16.37	.372	1.116	2.976		N ₂	0.2	.045		
N ₂		% Alc	10.9				C ₄ H ₁₀						H ₂ O				2,018
O ₂							N ₂						Total				8,608
							Total	313.23	12,559	8,410	30,386	11,370					30,386

Loss No 267.11

	FRESH FEED		WET GAS				RECYCLE	COMB. FEED	EFFLUENT		NET CHANGE ON REACTION														
	%	m/hr	#/hr	%	Measured	At Wt. Balance			m/hr	%	m/hr	%	Carbon			Hydrogen		Oxygen	Ultimate Oil		Unsat.				
CO	35.3	7.87	220.86	7.45	.846	23.69	.806	22.57	1.557	9.43	21.82	2.363	6.67	-7.06	-7.06	10.24									
H ₂	61.2	13.65	27.30	57.88	6.569	13.14	6.260	12.52	12.097	25.75	59.59	18.357	51.80	-7.39											
CO ₂	2.1	.47	20.68	21.51	2.441	107.40	2.326	102.34	4.496	4.97	11.50	6.922	19.53	1.86	1.86	23.63									
N ₂	.2	.04	1.12	.54	.061	1.71	.058	1.62	.113	.15	.35	.171	.48	.02											
CH ₄	1.2	.27	4.32	7.04	.799	12.78	.761	12.18	1.741	1.74	4.03	2.232	6.30	.49	.49	6.23	1.96								
C ₂ H ₆				1.69	.192	5.38	.183	5.12	.353	.35	.91	.536	1.51	.18	.36	4.57	.72							68.98	
C ₃ H ₈				.76	.086	2.58	.082	2.46	.159	.16	.37	.241	.68	.08	.16	2.03	.48								
C ₄ H ₁₀				1.41	.180	6.72	.152	6.38	.295	.30	.69	.447	1.26	.15	.45	5.72	.90							5.74	
C ₅ H ₁₂				.38	.043	1.89	.041	1.80	.079	.08	.19	.120	.34	.04	.12	1.52	.32								
C ₆ H ₁₄				.84	.095	5.32	.091	5.10	.176	.18	.42	.267	.75	.09	.36	4.57	.72							4.85	
C ₇ H ₁₆				.16	.018	1.04	.017	.99	.033	.03	.07	.050	.14	.02	.08	1.02	.20							.99	
C ₈ H ₁₈				.33	.037	2.59	.035	2.45	.069	.07	.16	.104	.28	.04	.40	5.08	.40							2.45	
C ₉ H ₂₀																									
OIL								38.92				.278	.78		2.78	35.32	5.56							3.34	
WATER																									38.92
TOTAL		22.30	273.78		11.35	184.24				43.21		35.428		11.52			1.76								52.95
H ₂ +CO		21.52																							8.36
H ₂ /CO		1.73						7.73		2.73		7.78													

ULTIMATE YIELDS				WEIGHT BALANCE			EFFLUENT RATIOS		CONTRACTION: 51.7	
%	#/hr	H ₂ /CO	H ₂ /CO	Wet Gas	#/hr	%	#/hr	H ₂ /H ₂ O	C ₀ Conversion:	
C ₀ Fed		#/MCF	g/M ³	12.83	15.44	1.89	31.96	5.50	89.76	
C ₁ +C ₂		Gal/hr	Gal/MCF	17.91	55.64	6.82	115.33	2.93	54.1	
C ₃ +		Gal/hr	Gal/MCF	10.67	47.46	5.82	98.42	7.77		
C ₄ +		Gal/hr	Gal/MCF							
Ult. Oil		Gal/hr	Gal/MCF							
C ₀ 2		Gal/hr	Gal/MCF							
H ₂ O		Gal/hr	Gal/MCF							

Yield Calculations assume "oil" is CH₂, and is found by difference on Carbon, and H₂O 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 24E From 9/16/47 Hr. 0700 to 9/17/47 Hr. 0700

FLOWS		RUN CONDITIONS			DISTILLATIONS			CATALYST DATA		CATALYST ANALYSIS				
SCFH	%	Generator Press.			A S T M		Hempel Dist.		In Reactor at Start of Period	Particle Size				
Oxygen	2140	O ₂ Preheat, °F	310	441	Prod.	6850	°F	%	A.P.I.	Fresh Catalyst Charged	Screen			
Nat. Gas	2570	Gas Preheat, °F	762	762	A.P.I.	43.5	to 400	75.7		Catalyst Recharged	Frac.	M	%	Sedimentation
Total	4650	Reactor Press.	303	303	I.B.P.	126	400-550	15.7		Total	On 40	420+	1.0	80+
Fresh Feed	7450	Steam Back Press.	1050	1050	5%		550+			Catalyst Taken Out	100	419-150	9.1	80-40
F. F. by C	7800	Temperatures, °F			10%	163				In Reactor at End of Period	150	149-105	11.9	40-20
Avg. F. F.		Heater Outlet	585	585	20	186					200	104-74	16.1	20-10
Wet Gas	4050	Catalyst #1	716	716	30	210	WATER				250	73-62	4.8	10-0
Contraction		#2	715	715	40	228	Temp.	%	Reactor d-P, H ₂ O	10.9	325	61-44	14.1	
Recycle	7500	#3	642	642	50	248	200		Pounds in Reactor	272.6	<325	43-0	4.8	
Bleed	374	#4	606	606	60	268	203		Density, lbs./cu. ft.	67.2				Chem. Anal.
Total	7834	#5	580	580	70	292	208		Bed Height, Feet	8.0				Aerated
Total Feed	15634	Average	652	652	80	312								Settled
Recycle/F.F.	1.0	Product Separator			90	348								Compacted
Inlet Vel.	1.03 ft/sec				95	378			Space Vel. SCFH/lb. cat.		Sp. Grav.	4.2		Specific Surface
Steam Flow	119 #/hr				E.P.	406			Inventory Figures	18.4				m ² gm
					Rec.	96.0			From d-P Meters	286				
					Res.	0.7								
					Loss.	1.3								

NATURAL GAS		PRODUCT INSPECTION						GENERATOR ELEMENTAL BALANCE									
%		Oil	Water	Product	Pour °F	SUS @ °F	IN			OUT							
							#/hr	Mol %	SEFH m/hr	C	H	O	Mol %	SEFH m/hr	C	H	O
CO ₂	8.67	Neut. No. 55.0	99.67				O ₂	180.67	5.646			11.282	CO ₂				
CH ₄	78.83	Sap. No. 55.8	131.32				CO ₂	7.79	.177	.177		.354	CO				
C ₂ H ₆	9.51	Hydrox. No.					CH ₄	97.54	5.221	5.221	20.884		CH ₄				
C ₃ H ₈	4.61	Bromine No.	37.14				C ₂ H ₆	18.90	.630	1.260	3.780		H ₂				
C ₄ H ₁₀		% Fe					C ₃ H ₈	13.42	.305	.915	2.440		N ₂				
N ₂		% Alc	9.1				C ₄ H ₁₀						H ₂ O				
O ₂							N ₂						Total				
							Total	304.32	11.979	7.573	27.104	11.646					

FRESH FEED		WET GAS				RECYCLE	COMB. FEED	EFFLUENT	NET CHANGE ON REACTION											
%	m/hr	#/hr	%	Measured	At Wt. Balance	m/hr	m/hr	%	m/hr	%	Carbon			Hydrogen		Oxygen	Ultimate Oil		Unsat.	
				m/hr	#/hr	m/hr	#/hr				m/hr	a/hr	%	a/hr	%	a/hr	#/hr	#/gal	gal/hr	%
CO																				
H ₂																				
CO ₂																				
N ₂																				
CH ₄																				
C ₂ H ₆																				
C ₃ H ₈																				
C ₄ H ₁₀																				
C ₅ H ₁₂																				
C ₆ H ₁₄																				
OIL																				
WATER																				
TOTAL																				
H ₂ +CO																				
H ₂ /CO																				

ULTIMATE YIELDS				WEIGHT BALANCE		EFFLUENT RATIOS		CONTRACTION:	
%	H ₂ /CO	H ₂ /CO		#/hr	%	#/hr	H ₂ /H ₂ O	C ₀ Conversion:	
C ₀ Fed	#/hr	#/MCF	g/M ³	Gal/hr	Gal/MCF	cc/M ³	CO ₂ /CO	H ₂ Conversion:	
C ₁ +C ₂							(H ₂)(CO ₂)		
C ₃ +							(H ₂ O)(CO)		
C ₄ +									
Un. Oil									
CO ₂									
H ₂ O									

Yield Calculations assume "oil" is CH₂, and is found by difference on Carbon, and H₂O 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 24F From 9/17/47 Hr. 0700 to 9/18/47 Hr. 0700

FLOWS		RUN CONDITIONS		DISTILLATIONS				CATALYST DATA		CATALYST ANALYSIS						
SCFH	%	Generator Press.	307	A S T M				Hempel Dist.		In Reactor at Start of Period		Particle Size				
Oxygen	2090	O ₂ Preheat, °F	490	Prod.	6450			°F	%	A.P.I.	Fresh Catalyst Charged	Screen				
Nat. Gas	2510	Gas Preheat, °F	773	A.P.I.	45.9			to 400	810		Catalyst Recharged	Frac.	M	%	Sedimentation	
Total	4600	Reactor Press.	301	I.B.P.	184			400-550	147		Total	On 40	420+	80+	80+	
Fresh Feed	7000	Steam Back Press.	1030	5%				550+			Catalyst Taken Out	100	419-150	80-40	25.0	
F.F. by C	7800	Temperatures, °F		10%	154						In Reactor at End of Period	150	149-105	40-20	38.0	
Avg. F.F.		Heater Outlet	841	20	174							200	104-74	20-10	3.0	
Wet Gas	3560	Catalyst #1	707	30	196			WATER				250	73-62	10-0	1.0	
Contraction		#2	703	40	218			Temp.	%		Reactor d-P, H ₂ O	325	61-44			
Recycle	9500	#3	645	50	238			200			Pounds in Reactor	<325	43-0			
Bleed	318	#4	605	60	258			203			Density, lbs./cu. ft.	58.8			Chem. Anal.	
Total	9818	#5	576	70	280			208			Bed Height, Feet	9.5			Aerated	% Fe
Total Feed	17418	Average	655	80	308										Settled	% C
Recycle/F.F.	1.26	Product Separator		90	348										Compacted	% Oil
Inlet Vel.	1.17 ft/sec			95	384						Space Vel. SCFH/lb. cat.		Sp. Grav.	4.2	Specific Surface	
Steam Flow	103 #/HR			E.P.	408						Inventory Figures	19.1				m ² gm
				Rec.	970						From d-P Meters	26.2				
				Res.	0.8											
				Loss	3.2											

NATURAL GAS		PRODUCT INSPECTION						GENERATOR ELEMENTAL BALANCE									
%		Oil	Water	Product	Pour °F	SUS @ °F	IN			OUT							
							#/hr	Mol-%	SCFH	C	H	O	Mol %	SCFH	C	H	O
CO ₂	1.68	Neut. No.	57.0	38.64			O ₂	176.48	5.515			11.070	CO ₂	4.1	844	844	1.688
CH ₄	84.63	Sap. No.	38.9	132.44			CO ₂	4.88	1.111	1.111		.222	CO	35.6	7326	7326	7.326
C ₂ H ₆	9.48	Hydrox. No.					CH ₄	89.68	5.605	5.605	22.420		CH ₄	0.8	1.65	1.65	.660
C ₃ H ₈	4.21	Bromine No.	43.4				C ₂ H ₆	18.84	.628	1.256	7.768		H ₂	59.1	12.163		24.326
C ₄ H ₁₀		% Fe					C ₃ H ₈	12.28	.279	.837	2.232		N ₂	0.4	1.082		
N ₂		% Alc	12.5				C ₄ H ₁₀						H ₂ O				3.434
O ₂							N ₂						Total				20.580
							Total	302.08	12.138	7809	28.420	11.252					8.335

Loss to 261.80

FRESH FEED		WET GAS				RECYCLE		COMB. FEED		EFFLUENT		NET CHANGE ON REACTION											
%	m/hr	#/hr	%	Measured	At Wt. Balance	m/hr	m/hr	%	m/hr	%	Carbon		Hydrogen		Oxygen		Ultimate Oil		Unsat.				
				m/hr	#/hr	m/hr	#/hr				m/hr	a/hr	%	a/hr	%	a/hr	%	#/hr	#/gal	gal/hr	%		
CO	35.6	7.33	205.24	9.28	.871	24.39	.993	27.80	2.404	9.73	20.94	3.39	8.47	-6.34	-6.34	13.55		-6.34					
H ₂	59.1	12.16	24.32	49.96	4.691	9.38	5.348	10.70	12.945	25.11	54.03	18.30	45.74	-6.81			-13.62						
CO ₂	4.1	.84	36.96	21.89	2.055	90.42	2.343	103.09	5.672	6.51	14.01	8.01	20.02	1.50	1.50	20.45		3.00					
N ₂	.4	.08	2.24	.94	.088	2.46	1.100	2.80	.244	.32	.69	.34	.85	-.02									
CH ₄	.5	.10	1.60	9.97	.936	14.98	1.067	17.07	2.583	2.68	5.77	3.65	9.12	.97	.97	13.2	3.98					39.02	
C ₂ H ₆	.3	.06	1.68	2.17	.204	5.71	.233	6.52	.562	.62	1.33	.79	1.97	.17	.34	4.63	.68						
C ₃ H ₈				1.28	.120	3.60	.137	4.11	.332	.33	.71	.47	1.17	.14	.28	3.82	.84						
C ₄ H ₁₀				2.00	.188	7.90	.214	8.99	.518	.52	1.12	.73	1.82	.21	.63	8.59	1.26			8.09	6.25	1.29	27.85
C ₅ H ₁₂				.44	.041	1.80	1.047	2.07	.114	.11	.24	.16	.40	.05	.15	2.04	.40						
C ₆ H ₁₄				1.14	.107	5.99	.122	6.83	.295	.30	.65	.42	1.05	.12	.48	6.54	.96			6.49	6.1	1.06	34.57
C ₇ H ₁₆				.28	.026	1.51	.030	1.74	.073	.07	.15	.10	.25	.03	.12	1.64	.30			1.74	4.86	.36	
C ₈ H ₁₈				.53	.050	3.50	.057	3.99	.137	.14	.30	.20	.50	.06	.30	4.09	.60			3.99	5.4	.74	
C ₉ H ₂₀				.11	.010	.86	.011	.95	.029	.03	.06	.04	.10	.01	.06	.82	.12			.95			
OIL								21.14							.51	20.58	1.02			21.14	6.5	3.25	
WATER											3.34	8.35				3.56				3.34			
TOTAL		20.58	272.04			9.39	172.50				46.47	40.09				9.91				1.78	42.40	6.70	
H ₂ +CO		19.49																					
H ₂ /CO		1.66																					

ULTIMATE YIELDS				WEIGHT BALANCE				EFFLUENT RATIOS		CONTRACTION: 48.2	
%	#/hr	H ₂ /CO	H ₂ /CO	Wet Gas	#/hr	%	#/hr	H ₂ /H ₂ O	5.48	CO Conversion:	86.45
CO Fed	#/hr	#/MCF	g/M ³	Gal/hr	Gal/MCF	cc/M ³		CO ₂ /CO	2.36	H ₂ Conversion:	56.0
C1+C2	21.67	24.42	3.30	55.80				(H ₂)/CO ₂	12.95		
C3+	44.30	45.71	6.19	104.67				(H ₂)/(CO)			
C4+	33.67	34.65	4.69	79.31							
Ult. Oil		42.40	5.74	97.06	6.70	.907	128.16				
CO ₂	20.45	66.13	8.95	151.34							
H ₂ O		60.12	8.14	137.65							

Yield Calculations assume "oil" is CH₂, and is found by difference on Carbon, and H₂O 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 × g/MCF.

THE TEXAS COMPANY — MONTEBELLO LABORATORY

DATA SUMMARY SHEET

Synthesis Run Number 246 From 9/19/47 Hr. 0700 to 9/19/47 Hr. 0700

FLOWS		RUN CONDITIONS				DISTILLATIONS				CATALYST DATA				CATALYST ANALYSIS					
	SCFH	%	Generator Press.	307	A S T M				Hempel Dist.		In Reactor at Start of Period		Particle Size						
Oxygen	2040		O ₂ Preheat, °F	521	Prod.	6420			°F	%	A.P.I.	Fresh Catalyst Charged		Screen		Sedimentation			
Nat. Gas	2390		Gas Preheat, °F	796	A.P.I.	470			to 400	82.3		Catalyst Recharged		Frac.	M	%	M	%	
Total	4430	46.1	Reactor Press.	309	I.B.P.	122			400-550	130		Total		100	420+	0.3	80+	32.0	
Fresh Feed	7550		Steam Back Press.	1063	5%				550+			Catalyst Taken Out		150	419-150	3.2	80-40	26.0	
F F by C	7750		Temperatures, °F		10%	154						In Reactor at End of Period		150	149-105	7.9	40-20	37.0	
Avg. F.F.			Heater Outlet	912	20	178								200	104-74	21.7	20-10	4.0	
Wet Gas	3700		Catalyst #1	705	30	198			WATER										
Contraction		52.4	#2	702	40	218			Temp.	%	Reactor d-P, H ₂ O		325	61-44	12.7				
Recycle	4900		#3	644	50	238			200		Pounds in Reactor		<325	43-0	48.1				
Bleed	248		#4	600	60	258			203		Density, lbs./cu. ft.		53.2	Density, lbs./cu. ft.		Chem. Anal.			
Total	10198		#5	568	70	281			208		Bed Height, Feet		8.5	Aerated		% Fe			
Total Feed	17848		Average	643	80	312								Settled		% C			
Recycle/F.F.	1.30		Product Separator		90	348								Compacted		% Oil			
Inlet Vel.	119 ft/sec				95	379					Space Vel. SCFH/lb. cat.			Sp. Grav.		4.2	Specific Surface		
Steam Flow	108 #/hr				E.P.	405					Inventory-Figures		18.3			m ² gm			
					Rec.	98.5					From d-P Meters		714						
					Res.	0.8													
					Loss	0.7													

NATURAL GAS				PRODUCT INSPECTION						GENERATOR ELEMENTAL BALANCE											
				Oil	Water	Product	Pour °F	SUS @ °F	IN				OUT								
												Mol %		SEFH		C		H		O	
CO ₂	1.51	Neut No	54.6	37.98					O ₂	172.26	5.383			10.766	CO ₂	2.2	.450	.450	.900		
CH ₄	84.26	Sap No	62.9	128.51					CO ₂	4.18	.095	.095		.190	CO	35.6	7.280	7.280	7.280		
C ₂ H ₆	10.27	Hydrox No							CH ₄	85.01	5.313	5.313	21.252		CH ₄	0.7	.143	.143	.572		
C ₃ H ₈	3.96	Bromine No	47.8						C ₂ H ₆	19.44	.648	1.246	3.888		H ₂	60.8	12.434		24.868		
C ₄ H ₁₀		% Fe							C ₃ H ₈	11.00	.250	.750	2.000		N ₂	0.7	.143				
N ₂		% Alc	13.8						C ₄ H ₁₀						H ₂ O				1.700		
O ₂									N ₂						Total						
									Total	291.89	11.689	745.4	27.140	10.956		20.450	7.873	27.140	10.956		

Less H₂O 241.92

	FRESH FEED				WET GAS				RECYCLE	COMB. FEED	EFFLUENT				NET CHANGE ON REACTION										
	%		#/hr		Measured		At Wt. Balance				m/hr		%		m/hr		Carbon		Hydrogen		Oxygen		Ultimate Oil		Unsat.
	m/hr	#/hr	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	
CO	35.6	7.28	203.84	10.17	.99	27.72	1.12	31.36	2.74	10.02	21.16	3.86	9.34	-6.16	-6.16	15.38			-6.16						
H ₂	60.8	12.43	24.86	54.76	5.34	10.68	6.03	12.06	14.74	27.17	57.38	20.77	50.26	-6.40											
CO ₂	2.2	.45	19.80	20.46	2.00	88.00	2.26	99.44	5.51	5.96	12.59	7.76	18.78	1.81	1.81	24.86									
N ₂	0.7	.14	3.92	.68	.07	1.96	.08	2.24	.18	.32	.68	.26	.63	-.06											
CH ₄	0.7	.14	2.24	7.80	.76	12.16	.86	13.76	2.10	2.24	4.73	2.96	7.16	.72	.72	9.99	2.88								
C ₂ H ₆				1.76	.17	4.76	.19	5.32	.47	.47	.99	.66	1.60	.19	.38	5.22	.76								63.31
C ₃ H ₈				1.76	.17	7.14	.19	7.98	.47	.47	.99	.66	1.60	.19	.57	7.83	1.14								81.48
C ₄ H ₁₀				.40	.04	1.76	.05	2.20	.11	.11	.23	.16	.39	.05	.15	2.06	.40								
C ₅ H ₁₂				.80	.08	4.48	.09	5.04	.22	.22	.46	.31	.75	.09	.36	4.95	.72								89.89
C ₆ H ₁₄				.09	.01	.58	.01	.58	.02	.02	.04	.03	.07	.01	.04	.55	.10								
C ₇ H ₁₆				.31	.03	2.58	.03	2.58	.08	.08	.17	.11	.27	.03	.15	2.06	.30								
C ₈ H ₁₈																									
OIL								24.64				.18	.44		1.76	24.18	3.52						24.64	6.5	3.79
WATER												2.54	6.15			2.32									
TOTAL				20.45	254.66		9.76	164.82				47.35	40.64		9.42								1.16	39.77	6.33
H ₂ +CO				19.71								2.71	5.38												
H ₂ /CO				1.71																					

	ULTIMATE YIELDS						WEIGHT BALANCE			EFFLUENT RATIOS		CONTRACTION: 46.1		
	% CO Fed	#/hr	H ₂ /CO #/MCF	g/M ³	Gal/hr	H ₂ /CO Gal/MCF	cc/M ³	Wet Gas	#/hr	%	#/hr	H ₂ /H ₂ O	8.18	CO Conversion: 84.62
C1+C2	18.13	20.14	2.70	45.66				Oil	7.9		7.9	CO ₂ /CO	2.01	H ₂ Conversion: 51.5
C3+	41.63	43.02	5.76	97.40				Water	61.5		61.5	(H ₂)/CO ₂	16.44	
C4+	31.74	32.84	4.40	74.40				Total	234.2	92.1	254.7	(H ₂)/(CO)		
Ult. Oil		39.77	5.32	89.96	6.33	.847	180.26							
CO ₂	24.86	79.64	10.66	180.26										
H ₂ O		45.72	6.12	103.49										

Yield Calculations assume "oil" is CH₂, and is found by difference on Carbon, and H₂O 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 244 From 9/19/47 Hr. 0700 to 9/20/47 Hr. 0200

FLOWS		RUN CONDITIONS			DISTILLATIONS			CATALYST DATA			CATALYST ANALYSIS							
	SCFH	%	Generator Press.		A S T M			Hempel Dist.			In Reactor at Start of Period			Particle Size				
Oxygen	2065		O ₂ Preheat, °F	320	Prod.		°F	%	A.P.I.	Fresh Catalyst Charged	424.4	Screen						
Nat. Gas	2570		Gas Preheat, °F	544	A.P.I.	6450				Catalyst Recharged	45	Sedimentation						
Total	4595	45.0	Reactor Press.	301	I.B.P.	44.0	to 400	783		Total	153	Frac.	M	%	M	%		
Fresh Feed	7400		Steam Back Press.	1135	5%	128	400-550	186		In Reactor at End of Period	475.4	On 40	420+	0.2	80+	31.0		
F. F. by C	8180		Temperatures, °F		10%	158	550+			Density, lbs./cu. ft.	49	150	149-105	7.6	40-20	36.0		
Avg. F. F.			Heater Outlet	938	20	160				Bed Height, Feet	11.0	200	104-74	2.14	20-10	4.0		
Wet Gas	3620		Catalyst #1	697	30	208	WATER			Reactor d-P, H ₂ O	25	250	73-62	7.8	10-0	2.0		
Contraction		55.8	#2	698	40	222	Temp.	%		Pounds in Reactor	255	<325	43-0	50.6				
Recycle	10300		#3	649	50	238	200			Density, lbs./cu. ft.	49	Aerated		Chem. Anal.				
Bleed	327		#4	603	60	258	203			Space Vel. SCFH/lb. cat.	4.2	Settled		%				
Total	10627		#5	574	70	278	208			Inventory Figures	17.2	Compacted		%				
Total Feed	18807		Average	644	80	302				From d-P Meters	32.0	Specific Surface		m ² gm				
Recycle/F.F.	1.30		Product Separator		90	338												
Inlet Vel.	130 ft/sec				E.P.	385												
Steam Flow					Rec.	985												
					Res.	0.5												
					Loss.	1.0												

NATURAL GAS		PRODUCT INSPECTION						GENERATOR ELEMENTAL BALANCE									
	%	Oil	Water	Product	Pour °F	SUS @ °F	IN			OUT							
							mol. %	SCFH	C	H	O	Mol %	SCFH	C	H	O	
CO ₂	1.80	Neut. No. 653	39.67				O ₂	174.37	5.449		10.888	CO ₂	4.4	850	850	15.00	
CH ₄	82.23	Sap. No. 73.9	129.64				CO ₂	5.28	.120	.120	.240	CO	36.5	7.877	7.877	7.877	
C ₂ H ₆	10.43	Hydrox. No.					CH ₄	82.88	5.555	5.555	22.220	CH ₄	1.8	388	388	1.552	
C ₃ H ₈	4.36	Bromine No. 243					C ₂ H ₆	20.88	6.46	1.392	4.176	H ₂	57.0	12.301		24.602	
C ₄ H ₁₀		% Fe					C ₃ H ₈	13.38	3.04	.912	2.432	N ₂	0.3	1.065			
N ₂		% Alc	12.5				C ₄ H ₁₀					H ₂ O				2.674	
O ₂							N ₂					Total				21.580	
							Total	302.79	12.124	7.979	28.828					9.215	
																	28.828

less H₂O 278.29

FRESH FEED		WET GAS				RECYCLE	COMB. FEED	EFFLUENT	NET CHANGE ON REACTION												
%	m/hr	#/hr	%	Measured	At Wt. Balance	m/hr	m/hr	%	m/hr	%	Carbon			Hydrogen		Oxygen	Ultimate Oil		Unsat.		
				m/hr	#/hr	m/hr	m/hr	%	m/hr	%	m/hr	a/hr	%	a/hr	%	a/hr	#/hr	#/gal	gal/hr	%	
CO	36.5	7.88	220.64	9.54	.91	25.48	1.26	35.28	2.68	10.56	21.28	3.94	8.86	-6.62	-6.62	15.99					
H ₂	57.0	12.30	24.60	50.58	4.83	9.66	6.67	13.34	14.18	26.48	53.37	20.85	46.90	-5.63		-11.26					
CO ₂	4.4	.95	41.80	20.26	1.93	84.92	2.66	117.04	5.68	6.63	13.36	8.34	18.76	1.71	1.71	21.63				3.42	
N ₂	0.3	.06	1.68	2.75	.26	7.28	.36	10.08	.77	.83	1.67	1.13	2.54	.30							
CH ₄	1.8	.39	6.24	10.49	1.00	16.00	1.38	22.08	2.94	3.33	6.71	4.32	9.72	.99	.99	12.52	3.96				
C ₂ H ₆				1.64	.16	4.48	.22	6.16	.46	.46	.93	.68	1.53	.22	.44	5.57	.88			58.78	
C ₃ H ₈				1.15	.11	3.30	.15	4.50	.32	.32	.64	.47	1.06	.15	.30	3.80	.90				
C ₄ H ₁₀				1.58	.15	6.30	.21	8.82	.44	.44	.89	.65	1.46	.21	.63	7.97	1.26	7.94	6.25	1.27	75.24
C ₂ H ₄				.52	.05	2.20	.07	3.08	.15	.15	.30	.22	.49	.07	.21	2.66	.56				
C ₄ H ₈				.74	.07	3.92	.10	5.60	.21	.21	.42	.31	.70	.10	.40	5.06	.80	5.32	6.1	.87	81.32
C ₅ H ₁₀				.17	.02	1.16	.03	7.54	.05	.05	.10	.08	.18	.03	.12	1.52	.30	7.54	4.86	1.55	
C ₆ H ₁₂				.43	.04	2.80	.06	4.20	.12	.12	.24	.18	.40	.06	.30	3.80	.60	4.20	5.4	.78	
C ₆ H ₁₂				.15	.01	.86	.01	.86	.04	.04	.08	.05	.11	.01	.06	.76	.12	.86			
OIL							20.44					.15	.34	1.46	18.47	2.92		20.44	6.5	3.14	
WATER												3.20	7.20			-8.96					
TOTAL		21.58	294.96		9.55	168.36			49.62		44.57			9.00				-4.48	46.30		7.61
H ₂ +CO		20.18																			
H ₂ /CO		1.56				5.29			2.51		5.29										

ULTIMATE YIELDS				WEIGHT BALANCE		#/hr		EFFLUENT RATIOS		CONTRACTION: 41.7	
% CO Fed	#/hr	#/MCF	g/M3	Gal/hr	Gal/MCF	cc/M3	Wet Gas	Oil	Water	H ₂ /H ₂ O	CO Conversion: 84.01
C1+C2	21.89	26.50	3.46	58.51			168.4	12.0	51.5	6.52	H ₂ Conversion: 45.8
C3+	40.24	50.54	6.61	111.78						2.12	
C4+	29.61	38.64	5.05	85.40						13.79	
Ult. Oil	46.30	6.05	102.31	7.61	0.995	140.59	231.9	78.6	294.9		
CO ₂	21.65	75.24	9.84	166.39							
H ₂ O	57.60	7.53	127.33								

Yield Calculations assume "oil" is CH₂, and is found by difference on Carbon, and H₂O 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 24E From 9/20/47 Hr. 0700 to 9/21/47 Hr. 0700

FLOWS		RUN CONDITIONS			DISTILLATIONS			CATALYST DATA			CATALYST ANALYSIS					
	SCFH	%	Generator Press		A S T M			Hempel Dist.			Particle Size					
Oxygen	1698		O ₂ Preheat, °F	331	Prod.	6250	"F	%	A.P.I.	Fresh Catalyst Charged	475.76					
Nat. Gas	2270		Gas Preheat, °F	859	A.P.I.	45.7	to 400	74.0		Catalyst Recharged	64	Frac.	420+	Screen	Sedimentation	
Total	3968	42.8	Reactor Press	301	I.B.P.	122	400-550	15.3		Total	539.4	On 40	M	%	M	%
Fresh Feed	4080		Steam Back Press	1000			550+			Catalyst Taken Out	70.4	100	419-150	3.0	80-40	29.0
F.F. by C	6920		Temperatures, °F		10%	152				In Reactor at End of Period	469.4	150	149-105	4.4	40-20	32.0
Avg F.F.			Heater Outlet	858	20	178						200	104-74	22.0	20-10	4.0
Wet Gas	3490		Catalyst #1	621	30	205	WATER					250	73-62	6.4	10-0	6.0
Contraction		49.6	#2	627	40	220	Temp	%	Reactor d-P, H ₂ O	30	325	61-44	8.4			
Recycle	9630		#3	604	50	241	200		Pounds in Reactor	294	<325	43-0	55.6			
Bleed	331		#4	584	60	260	203		Density, lbs./cu. ft.	37				Density, lbs./cu. ft.		Chem. Anal.
Total	9961		#5	548	70	280	208		Bed Height, Feet	190				Aerated		% Fe
Total Feed	16881		Average	596	80	320								Settled		% C
Recycle/F.F.	1.44		Product Separator		90	344								Compacted		% Oil
Inlet Vel.	1.07 ft/sec				95	374			Space Vel. SCFH/lb. cat.			Sp. Grav.	4.0			Specific Surface
Steam Flow					E.P.	396			Inventory Figures	14.75						m ² gm
					Rec	980			From d-P Meters	22.75						
					Res.											
					Loss											

NATURAL GAS		PRODUCT INSPECTION						IN						OUT					
	%	Oil	Water	Product	Pour °F	SUS @ °F		#/lb. Mat %	SEFH m/hr	C	H	O		Mol %	SEFH m/hr	C	H	O	
CO ₂	6.24	Neut No	6.97	50.08				O ₂	143.36	4.480		8.960	CO ₂	1.9	347	347		694	
CH ₄	78.86	Sap No	57.80	170.7				CO ₂	16.46	374	374	748	CO	36.8	6720	6720		6720	
C ₂ H ₆	9.95	Hydrox No						CH ₄	75.57	4723	4723	18.892	CH ₄	4.2	767	767		3068	
C ₃ H ₈	4.95	Bromine No	27.1					C ₂ H ₆	17.88	596	1.192	3.576	H ₂	57.1	10,426			20,852	
C ₄ H ₁₀		% Fe						C ₃ H ₈	13.02	296	868	2.368	N ₂						
N ₂		% Alc	18.2					C ₄ H ₁₀					H ₂ O					916	
O ₂								N ₂					Total					18,260	
								Total	266.29	10,469	7,177	24,836	9,708					27,844	

Loss H₂O 225.00

	FRESH FEED			WET GAS				RECYCLE	COMB. FEED	EFFLUENT			NET CHANGE ON REACTION										
	%	m/hr	#/hr	%	Measured	At Wt. Balance	m/hr			m/hr	%	m/hr	%	Carbon	Hydrogen	Oxygen	Ultimate Oil	Unsat.					
CO	36.8	6.72	188.16	13.82	1.27	35.56	1.64	45.92	3.63	10.35	23.24	5.27	12.75	-5.08	-5.08	24.40							
H ₂	57.1	10.42	20.86	52.33	4.82	9.64	6.22	12.44	13.75	24.18	54.30	19.97	48.33	-4.21									
CO ₂	1.9	.35	15.40	16.32	1.50	66.00	1.94	85.36	4.29	4.64	10.42	6.23	15.08	1.59	1.59	23.37			3.18				
N ₂				2.33	.21	5.88	.27	7.56	.61	.61	1.37	.88	2.13	-.27									
CH ₄	3.7	.68	10.88	9.90	.91	14.56	1.17	18.72	2.60	3.28	7.37	3.77	9.12	.39	.39	5.73	1.56						
C ₂ H ₄				1.64	.15	4.20	.19	5.32	.43	.43	.97	.62	1.50	.19	.38	5.58	.76			66.94			
C ₂ H ₆	0.5	.09	2.70	.81	.07	2.10	.09	2.70	.21	.30	.67	.30	.73										
C ₃ H ₆				1.18	.11	4.62	.14	5.88	.31	.31	.70	.45	1.09	.14	.42	6.17	.84			5.29	6.25	.85	69.82
C ₃ H ₈				.51	.05	2.20	.06	2.64	.13	.13	.29	.19	.46	.06	.18	2.65	.48						
C ₄ H ₈				.32	.03	1.68	.04	2.24	.08	.08	.18	.12	.29	.04	.16	2.35	.32			2.13	6.1	.35	66.67
C ₄ H ₁₀				.18	.01	.58	.01	.58	.04	.04	.09	.05	.12	.01	.04	.58	.10			.58	4.86	.12	
C ₅ H ₁₀				.48	.04	2.80	.05	3.50	.13	.13	.29	.18	.44	.05	.25	3.68	.50			3.50	5.4	.65	
C ₆ H ₁₂				.19	.02	1.72	.03	2.58	.05	.05	.11	.08	.19	.03	.18	2.65	.36			2.58			
OIL								20.86				.15	.36		1.49	21.90	2.98			20.86	6.5	3.21	
WATER												1.90	4.60			.52				1.90			
TOTAL		18.26	238.00		9.21	151.34				44.53		40.16		7.06						.26	34.94		5.18
H ₂ +CO		17.35																					
H ₂ /CO		1.55								2.34		3.79											

	ULTIMATE YIELDS				WEIGHT BALANCE				EFFLUENT RATIOS		CONTRACTION: 38.7			
	% CO Fed	#/hr	H ₂ /CO #/MCF	g/M3	Gal/hr	H ₂ /CO Gal/MCF	cc/M3	Wet Gas	#/hr	%	#/hr	H ₂ /H ₂ O	10.51	C ₀ Conversion: 75.60
C1+C2	11.32	13.16	2.02	34.16				Oil	8.8			CO ₂ /CO	1.18	H ₂ Conversion: 40.4
C3+	39.99	38.28	5.89	99.60				Water	35.6			(H ₂) (CO ₂)	12.44	
C4+	31.17	29.76	4.58	77.45				Total	195.7	81.9	238.0			
Ult. Oil		34.94	5.38	90.88	5.18	0.796	112.47							
CO ₂	23.37	69.96	10.76	181.95										
H ₂ O		34.20	5.26	88.95										

Yield Calculations assume "oil" is CH₂, and is found by difference on Carbon, and H₂O 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 247 From 9/21/47 Hr. 0700 to 9/22/47 Hr. 0700

FLOWS		RUN CONDITIONS			DISTILLATIONS			CATALYST DATA			CATALYST ANALYSIS						
	SCFH	%	Generator Press.		A S T M			Hempel Dist.		In Reactor at Start of Period	Particle Size						
Oxygen	2060		O ₂ Preheat, °F	324	Prod.	6050		°F	%	A.P.I.	Fresh Catalyst Charged	4694	Screen		Sedimentation		
Nat. Gas	2650		Gas Preheat, °F	763	A.P.I.	47.1		to 400	660		Catalyst Recharged		Frac.	M	%	M	%
Total	4710	43.9	Reactor Press.	295	I.B.P.	124		400-550	203		Total	5824	On 40	420+	0.6	80+	17.0
Fresh Feed	6900		Steam Back Press	1094				550+			Catalyst Taken Out	11334	100	419-150	4.4	80-40	27.0
F. F. by C	8800		Temperatures, °F		10%	152					In Reactor at End of Period	4685	150	149-105	4.8	40-20	36.0
Avg. F. F.			Heater Outlet	932	20	178							200	104-74	9.9	20-10	13.0
Wet Gas	3320		Catalyst #1	634	30	208		WATER					250	73-62	3.7	10-0	5.0
Contraction		62.3	#2	642	40	228		Temp.	%	Reactor d-P, H ₂ O	13.4	325	61-44	10.3			
Recycle	7100		#3	623	50	248		200		Pounds in Reactor	315.0	<325	43-0	66.3			
Bleed	505		#4	608	60	272		203		Density, lbs./cu. ft.	42.0				Chem. Anal.		
Total	1405		#5	574	70	288		208		Bed Height, Feet	17.0				Aerated	% Fe	
Total Feed	1405		Average	616	80	308									Settled	% C	
Recycle/F.F.	.86		Product Separator		90	339									Compacted	% Oil	
Inlet Vel.	103 ft/sec				95	378				Space Vel. SCFH/lb. cat.					Sp. Grav.	3.4	Specific Surface
Steam Flow	121 MHP				E.P.	395				Inventory Figures	18.8						m ² gm
					Rec.	97.0				From d-P Meters	27.9						
					Res.	1.0											
					Loss	2.0											

NATURAL GAS										PRODUCT INSPECTION										GENERATOR ELEMENTAL BALANCE									
		Oil		Water		Product		Pour °F		SUS @ °F		IN		OUT		Mol %		SCFH		C		H		O					
CO ₂	1.55	Neut. No.	60.8	49.2								O ₂	173.82	5.435			12.870	CO ₂	2.8	650	650				1300				
CH ₄	81.95	Sap. No.	65.4	127.64								CO ₂	4.75	108	108		.216	CO	37.2	8638	8638				8638				
C ₂ H ₆	11.06	Hydrox. No.										CH ₄	91.68	5.730	5.730	22.920		CH ₄	2.7	627	627	2508							
C ₃ H ₈	5.44	Bromine No.	35.65									C ₂ H ₆	23.19	.773	1.546	4.638		H ₂	56.5	13,119		26,238							
C ₄ H ₁₀		% Fe										C ₃ H ₈	16.72	.380	1.140	3.040		N ₂	2.8	186									
N ₂		% Alc	10.2									C ₄ H ₁₀						H ₂ O					1,952	1,148					
O ₂												N ₂						Total	33,220	9,915	30,538	11,086							
												Total	310.26	12.426	8.524	30.538	11,086												

1254.0 289.60

	FRESH FEED		WET GAS				RECYCLE	COMB. FEED	EFFLUENT		NET CHANGE ON REACTION																
	%	m/hr	Measured	At Wt. Balance	m/hr	#/hr			m/hr	%	m/hr	%	Carbon			Hydrogen		Oxygen	Ultimate Oil		Unsat.						
CO	37.2	0.64	241.92	6.85	.60	16.80	.02	22.96	1.34	9.98	23.34	2.16	6.07	-7.82	-7.82	9.49			-7.82								
H ₂	56.5	13.12	28.24	48.13	4.22	8.44	5.78	11.56	9.40	22.52	52.67	15.18	42.66	-7.34						-14.68							
CO ₂	2.8	.65	28.60	21.92	1.92	84.48	2.63	115.72	4.28	4.93	11.53	6.91	19.42	1.98	1.98	22.81				3.96							
N ₂	0.8	.19	5.32	4.16	.36	10.08	.49	13.72	.81	1.00	2.34	1.30	3.65	-.30													
CH ₄	2.7	.63	10.08	11.74	1.03	16.48	1.41	22.56	2.29	2.92	6.83	3.70	10.40	.78	.78	8.99	3.12										
C ₂ H ₆				1.92	.17	4.76	.23	6.44	.38	.38	.89	.61	1.71	.23	.46	5.30	.92									65.31	
C ₂ H ₄				1.02	.09	2.70	.12	3.60	.20	.20	.47	.32	.90	.12	.24	2.76	.72										
C ₃ H ₈				1.75	.15	6.30	.21	8.82	.34	.34	.80	.55	1.55	.21	.63	7.26	1.26						7.94	6.25	1.27	76.75	
C ₃ H ₆				.53	.05	2.20	.07	3.08	.10	.10	.23	.17	.48	.07	.21	2.42	.56										
C ₄ H ₈				1.06	.09	5.04	.12	6.72	.21	.21	.49	.33	.93	.12	.48	5.53	.96						6.38	6.1	1.05	89.83	
C ₄ H ₁₀				.12	.01	.58	.01	.58	.02	.02	.05	.03	.08	.01	.04	.46	.10						.58	4.86	.12		
C ₅ H ₁₀				.57	.05	3.50	.07	4.90	.11	.11	.26	.18	.51	.07	.35	4.03	.70						4.90	5.4	.91		
C ₆ H ₁₂				.24	.02	1.72	.03	2.58	.05	.05	.12	.08	.22	.03	.18	2.07	.36						2.58				
OIL							34.58					.25	.70		2.47	28.45	5.98						34.58	6.5	5.32		
WATER												3.86	10.85				0.00						3.86				
TOTAL		23.22	312.16		8.76	163.08				42.76	35.63			11.84									0.00	56.96		8.67	
H ₂ +CO		21.76																									
H ₂ /CO		1.52					7.05			2.26	7.03																

ULTIMATE YIELDS						WEIGHT BALANCE		EFFLUENT RATIOS		CONTRACTION: 51.0	
%	#/hr	#/MCF	g/M3	Gal/hr	Gal/MCF	#/hr	%	#/hr	H ₂ /H ₂ O	CO ₂ /CO	CO Conversion: 90.51
C1+C2	17.5	22.52	2.73	46.16		Wet Gas	163.1	224.0	3.93		H ₂ Conversion: 55.9
C3+	50.22	61.26	7.43	125.64		Oil	27.6	27.6	3.20		
C4+	40.54	49.36	5.98	101.12		Water	61.2	61.2	12.59		
Ult. Oil	56.96	6.90	116.67	8.67	1.05	Total	251.9	80.4	312.2		
CO ₂	22.81	87.12	10.56	178.57							
H ₂ O	69.48	8.42	142.38								

Yield Calculations assume "oil" is CH₂, and is found by difference on Carbon, and H₂O 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 x #/MCF. cc/M3 = 141.3 x gal/MCF.

THE TEXAS COMPANY — MONTEBELLO LABORATORY

DATA SUMMARY SHEET

Synthesis Run Number 25C From 10/3/47 Hr. 0700 to 10/4/47 Hr. 0700

FLOWS		RUN CONDITIONS		DISTILLATIONS				CATALYST DATA		CATALYST ANALYSIS					
SCFH	%	Generator Press.		A S T M		Hempel Dist.		In Reactor at Start of Period	285.5	Particle Size					
Oxygen	2250	O ₂ Preheat, °F	411	Prod.	630	°F	%	A.P.I.	Fresh Catalyst Charged	Screen					
Nat. Gas	2770	Gas Preheat, °F	-	A.P.I.	488	to 400	75.0		Catalyst Recharged	Frac.	M	%	M	%	
Total	5020	Reactor Press.	400	I.B.P.	108	400-550	183		Total	285.5	On 40	420+	0.2	80+	73.0
Fresh Feed	7870	Steam Back Press.	553	5%		550+			Catalyst Taken Out	6.0	100	419-150	36.6	80-40	27.0
F.F. by C	8730	Temperatures, °F		10%	144				In Reactor at End of Period	279.5	150	149-105	26.4	40-20	6.0
Avg. F.F.		Heater Outlet	408	20	168						200	104-74	22.6	20-10	4.0
Wet Gas	3430	Catalyst #1	672	30	188	WATER					250	73-62	4.2	10-0	-
Contraction		#2	630	40	212	Temp.	%	Reactor d-P, H ₂ O	10.0	325	61-44	7.4			
Recycle	14070	#3	563	50	232	200		Pounds in Reactor	116.0	<325	43-0	2.6			
Bleed	322	#4	543	60	256	203		Density, lbs./cu. ft.	49.0				Density, lbs./cu. ft.		Chem. Anal.
Total	14392	#5	506	70	282	208		Bed Height, Feet					Aerated		% Fe
Total Feed	22152	Average	583	80	308								Settled		% C
Recycle/F.F.	1.81	Product Separator		90	346								Compacted		% Oil
Inlet Vel.	1.098 ft/sec			95	372			Space Vel. SCFH/lb. cat.					Sp. Grav.	3.5	Specific Surface
Steam Flow				E.P.	401			Inventory Figures	31.2						m ² /gm
				Rec	97.0			From d-P Meters	75.0						
				Res.	0.8										
				Loss	2.2										

NATURAL GAS				PRODUCT INSPECTION				GENERATOR ELEMENTAL BALANCE											
%		Oil	Water	Product	Pour °F	SUS @ °F		IN				OUT							
								#/hr	Mol-%	SCFH	C	H	O	Mol-%	SCFH	C	H	O	
CO ₂	1.66	Neut. No.	58.52	43.33				O ₂	189.98	5.937			11.874	CO ₂	3.5	.806	.806	1.612	
CH ₄	86.72	Sap. No.	582	129.08				CO ₂	5.32	.121	.121		.242	CO	33.7	7.761	7.761	7.761	
C ₂ H ₆	8.45	Hydrox. No.						CH ₄	101.41	6.338	6.338	35.352		CH ₄	0.4	.092	.092	.368	
C ₃ H ₈	2.17	Bromine No.	38.6					C ₂ H ₆	185.4	.618	1.236	3.708		H ₂	62.0	14.279	28.558		
C ₄ H ₁₀		% Fe						C ₃ H ₈	10.21	.232	.464	1.856		N ₂	0.3	.069			
N ₂		% Alc	9.8					C ₄ H ₁₀						H ₂ O				1.890	
O ₂								N ₂						Total	23.007	8.659	30.916	12.116	
								Total	325.46	13.246	8.791	30.916	12.116						

4000 N₂ 276.09

FRESH FEED				WET GAS				RECYCLE		COMB. FEED		EFFLUENT		NET CHANGE ON REACTION										
%	m/hr	#/hr	%	Measured		At Wt. Balance		m/hr	m/hr	%	m/hr	%	Carbon			Hydrogen			Oxygen	Ultimate Oil		Unsat.		
				m/hr	#/hr	m/hr	#/hr						m/hr	a/hr	%	a/hr	%	a/hr	#/hr	#/gal	gal/hr	%		
CO	33.7	7.76	217.28	9.54	.86	24.08	.93	26.04	3.62	11.38	18.66	4.55	8.84	-6.83	-6.83	11.98			-6.83					
H ₂	62.0	14.28	28.56	50.90	4.61	9.22	4.98	9.96	19.33	33.61	55.12	24.31	47.23	-9.30				-18.60						
CO ₂	3.5	.81	35.64	25.54	2.31	101.64	2.49	109.56	9.70	10.51	17.24	12.19	23.68	1.68	1.68	21.65			3.36					
N ₂	.3	.07	1.96	1.75	.16	4.48	.17	4.76	.66	.73	1.20	.83	1.61	-.10										
CH ₄	.4	.09	1.44	5.95	.54	8.64	.58	9.28	2.26	2.35	3.85	2.84	5.52	.49	.49	6.31	1.96							
C ₂ H ₆				1.77	.16	4.48	.17	4.76	.67	.67	1.10	.84	1.63	.17	.34	4.38	.68						71.66	
C ₂ H ₄				.70	.06	1.80	.06	1.80	.27	.27	.44	.33	.64	.06	.12	1.55	.36							
C ₃ H ₆				1.12	.10	4.20	.11	4.62	.43	.43	.71	.54	1.05	.11	.33	4.25	.66				4.16	6.25	.67	76.19
C ₃ H ₈				.35	.03	1.32	.03	1.32	.13	.13	.21	.16	.31	.03	.09	1.16	.24							
C ₄ H ₈				1.21	.11	6.16	.12	6.72	.46	.46	.75	.58	1.13	.12	.48	6.19	.96				6.38	6.1	1.05	86.43
C ₄ H ₁₀				.19	.02	.88	.02	1.16	.07	.07	.11	.09	.17	.02	.08	1.03	.20				1.16	4.86	.24	
C ₅ H ₁₀				.75	.07	4.90	.08	5.60	.28	.28	.46	.36	.70	.08	.40	5.15	.80				5.60	5.4	1.04	
C ₆ H ₁₂				.23	.02	.84	.02	1.68	.09	.09	.15	.11	.21	.02	.12	1.55	.24				1.68			
OIL								37.80				.27	.52		2.70	34.79	5.40				37.80	6.5	5.82	
WATER												3.47	6.74				7.10							
TOTAL		23.03	284.88		9.05	172.64				60.98		51.47		13.45				3.47			3.55	56.78		8.82
H ₂ +CO		22.04																						
H ₂ /CO		1.84					5.35			2.95		5.34												

ULTIMATE YIELDS						WEIGHT BALANCE			EFFLUENT RATIOS		CONTRACTION: 58.4		
%	CO Fed	#/hr	#/MCF	g/M3	Gal/hr	#/hr	%	#/hr	H ₂ /H ₂ O	CO ₂ /CO	C ₀ Conversion: 88.02		
									(H ₂)/CO ₂	(H ₂ O)/CO	H ₂ Conversion: 65.13		
C1+C2	12.24	14.40	1.72	29.09		Wet Gas	172.6	185.0	7.01	2.68			
C3+	54.12	58.90	7.05	119.22		Oil	19.1	19.1	24.05				
C4+	48.71	52.96	6.34	107.21		Water	80.9	80.9					
Ult. Oil		56.78	6.80	114.99	8.82	Total	272.6	95.8	284.9				
CO ₂	21.65	73.92	8.85	149.65									
H ₂ O		62.46	7.48	126.49									

Yield Calculations assume "oil" is CH₂, and is found by difference on Carbon, and H₂O 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 1.01325 bar. g/M³ = 16.91 × #/MCF. cc/M³ = 141.3 × gal/MCF.

THE TEXAS COMPANY — MONTEBELLO LABORATORY

DATA SUMMARY SHEET

Synthesis Run Number 25D From 10/4/47 Hr. 0700 to 10/4/47 Hr. 1300

FLOWS		RUN CONDITIONS		DISTILLATIONS				CATALYST DATA		CATALYST ANALYSIS					
SCFH	%	Generator Press.		ASTM		Hempel Dist.		In Reactor at Start of Period		Particle Size					
Oxygen	2260	O ₂ Preheat, °F	410	Prod.	6220	°F	%	A.P.I.	Fresh Catalyst Charged	Screen					
Nat. Gas	2680	Gas Preheat, °F	-	A.P.I.		to 400			Catalyst Recharged	Frac.	M	%	M	%	
Total	4940	45.9	Reactor Press.	400	I.B.P.	400-550			Total	279.5	On 40	420+	0.2	80+	74.0
Fresh Feed	7240	Steam Back Press.	530	5%		550+			Catalyst Taken Out	100	149-150	26.3	80-40	14.0	
F. F. by C	8160	Temperatures, °F		10%					In Reactor at End of Period	279.5	150	104-74	23.4	40-20	1.0
Avg. F. F.	7700	Heater Outlet	460	20							200	73-62	6.6	20-10	11.0
Wet Gas	3500	Catalyst #1	670	30							250	61-44	5.4		
Contraction		#2	620	40							325	43-0	12.4		
Recycle	13700	#3	535	50											
Bleed	344	#4	535	60											
		#5	500	70											
Total	14044	Average	576	80											
Total Feed	22204	Product Separator		90											
Recycle/F.F.	1.72			95											
Inlet Vel.	1.10 ft/sec			E.P.											
Steam Flow	764 lb/hr			Rec.											
				Res.											
				Loss											

NATURAL GAS		PRODUCT INSPECTION						GENERATOR ELEMENTAL BALANCE									
%		Oil	Water	Product	Pour °F	SUS @ °F	IN					OUT					
							#/hr	Mol-%	SCFH	C	H	O	Mol %	SCFH	C	H	O
CO ₂	1.96	Neut No.	5207	45.95			O ₂	190.82	5.963			11.926	CO ₂	2.4	5.17	5.17	1.034
CH ₄	84.66	Sap. No.	25.8	130.76			CO ₂	6.12	1.39	1.29		2.78	CO	34.5	7.428	7.428	7.428
C ₂ H ₆	10.35	Hydrox. No.					CH ₄	95.76	5.985	5.985	22.940		CH ₄	0.1	1.08	1.08	4.32
C ₃ H ₈	2.03	Bromine No.					C ₂ H ₆	21.96	7.32	1.464	4.392		H ₂	61.0	13.33		26.266
C ₄ H ₁₀		% Fe					C ₃ H ₈	9.42	2.14	1.642	1.712		N ₂	1.1	3.23		
N ₂		% Alc					C ₄ H ₁₀						H ₂ O				3.346
O ₂							N ₂						Total				30.844
							Total	324.08	13.033	8.220	30.044	12.204		21.530	8.053		12.204

1000 256.72

	FRESH FEED		WET GAS				RECYCLE	COMB. FEED	EFFLUENT	NET CHANGE ON REACTION																								
	%	m/hr	#/hr	%	m/hr	#/hr				Measured	At Wt. Balance	Carbon			Hydrogen			Oxygen			Ultimate Oil	Unsat.												
CO	34.5	7.43	208.04	8.46	.87	24.36	.79	22.12	3.14	10.57	18.05	3.93	7.88	-6.64	-6.64	10.63																		
H ₂	61.0	13.13	26.26	54.86	5.06	10.12	4.59	9.18	20.33	33.46	57.15	24.92	49.94	-8.54																				
CO ₂	2.4	.52	22.88	22.00	2.03	89.32	1.84	86.46	8.15	8.67	14.81	9.99	20.02	1.32	1.32	17.77																		
N ₂	1.5	.32	8.96	2.74	.25	7.00	.23	6.44	1.02	1.34	2.29	1.25	2.51	-.09																				
CH ₄	0.5	.11	1.76	6.59	.61	9.76	.55	8.80	2.44	2.55	4.36	2.99	5.99	.44	.44	5.92	1.76																	
C ₂ H ₄				1.89	.17	4.76	.15	4.20	.70	.70	1.20	.85	1.70	.15	.30	4.04	.60								72.14									
C ₂ H ₆				.73	.07	2.10	.06	1.80	.27	.27	.46	.33	.66	.06	.12	1.62	.36																	
C ₃ H ₆				1.29	.20	8.40	.18	7.56	.48	.48	.82	.66	1.32	.18	.54	7.27	1.08								6.80	6.25	1.09	82.69						
C ₃ H ₈				.27	.02	.88	.02	.88	.10	.10	.17	.12	.24	.02	.06	.81	.16																	
C ₄ H ₈				.52	.05	2.80	.05	2.80	.19	.19	.32	.24	.48	.05	.20	2.69	.40											2.66	6.1	0.44	81.25			
C ₄ H ₁₀				.12	.01	.58	.01	.58	.04	.04	.07	.05	.10	.01	.04	.54	.10													.58	4.86	0.12		
C ₅ H ₁₀				.39	.04	2.80	.04	2.80	.14	.14	.24	.18	.36	.04	.20	2.69	.40														2.80	5.4	0.52	
C ₆ H ₁₂				.12	.01	.84	.01	.84	.04	.04	.07	.05	.10	.01	.06	.81	.12														.84			
OIL								47.04				.34	.68		3.36	45.22	6.72														47.04	6.5	7.24	
WATER												4.00	8.02				5.38														4.00			
TOTAL		21.53	267.90		9.23	163.28				58.55		49.90		12.99																		2.69	60.72	9.41
H ₂ +CO		20.56																																
H ₂ /CO		1.77																																

ULTIMATE YIELDS						WEIGHT BALANCE		EFFLUENT RATIOS		CONTRACTION: 60.3	
%	#/hr	H ₂ /CO	#/MCF	g/M3	Gal/hr	#/hr	%	#/hr	H ₂ /H ₂ O	CO ₂ /CO	CO Conversion: 89.37
C1+C2	11.58	14.80	1.90	32.13		Wet Gas	163.3	148.6	6.23		
C3+	60.03	82.50	8.02	135.62		Oil	14.3	14.3	2.54		
C4+	51.95	54.06	6.94	117.36		Water	105.0	105.0			
Ult. Oil	60.72	7.80	131.90	9.41	1.21	Total	282.6	105.6	267.9		
CO ₂	17.77	63.58	8.16	137.99							
H ₂ O	72.00	9.24	156.25								

Yield Calculations assume "oil" is CH₂, and is found by difference on Carbon, and H₂O 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 25F From 10/8/47 Hr. 0700 to 10/9/47 Hr. 0700

FLOWS		RUN CONDITIONS			DISTILLATIONS			CATALYST DATA		CATALYST ANALYSIS						
	SCFH	%	Generator Press.		A S T M			Hempel Dist.		In Reactor at Start of Period		Particle Size				
Oxygen	2700		O ₂ Preheat, °F	404	Prod.	6430		°F	%	A.P.I.	Fresh Catalyst Charged		25.0			
Nat. Gas	2950		Gas Preheat, °F	749	A.P.I.			to 400			Catalyst Recharged		20.0			
Total	5280	43.6	Reactor Press.	398	I.B.P.			400-550			Total		279.5			
Fresh Feed	7340		Steam Back Press.	456				550+			Catalyst Taken Out		63.5			
F.F. by C	8640		Temperatures, °F					10%			In Reactor at End of Period		216.0			
Avg. F.F.	7990		Heater Outlet	370				20								
Wet Gas	4700		Catalyst #1	617				30	WATER							
Contraction		45.8	#2	588				40	Temp	%	Reactor d-P, H ₂ O		325 61-44			
Recycle	11700		#3	536				50	200		Pounds in Reactor		93.1 <325 43-0			
Bleed	278		#4	507				60	203		Density, lbs./cu. ft.		39.2			
Total	11978		#5	478				70	208		Bed Height, Feet		—			
Total Feed	20618		Average	545				80					Settled % C			
Recycle/F.F.	1.39		Product Separator					90					Compacted % Oil			
Inlet Vel.	1.77 ft/sec							95			Space Vel SCFH/lb. cat.		Sp. Grav. Specific Surface			
Steam Flow	61.6 #/hr							F.P.			Inventory Figures		40.0 m ² gm			
								Rec.			From d-P Meters		93.0			
								Res.								
								Loss								

NATURAL GAS		PRODUCT INSPECTION							GENERATOR ELEMENTAL BALANCE									
	%	Neut. No.	Oil	Water	Product	Pour °F	SUS @ °F	IN					OUT					
		Sap. No.						#/L Mol-%	SCFH m/hr	C	H	O	Mol %	SCFH m/hr	C	H	O	
CO ₂	1.69		57.17	42.76				O ₂	194.21	6.069			12.138	CO ₂	4.1	.930	.930	1.860
CH ₄	85.48		60.6	127.95				CO ₂	5.81	.132	.132		.264	CO	35.1	8.000	8.000	8.000
C ₂ H ₆	10.16	Hydrox. No.						CH ₄	106.46	6.654	6.654	26.616		CH ₄	0.1	.020	.020	.040
C ₃ H ₈	2.67	Bromine No.	44.2					C ₂ H ₆	23.70	.790	1.580	4.740		H ₂	58.2	13.270		26.540
C ₄ H ₁₀		% Fe						C ₃ H ₈	9.15	.208	.624	1.664		N ₂	2.5	.570		
N ₂		% Alc		11.1				C ₄ H ₁₀						H ₂ O				6.440 2.542
O ₂								N ₂						Total				22.790 8.950 33.020 12.402
								Total	339.33	13.853	8.990	33.020	12.402					

less 440 293.57

	FRESH FEED		WET GAS				RECYCLE	COMB. FEED	EFFLUENT		NET CHANGE ON REACTION							Unsat.			
	%	m/hr	%	m/hr	#/hr	At Wt. Balance			m/hr	%	m/hr	%	Carbon			Hydrogen			Oxygen	Ultimate Oil	
											m/hr	a/hr	%	a/hr	%	a/hr	#/hr	#/gal	gal/hr	%	
CO	35.1	8.00	224.00	18.84	2.34	65.52	2.64	73.92	5.95	13.95	25.65	8.59	17.94	-5.36	-5.36	33.00					
H ₂	58.2	13.27	26.54	57.05	7.07	14.14	7.99	15.93	18.03	31.30	57.56	26.02	54.33	-5.28		-10.56					
CO ₂	4.1	.93	40.92	18.40	2.28	100.32	2.58	113.52	5.81	6.74	12.39	8.39	17.52	1.65	1.65	20.63					
N ₂	2.5	.57	15.96	.66	.08	2.24	.09	2.52	.21	.78	1.43	.30	.63	.48							
CH ₄	0.1	.02	.32	2.86	.35	5.60	.40	6.40	.90	.92	1.69	1.30	2.71	.38	.38	4.75	1.52				
C ₂ H ₄				.41	.05	1.40	.06	1.68	.13	.13	.24	.19	.40	.06	.12	1.50	.24				52.56
C ₂ H ₆				.37	.05	1.50	.06	1.80	.12	.12	.22	.18	.38	.06	.12	1.50	.36				
C ₃ H ₆				.21	.03	1.26	.03	1.26	.07	.07	.13	.10	.21	.03	.09	1.13	.09	1.13	6.25	0.18	45.65
C ₃ H ₈				.25	.03	1.32	.03	1.32	.08	.08	.15	.11	.23	.03	.09	1.13	.24				
C ₄ H ₈				.50	.06	3.36	.07	3.92	.16	.16	.29	.23	.48	.07	.28	3.50	.56				3.72 6.1 0.61 33.33
C ₄ H ₁₀																					
C ₅ H ₁₀				.41	.05	3.50	.06	4.20	.13	.13	.24	.19	.40	.06	.30	3.75	.60				4.20 5.4 0.78
C ₆ H ₁₂																					
OIL								32.62										32.62	6.5	5.02	
WATER											2.06	4.30									
TOTAL		22.80	307.74		12.4	200.16				54.38	47.89		8.78					2.33	41.67	6.59	
H ₂ +CO		21.27																			
H ₂ /CO		1.66																			

	ULTIMATE YIELDS						WEIGHT BALANCE		EFFLUENT RATIOS		CONTRACTION: 38.5	
	% CO Fed	#/hr	H ₂ /CO #/MCF	g/M3	Gal/hr	H ₂ /CO Gal/MCF	cc/M3	#/hr	%	#/hr	H ₂ /H ₂ O	CO ₂ /CO
C ₁ +C ₂	7.75	9.56	1.19	20.12				Wet Gas	200.16	1.13	226.0	12.63
C ₃ +	38.64	43.32	5.37	90.81				Oil	11.9		11.9	0.98
C ₄ +	36.38	40.74	5.05	85.40				Water	69.8		69.8	12.33
Ult. Oil		41.67	5.17	87.42	6.59	0.82	115.87	Total	281.9	91.5	307.74	
CO ₂	20.63	72.60	9.01	152.36								
H ₂ O		37.08	4.60	77.79								

Yield Calculations assume "oil" is CH₂, and is found by difference on Carbon, and H₂ 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 26A From 10/19/47 Hr. 1200 to 10/20/47 Hr. 0700

FLOWS		RUN CONDITIONS			DISTILLATIONS			CATALYST DATA		CATALYST ANALYSIS							
	SCFH	%	Generator Press	365	A S T M			Hempel Dist.		In Reactor at Start of Period		Particle Size					
Oxygen	1610		O ₂ Preheat, °F	484	Prod.	GA90	°F	%	A.P.I.	Fresh Catalyst Charged		Screen		Sedimentation			
Nat Gas	2360		Gas Preheat, °F	748	A.P.I.		to 400			Catalyst Recharged		Frac.	M	%	M	%	
Total	3970	40.6	Reactor Press.	368	I.B.P.		400-550			Total		On 40	420+	10	80+		
Fresh Feed	5960		Steam Back Press.	828	5%		550+			Catalyst Taken Out		100	419-150	24.4	80-40		
F F by C	6850		Temperatures, °F		10%					In Reactor at End of Period		150	149-105	31.4	40-20		
Avg F F	6405		Heater Outlet	498	20							200	104-74	18.2	20-10		
Wet Gas	2940		Catalyst #1	723	30		WATER					250	73-62	3.6	10-0		
Contraction		54.0	#2	647	40		Temp	%		Reactor d-P, H ₂ O		325	61-44	0.6			
Recycle	8900		#3	574	50		200			Pounds in Reactor		127	<325	43-0	31.0		
Bleed	248		#4	540	60		203			Density, lbs./cu. ft.		70				Chem Anal	
Total	9148		#5	502	70		208			Bed Height, Feet		3.05				Aerated	
Total Feed	15553		Average	597	80											Settled	% C
Recycle/F.F.	1.42		Product Separator		90											Compacted	% Oil
Inlet Vel	114 ft/sec				95					Space Vel. SCFH/lb. cat.			Sp. Grav.	5.4		Specific Surface	
Steam Flow					E.P.					Inventory Figures		276					m ² gm
					Rec.					From d-P Meters		46.9					
					Res.												
					Loss												

NATURAL GAS		PRODUCT INSPECTION						GENERATOR ELEMENTAL BALANCE											
%		Oil	Water	Product	Pour °F	SUS @ °F	IN				OUT								
							SCFH	C	H	O	Mal %	SCFH	C	H	O				
CO ₂	1.16						135.94	4.248		8.496	CO ₂	2.0	.338	.338	6.76				
CH ₄	86.56						3.17	.072	.072	.144	CO	33.2	5.611	5.611	5.611				
C ₂ H ₆	8.46						86.25	5.328	5.328	21.312	CH ₄	4.8	.810	.810	3.240				
C ₃ H ₈	3.81						15.81	1.527	1.054	3.162	H ₂	56.5	9.549	19.048					
C ₄ H ₁₀							12.43	.237	.711	1.896	N ₂	3.5	.582						
N ₂											H ₂ O				4.032	2.353			
O ₂											Total								
							Total	250.60	10.408	7.165	26.370	8.640				16.900	6.759	26.370	8.640

2025 140 208.25

FRESH FEED		WET GAS				RECYCLE	COMB. FEED	EFFLUENT	NET CHANGE ON REACTION											
%	m/hr	#/hr	Measured	At Wt. Balance	m/hr	m/hr	%	m/hr	%	Carbon		Hydrogen		Oxygen	Ultimate Oil		Unsat.			
			m/hr	#/hr	m/hr					m/hr	a/hr	%	a/hr	%	a/hr	#/hr	#/gal	gal/hr	%	
CO	33.2	5.61	127.08	12.01	1.56	29.68	1.24	34.72	3.29	8.90	21.36	4.53	12.68	-4.37	-4.37	22.10				
H ₂	56.5	9.55	19.10	5.01	3.88	7.16	4.54	9.08	12.07	22.25	53.41	16.61	46.31	-5.01		10.02				
CO ₂	2.0	.34	14.96	14.30	1.11	48.84	1.30	57.20	3.45	3.79	9.10	4.75	13.24	.96	.96	17.11				1.72
N ₂	3.5	.59	16.58	6.24	1.49	18.72	1.57	18.96	1.52	2.11	5.06	2.09	5.88	-.02						
CH ₄	4.8	.81	12.96	11.05	.86	13.76	1.01	16.16	2.67	3.48	8.35	3.68	10.26	.20	.20	3.57	.80			
C ₂ H ₆				1.34	.12	2.80	.12	3.36	.32	.32	1.77	1.44	1.23	.12	.24	4.28	1.48			160.34
C ₃ H ₈				.68	.05	1.50	.06	1.50	.16	.16	.38	.22	.11	.06	.12	2.14	1.36			
C ₄ H ₁₀				.93	.07	2.94	.08	3.36	.22	.22	.53	.30	.84	.08	.24	4.28	1.48			3.02
C ₅ H ₁₂				.34	.03	1.32	.04	1.76	.08	.08	.19	.12	.33	.04	.12	2.14	.34			1.48
C ₆ H ₁₄				.41	.03	1.68	.04	2.24	.10	.10	.24	.14	.39	.04	.16	2.85	.32			1.35
C ₇ H ₁₆				.49	.04	2.32	.05	3.40	.12	.12	.29	.17	.47	.05	.20	3.57	.50			1.70
C ₈ H ₁₈				.39	.03	2.10	.04	2.80	.09	.09	.22	.13	.36	.04	.20	3.57	.40			1.52
C ₉ H ₂₀				.15	.01	.84	.01	.84	.04	.04	.10	.05	.14	.01	.06	1.07	.12			.84
OIL								26.18												26.18
WATER																				26.18
TOTAL	14.90	220.62		7.76	129.26				41.66	75.87	7.80									
H ₂ +CO	15.16																			
H ₂ /CO	1.70																			

ULTIMATE YIELDS				WEIGHT BALANCE				EFFLUENT RATIOS		CONTRACTION: 46.2	
%	#/hr	H ₂ /CO	H ₂ /CO	#/hr	%	#/hr	%	H ₂ /H ₂ O	CO Conversion:	H ₂ Conversion:	
CO Fed	#/hr	#/MCF	g/M ³	Gal/hr	Gal/MCF	cc/M ³			77.90	52.46	
C1+C2	9.99	8.36	1.45	24.52				6.78			
C3+	50.81	40.58	7.06	119.38				1.05			
C4+	44.39	35.46	6.17	104.33				7.11			
Ult. Oil	38.37	6.67	112.79	6.08	1.06	149.78					
CO ₂	17.11	42.24	7.35	124.29							
H ₂ O	44.10	7.67	129.70								

Yield Calculations assume "oil" is CH₂, and is found by difference on Carbon, and H₂O 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 1.01325 bar. g/M³ = 16.91 × #/MCF. cc/M³ = 141.3 × gal/MCF.

THE TEXAS COMPANY — MONTEBELLO LABORATORY

DATA SUMMARY SHEET

Synthesis Run Number 26 B From 10/20/47 Hr. 0700 to 10/21/47 Hr. 0700

FLOWS		RUN CONDITIONS				DISTILLATIONS				CATALYST DATA				CATALYST ANALYSIS					
	SCFH	%	Generator Press			A S T M				Hempel Dist.		In Reactor at Start of Period		Particle Size					
Oxygen	1520		O ₂ Preheat, °F	308	Prod.	6950				°F	%	A.P.I.	Fresh Catalyst Charged	216	Screen				
Nat. Gas	2230		Gas Preheat, °F	776	A.P.I.	45.7				to 400	75.3	52.8	Catalyst Recharged	62	Frac.		Sedimentation		
Total	3750	40.5	Reactor Press.	300	I.B.P.	112				400-550	16.3	33.2	Total	278	On 40	420+	1.2	80+	
Fresh Feed	4930		Steam Back Press	864						550+			Catalyst Taken Out	41	100	419-150	22.3	80-40	
F. F. by C	6870		Temperatures, °F		10%	150							In Reactor at End of Period	237	150	149-105	22.3	40-20	
Avg. F. F.	5900		Heater Outlet	382	20	180									200	104-74	22.5	20-10	
Wet Gas	2440		Catalyst #1	678	30	204				WATER					250	73-62	4.2	10-0	
Contraction		58.6	#2	632	40	228				Temp.	%	Reactor d-P, H ₂ O		325	61-44	11.7			
Recycle	8420		#3	581	50	248				200		Pounds in Reactor	145	<325	43-0	15.8			
Bleed	216		#4	550	60	274				203		Density, lbs./cu. ft.	70				Chem. Anal.		
Total	8616		#5	577	70	300				208		Bed Height, Feet	3.6				Aerated	% Fe	
Total Feed	14576		Average	591	80	328											Settled	% C	
Recycle/F.F.	1.46		Product Separator		90	362											Compacted	% Oil	
Inlet Vel.	1.06 ft/sec				95	390						Space Vel. SCFH/lb. cat.					Sp. Grav.	4.9	Specific Surface
Steam Flow					E.P.	444						Inventory Figures	24.9						m ² gm
					Rec.	980						From d-P Meters	40.8						
					Res.	1.0													
					Loss	1.0													

NATURAL GAS										PRODUCT INSPECTION										GENERATOR ELEMENTAL BALANCE									
		Oil		Water		Product		Pour °F		SUS @ °F		IN		OUT															
%												Wt. Mol. %	SCFH m/hr	C	H	O	Mol %	SCFH m/hr	C	H	O	Mol %							
CO ₂	95	Neut. No.	56.16	34.23								O ₂	128.35	4.011		8.022	CO ₂	2.9	4.52	4.52		90.4							
CH ₄	85.93	Sap. No.	49.4	128.51								CO ₂	2.46	.056	.056	.112	CO	33.8	5.263	5.263		5.263							
C ₂ H ₆	9.17	Hydrox. No.	56.0									CH ₄	80.90	5.056	5.056	20.224	CH ₄	1.6	2.249	2.249		99.6							
C ₃ H ₈	3.94	Bromine No.	126.34									C ₂ H ₆	16.20	.540	1.080	3.240	H ₂	58.3	9.077			81.54							
C ₄ H ₁₀		% Fe										C ₃ H ₈	10.21	.232	.464	1.356	N ₂	3.5	5.55										
N ₂		% Alc		7.6								C ₄ H ₁₀					H ₂ O					6.170							
O ₂												N ₂					Total					15.586							
												Total	238.12	9.895	7.888	25.320	8.134					5.964							

Loss H₂O 202.71

	FRESH FEED				WET GAS				RECYCLE	COMB. FEED	EFFLUENT	NET CHANGE ON REACTION															
	%	m/hr	#/hr	%	Measured	At Wt. Balance	m/hr	m/hr				%	m/hr	%	Carbon			Hydrogen			Oxygen		Ultimate Oil		Unsat.		
CO	33.8	5.26	147.28	11.78	.76	21.28	1.00	28.00	2.68	7.94	20.72	3.68	10.87	-4.26	-4.26	19.01											
H ₂	58.3	9.08	18.16	51.32	3.31	6.62	4.37	8.74	11.67	20.75	54.15	16.04	47.39	-4.71													
CO ₂	2.9	.45	19.80	15.90	1.02	4.88	1.35	59.40	3.61	4.06	10.59	4.96	14.65	.90	.90	17.11											
N ₂	3.5	.54	15.12	5.23	.34	9.52	.45	12.60	1.19	1.73	4.57	1.64	4.84	.09													
CH ₄	1.6	.25	4.00	10.37	.67	10.72	.88	14.08	2.36	2.61	6.81	3.24	9.57	.53	.53	10.08	2.12										
C ₂ H ₆				1.57	.10	2.80	.13	3.64	.34	.34	1.89	.47	1.39	.13	.26	4.94	.52										
C ₃ H ₈				.68	.04	1.20	.05	1.50	.15	.15	.39	.20	.59	.05	.10	1.90	.30										
C ₄ H ₁₀				1.15	.07	3.08	.09	3.78	.26	.26	1.68	1.35	1.03	.09	.27	5.13	.54										
C ₅ H ₁₂				.26	.02	.88	.03	1.32	.06	.06	1.16	.09	.27	.03	.09	1.71	.27										
C ₆ H ₁₄				.52	.03	1.68	.04	2.24	.12	.12	.31	.16	.47	.04	.16	3.04	.32										
C ₇ H ₁₆				.74	.05	3.40	.07	4.06	.17	.17	.44	.24	.71	.07	.28	5.32	.70										
C ₈ H ₁₈				.42	.03	2.10	.04	2.80	.10	.10	.26	.14	.41	.04	.20	3.80	.40										
C ₉ H ₂₀				.12	.01	.84	.01	.84	.03	.03	.08	.04	.12	.01	.06	1.14	.12										
OIL								19.74				.14	.41		1.41	2.681	2.82										
WATER												2.46	7.27				1.31										
TOTAL		15.57	204.36		6.44	108.00				38.32		33.85		7.17													
H ₂ +CO		14.34																									
H ₂ /CO		1.73						4.37				2.61		4.76													

ULTIMATE YIELDS						WEIGHT BALANCE				EFFLUENT RATIOS		CONTRACTION: 46.05			
% CO Fed	#/hr	H ₂ /CO #/MCF	g/M ³	Gal/hr	H ₂ /CO Gal/MCF	cc/M ³	Wet Gas	Oil	Water	Total	H ₂ /H ₂ O	CO ₂ /CO	(H ₂)(CO ₂)/(H ₂ O)(CO)	CO Conversion:	H ₂ Conversion:
C1+C2	16.92	15.22	2.80	47.35			109.0	11.8	49.1	169.9	6.52	1.35	8.79	80.99	57.87
C3+	46.95	34.78	6.41	108.39											
C4+	40.11	29.68	5.47	92.50											
Unk. Oil		32.97	6.07	102.64	5.29	0.974	137.63								
CO ₂	17.11	39.60	7.29	123.27											
H ₂ O		44.28	8.15	137.82											

Yield Calculations assume "oil" is CH₂, and is found by difference on Carbon, and H₂O 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 26C From 10/21/47 Hr. 0700 to 10/22/47 Hr. 0700

FLOWS		RUN CONDITIONS			DISTILLATIONS			CATALYST DATA		CATALYST ANALYSIS			
SCFH	%	Generator Press			A S T M	Hempel Dist.	In Reactor at Start of Period		Particle Size				
Oxygen	1570	O ₂ Preheat, °F	309	Prod.	Gas	°F		237	Screen		Sedimentation		
Nat. Gas	2280	Gas Preheat, °F	493	A.P.I.	45.7	%	A.P.I.	32	Frac.	M	%	M	%
Total	3790	Reactor Press.	300	I.B.P.	111	400-550	72.6 49.9	Catalyst Recharged	On 40	420+	1.3	80+	
Fresh Feed	5320	Steam Back Press.	683	5%		550+		Total	100	419-150	18.3	80-40	
F.F. by C	6800	Temperatures, °F		10%	152			Catalyst Taken Out	150	149-105	18.8	40-20	
Avg. F.F.	6060	Heater Outlet	512	20	168			In Reactor at End of Period	200	104-74	24.2	20-10	
Wet Gas	2900	Catalyst #1	672	30	202	WATER			250	73-62	9.6	10-0	
Contraction		#2	630	40	224	Temp.	%	Reactor d-P, H ₂ O	325	61-44	3.4		
Recycle	8250	#3	591	50	244	200		Pounds in Reactor	<325	43-0	23.4		
Bleed	202	#4	564	60	264	203		Density, lbs./cu. ft.				Chem. Anal.	
		#5	516	70	284	208		Bed Height, Feet				Aerated	% Fe
Total	8452	Average	594	80	318							Settled	% C
Total Feed	14512	Product Separator		90	354							Compacted	% Oil
Recycle/F.F.	1.39			95	382			Space Vel. SCFH/lb. cat.					
Inlet Vel.	1.09 ft/sec			E.P.	400			Inventory Figures	23.9				
Steam Flow				Rec.	98.0			From d-P Meters	41.8				
				Res.	0.8								
				Loss	1.2								

GENERATOR ELEMENTAL BALANCE

NATURAL GAS		PRODUCT INSPECTION						IN				OUT				
%		Oil	Water	Product	Pour °F	SUS @ °F	#/L Mol %	SEFH m/hr	C	H	O	Mol %	SEFH m/hr	C	H	O
CO ₂	1.95	Neut. No.	53.0	38.26			O ₂	127.49	3.984		7.968	CO ₂	2.4	.384	.384	.768
CH ₄	85.91	Sop. No.	102.8	127.95			CO ₂	5.15	.117	.117	.234	CO	35.1	5.612	5.612	5.612
C ₂ H ₆	8.94	Hydrox. No.	68.7				CH ₄	82.69	5.168	5.168	20.672	CH ₄	1.0	.160	.160	.640
C ₃ H ₈	3.20	Bromine No.	109.5				C ₂ H ₆	16.14	.528	1.016	3.228	H ₂	57.9	9.258		18.516
C ₄ H ₁₀		% Fe					C ₃ H ₈	8.49	.193	.379	1.544	N ₂	3.6	.576		
N ₂		% Alc	8.0				C ₄ H ₁₀					H ₂ O				6.288 1.822
O ₂							N ₂					Total				15.990 6.156 25.440 8.202
							Total	239.96	10.000	6.940	25.444	8.202				

1005 H₂O 207.19

	FRESH FEED		WET GAS				RECYCLE	COMB. FEED		EFFLUENT		NET CHANGE ON REACTION										
	%	m/hr	%	Measured m/hr	At Wt. Balance #/hr	m/hr		m/hr	%	m/hr	%	Carbon		Hydrogen		Oxygen		Ultimate Oil		Unsat.		
CO	35.1	5.61	157.08	9.24	.71	19.88	.78	21.84	2.06	7.67	20.03	2.84	8.67	-4.83	-4.83	13.90						
H ₂	57.9	9.26	18.52	4.753	3.67	7.34	4.04	8.08	10.69	17.95	52.09	14.73	44.79	-5.22		10.44						
CO ₂	2.4	.38	16.72	22.10	1.69	7.463	1.86	8.84	4.93	5.31	13.86	6.79	20.74	1.48	1.48	26.38					2.96	
N ₂	3.6	.58	16.24	5.45	1.42	11.76	1.46	12.88	1.22	1.80	4.70	1.68	5.13	- .12								
CH ₄	1.0	.16	2.56	9.70	.74	11.84	.81	12.96	2.16	2.32	6.06	2.97	9.07	.65	.65	11.59	2.60					
C ₂ H ₄				1.33	.10	.28	.11	3.08	.30	.30	.78	.41	1.25	.11	.11	2.2	3.92	.44				64.56
C ₂ H ₆				.73	.06	1.80	.07	2.10	.16	.16	.42	.23	.70	.07	.07	.14	2.53	.42				
C ₃ H ₆				1.00	.08	3.36	.09	3.78	.22	.22	.57	.31	.95	.09	.09	.27	4.81	.54				3.40
C ₃ H ₈				1.33	.10	4.40	.11	4.84	.30	.30	.78	.41	1.25	.11	.11	3.3	5.88	.88				
C ₄ H ₈				1.48	.04	2.24	.04	2.24	.11	.11	.29	.15	.46	.04	.04	.16	2.85	.32				2.13
C ₄ H ₁₀				1.42	.03	1.74	.03	1.74	.09	.09	.23	.12	.37	.03	.03	.12	2.14	.30				1.74
C ₅ H ₁₀				1.33	.03	2.10	.03	2.10	.07	.07	.18	.10	.31	.03	.03	.15	2.67	.30				2.10
C ₆ H ₁₂																						.39
OIL							18.34					.13	.40			1.31	23.35	2.62				18.34
WATER												1.87	5.71			3.02						
TOTAL		15.99	211.12			7.65	14.137			38.30		32.74	7.56									
H ₂ +CO		14.87																				
H ₂ /CO		1.65					5.18			2.60		5.19										

	ULTIMATE YIELDS				WEIGHT BALANCE			EFFLUENT RATIOS		CONTRACTION: 47.28	
	% CO Fed	#/hr	H ₂ /CO #/MCF	g/M3	Gal/hr	H ₂ /CO Gal/MCF	cc/M3	Wet Gas	#/hr	%	#/hr
C1+C2	18.01	15.58	2.76	46.67				Wet Gas	141.4		155.0
C3+	41.70	33.04	5.86	99.09				Oil	14.5		
C4+	31.01	24.42	4.33	73.22				Water	42.2		
Ult. Oil		27.71	4.91	83.03	4.46	0.791	52.84	Total	198.1	93.8	211.1
CO ₂	26.38	65.12	11.54	195.14							
H ₂ O		33.66	5.97	100.95							

Yield Calculations assume "oil" is CH₂, and is found by difference on Carbon, and H₂O 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 x #/MCF. cc/M3 = 141.3 x gal/MCF.

THE TEXAS COMPANY — MONTEBELLO LABORATORY

DATA SUMMARY SHEET

Synthesis Run Number 26E From 10/23/47 Hr. 0700 to 10/24/47 Hr. 0700

FLOWS		RUN CONDITIONS			DISTILLATIONS			CATALYST DATA		CATALYST ANALYSIS						
	SCFH	%	Generator Press.	310	A S T M			Hempel Dist.		In Reactor at Start of Period		Particle Size				
Oxygen	1550		O ₂ Preheat, °F	464	Prod.	2850	°F	%	A.P.I.	Fresh Catalyst Charged		Screen				
Nat. Gas	2180		Gas Preheat, °F	756	A.P.I.	475	to 400	71.6	54.1	Catalyst Recharged		Sedimentation				
Total	3730	41.6	Reactor Press.	300	I.B.P.	110	400-550	20.3	35.1	Total		On 40	420+	2.2	80+	57.0
Fresh Feed	5000		Steam Back Press.	760		5%	550+			Catalyst Taken Out		100	419-150	22.0	80-40	35.0
F.F. by C	5500		Temperatures, °F			10%				In Reactor at End of Period		150	149-105	21.4	40-20	4.0
Avg. F.F.	5250		Heater Outlet	620		20						200	104-74	17.2	20-10	2.0
Wet Gas	2490		Catalyst #1	675		30	WATER					250	73-62	25.3	10-0	2.0
Contraction		54.8	#2	659		40	Temp.	%		Reactor d-P, H ₂ O		325	61-44	4.6		
Recycle	8900		#3	624		50				Pounds in Reactor		2320	<325	43-0	7.7	
Bleed	283		#4	616		60				Density, lbs./cu. ft.		95.0				
Total	9123		#5	604		70				Bed Height, Feet		4.6				
Total Feed	14623		Average	635		80				Aerated					% Fe	
Recycle/F.F.	1.65		Product Separator			90				Settled					% C	
Inlet Vel.	1.06 ft/sec					95				Compacted					% Oil	
Steam Flow						E.P.				Space Vel SCFH/lb. cat.		Sp. Grav.	4.2		Specific Surface	
						Rec.				Inventory Figures		17.9			m ² /gm	
						Res.				From d-P Meters		23.6				
						Loss				GENERATOR ELEMENTAL BALANCE						

NATURAL GAS		PRODUCT INSPECTION						IN					OUT					
	%	Oil	Water	Product	Pour °F	SUS @ °F		20/2 Mol-%	SEFH m/hr	C	H	O		Mol %	SEFH m/hr	C	H	O
CO ₂	1.18		47.0	40.51			O ₂	130.88	4.090			8.180	CO ₂	1.7	2.47	2.47		4.94
CH ₄	87.89	Neut No.	94.3	127.95			CO ₂	2.99	0.068	0.068		1.36	CH ₄	38.2	5.543	5.543		5.543
C ₂ H ₆	8.63	Sap No.					CH ₄	80.88	5.055	5.055	20.220		CH ₄	5.0	7.26	7.26	2.904	
C ₃ H ₈	2.30	Hydrox. No.	75.0				C ₂ H ₆	14.88	4.96	9.92	2.976		H ₂	54.5	7.907		15.814	
C ₄ H ₁₀		Bromine No.	106.0				C ₃ H ₈	5.81	1.32	6.90	1.056		N ₂	0.6	0.87			
N ₂		% Fe					C ₄ H ₁₀						H ₂ O					5.534
O ₂		% Alc	10.9				N ₂						Total	14.570	6.576	24.882	8.316	
							Total	235.44	9.842	6.805	24.252	8.316						

FRESH FEED		WET GAS				RECYCLE		COMB. FEED		EFFLUENT		NET CHANGE ON REACTION											
	%	m/hr	#/hr	%	Measured	At Wt. Balance	m/hr	m/hr	%	m/hr	%	Carbon		Hydrogen		Oxygen		Ultimate Oil		Unsat.			
					m/hr	#/hr	m/hr	m/hr	%	m/hr	%	m/hr	a/hr	%	a/hr	%	a/hr	%	#/hr	#/gal	gal/hr	%	
CO	38.2	554	183.12	1.41	.09	2.52	.10	2.80	.34	5.88	15.24	.44	1.27	-5.44	-5.44	1.81							
H ₂	54.5	791	15.82	49.86	3.28	6.56	3.80	7.60	12.00	19.91	57.59	15.80	45.65	-4.11									
CO ₂	1.7	25	11.00	20.20	4.33	8.66	1.54	67.76	4.86	5.11	13.24	6.40	18.49	1.29	1.29	23.29							
N ₂	0.6	09	2.52	6.5	1.10	2.80	1.8	3.36	.37	.46	1.19	.49	1.42	- .03									
CH ₄	5.0	73	11.68	19.44	1.28	20.48	1.48	23.68	4.68	5.41	14.02	6.16	17.80	.75	.75	13.54	3.00						
C ₂ H ₆				2.00	.13	3.64	.15	4.20	.48	.48	1.24	.63	1.82	.15	.30	5.42	.60						68.03
C ₃ H ₈				.94	.06	1.80	.07	2.10	.23	.23	.60	.30	.87	.07	.14	2.53	.42						
C ₄ H ₁₀				.69	.11	4.62	.13	5.46	.41	.41	1.06	.54	1.56	.13	.39	7.04	1.72						
C ₅ H ₁₂				.69	.05	2.20	.06	2.64	.17	.17	.44	.23	.66	.06	.18	3.25	.48						
C ₆ H ₁₄				.81	.05	2.80	.10	3.36	.19	.19	.49	.25	.72	.06	.24	4.33	.48						
C ₇ H ₁₆				.34	.02	1.16	.02	1.16	.08	.08	.21	.10	.29	.02	.08	1.44	.20						
C ₈ H ₁₈				.78	.05	3.50	.06	4.20	.19	.19	.49	.25	.72	.06	.24	5.42	.60						
C ₉ H ₂₀				.31	.02	1.68	.02	1.68	.07	.07	.18	.09	.26	.12	.217	2.24							
OIL							23.10					.17	.49	1.65	29.78	2.20							
WATER												2.86	8.26			-8.18							
TOTAL		14651	196.14		6.57	112.28			38.59		34.61	6.97				2.86	8.26						
H ₂ +CO		13.45																					
H ₂ /CO		1.43				38.0			3.39		35.9												

ULTIMATE YIELDS					WEIGHT BALANCE			EFFLUENT RATIOS		CONTRACTION: 48.04	
% CO Fed	#/hr	H ₂ /CO #/MCF	g/M ³	Gal/hr	Wet Gas	#/hr	%	#/hr	H ₂ /H ₂ O	CO Conversion:	98.19
C1+C2	21.49	18.30	3.59	60.70	Oil	20.4			CO ₂ /CO	H ₂ Conversion:	57.96
C3+	53.43	41.60	8.16	137.99	Water	46.4			(H ₂)(CO ₂)(H ₂)(CO)		
C4+	43.14	37.50	6.57	111.10	Total	179.0	91.3	196.1			
Ult. Oil		39.24	7.50	126.83							
CO ₂	23.29	36.76	11.13	188.21							
H ₂ O		51.48	10.09	170.62							

Yield Calculations assume "oil" is CH₂, and is found by difference on Carbon, and H₂O 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 1.47 psig. g/M³ = 16.91 × #/MCF. cc/M³ = 141.3 × gal/MCF.

THE TEXAS COMPANY — MONTEBELLO LABORATORY

DATA SUMMARY SHEET

Synthesis Run Number 26F From 10/24/47 Hr. 0700 to 10/25/47 Hr. 0700

FLOWS		RUN CONDITIONS				DISTILLATIONS				CATALYST DATA				CATALYST ANALYSIS			
SCFH	%	Generator Press		A S T M	Hempel Dist.	In Reactor at Start of Period		Particle Size		Screen		Sedimentation					
Oxygen	1530	O ₂ Preheat, °F	309	Prod.	6000	°F	%	A.P.I.	Fresh Catalyst Charged	307.2	20						
Nat. Gas	2240	Gas Preheat, °F	474	A.P.I.	47.1	to 400	72.3	54.8	Catalyst Recharged	29.7		Frac.	M	%	M	%	
Total	3770	40.7	Reactor Press.	300	I.B.P.	108	400-550	16.0	35.1	Total	357.0	On 40	420+	1.8	80+	71.0	
Fresh Feed	5090	Steam Back Press	758	5%		550+			Catalyst Taken Out	46	100	419-150	26.5	80-40	27.0		
F.F. by C	5400	Temperatures, °F	10%	148					In Reactor at End of Period	291.0	150	149-105	24.5	40-20	1.0		
Avg. F.F.		Heater Outlet	674	20	160	WATER						200	104-74	24.1	20-10	1.0	
Wet Gas	2910	Catalyst #1	671	30	196	Temp.	%	Reactor d-P, H ₂ O			250	73-62	12.0	10-0			
Contraction		#2	657	40	218	200		Pounds in Reactor	210	<325	43-0	3.3					
Recycle	8950	#3	624	50	240	203		Density, lbs./cu. ft.	91.0	Density, lbs./cu. ft.			Chem. Anal.				
Bleed	238	#4	607	60	264	208		Bed Height, Feet	4.6	Aerated	% Fe						
Total	9188	Average	626	80	318					Settled	% C						
Total Feed	14588	Product Separator	90	350						Compacted	% Oil						
Recycle/F.F.	1.70		95	380						Space Vel. SCFH/lb. cat.	Sp. Grav.	3.6	Specific Surface				
Inlet Vel.	1.06 ft/sec		E.P.	400						Inventory Figures	18.5		m ² gm				
Steam Flow			Rec.	98.0						From d-P Meters	25.7						
			Res.	1.0													
			Loss	1.0													

GENERATOR ELEMENTAL BALANCE

NATURAL GAS		PRODUCT INSPECTION						IN					OUT				
%		Oil	Water	Product	Pour °F	SUS @ °F	#/hr	Mol/hr	SEFH m/hr	C	H	O	Mol %	SEFH m/hr	C	H	O
CO ₂	1.54	Neut. No.	57.7	41.64			O ₂	129.18	4.037			8.074	CO ₂	2.3	328	328	656
CH ₄	88.23	Sap. No.	102.8	128.51			CO ₂	4.05	0.092	0.92		1.84	CO	37.9	5400	5400	5400
C ₂ H ₆	7.62	Hydrox. No.	69.0				CH ₄	83.42	5.214	5.214	20.856		CH ₄	6.9	98.0	98.0	392.0
C ₃ H ₈	2.61	Bromine No.	103.1				C ₂ H ₆	13.50	0.450	0.900	2.700		H ₂	52.7	7588	15196	
C ₄ H ₁₀		% Fe					C ₃ H ₈	6.78	0.154	0.462	1.232		N ₂	0.1	0.14		
N ₂		% Alc	11.3				C ₄ H ₁₀						H ₂ O				5.672
O ₂							N ₂						Total				2.202
							Total	236.93	9.947	6.668	24.788	8.258		14.320	6.708	24.768	8.258

Loss H₂O 197.29

FRESH FEED				WET GAS				RECYCLE	COMB. FEED	EFFLUENT		NET CHANGE ON REACTION							
%	m/hr	#/hr	%	Measured m/hr	At Wt. Balance #/hr	m/hr	m/hr	%	m/hr	%	Carbon		Hydrogen		Oxygen	Ultimate Oil		Unsat.	
CO	379	5.40	157.20	10.36	180	2240	86	24.08	2.57	7.91	20.56	3.37	9.76	-4.54	-4.54	15.93			
H ₂	52.7	7.51	15.02	52.01	399	798	4.27	8.54	12.61	20.12	52.30	16.88	48.89	-3.24		-6.48			
CO ₂	2.3	.33	14.52	20.40	1.57	69.08	1.68	73.92	4.94	5.27	13.70	6.62	19.17	1.35	1.35	24.99			
N ₂	0.1	.01	.28	1.03	.08	2.24	.09	2.52	.25	.26	.68	.34	.98	.08					
CH ₄	6.9	.98	15.68	12.66	.97	15.22	1.04	16.64	3.07	4.05	10.53	4.11	11.90	.06	.06	1.11	.24		
C ₂ H ₆				1.22	.09	2.52	.10	2.80	.30	.30	.80	.40	1.16	.10	.20	3.70	.40		74.85
C ₃ H ₈				.41	.03	.90	.03	.90	.10	.10	.26	.13	.28	.03	.06	1.11	.18		
C ₄ H ₁₀				.57	.04	1.68	.04	1.68	.14	.14	.36	.18	.52	.04	.12	2.22	.24	1.57	.24
C ₅ H ₁₂				.33	.03	1.32	.03	1.32	.08	.08	.21	.11	.32	.03	.09	1.67	.24		63.33
C ₆ H ₁₄				.29	.02	1.12	.02	1.12	.07	.07	.18	.09	.26	.02	.08	1.48	.16		54.72
C ₇ H ₁₆				.24	.02	1.16	.02	1.16	.06	.06	.16	.08	.23	.02	.08	1.48	.20		24
C ₈ H ₁₈				.38	.03	2.10	.03	2.10	.09	.09	.23	.12	.35	.03	.15	2.28	.30		24
C ₉ H ₂₀				.10	.01	.84	.01	.84	.02	.02	.05	.03	.09	.01	.06	1.11	.12		84
OIL							32.06				.23	.67	2.29	42.41	4.58		32.06	4.93	
WATER											1.84	5.33		-8.2					
TOTAL	1425	196.7		768	1289				38.47		34.53	6.17							
H ₂ +CO	12.91																		
H ₂ /CO	1.40								2.54		5.01								

ULTIMATE YIELDS

WEIGHT BALANCE

Yield Calculations assume "oil" is CH₂, and is found by difference on Carbon, and H₂O 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 265 From 10/25/47 Hr. 0700 to 10/26/47 Hr. 0400

FLOWS		RUN CONDITIONS		DISTILLATIONS				CATALYST DATA			CATALYST ANALYSIS			
	SCFH	%	Generator Press.	ASTM	Hempel Dist.	In Reactor at Start of Period		Fresh Catalyst Charged		Particle Size				
			O ₂ Preheat, °F	Prod.	"F % A.P.I.	Fresh Catalyst Charged		Catalyst Recharged		Screen		Sedimentation		
Oxygen	1580		514	6050				67						
Nat. Gas	2220		748	479		to 400 720 545		90		Frac.	M	%	M	%
Total	3800	41.6	300	106		400-550 163 747		448		On 40	420+	2.2	80+	37.0
Fresh Feed	5200		849	5%		550+		103.75		100	419-150	14.0	80-40	17.0
F. F. by C	6080			10%	142			344.25		150	149-105	10.2	40-20	27.0
Avg. F. F.			764	20	168					200	104-74	13.9	20-10	15.0
Wet Gas	2280		Catalyst #1	692	30	188				250	73-62	5.2	10-0	4.0
Contraction		62.5	#2	669	40	218				325	61-44	8.1		
Recycle	8800		#3	625	50	278				200				
Bleed	221		#4	585	60	262				203				
			#5	550	70	288				208				
Total	9021		Average	624	80	718								
Total Feed	15701		Product Separator		90	342								
Recycle/F.F.	1.48				95	374								
Inlet Vel.	1.02 ft/sec				E.P.	401								
Steam Flow					Rec.	980								
					Res.	1.0								
					Loss	1.0								

NATURAL GAS										PRODUCT INSPECTION										GENERATOR ELEMENTAL BALANCE									
		Oil		Water		Product		Pour °F		SUS @ °F		IN			OUT			IN			OUT								
%	SCFH	%	SCFH	%	SCFH	%	SCFH	%	SCFH	%	SCFH	SCFH	C	H	O	Mol %	SCFH	C	H	O	Mol %	SCFH	C	H	O				
CO ₂	3.21		48.0	39.11								133.41	4.169		8.338	2.7	4.33				2.7	4.33				8.66			
CH ₄	85.50		75.4	124.59								8.27	.188	.188	.376	32.7	5.245	5.245			32.7	5.245	5.245			5.245			
C ₂ H ₆	8.60		15.0									80.13	5.008	5.008	20.032	6.2	9.94	9.94			6.2	9.94	9.94			3.976			
C ₃ H ₈	2.69		12.36									15.12	.504	1.008	3.024	58.2	9.335				58.2	9.335				18.670			
C ₄ H ₁₀												6.95	.158	.774	1.264	N ₂	0.2				0.2								
N ₂			11.1													H ₂ O											1.674		
O ₂																Total	16.040	6.672	24.320	8.714									
Total												243.88	10.027	6.978	24.320	8.714													

Loss H₂O 197.03

FRESH FEED		WET GAS				RECYCLE		COMB. FEED		EFFLUENT		NET CHANGE ON REACTION																	
%	m/hr	#/hr	%	Measured m/hr	At Wt. Balance #/hr	m/hr	m/hr	%	m/hr	%	Carbon	Hydrogen	Oxygen	Ultimate Oil	Unsats.														
				m/hr	#/hr	m/hr	m/hr		m/hr		m/hr	a/hr	%	a/hr	%	#/hr	#/gal	gal/hr											
CO	32.7	5.25	147.00	3.85	.23	6.44	.23	6.44	.91	6.16	15.46	1.14	3.46	-5.02	-5.02	4.38													
H ₂	59.2	9.34	18.68	40.04	3.41	4.82	3.36	4.72	9.53	18.87	47.36	11.89	36.08	-6.88		-13.96													
CO ₂	2.7	.43	18.92	24.10	1.45	63.80	1.42	62.48	5.74	6.17	15.49	7.16	21.73	.99	.99	18.86													
N ₂	0.2	.03	.84	.41	.02	.28	.02	.28	.10	.13	.33	.12	.36	.01															
CH ₄	6.2	.99	15.84	22.14	1.33	21.28	1.30	20.80	6.27	6.26	15.71	6.57	19.94	.31	.31	5.90	1.24												
C ₂ H ₆				3.08	.19	5.32	.19	5.32	.73	.73	1.83	.92	2.79	.19	.38	7.24	.76												
C ₃ H ₈				1.23	.07	2.10	.07	2.10	.29	.29	.73	.36	1.09	.07	.14	2.67	.42												
C ₄ H ₁₀				3.02	.18	7.56	.18	7.56	.72	.72	1.81	.90	2.73	.18	.54	10.29	1.08	6.80	1.09										
C ₅ H ₁₂				.39	.02	.88	.02	.88	.09	.09	.23	.11	.33	.02	.06	1.14	.16												
C ₆ H ₁₄				.78	.05	2.80	.05	2.80	.19	.19	.48	.24	.73	.05	.20	3.81	.40												
C ₇ H ₁₆				.26	.02	1.16	.02	1.16	.06	.06	.15	.08	.24	.02	.08	1.52	.20												
C ₈ H ₁₈				.56	.03	2.10	.03	2.10	.13	.13	.33	.16	.49	.03	.15	2.86	.30												
C ₉ H ₂₀				.17	.01	.84	.01	.84	.04	.04	.10	.05	.15	.01	.06	1.14	.12												
OIL						29.54						.21	.64		2.11	40.19	4.22	29.54											
WATER												3.04	9.23		5.06														
TOTAL		16.04	201.28			6.02	119.38					39.84	32.95	10.14															
H ₂ +CO		14.59																											
H ₂ /CO		1.78																											

ULTIMATE YIELDS						WEIGHT BALANCE				EFFLUENT RATIOS		CONTRACTION: 63.2	
% CO Fed	#/hr	#/MCF	g/M3	Gal/hr	cc/M3	Wet Gas	#/hr	%	#/hr	H ₂ /H ₂ O	CO ₂ /CO	CO Conversion:	H ₂ Conversion:
C1+C2	15.81	12.38	2.24	37.88		Oil	20.4		117.1	3.91	6.28	95.62	74.7
C3+	60.95	44.88	8.12	137.31		Water	63.8		63.8	(H ₂)/CO ₂	24.53		
C4+	49.52	36.44	6.59	111.44		Total	203.6	100.9	201.3	(H ₂)/CO			
Ult. Oil	43.10	7.79	131.73	6.70	1.21								
CO ₂	18.86	43.52	7.87	137.08									
H ₂ O		54.72	9.90	167.41									

Yield Calculations assume "oil" is CH₂, and is found by difference on Carbon, and H₂O 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 274 From 10/27/47 Hr. 2000 to 10/28/47 Hr. 0700

FLOWS		RUN CONDITIONS			DISTILLATIONS			CATALYST DATA		CATALYST ANALYSIS							
SCFH	%	Generator Press.			A S T M			Hempel Dist.		In Reactor at Start of Period		Particle Size					
Oxygen	1830	O ₂ Preheat, °F	407	Prod.	6850			°F	% A.P.I.	Fresh Catalyst Charged		Screen					
Nat. Gas	2500	Gas Preheat, °F	714	A.P.I.	47.0			to 400	72.6	539	Catalyst Recharged		Frac.	M	%	M	%
Total	4330	Reactor Press.	403	I.B.P.	110			400-550	15.0	347	Total	197	On 40	420+	0.8	80+	
Fresh Feed	7240	Steam Back Press	620	5%				550+			Catalyst Taken Out	19	100	419-150	22.8	80-40	
F F by C	6870	Temperatures, °F		10%	148						In Reactor at End of Period	178	150	149-105	17.4	40-20	
Avg. F F		Heater Outlet	240	20	168								200	104-74	12.6	20-10	
Wet Gas	2060	Catalyst #1	676	30	200			WATER					250	73-62	1.0	10-0	
Contraction		#2	608	40	222			Temp	%	Reactor d-P, H ₂ O			325	61-44	8.4		
Recycle	10300	#3	557	50	245			200		Pounds in Reactor	74.8		<325	43-0	37.0		
Bleed	274	#4	534	60	270			203		Density, lbs./cu. ft.	39.2						
Total	10574	#5	493	70	292			208		Bed Height, Feet							
Total Feed	17814	Average	574	80	322												
Recycle F F	145	Product Separator		90	365												
Inlet Vel	1.144/sec			95	380					Space Vel. SCFH/lb. cat.			Sp. Grav.	5.0			
Steam Flow				E.P.	403					Inventory Figures	40.6						
				Rec	96.0					From d-P Meters	96.8						
				Res	1.2												
				Loss	0.8												

NATURAL GAS		PRODUCT INSPECTION						GENERATOR ELEMENTAL BALANCE									
%		Oil	Water	Product	Pour °F	SUS @ °F	IN			OUT							
							#/L	Mol %	SEFH m/hr	C	H	O	Mol %	SEFH m/hr	C	H	O
CO ₂	1.57	Neut No	37.3	34.51			O ₂	154.50	4.828			9.656	CO ₂	1.8	3.44	3.44	6.68
CH ₄	85.55	Sap No	46.58	127.39			CO ₂	4.58	1.04	1.04		2.08	CO	33.8	6.456	6.456	6.456
C ₂ H ₆	9.20	Hydrax No	18.0				CH ₄	90.29	5.643	5.643	22.572		CH ₄	6.7	1.240	1.240	5.120
C ₃ H ₈	3.37	Bromine No	122.87				C ₂ H ₆	18.81	6.27	12.54	3.762		H ₂	57.3	10.944		21.888
C ₄ H ₁₀		% Fe					C ₃ H ₈	9.77	2.22	6.86	1.716		N ₂	0.4	0.76		
N ₂		% Alc	9.5				C ₄ H ₁₀						H ₂ O				1.102 2720
O ₂							N ₂						Total				
							Total	277.95	11.424	7.667	28.110	9.864		19.100	8.060	28.110	9.864

Loss into 228.99

	FRESH FEED		WET GAS				RECYCLE	COMB. FEED	EFFLUENT	NET CHANGE ON REACTION								
	%	m/hr	#/hr	%	Measured m/hr	At Wt. Balance #/hr				m/hr	m/hr	%	m/hr	%	Carbon m/hr	Hydrogen a/hr	Oxygen a/hr	Ultimate Oil #/gal
CO	33.8	6.46	180.88	11.57	6.3	17.64	1.13	31.75	3.21	7.89	26.28	4.34	10.76	-5.33	-5.33	17.49		
H ₂	57.3	10.94	21.88	46.88	2.55	5.10	4.59	9.18	13.08	15.33	55.77	17.67	48.79	-6.35		-12.70		
CO ₂	1.8	.34	14.96	18.29	.99	4.356	1.78	78.41	5.10	2.12	7.34	6.88	17.05	1.44	1.44	22.29		2.88
N ₂	0.4	.08	2.24	1.18	.06	1.68	.11	3.02	.33	.19	.66	.44	1.09	.03				
CH ₄	6.7	1.28	20.48	17.57	.96	15.36	1.73	27.65	4.90	3.01	10.42	6.63	16.48	.45	.45	6.97	.90	
C ₂ H ₆				1.36	.07	1.96	.13	3.53	.38	.13	.45	.57	1.26	.13	.24	4.02	.52	
C ₃ H ₈				.69	.04	1.20	.07	2.16	.19	.07	.24	.26	.64	.07	.14	2.17	.42	
C ₄ H ₁₀				1.18	.06	2.52	.11	4.54	.33	.11	.38	.44	1.09	.11	.33	5.11	1.66	4.09
C ₅ H ₁₂				.27	.01	.44	.02	.79	.08	.02	.07	.10	.25	.02	.06	.93	.16	6.25
C ₆ H ₁₄				.48	.03	1.68	.05	3.02	.13	.05	.17	.18	.45	.05	.20	3.10	.40	6.25
C ₇ H ₁₆				.15	.01	.58	.02	1.04	.04	.02	.07	.06	.15	.02	.08	1.24	.20	6.1
C ₈ H ₁₈				.39	.02	1.40	.04	2.52	.11	.04	.14	.15	.37	.04	.20	3.10	.40	0.47
C ₉ H ₂₀				.06					.02			.02	.05					5.4
OIL							30.38					22	.55		2.17	33.59	4.34	6.5
WATER												2.45	6.07			4.70		4.67
TOTAL		19.10	240.44		5.43	93.12			28.68			40.35	9.32		(2.45)			4.90
H ₂ +CO		17.40													2.35			
H ₂ /CO		1.69				4.06			2.05			4.07						

ULTIMATE YIELDS						WEIGHT BALANCE			EFFLUENT RATIOS		CONTRACTION: 48.8	
%	CO Fed	#/hr	H ₂ /CO #/MCF	g/M ³	Gal/hr	#/hr	%	#/hr	H ₂ /H ₂ O	CO ₂ /CO	CO Conversion:	H ₂ Conversion:
C1+C2	13.16	12.86	1.95	32.97		93.1		167.0	7.21	1.59	82.51	58.04
C3+	47.07	42.29	4.42	106.56		Oil		21.8				
C4+	41.03	36.96	5.61	94.87		Water		51.6				
Ult. Oil		40.90	4.21	105.01	6.47	Total		166.5	69.3	240.4		
CO ₂	22.29	23.43	9.63	162.84					(H ₂)(CO ₂)(H ₂ O)(CO)	11.47		
H ₂ O		44.10	6.69	113.13								

Yield Calculations assume "oil" is CH₂, and is found by difference on Carbon, and H₂O 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 27B From 10/28/47 Hr. 0700 to 10/29/47 Hr. 0700

FLOWS		RUN CONDITIONS				DISTILLATIONS				CATALYST DATA				CATALYST ANALYSIS				
	SCFH	%	Generator Press.			A S T M			Hempel Dist.		In Reactor at Start of Period		Particle Size					
Oxygen	1790		O ₂ Preheat, °F	411	Prod.	6250			°F	%	A.P.I.	Fresh Catalyst Charged	178	Screen				
Nat. Gas	2490		Gas Preheat, °F	501	A.P.I.	57.2			to 400	75.0	57.2	Catalyst Recharged	86	Frac.	M	%	M	%
Total	4280	41.8	Reactor Press.	727	I.B.P.	10.8			400-550	15.3	37.0	Total	18	On 40	420+	0.6	80+	31.0
Fresh Feed	7500		Steam Back Press	404	5%				550+			Catalyst Taken Out	282	100	419-150	12.4	80-40	13.0
F. F. by C	7550		Temperatures, °F	825	10%	12.8						In Reactor at End of Period	5	150	149-105	10.4	40-20	25.0
Avg. F. F.			Heater Outlet	430	20	15.0							277	200	104-74	9.6	20-10	29.0
Wet Gas	1700		Catalyst #1	620	30	17.8			WATER					250	73-62	3.4	10-0	2.0
Contraction		77.3	#2	603	40	20.0			Temp.	%		Reactor d-P, H ₂ O		325	61-44	6.0		
Recycle	9340		#3	572	50	22.6			200			Pounds in Reactor	196	<325	43-0	55.6		
Bleed	235		#4	549	60	25.0			203			Density, lbs./cu. ft.	62					
Total	9575		#5	572	70	27.6			208			Bed Height, Feet	4.6					
Total Feed	17075		Average	571	80	30.8												
Recycle/F.F.	1.27		Product Separator		90	34.6						Space Vel. SCFH/lb. cat.						
Inlet Vel.	1.25 ft/sec				95	37.6						Inventory Figures	27.1					
Steam Flow					E.P.	396						From d-P Meters	38.3					m ² gm
					Res.	0.8												
					Loss	1.2												

GENERATOR ELEMENTAL BALANCE

NATURAL GAS		PRODUCT INSPECTION							IN					OUT				
	%	Neut. No.	Oil	Water	Product	Pour °F	SUS @ °F	Wt. %	Mol %	SEFF m/hr	C	H	O	Mol %	SEFF m/hr	C	H	O
CO ₂	1.76	39.96	38.26					O ₂	15.14	4.723			9.446	CO ₂	2.2	435	435	1870
CH ₄	85.72	49.4	126.83					CO ₂	5.10	.116	.116	.232	CO	32.3	6.392	6.392	6.392	
C ₂ H ₆	10.07	Hydrox. No.	11.5					CH ₄	90.11	5.632	5.632	22.528	CH ₄	5.4	1.069	1.069	4.276	
C ₃ H ₈	2.45	Bromine No.	113.88					C ₂ H ₆	19.86	.662	1.324	3.972	H ₂	60.1	11.894		22.788	
C ₄ H ₁₀		% Fe						C ₃ H ₈	7.04	.160	.480	1.280	N ₂	-				
N ₂		% Alc	12.5					C ₄ H ₁₀					H ₂ O				-2841.416	
O ₂								N ₂					Total					
								Total	273.25	11.293	7.552	27.780	9.678	19.790	7.896	27.780	9.678	

Summ'd 247.76

FRESH FEED		WET GAS				RECYCLE		COMB. FEED		EFFLUENT				NET CHANGE ON REACTION						
%	m/hr	#/hr	%	Measured m/hr	At Wt. Balance #/hr	m/hr	m/hr	%	m/hr	%	Carbon		Hydrogen		Oxygen		Ultimate Oil		Unsat.	
CO	32.3	639	178.92	691	.09	2.52	.13	364	1.48	6.87	15.25	.61	1.65	-6.26	-6.26	2.03				
H ₂	60.1	1189	2378	3431	1.54	3.08	2.28	452	8.67	20.56	45.64	11.95	32.41	-9.61		-19.22				
CO ₂	2.2	.44	19.36	25.60	1.15	80.60	1.70	74.80	6.47	6.91	15.24	8.17	22.16	1.26	1.26	19.72			2.52	
N ₂	-		.48	.02	.56	.03	.84	.12	.12	.27	.15	.41	.03							
CH ₄	5.4	1.07	17.12	27.36	1.23	14.68	1.82	29.12	6.91	7.89	17.71	8.73	23.68	.75	.75	11.74	3.00			
C ₂ H ₆			3.14	.14	3.92	.21	5.88	.79	.79	1.75	1.00	2.71	.21	.42	6.57	1.68				67.24
C ₃ H ₈			1.53	.07	2.10	.10	3.00	.39	.39	1.87	1.49	1.33	.10	.20	3.13	.60				
C ₄ H ₁₀			3.25	.15	6.30	.82	9.24	.82	.82	1.82	1.04	2.82	.22	.66	10.33	1.32			8.32	1.33
C ₅ H ₁₂			.48	.02	.88	.03	1.32	.12	.12	.27	.15	.41	.03	.09	1.41	.24				
C ₆ H ₁₄			.82	.04	2.24	.06	3.36	.21	.21	.47	.27	.73	.06	.24	3.76	.48			3.19	.52
C ₇ H ₁₆			.17	.01	.58	.01	.58	.04	.04	.09	.05	.14	.01	.04	.63	.10			.78	.12
C ₈ H ₁₈			.73	.03	2.10	.04	2.80	.18	.18	.40	.22	.60	.04	.20	3.13	.40			2.80	.52
C ₉ H ₂₀			.23	.01	.84	.01	.84	.06	.06	.13	.07	.19	.01	.06	.94	.12			.84	
OIL							32.76				.23	.62		2.34	36.62	4.68			32.76	5.04
WATER											3.74	10.14			6.60					
TOTAL	19.79	239.18		4.49	9540			45.05			36.87	13.21			3.30				48.49	7.53
H ₂ +CO	18.28																			
H ₂ /CO	1.86					17.54		2.99			19.59									

ULTIMATE YIELDS						WEIGHT BALANCE				EFFLUENT RATIOS		CONTRACTION: 66.8	
% CO Fed	#/hr	H ₂ /CO #/MCF	g/M ³	Gal/hr	H ₂ /CO Gal/MCF	cc/M ³	Wet Gas	#/hr	%	#/hr	H ₂ /H ₂ O	CO Conversion:	H ₂ Conversion:
C1+C2	21.44	20.88	3.01	50.90			Wet Gas	95.4		14.1	3.20	97.77	80.8
C3+	56.82	50.80	7.34	124.12			Oil	30.3			13.39		
C4+	45.08	40.34	5.82	98.42			Water	67.8			(H ₂)(CO ₂)		
Ult. Oil	48.49	699	118.20	7.53	1.09	154.12	Total	193.5	80.9	239.2	(H ₂)(CO)	42.45	
CO ₂	19.72	55.44	8.00	135.28									
H ₂ O		67.32	9.71	164.20									

Yield Calculations assume "oil" is CH₂, and is found by difference on Carbon, and H₂O 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 27-C From 10-29-47 Hr. 0700 to 10-30-47 Hr. 0700

FLOWS			RUN CONDITIONS			DISTILLATIONS			CATALYST DATA			CATALYST ANALYSIS								
SCFH	%		Generator Press.		410	A S T M			Hempel Dist.			Particle Size								
Oxygen	1790		O ₂ Preheat, °F		492	Prod.	Raw		°F	%	A.P.I.	Fresh Catalyst Charged								
Nat. Gas	2460		Gas Preheat, °F		730	A.P.I.	54.1		to 400			Catalyst Recharged								
Total	4250	42.2	Reactor Press.		405	I.B.P.	110		400-550			Total	277	On 40	420+	0.2	80+	29.0		
Fresh Feed	7850		Steam Back Press.		840		5%		550+			Catalyst Taken Out	4	100	419-150	10.5	80-40	10.0		
F.F. by C	8150		Temperatures, °F			10%	130					In Reactor at End of Period	273	150	149-105	10.5	40-20	45.0		
Avg. F.F.			Heater Outlet		470	20	150							200	104-74	8.8	20-10	14.0		
Wet Gas	1720		Catalyst #1		622	30	170		WATER					250	73-62	2.5	10-0	4.0		
Contraction		68.7	#2		613	40	192		Temp	%		Reactor d-P, H ₂ O		325	61-44	4.9				
Recycle	9220		#3		580	50	218		200			Pounds in Reactor	226	< 325	43-0	62.6				
Bleed	240		#4		555	60	244		203			Density, lbs./cu. ft.	84					Chem. Anal.		
			#5		519	70	274		208			Bed Height, Feet	5.2					Aerated	% Fe	
Total	9460		Average		578	80	306											Settled	% C	
Total Feed	17310		Product Separator			90	344											Compacted	% Oil	
Recycle/F.F.	1.20					95	382					Space Vel. SCFH/lb. cat.						Sp. Grav.	4.7	Specific Surface
Inlet Vel.	1.23					E.P.	390					Inventory Figures	28.5							m ² /gm
Steam Flow						Rec.	97.0					From d-P Meters	34.7							
						Res.	0.8													
						Loss	2.2													

NATURAL GAS		PRODUCT INSPECTION										GENERATOR ELEMENTAL BALANCE									
%		Oil	Water	Product	Pour °F	SUS @ °F	IN					OUT									
							Mol %	SCFH	C	H	O	Mol %	SCFH	C	H	O					
CO ₂	1.66	Neut. No. 34.58	33.2				O ₂	151.14	4.723			CO ₂	3.5	.725	.725		1.450				
CH ₄	84.27	Sap No. 42.65	129.64				CO ₂	4.75	.108	.108		CO	26.3	5.447	5.447		5.447				
C ₂ H ₆	10.76	Hydrox. No. 92.0					CH ₄	87.52	5.470	5.470	21.880	CH ₄	5.4	1.118	1.118		4.472				
C ₃ H ₈	3.31	Bromine No. 127.75					C ₂ H ₆	20.94	.698	1.396	4.188	H ₂	64.2	13.296			26.592				
C ₄ H ₁₀		% Fe					C ₃ H ₈	9.46	.215	.645	1.720	N ₂	0.6	.124							
N ₂		% Alc	12.5				C ₄ H ₁₀					H ₂ O					-5.276	2.765			
O ₂							N ₂					Total									
							Total	273.81	11.214	7.619	27.788	9.662						20.710	8.290	27.788	9.662

Less H₂O 224.04

FRESH FEED				WET GAS				RECYCLE	COMB. FEED	EFFLUENT	NET CHANGE ON REACTION											
%	m/hr	#/hr	%	Measured	At Wt. Balance	m/hr	m/hr	%	m/hr	%	Carbon			Hydrogen			Oxygen	Ultimate Oil		Unsat.		
				m/hr	#/hr	m/hr	#/hr				m/hr	a/hr	%	a/hr	%	a/hr	%	#/hr	#/gal	gal/hr	%	
CO	26.3	5.45	152.60	1.74	.11	3.08	.11	3.18	.43	5.88	12.90	.54	1.53	- 5.34	- 5.34	2.02		- 5.34				
H ₂	64.2	13.30	26.60	37.55	2.36	4.72	2.44	4.88	9.33	22.63	49.68	11.77	55.41	-10.86				-21.72				
CO ₂	3.5	.72	31.68	23.90	1.50	66.00	1.55	68.22	5.94	6.66	14.61	7.49	21.26	.83	.83	15.23		1.66				
N ₂	0.6	.12	3.36	-	-	-	-	-	.12	.26	-	-	-	.12								
CH ₄	5.4	1.12	17.92	27.62	1.73	27.68	1.79	28.61	6.86	7.98	17.51	8.65	24.55	.67	.67	12.29	2.68					
C ₂ H ₄				2.92	.18	5.04	.19	5.21	.73	.73	1.60	.92	2.61	.19	.38	6.97	.76					
C ₂ H ₆				1.15	.07	2.10	.07	2.17	.29	.29	.64	.36	1.02	.07	.14	2.57	.42					
C ₃ H ₆				2.49	.16	6.72	.17	6.95	.62	.62	1.36	.79	2.24	.17	.51	9.36	1.02	6.26	6.25	1.00		
C ₃ H ₈				.51	.03	1.32	.03	1.36	.13	.13	.29	.16	.45	.03	.09	1.65	.24					
C ₄ H ₈				.91	.06	3.36	.06	3.47	.23	.23	.50	.29	.82	.06	.24	4.40	.48	3.30	6.10	.54		
C ₄ H ₁₀				.29	.02	1.16	.02	1.20	.07	.07	.15	.09	.26	.02	.08	1.47	.20	1.20	4.86	.25		
C ₅ H ₁₀				.67	.04	2.80	.04	2.89	.17	.17	.37	.21	.60	.04	.20	3.67	.40	2.89	5.40	.54		
C ₆ H ₁₂				.24	.01	.84	.01	.87	.06	.06	.13	.07	.20	.01	.06	1.10	.12	.87	5.50	.16		
OIL								(29.96)			.21	.60		2.14	39.26	4.28		29.96	6.50	4.61		
WATER											3.68	10.45				11.12		(5.56)	3.68			
TOTAL	20.71	232.16		6.28	124.82	6.48	129.01	24.85	45.57	99.98	35.23	100.00	14.23	99.99				44.48	7.10			
H ₂ +CO	18.75			2.47		2.55																
H ₂ /CO	2.44			21.45		22.18			3.85		21.80											

ULTIMATE YIELDS						WEIGHT BALANCE			EFFLUENT RATIOS			CONTRACTION: 68.7		
% CO Fed	#/hr	H ₂ /CO #/MCF	g/M ³	Gal/hr	H ₂ /CO Gal/MCF	cc/M ³	Wet Gas	#/hr	%	#/hr	H ₂ /H ₂ O	CO Conversion:	H ₂ Conversion:	H ₂ + CO = 86.4
C1+C2	21.85	18.07	2.55	43.12			Wet Gas	124.8		129.0	3.20	97.9	81.6	
C3+	60.91	46.70	6.58	111.27			Oil	29.8		29.8	CO ₂ /CO	13.87		
C4+	49.90	38.39	5.41	91.48			Water	73.4		73.4	(H ₂)(CO ₂)(H ₂ O)(CO)	44.37		
Ult. Oil	44.48	6.26	105.86	7.10	1.00	141.30	Total	228.0	98.2	232.2				
CO ₂	15.23	36.54	5.15	87.08										
H ₂ O	66.24	9.33	157.77											

Yield Calculations assume "oil" is CH₂, and is found by difference on Carbon, and H₂O 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 #/MCF.

THE TEXAS COMPANY — MONTEBELLO LABORATORY

DATA SUMMARY SHEET

Synthesis Run Number 27 D From 10-30-47 Hr. 0700 to 10-31-47 Hr. 0700

FLOWS		RUN CONDITIONS			DISTILLATIONS			CATALYST DATA			CATALYST ANALYSIS					
SCFH	%	Generator Press.	409	A S T M			Hempel Dist.			Particle Size						
Oxygen	1790	O ₂ Preheat, °F	490	Prod.	Raw 011		°F	%	A.P.I.	Fresh Catalyst Charged	Screen		Sedimentation			
Nat. Gas	2480	Gas Preheat, °F	730	A.P.I.	55.6		to 400	78.0	59.1	Catalyst Recharged	Frac.	M	%	M	%	
Total	4270	Reactor Press.	400	I.B.P.	108		400-550	12.0		Total	On 40	420+	0.8	80+	23.0	
Fresh Feed	7950	Steam Back Press.	860		5%		550+			Catalyst Taken Out	100	419-150	9.0	80-40	10.0	
F.F. by C	7550	Temperatures, °F		10%	130					In Reactor at End of Period	271.5	150	149-105	7.6	40-20	46.0
Avg. F.F.		Heater Outlet	478	20	152							200	104-74	6.5	20-10	19.0
Wet Gas	1840	Catalyst #1	620	30	174		WATER					250	73-62	1.4	10-0	2.0
Contraction		#2	612	40	197		Temp.	%		Reactor d-P, H ₂ O		325	61-44	5.2		
Recycle	9300	#3	575	50	222		200			Pounds in Reactor	249	<325	43-0	69.7		
Bleed	244	#4	555	60	246		203			Density, lbs./cu. ft.	59					
		#5	519	70	272		208			Bed Height, Feet	7.4					
Total	9544	Average	574	80	308											
Total Feed	17094	Product Separator		90	342											
Recycle/F.F.	1.26			95	374					Space Vel. SCFH/lb. cat.		Sp. Grav.	4.3			
Inlet Vel.	1.25			E.P.	394					Inventory Figures	27.8					
Steam Flow				Rec.	98.0					From d-P Meters	30.4					m ² gm
				Res.	1.0											
				Loss	1.0					GENERATOR ELEMENTAL BALANCE						

NATURAL GAS		PRODUCT INSPECTION						IN					OUT					
%		Oil	Water	Product	Pour °F	SUS @ °F		Mol %	SCFH m/hr	C	H	O		Mol %	SCFH m/hr	C	H	O
CO ₂	1.51		37.16	32.64				O ₂	151.14	4.723			9.446	CO ₂	1.8	.359	.359	.718
CH ₄	86.95		46.58	128.51				CO	4.36	.099	.099	.198	CO	29.7	5.916	5.916	5.916	
C ₂ H ₆	8.71		127.0					CH ₄	91.04	5.690	5.690	22.780	CH ₄	6.0	1.195	1.195	4.780	
C ₃ H ₈	2.83		90.11					C ₂ H ₆	17.10	.570	1.140	3.420	H ₂	61.7	12.291		24.582	
C ₄ H ₁₀								C ₃ H ₈	8.14	.185	.555	1.490	N ₂	0.8	.159			
N ₂		% Alc	12.5					C ₄ H ₁₀					H ₂ O				-1.7025	
O ₂								N ₂					Total					
								Total	271.78	11.267	7.484	27.6609		19.920	7.47027	6.609	6.444	

Less H₂O 217.60

FRESH FEED				WET GAS				RECYCLE	COMB. FEED	EFFLUENT		NET CHANGE ON REACTION											
%	m/hr	#/hr	%	Measured m/hr	#/hr	At Wt. Balance m/hr	#/hr	m/hr	m/hr	%	m/hr	%	Carbon			Hydrogen		Oxygen	Ultimate Oil		Unsat.		
				m/hr	#/hr	m/hr	#/hr						m/hr	a/hr	%	a/hr	%	a/hr	#/hr	#/gal	gal/hr	%	
CO	29.7	5.92	165.76	2.97	.19	5.32	.19	5.35	.75	6.67	14.78	.94	2.68	- 5.73	- 5.73	3.21		- 5.73					
H ₂	61.7	12.29	24.58	38.04	2.41	4.82	2.43	4.85	9.59	21.88	48.48	12.02	34.21	- 9.86			-19.72						
CO ₂	1.8	.36	15.84	25.00	1.58	69.52	1.59	69.97	6.30	6.66	14.76	7.89	22.46	1.23	1.23	20.78		2.46					
N ₂	0.8	.16	4.48	-	-	-	-	-	.16	.35	-	-	-	.16									
CH ₄	6.0	1.19	19.04	27.87	1.75	28.00	1.76	28.18	6.97	8.16	18.08	8.73	24.85	.57	.57	9.63	2.28						
C ₂ H ₆			2.52	.16	4.48	.16	4.51	.64	.64	1.42	.80	2.28	.16	.32	5.41	.64							
C ₃ H ₈			1.22	.08	2.40	.08	2.42	.51	.51	.69	.39	1.11	.08	.16	2.70	.48							
C ₄ H ₁₀			.08	.005	.21	.01	.21	.02	.02	.04	.03	.09	.01	.03	.51	.06			.19	6.25	.03		
C ₅ H ₁₂			.76	.05	2.20	.05	2.21	.19	.19	.42	.24	.68	.05	.15	2.53	.40							
C ₆ H ₁₄			.80	.05	2.80	.05	2.82	.20	.20	.44	.25	.71	.05	.20	3.38	.40			2.68	6.10	.44		
C ₇ H ₁₆			.23	.01	.58	.01	.58	.06	.06	.13	.07	.20	.01	.04	.68	.10			.58	4.86	.12		
C ₈ H ₁₈			.53	.03	2.10	.03	2.11	.13	.13	.29	.16	.46	.03	.15	2.53	.30			2.11	5.40	.39		
C ₉ H ₂₀			.19	.01	.84	.01	.85	.05	.05	.11	.06	.17	.01	.06	1.01	.12			.85	5.50	.15		
OIL							(39.48)				.28	.80		2.82	47.63	5.64			59.48	6.50	6.07		
WATER											5.27	9.31				9.30			(4.85) 3.27				
TOTAL	19.92	229.70		6.33	123.27	6.37	124.06	25.20	45.13	99.99	35.13	100.01	13.55		100.00				45.89		7.20		
H ₂ +CO	18.21			2.60		2.62																	
H ₂ /CO	2.08			12.68		12.79					3.28	12.79											

ULTIMATE YIELDS						WEIGHT BALANCE			EFFLUENT RATIOS		CONTRACTION: 68.0	
% CO Fed	#/hr	#/MCF	g/M3	Gal/hr	Gal/MCF	cc/M3	#/hr	%	#/hr	H ₂ /H ₂ O	CO ₂ /CO	CO Conversion: 96.8
C1+C2	18.74	16.07	2.33	39.40			Wet Gas	123.5	124.1	3.68	8.39	H ₂ Conversion: 80.2
C3+	58.27	48.26	6.99	118.20			Oil	28.0	28.0			H ₂ + CO = 85.6
C4+	55.23	45.84	6.64	112.28			Water	77.6	77.6	(H ₂)(CO ₂)(H ₂ O)(CO)	30.89	
Ult. Oil	45.89	6.65	112.45	7.20	1.04	146.95	Total	228.9	99.7	229.7		
CO ₂	20.78	54.13	7.84	132.57								
H ₂ O	58.86	8.53	144.24									

Yield Calculations assume "oil" is CH₂, and is found by difference on Carbon, and H₂O 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 x #/MCF. cc/M³ = 141.3 x gal/MCF.

THE TEXAS COMPANY — MONTEBELLO LABORATORY

DATA SUMMARY SHEET

Synthesis Run Number 27E From 10/31/47 Hr. 0700 to 10/31/47 Hr. 1900

FLOWS		RUN CONDITIONS			DISTILLATIONS				CATALYST DATA			CATALYST ANALYSIS						
	SCFH	%	Generator Press	409	A S T M				Hempel Dist.			In Reactor at Start of Period		Particle Size				
Oxygen	1750		O ₂ Preheat, °F	570	Prod.	690			°F	%	A.P.I.	Fresh Catalyst Charged		Screen				
Nat. Gas	2440		Gas Preheat, °F	745	A.P.I.	538			to 400	76.0	57.8	Catalyst Recharged		Frac.	M	%	M	%
Total	4190	41.9	Reactor Press.	400	I.B.P.	106			400-550	18.0	39.4	Total		271.5	On 40	420+	80+	
Fresh Feed	7800		Steam Back Press.	870		5%			550+			Catalyst Taken Out		100	419-150	80-40		
F. F. by C	7500		Temperatures, °F			10%	134					In Reactor at End of Period		271.5	150	149-105	40-20	
Avg. F. F.			Heater Outlet	584		20	154							200	104-74	20-10		
Wet Gas	1690		Catalyst #1	620		30	176					WATER		250	73-62	10-0		
Contraction		77.4	#2	612		40	198		Temp.	%		Reactor d-P, H ₂ O		325	61-44			
Recycle	9200		#3	575		50	220		200			Pounds in Reactor		234.0	<325	43-0		
Bleed	122		#4	554		60	246		203			Density, lbs./cu. ft.		64.4	Density, lbs./cu. ft.		Chem. Anal.	
Total	9322		#5	572		70	272		208			Bed Height, Feet		7.2	Aerated		% Fe	
Total Feed	16822		Average	574		80	302								Settled		% C	
Recycle/F. F.	1.24		Product Separator			90	344								Compacted		% Oil	
Inlet Vel.	1.27 ft/sec					95	374					Space Vel. SCFH/lb. cat.			Sp. Grav.		Specific Surface	
Steam Flow						E.P.	388					Inventory Figures		28.8			m ² gm	
						Rec.	98.0					From d-P Meters		38.4				
						Res.	0.8											
						Loss	1.2											

GENERATOR ELEMENTAL BALANCE

NATURAL GAS		PRODUCT INSPECTION						IN					OUT					
	%	Oil	Water	Product	Pour °F	SUS @ °F		1/2 Mol %	SEFH m/hr	C	H	O		Mol %	SEFH m/hr	C	H	O
CO ₂	3.85	Neut No. 39.0	32.82					O ₂	147.74	4.617			9.234	CO ₂	1.8	370	370	740
CH ₄	92.57	Sap No. 43.77	128.51					CO ₂	1.18	.254	.254	.508	CO	28.4	6.057	6.057	6.057	
C ₂ H ₆	3.06	Hydrox. No. 161.0						CH ₄	95.30	5.956	5.956	23.824	CH ₄	3.6	.741	.741	2.964	
C ₃ H ₈	.48	Bromine No. 109.8						C ₂ H ₆	5.91	.197	.394	1.182	H ₂	65.2	13.418		26.836	
C ₄ H ₁₀		% Fe						C ₃ H ₈	1.36	.031	.063	.248	N ₂	-				
N ₂		% Alc	14.6					C ₄ H ₁₀					H ₂ O				-4.546	2.951
O ₂								N ₂					Total					
								Total	261.49	11.055	6.697	25.254	9.747		20.580	7.162	25.254	9.747

Loss H₂O 208.37

FRESH FEED		WET GAS				RECYCLE	COMB. FEED	EFFLUENT		NET CHANGE ON REACTION													
%	m/hr	#/hr	%	Measured m/hr	At Wt. Balance #/hr	m/hr	m/hr	%	m/hr	%	Carbon			Hydrogen			Oxygen		Ultimate Oil		Unsat.		
				m/hr	#/hr	m/hr	m/hr	%	m/hr	%	m/hr	a/hr	%	a/hr	%	a/hr	%	#/hr	#/gal	gal/hr	%		
CO	29.4	6.05	148.40	5.25	.24	6.72	.21	5.88	1.32	7.37	16.32	1.53	4.53	-5.84	-5.84	3.47							
H ₂	65.2	13.42	26.84	40.79	1.82	3.64	1.60	3.20	10.03	23.45	57.91	11.63	34.42	-11.82		23.64							
CO ₂	1.8	.37	16.28	21.75	.97	4.268	.85	3.740	5.35	5.72	12.66	6.20	18.34	.48	.48	7.93							
N ₂	-		.53	.02	.56	.02	.56	.13	.13	.29	.15	.44											
CH ₄	3.6	.74	11.84	22.17	.99	15.84	.87	13.92	5.45	6.19	13.70	6.32	18.69	.13	.13	2.15	.52						
C ₂ H ₆			2.74	.18	3.36	.11	3.08	.67	.67	1.48	.78	2.31	.11	.22	3.64	.44							65.24
C ₃ H ₈			1.46	.07	2.10	.06	1.80	.36	.36	.80	.52	1.24	.06	.12	1.88	.36							
C ₄ H ₁₀			3.00	.13	5.46	.11	4.62	.74	.74	1.64	.85	2.51	.11	.33	5.45	.66							
C ₃ H ₈			.48	.02	.88	.02	.88	.12	.12	.27	.14	.41	.02	.06	.99	.16							
C ₄ H ₁₀			.84	.04	2.24	.04	2.24	.21	.21	.46	.25	.74	.04	.16	2.64	.32							
C ₅ H ₁₂			.82	.01	.58	.01	.58	.05	.05	.11	.06	.18	.01	.04	.66	.10							
C ₆ H ₁₄			.50	.02	1.40	.02	1.40	.12	.12	.27	.14	.41	.02	.10	1.65	.20							
C ₇ H ₁₆			.17	.01	.84	.01	.84	.04	.04	.09	.05	.15	.01	.06	.99	.12							
OIL							57.96				.41	1.21		4.14	68.42	8.28							
WATER											4.88	14.43			12.48								
TOTAL	20.58	224.36		4.46	86.30				45.17		33.81	16.67			4.88	6.24		67.07					
H ₂ +CO	19.47																						
H ₂ /CO	2.22					7.62			3.18		7.61												

ULTIMATE YIELDS					WEIGHT BALANCE			EFFLUENT RATIOS		CONTRACTION: 81.0	
% CO Fed	#/hr	H ₂ /CO #/MCF	g/M3	Gal/hr	Wet Gas	#/hr	%	H ₂ /H ₂ O	CO Conversion:	H ₂ Conversion:	
C1+C2	7.77	6.96	0.94	15.90	Oil	31.2	76.3	2.38	96.57	88.1	
C3+	90.80	68.52	9.28	156.92	Water	116.9		4.05			
C4+	74.36	62.02	8.54	144.41	Total	234.4	104	9.65			
Ult. Oil	67.07	9.09	153.71	10.32							
CO ₂	7.93	21.12	2.86	48.36							
H ₂ O	87.84	11.90	201.23								

Yield Calculations assume "oil" is CH₂, and is found by difference on Carbon, and H₂O 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 288 From 11/4/47 Hr. 1600 to 11/4/47 Hr. 2400

FLOWS		RUN CONDITIONS				DISTILLATIONS				CATALYST DATA				CATALYST ANALYSIS						
	SCFH	%	Generator Press.	415	A S T M				Hempel Dist.		In Reactor at Start of Period		781		Particle Size					
Oxygen	1800		O ₂ Preheat, °F	353	Prod.	6050			°F	%	A.P.I.	Fresh Catalyst Charged				Screen		Sedimentation		
Nat. Gas	2480		Gas Preheat, °F	693	A.P.I.	51.6			to 400	785		Catalyst Recharged				Frac.	M	%	M	%
Total	4280	42.2	Reactor Press.	400	I.B.P.	108			400-550	133	72.9	Total		381	On 40	420+	0.6	80+		
Fresh Feed	6850		Steam Back Press.	725	5%				550+			Catalyst Taken Out		20	100	419-150	21.2	80-40		
F. F. by C	7060		Temperatures, °F		10%	136						In Reactor at End of Period		361	150	149-105	21.0	40-20		
Avg. F. F.	6955		Heater Outlet	207	20	180									200	104-74	15.4	20-10		
Wet Gas	2050		Catalyst #1	638	30	182									250	73-62	11.5	10-0		
Contraction		70.2	#2	620	40	208									325	61-44	12.4			
Recycle	9220		#3	582	50	234			200	%		Reactor d-P, H ₂ O			<325	43-0	17.9			
Bleed	268		#4	570	60	256			203			Pounds in Reactor		211						
Total	9488		#5	534	70	280			208			Density, lbs./cu. ft.		92						
Total Feed	16443		Average	590	80	310						Bed Height, Feet								
Recycle/F.F.	1.36		Product Separator		90	352						Space Vel. SCFH/lb. cat.								
Inlet Vel.	1.30 ft/sec				95	390						Inventory Figures		18.9						
Steam Flow					Rec.	97.0						From d-P Meters		32.4						
					Res.	1.0														
					Loss.	2.0														

NATURAL GAS										PRODUCT INSPECTION										GENERATOR ELEMENTAL BALANCE									
		Oil		Water		Product		Pour °F		SUS @ °F		IN		OUT		IN		OUT		IN		OUT							
CO ₂	%	Neut. No.	41.7	43.33							SCFH	C	H	O	Mal %	SEFH	C	H	O	Mal %	SEFH	C	H	O					
2.16		Sap. No.	46.0	126.83							151.97	4.749			1.5	275	275			1.5	275	275			3.50				
85.96		Hydrox. No.	144.0								6.20	.141	.141	.282	34.2	6.276	6.276			34.2	6.276	6.276			6.276				
2.95		Bromine No.	115.53								90.00	5.625	5.625	22.500	4.7	.863	.863			4.7	.863	.863			3.452				
2.93		% Fe									17.58	.586	1.172	7.516	57.8	10.606			57.8	10.606					21.212				
		% Alc	12.4								8.45	.192	.376	1.536	1.8	.320			1.8	.320									
																										2.888 2.954			
																										18.350 7.414 27.552 9.780			
											Total	274.20	11.293	7.514	27.552	9.780													

Loss H-0 221.03

FRESH FEED				WET GAS				RECYCLE		COMB. FEED		EFFLUENT		NET CHANGE ON REACTION											
%	m/hr	#/hr		Measured	At Wt. Balance			m/hr	m/hr	%	m/hr	%	Carbon		Hydrogen		Oxygen		Ultimate Oil		Unsat.				
				m/hr	#/hr	m/hr	#/hr						m/hr	a/hr	%	a/hr	%	a/hr	%	#/hr	#/gal	gal/hr	%		
CO	74.2	6.28	175.84	10.53	.58	16.24	1.04	29.12	2.64	8.92	20.35	3.68	8.65	-5.24	-5.24	16.56									
H2	57.8	10.61	21.22	48.67	2.73	5.46	4.91	9.82	12.43	23.04	53.09	17.34	45.48	-5.70			-11.40								
CO2	1.5	.28	12.22	14.00	.77	33.80	1.39	61.16	3.50	3.78	8.71	4.89	12.82	1.11	1.11	17.68			2.22						
N2	1.8	.33	9.24	3.29	.18	5.04	.32	8.96	.82	1.15	2.65	1.14	2.99	-.01											
CH4	4.7	.86	13.76	17.26	.95	15.20	1.71	27.36	4.32	5.18	11.94	6.03	15.81	.85	.85	13.54	3.40								
C2H4				1.66	.09	2.52	.16	4.48	.42	.42	.97	.58	1.52	.16	.32	5.10	.64							68.03	
C2H6				.78	.04	1.20	.07	2.10	.20	.20	.46	.27	.71	.07	.14	2.23	.42								
C3H6				1.45	.08	3.36	.14	5.88	.36	.36	.83	.50	1.31	.14	.42	6.69	.84			5.29	.85			81.46	
C3H8				.33	.02	.88	.04	1.76	.08	.08	.18	.12	.31	.04	.12	1.91	.32								
C4H8				.46	.03	1.68	.05	2.80	.12	.12	.28	.17	.45	.05	.20	3.18	.40			2.66	.44			41.77	
C4H10				.18	.01	.58	.02	1.16	.05	.05	.12	.07	.18	.02	.08	1.27	.20			1.16	.24				
C5H10				.30	.02	1.40	.04	2.80	.08	.08	.18	.12	.31	.04	.20	3.18	.40			2.80	.52				
C6H12				.09	-				.02	.02	.05	.02	.05												
OIL								25.20				.18	.47	1.80	28.66	3.60			25.20	3.88					
WATER												3.02	7.92		1.18										
TOTAL				18.35	232.38		5.49	87.36			43.40	38.13	8.47							3.02					
H2+CO				16.89							2.58		4.71												
H2/CO				1.69				4.72																	

Yield Calculations assume "oil" is CH₂, and is found by difference on Carbon, and H₂O 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 x #/MCF. cc/M3 = 141.3 x gal/MCF.

THE TEXAS COMPANY — MONTEBELLO LABORATORY

DATA SUMMARY SHEET

Synthesis Run Number 28C From 11/5/47 Hr. 0700 to 11/5/47 Hr. 2400

FLOWS		RUN CONDITIONS				DISTILLATIONS				CATALYST DATA				CATALYST ANALYSIS				
	SCFH	%	Generator Press		A S T M				Hempel Dist.		In Reactor at Start of Period		Particle Size					
Oxygen	1750		O ₂ Preheat, °F	411	Prod.	6450			°F	%	A.P.I.	Fresh Catalyst Charged		Screen				
Nat. Gas	2440		Gas Preheat, °F	704	A.P.I.	50.2			to 400	76.0	56.4	Catalyst Recharged		Sedimentation				
Total	4190	41.9	Reactor Press.	400	I.B.P.	99			400-550	15.0	35.6	Total	361	Frac.	M	%	M	%
Fresh Feed	6980		Steam Back Press	720	5%				550+			Catalyst Taken Out	23.5	On 40	420+	0.4	80+	
F. F. by C	7080		Temperatures, °F		10%	136						In Reactor at End of Period	337.5	100	419-150	23.8	80-40	
Avg. F. F.			Heater Outlet	343	20	158								150	149-105	18.5	40-20	
Wet Gas	2440		Catalyst ±1	1059	30	182			WATER					200	104-74	20.9	20-10	
Contraction		65.5	±2	643	40	230			Temp	%		Reactor d-P, H ₂ O		250	73-62	4.9	10-0	
Recycle	9150		±3	585	50	246			200			Pounds in Reactor	232.0	325	61-44	5.2		
Bleed	254		±4	360	60	262			203			Density, lbs./cu. ft.	96.0	<325	43-0	26.3		Chem. Anal.
Total	9404		±5	523	70	279			208			Bed Height, Feet						% Fe
Total Feed	16484		Average	594	80	310												% C
Recycle/F.F.	1.33		Product Separator		90	348												% Oil
Inlet Vel.	1.26 ft/sec				95	378						Space Vel. SCFH/lb. cat.		Sp. Grav.				Specific Surface
Steam Flow					E.P.	396						Inventory Figures	21.3					m ² gm
					Rec.	98.0						From d-P Meters	31.0					
					Res.													
					Loss													

NATURAL GAS		PRODUCT INSPECTION						GENERATOR ELEMENTAL BALANCE									
%		Oil	Water	Product	Pour °F	SUS @ °F	IN			OUT							
							mol-%	SCFH	C	H	O	Mol %	SEFH	C	H	O	
CO ₂	1.49	Neut No. 49.5	41.54				O ₂	147.74	4.617			CO ₂	2.1	393	393	786	
CH ₄	85.58	Sop No. 35.9	128.51				CO ₂	4.22	0.96	0.96	1.92	CO	33.8	6.314	6.314	6.314	
C ₂ H ₆	9.51	Hydrox No. 252.0					CH ₄	88.16	5.510	5.510	22.040	CH ₄	3.7	6.91	6.91	2.764	
C ₃ H ₈	3.42	Bromine No. —					C ₂ H ₆	18.36	6.12	1.224	3.672	H ₂	60.2	11.245	22.490		
C ₄ H ₁₀		% Fe					C ₃ H ₈	9.68	2.20	1.660	1.780	N ₂	0.2	0.37			
N ₂		% Alc	12.8				C ₄ H ₁₀					H ₂ O				2.298	
O ₂							N ₂					Total					18.680
							Total	268.16	11.055	7.490	27.492	9.234					7.398
																	27.492
																	9.234

Loss H₂O 22.75

FRESH FEED		WET GAS				RECYCLE	COMB. FEED	EFFLUENT	NET CHANGE ON REACTION											
%	m/hr	#/hr	%	Measured	At Wt. Balance	m/hr	m/hr	%	m/hr	%	Carbon		Hydrogen		Oxygen	Ultimate Oil		Unsat.		
				m/hr	#/hr	m/hr					m/hr	a/hr	%	a/hr	%	a/hr	#/hr	#/gal	gal/hr	%
CO	33.8	6.31	176.68	10.54	1.68	19.04	1.11	31.08	2.61	8.92	20.52	3.72	7.84	-5.20	-5.20	17.59				
H ₂	60.2	11.25	29.70	49.19	3.17	6.34	5.17	10.34	12.20	23.45	53.95	17.37	43.96	-6.08		12.16				
CO ₂	2.1	3.9	17.16	17.19	1.11	48.84	1.81	79.64	4.26	4.65	10.70	6.07	16.06	1.42	1.42	22.50				2.84
N ₂	0.2	0.4	1.12	2.63	.17	4.76	.28	7.84	.65	.69	1.59	.93	2.46	.24						
CH ₄	3.7	6.9	11.04	14.83	.96	16.36	1.56	24.96	3.68	4.37	10.05	5.24	13.87	.87	.87	13.79				3.48
C ₂ H ₆				1.70	.11	3.08	.18	5.04	.42	.42	.97	.60	1.59	.18	.36	5.71				.72
C ₃ H ₈				.90	.06	1.80	.10	3.00	.22	.22	.51	.32	.85	.10	.20	3.17				65.58
C ₄ H ₁₀				1.63	.10	4.20	.16	17.64	.40	.40	.92	.56	1.48	.16	.48	7.61				15.89
C ₅ H ₁₂				.27	.02	.88	.03	1.32	.07	.07	.16	.10	.26	.03	.09	1.43				.24
C ₆ H ₁₄				.43	.03	1.68	.05	2.80	.11	.11	.25	.16	.42	.05	.20	3.17				2.66
C ₇ H ₁₆				.23	.01	.58	.02	1.16	.06	.06	.14	.08	.21	.02	.08	1.27				1.16
C ₈ H ₁₈				.33	.02	1.40	.03	2.10	.08	.08	.18	.11	.29	.03	.15	2.38				2.10
C ₉ H ₂₀				.13	.01	.84	.02	1.68	.03	.03	.07	.05	.13	.02	.12	1.90				1.68
OIL						17.22						.12	.32		1.23	19.49				17.22
WATER												.236	6.25		2.56					2.36
TOTAL	18.68	228.50		6.44	108.80				43.47		37.79	8.64								40.71
H ₂ +CO	17.56																			6.26
H ₂ /CO	1.78					4.66			2.65		4.67									

ULTIMATE YIELDS				WEIGHT BALANCE				EFFLUENT RATIOS		CONTRACTION: 46.3					
% CO Fed	#/hr	H ₂ /CO #/MCF	H ₂ /CO g/M3	Gal/hr	H ₂ /CO Gal/MCF	H ₂ /CO cc/M3	Wet Gas	Oil	Water	Total	H ₂ /H ₂ O	CO ₂ /CO	(H ₂)(CO ₂)/(H ₂ O)(CO)	CO Conversion: 82.41	H ₂ Conversion: 54.0
C1+C2	22.67	21.96	3.30	55.80			108.8	15.6	36.4	160.8	7.36	1.63	1.20		
C3+	37.25	43.82	6.59	111.44											
C4+	28.21	24.96	3.75	63.41											
Ult. Oil	42.71	6.11	103.22	6.26	0.94	132.82									
CO ₂	22.50	62.48	9.38	158.62											
H ₂ O	42.48	6.38	107.89												

Yield Calculations assume "oil" is CH₂, and is found by difference on Carbon, and H₂ 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.