

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 <sub>2</sub> Preheat, °F	505	Prod.	Rev Oil	Gasoline	°F	%	A.P.I.	Fresh Catalyst Charged	Screen					
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+	62.0
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	WATER						250	73-62	5.0	10-0	
Contraction		45.9	#2	645	40	264	Temp.	%	Reactor d-P. H <sub>2</sub> O				325	61-44	10.8		
Recycle	9700		#3	625	50	296	200		Pounds in Reactor	208.0			<325	43-0	18.4		
Bleed	336		#4	595	60	334	203		Density, lbs./cu. ft.	98.0							Chem. Anal.
			#5	565	70	375	208		Bed Height, Feet	2.8							Chem. Anal.
Total	10036		Average	617	80	470											Chem. Anal.
Total Feed	16636		Product Separator	90	90	620											Chem. Anal.
Recycle/F.F.	1.52				95				Space Vel. SCFH/lb. cat.								Chem. Anal.
Inlet Vel.	1.09				E.P.	650			Inventory Figures	25.2							Chem. Anal.
Steam Flow	80#/hr				Rec.	93.0			From d-P Meters	31.0							Chem. Anal.
					Res.												Chem. Anal.
					Loss												Chem. Anal.

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 <sub>2</sub>	1.01	Neut. No. 43.3	48.5	011	-45		O <sub>2</sub>	146.61	4.644		9.268	CO <sub>2</sub>	2.6	4.40	4.40	.880	
CH <sub>4</sub>	85.71	Sop. No. 52.5	49.2				CO <sub>2</sub>	2.60	.059	.059	.118	CO	34.9	5.905	5.905	5.905	
C <sub>2</sub> H <sub>6</sub>	9.58	Hydrox. No. 61.0					CH <sub>4</sub>	80.34	5.0215	0.21	20.084	CH <sub>4</sub>	3.0	.508	.508	2.032	
C <sub>3</sub> H <sub>8</sub>	3.70	Bromine No. 58.5					C <sub>2</sub> H <sub>6</sub>	16.83	.5611	.122	3.366	H <sub>2</sub>	58.0	9.814		19.628	
C <sub>4</sub> H <sub>10</sub>		% Fe					C <sub>3</sub> H <sub>8</sub>	9.55	.217	.651	1.736	N <sub>2</sub>	1.5	.254			
N <sub>2</sub>		% Alc					C <sub>4</sub> H <sub>10</sub>					H <sub>2</sub> O				3.5262	
O <sub>2</sub>							N <sub>2</sub>					Total				16.921	
							Total	257.93	10.502	6.853	25.186	9.406				6.855	
																25.18	
																9.406	

Less H<sub>2</sub>O 210.75

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	#/hr				m/hr	a/hr	%	a/hr	%	a/hr	#/hr	#/gal	gal/hr	%	
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					
H <sub>2</sub>	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 <sub>2</sub>	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					
N <sub>2</sub>	1.5	.25	7.00	1.21	.11	3.08	.12	3.46	.31	.56	1.31	.83	1.10	- .13							
CH <sub>4</sub>	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 <sub>2</sub> H <sub>4</sub>				.92	.08	2.24	.09	2.51	.24	.24	.56	.33	.85	.09	.18	3.04	.36				
C <sub>2</sub> H <sub>6</sub>				.63	.06	1.80	.07	2.02	.16	.16	.37	.23	.59	.07	.14	2.36	.42				
C <sub>3</sub> H <sub>6</sub>				1.11	.10	4.20	.11	4.71	.29	.29	.68	.40	1.02	.11	.33	5.56	.66	4.24	6.25	.68	
C <sub>3</sub> H <sub>8</sub>				.39	.04	1.76	.04	1.98	.10	.10	.23	.14	.36	.04	.12	2.02	.32				
C <sub>4</sub> H <sub>8</sub>				2.56	.24	13.44	.27	15.08	.66	.66	1.54	.93	2.38	.27	1.08	18.21	2.16	14.33	6.10	2.35	
C <sub>4</sub> H <sub>10</sub>				-	-	-	-	-	-	-	-	-	-	-	-	-	-				
C <sub>5</sub> H <sub>10</sub>				.48	.04	2.80	.04	3.14	.12	.12	.28	.16	.41	.04	.20	3.37	.40	3.14	5.40	.58	
C <sub>6</sub> H <sub>12</sub>				-	-	-	-	-	-	-	-	-	-	-	-	-	-				
OIL								(15.26)				.11	.28		1.09	18.38	2.18	15.26	6.50	2.35	
WATER												2.83	7.25			.28	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		5.96	
H <sub>2</sub> +CO		15.78			6.79		7.62														
H <sub>2</sub> /CO		1.66			3.19		3.19					2.33		3.19							
ULTIMATE YIELDS		WEIGHT BALANCE				#/hr		% #/hr		EFFLUENT RATIOS		CONTRACTION: 39.4									
%	C0 Fed	#/hr	H <sub>2</sub> /C <sub>0</sub>	H <sub>2</sub> /C <sub>0</sub>	Wet Gas	139.3	156.1	H <sub>2</sub> /H <sub>2</sub> O	7.19	C <sub>0</sub> Conversion: 69.3											
	10.96	9.84	1.65	27.90	Oil	13.4	13.4	CO <sub>2</sub> /C <sub>0</sub>	0.59	H <sub>2</sub> Conversion: 41.1											
	47.54	40.17	6.72	113.64	Water	50.8	50.8	(H <sub>2</sub> )(CO <sub>2</sub> )(H <sub>2</sub> O)(CO)	4.26	H <sub>2</sub> + CO = 51.7											
	39.96	33.48	5.60	94.70	Total	203.5	92.3	220.3													
Ult. Oil	36.97	6.18	104.50	5.96	0.997	140.88															
CO <sub>2</sub>	10.79	28.05	4.69	79.31																	
H <sub>2</sub> O	50.94	8.52	144.07																		

Yield Calculations assume "oil" is CH<sub>2</sub>, and is found by difference on Carbon, and H<sub>2</sub>O 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/M<sup>3</sup> = 16.91 × #/MCF. cc/M<sup>3</sup> = 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.		In Reactor at Start of Period		Particle Size					
Oxygen	1740	O <sub>2</sub> Preheat, °F	309	440	Prod.	6000		°F	%	A.P.I.	Fresh Catalyst Charged						
Nat. Gas	2000	Gas Preheat, °F	790	444	A.P.I.	444		to 400	64.3	55.1	Catalyst Recharged						
Total	3740	Reactor Press.	295	122	I.B.P.	122		400-550	21.3	26.9	Total	255	On 40	420+	80+	70.0	
Fresh Feed	6500	Steam Back Press.	900	5%				550+	14.4		Catalyst Taken Out	1.5	100	419-150	23.6	80-40	23.0
F.F. by C	6740	Temperatures, °F		10%	154						In Reactor at End of Period	254.5	150	149-105	254	40-20	6.0
Avg. F.F.	6620	Heater Outlet	434	20	178								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 <sub>2</sub> O	40.0	325	61-44	13.6			
Recycle	10000	#3	645	50	248			200		Pounds in Reactor	165.0	<325	43-0	7.8			
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							Compacted		% Oil			
Inlet Vel.	1.07 ft/sec			95	368					Space Vel. SCFH/lb. cat.		Sp. Grav.	4.7	Specific Surface			
Steam Flow	78 ft/hr			E.P.	402					Inventory Figures	26.0			m <sup>2</sup> /gm			
				Rec.	98.5					From d-P Meters	40.1						
				Res.	0.6												
				Loss.	0.9												

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 <sub>2</sub>	1.30	Neuf. No. 370					O <sub>2</sub>	146.91	4.591		9.182	CO <sub>2</sub>	2.4	4.49	4.49	8.88	
CH <sub>4</sub>	85.34	Sap. No. 35.9					CO <sub>2</sub>	3.30	.075	.075	.150	CO	34.7	6.061	6.061	6.061	
C <sub>2</sub> H <sub>6</sub>	9.23	Hydrax. No. 47.0					CH <sub>4</sub>	79.26	4.954	4.954	19.816	CH <sub>4</sub>	2.2	3.84	3.84	1.536	
C <sub>3</sub> H <sub>8</sub>	4.13	Bromine No. 21.1					C <sub>2</sub> H <sub>6</sub>	16.08	.536	1.072	3.216	H <sub>2</sub>	59.2	10.341	20.682		
C <sub>4</sub> H <sub>10</sub>		% Fe					C <sub>3</sub> H <sub>8</sub>	10.56	.240	.720	1.920	N <sub>2</sub>	1.5	.262			
N <sub>2</sub>		% Alc					C <sub>4</sub> H <sub>10</sub>					H <sub>2</sub> O			2.734	2.633	
O <sub>2</sub>							N <sub>2</sub>					Total					
							Total	256.11	10.396	6.621	24.962	9.332					

4.954 2.12, 3.2

	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.								
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	-4.574				
H <sub>2</sub>	59.2	10339	2067	5389	4977	985	4977	985	14.702	25.041	55.83	19.679	50.00	-5.362		-10.724					
CO <sub>2</sub>	2.4	449	1844	1464	1352	5849	1352	5849	3.994	4.413	8.85	5.746	12.83	.943	.943	15.56		1.886			
N <sub>2</sub>	1.5	262	734	1.5	.106	.297	.106	.297	.314	.576	1.20	.420	1.07	.156							
CH <sub>4</sub>	2.2	384	614	8.88	.820	13.12	.820	13.12	2.423	2.807	6.28	3.243	8.24	1.436	.436	7.19	1.744				
C <sub>2</sub> H <sub>6</sub>				1.33	.123	3.04	.123	3.04	.363	.80	1.86	1.23	.123	.246	.406	.492			.679		
C <sub>3</sub> H <sub>8</sub>				.63	.058	1.74	.058	1.74	.172	.172	.38	.230	.58	.058	.116	1.91	3.48				
C <sub>4</sub> H <sub>10</sub>				1.27	.117	4.91	.117	4.91	.346	.346	.78	.463	1.18	.117	.357	5.79	7.02	4.42	6.5	0.71	7.4
C <sub>3</sub> H <sub>8</sub>				.33	.030	1.32	.030	1.32	.090	.090	.20	.120	.30	.030	.150	2.48	2.40				
C <sub>4</sub> H <sub>10</sub>				.82	.076	4.26	.076	4.26	.224	.224	.49	.300	.76	.076	.304	5.02	6.08	4.05	6.1	0.46	7.6
C <sub>4</sub> H <sub>10</sub>				.21	.019	1.10	.019	1.10	.057	.057	.13	.076	.19	.019	.076	1.25	1.90	1.10	4.86	0.23	
C <sub>5</sub> H <sub>12</sub>				.47	.042	3.01	.042	3.01	.128	.128	.29	.171	.43	.042	.215	3.55	4.30	3.01	5.4	0.56	
C <sub>6</sub> H <sub>14</sub>				.27	.023	2.10	.023	2.10	.074	.074	.16	.089	.23	.023	.150	2.47	3.00	2.10	5.5	0.38	
OIL						22.22					.157	.40	1.587	26.19	3.174			22.22	6.5	3.42	
WATER											2.688	6.83			2.496						
TOTAL		17.467	222.27		9.235	149.02			27.282	44.744		39.356		-8.222				12.668	1.448	36.90	5.96
H <sub>2</sub> +CO		16.399																			
H <sub>2</sub> /CO		765	150			3.34			2.40		3.35										

ULTIMATE YIELDS				WEIGHT BALANCE			EFFLUENT RATIOS		CONTRACTION: 4.207	
% CO Fed	#/hr	H <sub>2</sub> /CO #/MCF	g/M3	Gal/hr	H <sub>2</sub> /CO Gal/MCF	cc/M3	Wet Gas	H <sub>2</sub> /H <sub>2</sub> O	CO Conversion: 75.48	
C1+C2	13.16	13.16	1.956	33.08			Oil	7.221	H <sub>2</sub> Conversion: 51.86	
C3+	44.76	3892	6.262	105.19			Water	0.910	60.589	
C4+	38.49	32.69	5.260	88.95			Total	6.66		
Ult. Oil		36.90	5.887	100.4	5.96	9.959				
CO <sub>2</sub>	15.56	41.49	6.676	113.9						
H <sub>2</sub> O		48.38	7.784	131.6						

Yield Calculations assume "oil" is CH<sub>2</sub>, and is found by difference on Carbon, and H<sub>2</sub>O 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 <sub>2</sub> 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	12.3	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	3400		Catalyst #1	703	30	188			WATER										
Contraction		48.4	#2	702	40	234			Temp.	%	Reactor d-P, H <sub>2</sub> 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 ft/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 <sup>2</sup> /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 <sub>2</sub>	1.15	Neur. No.	44.0					O <sub>2</sub>	146.50	4.578			9.156	CO <sub>2</sub>	2.6	4.52	4.52		9.04
CH <sub>4</sub>	85.55	Sp. No.	32.11					CO <sub>2</sub>	2.99	.068	.068		.136	CO	349	6.060	6.060		6.060
C <sub>2</sub> H <sub>6</sub>	9.06	Hydrax. No.	36.0					CH <sub>4</sub>	80.34	5.034	5.034	20.136		CH <sub>4</sub>	3.5	.608	.608		2.432
C <sub>3</sub> H <sub>8</sub>	4.24	Bromine No.	29.14					C <sub>2</sub> H <sub>6</sub>	15.99	.533	1.066	3.198		H <sub>2</sub>	58.3	10.132			20.264
C <sub>4</sub> H <sub>10</sub>		% Fe						C <sub>3</sub> H <sub>8</sub>	10.96	.249	.747	1.992		N <sub>2</sub>	0.7	.122			
N <sub>2</sub>		% Alc						C <sub>4</sub> H <sub>10</sub>						H <sub>2</sub> O					2.630
O <sub>2</sub>								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						Ultimate Oil	Unsat.					
%	m/hr	#/hr	%	Measured	At Wt. Balance	m/hr	m/hr	%	m/hr	%	Carbon		Hydrogen		Oxygen									
				m/hr	#/hr	m/hr	m/hr				m/hr	a/hr	%	a/hr	%	a/hr								
CO	24.9	6.060	122.85	12.34	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 <sub>2</sub>	58.3	10.132	20.26	53.97	4.841	9.68	4.257	8.57	15.177	25.31	55.43	14.432	48.96	-5.875		-11.750								
CO <sub>2</sub>	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								
N <sub>2</sub>	0.7	.122	3.42	.89	.079	2.21	.069	1.94	.247	.37	.81	.316	.80	-.053										
CH <sub>4</sub>	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 <sub>2</sub> H <sub>6</sub>					1.57	.163	4.00	.126	3.87	.447	.465	.99	.573	1.44	.126	.252	4.15	.504						
C <sub>3</sub> H <sub>8</sub>					.71	.061	1.92	.056	1.69	.200	.20	.44	.256	.44	.056	.112	1.85	.336						
C <sub>4</sub> H <sub>10</sub>					1.57	.145	4.01	.126	5.29	.447	.465	.99	.573	1.44	.126	.379	6.23	.756			4.76	6.15	.76	18.81
C <sub>3</sub> H <sub>8</sub>					.33	.030	1.32	.026	1.16	.093	.09	.20	.119	.30	.026	.078	1.29	.208						
C <sub>4</sub> H <sub>10</sub>					.93	.083	4.65	.073	4.09	.262	.26	.57	.335	.84	.073	.292	4.81	.584			2.89	6.1	.64	18.03
C <sub>5</sub> H <sub>12</sub>					.19	.017	0.99	.015	.87	.053	.05	.11	.068	.17	.015	.060	.99	.150			.87	4.86	.18	
C <sub>6</sub> H <sub>14</sub>					.49	.044	3.08	.039	2.71	.139	.14	.31	.177	.45	.039	.145	3.21	.390			2.71	5.4	.50	
C <sub>7</sub> H <sub>16</sub>					.16	.014	1.18	.012	1.04	.045	.05	.11	.057	.14	.012	.072	1.19	.144			1.04	5.5	.19	
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		17.380	205.25			8.971	145.26																	
H <sub>2</sub> +CO		14.188																						
H <sub>2</sub> /CO		1.67					4.06																	

ULTIMATE YIELDS				WEIGHT BALANCE		EFFLUENT RATIOS		CONTRACTION: 54.61	
% CO Fed	#/hr	#/MCF	g/M <sup>3</sup>	Gal/hr	Gal/MCF	H <sub>2</sub> /CO	CO <sub>2</sub> /CO	CO Conversion:	82.64
C1+C2	9.03	8.13	1.324	22.39		H <sub>2</sub> /M <sub>2</sub> O	1.182	H <sub>2</sub> Conversion:	57.98
C3+	60.53	57.52	8.390	141.9		(H <sub>2</sub> )/CO <sub>2</sub>	6.708		
C4+	53.01	45.07	7.340	124.1		(H <sub>2</sub> O)/CO			
Ult. Oil	49.62	8.081	136.6	7.86	1.280	180.86			
CO <sub>2</sub>	17.07	52.80	8.600	145.4					
H <sub>2</sub> O	61.69	10.047	170.6						

Yield Calculations assume "oil" is CH<sub>2</sub>, and is found by difference on Carbon, and H<sub>2</sub>O 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/M<sup>3</sup> = 16.91 x #/MCF. cc/M<sup>3</sup> = 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 <sub>2</sub> 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
Fresh Feed	7030	Steam Back Press.	834	5%				550+	Catalyst Taken Out	178.5	100	419-150	9.8
F. F. by C	6640	Temperatures, °F		10%					In Reactor at End of Period	402.0	150	149-105	12.5
Avg. F. F.	6815	Heater Outlet	650	20							200	104-74	10.9
Wet Gas	2285	Catalyst #1	665	30							250	73-62	5.1
Contraction		#2	650	40									
Recycle	8820	#3	618	50									
Bleed	297	#4	578	60									
		#5	522	70									
Total	8817	Average	561	80									
Total Feed	15632	Product Separator		90									
Inlet/F.F.	1.30			95									
Inlet Vel.	1.03 ft/sec			E.P.									
Steam Flow	249 #/hr			Rec.									
				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 <sub>2</sub>	2.35						O <sub>2</sub>	152.42	4763			9.526	CO <sub>2</sub>	2.2	376	376	772
CH <sub>4</sub>	84.98						CO <sub>2</sub>	6.29	143	143		266	CO	36.2	6509	6509	6509
C <sub>2</sub> H <sub>6</sub>	9.06						CH <sub>4</sub>	82.51	5157	5157	20628		CH <sub>4</sub>	2.2	575	575	2300
C <sub>3</sub> H <sub>8</sub>	3.59						C <sub>2</sub> H <sub>6</sub>	16.53	537	1102	3706		H <sub>2</sub>	58.0	10430		20860
C <sub>4</sub> H <sub>10</sub>							C <sub>3</sub> H <sub>8</sub>	9.59	218	654	1744		N <sub>2</sub>	0.4	122		
N <sub>2</sub>							C <sub>4</sub> H <sub>10</sub>						H <sub>2</sub> O				2518
O <sub>2</sub>							N <sub>2</sub>						Total				2511
							Total	267.34	10.832	7052	25628	9.812					17.982

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	#/hr					m/hr	a/hr	%	a/hr	%	a/hr	#/hr	#/gal
CO	36.2	6509	162.35	6044	364	1022	1405	7.92	1920	179	5.25	-6129	-6129	5.54		6.129		
H <sub>2</sub>	58.0	10430	22.86	4474	2697	540	283	5.66	10408	20.84	52.53	13.24	38.50	-9.400		-16.800		
CO <sub>2</sub>	2.2	376	17.42	31.07	1270	55.88	133	58.52	4.902	5.30	12.88	6.23	18.26	934	934	14.35	1.868	
N <sub>2</sub>	0.4	122	3.02	1.12	268	1.90	107	1.96	1261	88	2.38	33	97	-1002				
CH <sub>4</sub>	2.2	575	9.20	16.72	1008	16.13	186	16.96	3.890	4.47	10.84	4.95	14.51	485	485	7.45	1.940	
C <sub>2</sub> H <sub>6</sub>				2.75	166	465	17	4.76	1640	64	1.55	81	237	170	340	5.22	780	
C <sub>3</sub> H <sub>8</sub>				1.09	266	1.98	107	3.10	254	25	1.61	32	84	270	140	2.15	420	
C <sub>4</sub> H <sub>10</sub>				2.92	176	7.39	18	7.56	678	68	1.65	84	246	180	1540	9.30	1080	6.80
C <sub>3</sub> H <sub>8</sub>				.57	131	1.36	103	1.32	119	12	2.9	15	44	1030	1090	1.38	240	
C <sub>4</sub> H <sub>8</sub>				1.70	102	5.71	11	6.16	395	140	9.7	51	149	110	1440	6.76	880	5.85
C <sub>4</sub> H <sub>10</sub>				.20	122	170	101	5.8	246	105	1.2	26	118	1010	1040	1.67	100	.58
C <sub>5</sub> H <sub>10</sub>				.88	253	3.71	166	4.20	205	21	1.51	27	79	1060	300	4.61	1600	4.20
C <sub>6</sub> H <sub>12</sub>				.27	86	1.38	102	1.72	163	26	1.15	108	23	1020	1120	1.84	240	1.72
OIL							37.50					.27	.79	3.700	41.48	5.400	37.80	6.5
WATER												4.26	12.49		5.220		(4.26)	
TOTAL		17.982	231.75		6.029	107.21	6.32		23.264	41.246	34.115		12.462				2.610	56.95
H <sub>2</sub> +CO		16.939																9.08
H <sub>2</sub> /CO		1.60																7.45

ULTIMATE YIELDS				WEIGHT BALANCE				EFFLUENT RATIOS		CONTRACTION: 68.3	
% CO Fed	#/hr	H <sub>2</sub> /CO	H <sub>2</sub> /CO	Wet Gas	#/hr	%	#/hr	H <sub>2</sub> /H <sub>2</sub> O	CO <sub>2</sub> /CO	CO Conversion:	H <sub>2</sub> Conversion:
		#/MCF	g/M <sup>3</sup>	Gal/hr						84.16	80.54
C1+C2	14.62	14.62	2.277	38.50	107.2		112.3	3.11	3.48		
C3+	65.00	63.02	9.816	166.0							
C4+	55.32	54.14	8.433	142.6							
Ult. Oil	56.93	8.871	150.0	208							
CO <sub>2</sub>	14.35	41.10	6400	108.0							
H <sub>2</sub> O		76.70	11.950	202.1							

Yield Calculations assume "oil" is CH<sub>2</sub>, and is found by difference on Carbon, and H<sub>2</sub>O 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/M<sup>3</sup> = 16.91 × #/MCF. cc/M<sup>3</sup> = 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 <sub>2</sub> Preheat, °F	534	Prod.	6460			°F	%	A.P.I.	Fresh Catalyst Charged	106.0	Screen		Sedimentation		
Nat. Gas	2120		Gas Preheat, °F	817	A.P.I.	490			to 400	663	584	Catalyst Recharged		Frac.	M	%	M	%
Total	3775	43.8	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	5%				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 <sub>2</sub> 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				Density, lbs./cu. ft.		Chem. Anal.
Total	8827		#5	545	70	284			208		Bed Height, Feet	22.2				Aerated	% Fe	% C
Total Feed	15317		Average	604	80	312										Settled	% C	% Oil
Recycle/F.F.	1.36		Product Separator		90	343					Space Vel. SCFH/lb. cat.					Compacted	% Oil	
Inlet Vel.	1.03 ft/sec				95	364					Inventory Figures	1.44				Sp. Grav.	4.0	Specific Surface
Steam Flow	242 ft <sup>3</sup> /hr				E.P.	344					From d-P Meters	21.6						m <sup>2</sup> gm
					Res.	0.5												
					Loss	1.5												

GENERATOR ELEMENTAL BALANCE

NATURAL GAS		PRODUCT INSPECTION						IN					OUT						
	%		Oil	Water	Product	Pour °F	SUS @ °F		% Met %	SCFH m/hr	C	H	O		Mol %	SCFH m/hr	C	H	O
CO <sub>2</sub>	2.12	Neut. No.	20.0						O <sub>2</sub>	139.74	4.367			8.734	CO <sub>2</sub>	2.1	366	366	732
CH <sub>4</sub>	80.77	Sap. No.	48.0						CO	5.72	130	130		260	CO	33.9	5,903	5,903	5,903
C <sub>2</sub> H <sub>6</sub>	11.83	Hydrox. No.	41.0						CH <sub>4</sub>	72.30	4,519	4,519	18,074		CH <sub>4</sub>	3.5	609	1,609	2,436
C <sub>3</sub> H <sub>8</sub>	4.96	Bromine No.	92.6						C <sub>2</sub> H <sub>6</sub>	20.01	1,027	1,134	4,002		H <sub>2</sub>	58.9	10,257	20,514	
C <sub>4</sub> H <sub>10</sub>		% Fe							C <sub>3</sub> H <sub>8</sub>	12.19	277	871	2,216		N <sub>2</sub>	1.6	279		
N <sub>2</sub>		% Alc							C <sub>4</sub> H <sub>10</sub>						H <sub>2</sub> O				1,344
O <sub>2</sub>									N <sub>2</sub>						Total				2,357
									Total	249.96	9,960	6,814	24,244	8,944		17,414	6,878	24,244	8,944

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	2.30	132	370	1.29	3.06	5.36	6.44	15.12	6.45	109	-5.794	1.45		-5.794				
H <sub>2</sub>	58.9	10,257	20.51	41.91	2,460	4.3	1,989	3.48	9.761	20.02	42.19	11,749	36.02	8.269		16,538					
CO <sub>2</sub>	2.1	366	16.10	23.81	1,363	59.97	1,129	4,966	5,545	5.42	14.55	6,674	20.86	763	763	12.85		1,526			
N <sub>2</sub>	1.6	279	7.81	2.37	136	2.81	113	3.16	5.52	8.3	2.04	1,665	2.04	166							
CH <sub>4</sub>	3.5	609	9.74	17.71	1,014	16.22	840	13.43	4,125	4.74	11.65	4,965	15.22	231	231	3.91		924			
C <sub>2</sub> H <sub>6</sub>				3.43	196	5.47	163	4.55	779	80	1.97	761	2.25	162	324	5.49		648			70.0
C <sub>3</sub> H <sub>8</sub>				1.47	654	2.52	670	2.09	342	34	84	412	1.26	670	140	3.77		480			
C <sub>4</sub> H <sub>10</sub>				3.00	172	1.22	142	5.98	699	70	1.72	841	2.58	142	426	7.22		852			538
C <sub>3</sub> H <sub>8</sub>				.37	621	.92	217	.16	286	.09	.22	103	.32	217	651	8.6		136			
C <sub>4</sub> H <sub>10</sub>				2.20	126	1.26	104	2.85	272	.51	1.25	410	1.89	204	416	7.05		832			5.56
C <sub>5</sub> H <sub>12</sub>				.60	103	1.97	268	1.63	140	.14	.34	161	.52	228	112	1.80		280			1.63
C <sub>6</sub> H <sub>14</sub>				.67	109	2.24	251	2.20	156	.16	.39	187	.57	231	152	2.63		310			2.20
C <sub>6</sub> H <sub>12</sub>				.17	110	.44	602	.13	840	.04	.10	648	.15	608	241	.81		696			.70
OIL							42.79					313	96	7,128	52.99	6,256		48.79	6.5	6.74	
WATER												4,268	13.09			5,784		4,268			
TOTAL		17,414	24,244		5,726	117.18	4,142		22,290	40,704		32,115		12,673				2,892	59.26	9.39	
H <sub>2</sub> +CO		16,140																			
H <sub>2</sub> /CO		1.74					18.04														

ULTIMATE YIELDS

	% CO Fed	#/hr	H <sub>2</sub> /CO	Gal/hr	H <sub>2</sub> /CO	Gal/MCF	cc/M <sup>3</sup>
C1+C2	11.17	19.33	1.387	28.23			
C3+	71.46	62.31	9.944	168.15			
C4+	15.18	24.17	8.844	149.55	8.79	1,332	188.2
Ult. Oil		29.26	9.675	123.6	9.39	1,533	216.6
CO <sub>2</sub>	12.33	22.26	5.279	72.27			
H <sub>2</sub> O		76.12	15.573	312.1			

WEIGHT BALANCE

	#/hr	%	#/hr
Wet Gas	117.18		77.04
Oil	29.1		29.1
Water	92.6		92.6
Total	238.88	107.18	219.44

EFFLUENT RATIOS

H <sub>2</sub> /H <sub>2</sub> O	2.753
CO <sub>2</sub> /CO	12.347
(H <sub>2</sub> ) (CO <sub>2</sub> ) / (H <sub>2</sub> O) (CO)	28.44

CONTRACTION: 72.77

CO Conversion:	98.15
H <sub>2</sub> Conversion:	80.62

87.023

Yield Calculations assume "oil" is CH<sub>2</sub>, and is found by difference on Carbon, and H<sub>2</sub>O 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/M<sup>3</sup> = 16.91 x #/MCF. cc/M<sup>3</sup> = 141.3 x gal/MCF.