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

THE TEXAS COMPANY — MONTEBELLO LABORATORY
YIELD CALCULATIONS

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

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

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

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

THE TEXAS COMPANY — MONTEBELLO LABORATORY
YIELD CALCULATIONS

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

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

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

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

THE TEXAS COMPANY — MONTEBELLO LABORATORY
YIELD CALCULATIONS

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

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

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

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

Form ML-11 K_{shift} = 9.1

**Included in Reactor Effluent Total

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

THE TEXAS COMPANY — MONTEBELLO LABORATORY
DATA SUMMARY

RUN NO. 59-A
HOURS 0-14

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

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

THE TEXAS COMPANY — MONTEBELLO LABORATORY
YIELD CALCULATIONS

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

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

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

Form ML—11

**Included in Reactor Effluent Total

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

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

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

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

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

THE TEXAS COMPANY — MONTEBELLO LABORATORY
DATA SUMMARY

RUN NO. 59-B
HOURS 14-38

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

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

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

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

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

THE TEXAS COMPANY — MONTEBELLO LABORATORY
YIELD CALCULATIONS

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

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

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

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

YIELDS BASIS BROWNSVILLE DESIGN FEED RATE*

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

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

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

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

Form ML—11

**Included In Reactor Effluent Total

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

RUN NO. 59-C
HOURS 38-62

THE TEXAS COMPANY — MONTEBELLO LABORATORY
DATA SUMMARY

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

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

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

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

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

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

THE TEXAS COMPANY — MONTEBELLO LABORATORY
YIELD CALCULATIONS

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

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

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

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

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

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

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

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

Form ML—11

**Included in Reactor Effluent Total

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

RUN NO. 59-D
HOURS 58-82

THE TEXAS COMPANY — MONTEBELLO LABORATORY
DATA SUMMARY

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

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

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

THE TEXAS COMPANY — MONTEBELLO LABORATORY
YIELD CALCULATIONS

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

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

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

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

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

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

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

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

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

Form ML—11

**Included in Reactor Effluent Total

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

THE TEXAS COMPANY — MONTEBELLO LABORATORY
DATA SUMMARY

RUN NO. 59-E
HOURS 82-106

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

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

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

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

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

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

THE TEXAS COMPANY — MONTEBELLO LABORATORY
DATA SUMMARY

RUN NO. 59-F
HOURS 106-130

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

THE TEXAS COMPANY — MONTEBELLO LABORATORY
YIELD CALCULATIONS

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

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

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

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

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

Form ML—11

**Included in Reactor Effluent Total

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

THE TEXAS COMPANY — MONTEBELLO LABORATORY
DATA SUMMARY

RUN NO. 59-G
HOURS 130-154

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

THE TEXAS COMPANY — MONTEBELLO LABORATORY
YIELD CALCULATIONS

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

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

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

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

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

Form ML—11

**Included in Reactor Effluent Total

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

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

THE TEXAS COMPANY — MONTEBELLO LABORATORY
YIELD CALCULATIONS

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

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

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

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

Form ML—11

**Included in Reactor Effluent Total

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

THE TEXAS COMPANY — MONTEBELLO LABORATORY
DATA SUMMARY

RUN NO. 59-H
HOURS 154-174

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

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

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

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

THE TEXAS COMPANY — MONTEBELLO LABORATORY
YIELD CALCULATIONS

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

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

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

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

YIELD BASIS H_2 + CO FED

	CONDENSATE #/MCF	#/gal	gal/hr	gal/MCF
	0.557**	78.06	4.858	11.962	0.744
		120.72	7.513	20.719	1.288
	0.259**	13.74	0.855	1.717	0.107
		134.46	8.368	22.436	1.395
	7.651**	137.84	8.578	16.548	1.030
		151.58	9.433	18.265	1.137
		174.75	10.876		

YIELDS BASIS BROWNSVILLE DESIGN FEED RATE*

	CORRECTED HEMPEL, %	gal/hr	TREATING RECOVERY, %	gal/hr
400 EP	73.5	8.792	98.0	8.616
400-550	12.8	1.531	91.4	1.399
550 +	13.7	1.639	114.6	1.878

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

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

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

Form ML—11

**Included in Reactor Effluent Total

g/NCM = 16.91 × #/MCF

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

RUN NO. 59-I
HOURS 178-206

THE TEXAS COMPANY — MONTEBELLO LABORATORY
DATA SUMMARY

OPERATING CONDITIONS				PRODUCT TESTS		
PRESSURES PSIG		RATES S.C.F.H.			OIL	WATER
Oxygen	432	Fresh Feed	16729	°API	49.0	10.5
Natural Gas	429	Recycle	14814	Neut. No.	27.8	22.9
Generator Outlet	412	Combined Feed	31543	Sap. No.	43.6	30.5
Reactor Inlet	404	Wet Gas—Measured	5272	Hydrox. No.		
Condenser Inlet		Adjusted	5652	Bromine No.	89	
Product Accumulator	375	Loss	380	Pour °F.	Below -40	
				Chemicals, % by K_2CO_3		9.4
TEMPERATURES—°F.		Recycle/Fresh Feed	0.89			
Oxygen	303	Inlet Velocity—ft./sec.	1.03			
Natural Gas	327	Fresh Feed Rate—S.C.F.H. H_2+CO	16069	HEMPEL, DIST. %	°API	
Generator		per Cu. Ft. Dense Bed	2063	205 °F.		
Quench Accumulator	148	per Lb. Catalyst	18.4	400	72.5	54.4
Reactor Inlet	123	per Sq. Ft.	24347	400-550	12.8	36.3
Condenser Inlet	571			550+	14.7	
Product Accumulator	93	Heat Transfer Calculations				
Catalyst No. Height		Steam Rate = 346 #/hr @		A. S. T. M. DIST. ON		
1 See Period A	631	728 psia & 489°F =		Naphtha °F.		
2	690	1203 BTU/#		IBP	108	
3	699	Water in @ 71.3 = 39.3 BTU/#		10%	140	
4	673	Net BTU/# Steam = 1164		50%	216	
5	706	1164 x 346 = 402,744		90%	348	
6*	696	Ave. Bed Temp = 693°F		EP	390	
7	668	dT = 693-489 = 204°F		Rec.	97.0	
8	656	Tube Area = 21.4 sq. ft.				
9	659					
10	651	K = $\frac{402,744}{(21.4)(204)}$ = 92.3 BTU/°F/sq ft				
11	627					

CATALYST DATA					
INVENTORY DATA	Loaded 988	PARTICLE SIZE			
	H_2O 138	Screen Analysis			Sedimentation
In Reactor at Start of Period	Rec. 33	Mesh	Microns	%	Microns %
Fresh Catalyst Added	817	On 40	419+	36.1	80+
Total +0.66		100	150	43.5	40—80
Catalyst Recovered	102	150	105	8.0	20—40
In Reactor at End of Period		200	74	6.2	10—20
		250	62	1.8	0—20
REACTOR d-p, Inches H_2O		325	44	3.2	
No. Height		<325		1.2	
0 See Period A	39	CATALYST			
1	58	Bulk Density, Lbs./Cu.Ft.			
2	56	Aerated			131
3	55	Settled			132
4	46	Compacted			168
Total	254	Particle Density, gm./cc.			4.18
		NH_3 Value, ml./gm.			
CALCULATED FROM dp		N_2 Surface, m^2/gm.			
Density, Lbs./Cu.Ft.	112				
Inventory, Lbs.	872				
Bed Depth, Ft.	11.80	CHEMICAL ANALYSIS			
Vol., Cu. Ft.	7.79	Fe			67.0
		C			9.16
		O			
		H			
		K_2O, W+, % basis Fe			
		X-Ray Analysis—			
		$Fe_{20}C_9$			
		Fe_3O_4			
		Fe			