THE TEXAS COMPANY — MONTEBELLO LABORATORY

DATA SUMMARY SHEET

Synthesis Run Number 284 From 11/3/47 Hr. 1600 to 11/4/47 Hr. 0100

FLOWS	SCFH	%
Oxygen	1580	
Nat. Gas	2250	
Total	3830	41.4
Fresh Feed	7180	
F. F. by C	6420	
Avg. F. F.	6800	
Wet Gas	2060	
Contraction		69.7
Recycle	9020	
Bleed	249	
Total	9269	
Total Feed	16069	
Recycle/F.F.	1.36	
Inlet Vel.	1.15 FT/SEC	
Steam Flow		

RUN CONDITIONS	
Generator Press.	316
O_2 Preheat, °F	400
Gas Preheat, °F	736
Reactor Press.	328
Steam Back Press.	642
Temperatures, °F	
Heater Outlet	452
Catalyst #1	645
#2	627
#3	583
#4	556
#5	514
Average	585
Product Separator	

DISTILLATIONS	A S T M					Hempel Dist.		
						°F	%	A.P.I.
Prod.	GASO					to 400		
A.P.I.						400-550		
I.B.P.						550+		
5%								
10%								
20								
30						WATER		
40						Temp.	%	
50						200		
60						203		
70						208		
80								
90								
95								
E.P.								
Rec.								
Res.								
Loss								

CATALYST DATA	
In Reactor at Start of Period	271.5
Fresh Catalyst Charged	109.5
Catalyst Recharged	
Total	381.0
Catalyst Taken Out	
In Reactor at End of Period	381.0
Reactor d-P, H_2O	
Pounds in Reactor	228
Density, lbs./cu. ft.	88
Bed Height, Feet	—
Space Vel. SCFH/lb. cat.	
Inventory Figures	17.8
From d-P Meters	29.8

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

NATURAL GAS	%
CO_2	1.77
CH_4	86.81
C_2H_6	8.95
C_3H_8	2.47
C_4H_{10}	
N_2	
O_2	

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

GENERATOR ELEMENTAL BALANCE

	IN ~~#/hr~~ Mol %	~~SCFH~~ m/hr	C	H	O		OUT Mol %	~~SCFH~~ m/hr	C	H	O
O_2	133.41	4.169			8.338	CO_2	3.2	.575	.575		1.150
CO_2	4.62	.105	.105		.210	CO	32.6	5.848	5.848		5.848
CH_4	82.46	5.154	5.154	20.616		CH_4	4.6	.825	.825	3.300	
C_2H_6	15.93	.531	1.062	3.186		H_2	58.1	10.423		20.846	
C_3H_8	6.47	.147	.441	1.176		N_2	1.5	.269			
C_4H_{10}						H_2O				.832	1.550
N_2						Total		17.940	7.248	24.978	8.548
Total	242.89	10.106	6.762	24.978	8.548						

Less H_2O 214.99

	FRESH FEED %	m/hr	#/hr	WET GAS %	Measured m/hr	Measured #/hr	At Wt. Balance m/hr	At Wt. Balance #/hr	RECYCLE m/hr	COMB. FEED m/hr	COMB. FEED %	EFFLUENT m/hr	EFFLUENT %
CO	32.6	5.85	163.80	9.68	.53	14.84			2.37	8.22			
H2	58.1	10.42	20.84	62.47	2.85	5.70			12.83	23.25			
CO2	3.2	.57	25.08	15.85	.86	77.84			3.88	4.45			
N2	1.5	.27	7.56	1.75	.10	2.80			.43	.70			
CH4	4.6	.83	13.28	15.57	.85	13.60			3.81	4.64			
C2H4				1.41	.08	2.24			.34	.34			
C2H6				.66	.04	1.20			.16	.16			
C3H6				1.52	.08	3.36			.37	.37			
~~C3H8~~				.26	.01	.44			.06	.06			
C4H8				.37	.02	1.12			.09	.09			
C4H10				.23	.01	.58			.06	.06			
C5H10				.23	.01	.70			.06	.06			
C6H12													
OIL													
WATER													
TOTAL		17.94											
H2+CO													
H2/CO													

NET CHANGE ON REACTION	Carbon m/hr	Carbon a/hr	Carbon %	Hydrogen a/hr	Hydrogen %	Oxygen a/hr	Ultimate Oil #/hr	Ultimate Oil #/gal	Ultimate Oil gal/hr	Unsats. %
CO										
H2										
CO2										
N2										
CH4										
C2H4										
C2H6										
C3H6										
~~C3H8~~										
C4H8										
C4H10										
C5H10										
C6H12										
OIL										
WATER										
TOTAL										
H2+CO										
H2/CO										

ULTIMATE YIELDS	% C0 Fed	#/hr	H2 / C0 #/MCF	H2 / C0 g/M3	Gal/hr	H2 / C0 Gal/MCF	H2 / C0 cc/M3
C1+C2			No Yield				
C3+							
C4+							
Ult. Oil							
C02							
H20							

WEIGHT BALANCE	#/hr	%	#/hr
Wet Gas		No. Wt. Balance	
Oil			
Water			
Total			

EFFLUENT RATIOS	
H2/H20	
C02/C0	
(H2) (C02) / (H20) (C0)	

CONTRACTION:

C0 Conversion:

H2 Conversion:

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

THE TEXAS COMPANY — MONTEBELLO LABORATORY

DATA SUMMARY SHEET

Synthesis Run Number 288 From 11/4/47 Hr. 1600 to 11/4/47 Hr. 2400

FLOWS	SCFH	%
Oxygen	1800	
Nat. Gas	2480	
Total	4280	42.2
Fresh Feed	6850	
F. F. by C	7060	
Avg. F. F.	6955	
Wet Gas	2080	
Contraction		70.2
Recycle	9220	
Bleed	268	
Total	9488	
Total Feed	16443	
Recycle/F.F.	1.36	
Inlet Vel.	1.30 ft/sec	
Steam Flow		

RUN CONDITIONS	
Generator Press.	415
O_2 Preheat, °F	353
Gas Preheat, °F	693
Reactor Press.	400
Steam Back Press.	725
Temperatures, °F	
Heater Outlet	207
Catalyst #1	638
#2	630
#3	582
#4	570
#5	534
Average	590
Product Separator	

DISTILLATIONS — A S T M	
Prod.	64/50
A.P.I.	51.6
I.B.P.	108
5%	
10%	136
20	160
30	182
40	208
50	234
60	256
70	280
80	310
90	352
95	390
E.P.	394
Rec.	97.0
Res.	1.0
Loss.	2.0

Hempel Dist.		
°F	%	A.P.I.
to 400	76.5	
400-550	13.3	37.9
550+		

WATER	
Temp.	%
200	
203	
208	

CATALYST DATA	
In Reactor at Start of Period	381
Fresh Catalyst Charged	
Catalyst Recharged	
Total	381
Catalyst Taken Out	20
In Reactor at End of Period	361
Reactor d-P, H_2O	
Pounds in Reactor	211
Density, lbs./cu. ft.	92
Bed Height, Feet	
Space Vel. SCFH/lb. cat.	
Inventory Figures	18.9
From d-P Meters	32.4

CATALYST ANALYSIS — Particle Size				
	Screen		Sedimentation	
Frac.	M	%	M	%
On 40	420+	0.6	80+	
100	419-150	21.2	80-40	
150	149-105	21.0	40-20	
200	104-74	15.4	20-10	
250	73-62	11.5	10-0	
325	61-44	12.4		
<325	43-0	17.9		

Density, lbs./cu. ft. — Chem. Anal.

Aerated — % Fe
Settled — % C
Compacted — % Oil

Sp. Grav. 4.3 — Specific Surface m^2 gm

NATURAL GAS	%
CO_2	2.16
CH_4	85.96
C_2H_6	8.95
C_3H_8	2.93
C_4H_{10}	
N_2	
O_2	

PRODUCT INSPECTION					
	Oil	Water	Product	Pour °F	SUS @ °F
Neut. No.	41.7	43.33			
Sap. No.	46.0	126.83			
Hydrox. No.	184.0				
Bromine No.	115.53				
% Fe					
% Alc		12.4			

GENERATOR ELEMENTAL BALANCE

IN	#/Mol %	SCFH m/hr	C	H	O
O_2	151.97	4.749			9.498
CO_2	6.20	.141	.141		.282
CH_4	90.00	5.625	5.625	22.500	
C_2H_6	17.58	.586	1.172	3.516	
C_3H_8	8.45	.192	.576	1.536	
C_4H_{10}					
N_2					
Total	274.20	11.293	7.514	27.552	9.780

Loss H-0 221.03

OUT	Mol %	SCFH m/hr	C	H	O
CO_2	1.5	.275	.275		.550
CO	34.2	6.276	6.276		6.276
CH_4	4.7	.863	.863	3.452	
H_2	57.8	10.606		21.212	
N_2	1.8	.330			
H_2O				2.888	2.954
Total		18.350	7.414	27.552	9.780

	FRESH FEED			WET GAS					RECYCLE	COMB. FEED		EFFLUENT		NET CHANGE ON REACTION								
					Measured		At Wt. Balance							Carbon			Hydrogen		Oxygen	Ultimate Oil			Unsats.
	%	m/hr	#/hr	%	m/hr	#/hr	m/hr	#/hr	m/hr	m/hr	%	m/hr	%	m/hr	a/hr	%	a/hr	%	a/hr	#/hr	#/gal	gal/hr	%
CO	34.2	6.28	175.84	10.53	.58	16.24	1.04	29.12	2.64	8.92	20.55	3.68	9.65	- 5.24	- 5.24	16.56			- 5.24				
H2	57.8	10.61	21.22	49.67	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	12.32	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			2.28				
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	6.83	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		(3.02)				
TOTAL		18.35	232.38		5.49	87.36				43.40		38.13		8.47					.59	37.11		5.93	
H2+CO		16.89																					
H2/CO		1.69					4.72			2.58		4.71											

ULTIMATE YIELDS	% CO Fed	#/hr	H2/CO #/MCF	H2/CO g/M3	Gal/hr	H2/CO Gal/MCF	H2/CO cc/M3
C1+C2	20.87	20.18	3.15	53.87			
C3+	44.89	39.60	6.19	104.67			
C4+	36.29	31.96	4.99	84.38			
Ult. Oil		32.11	5.80	98.08	5.93	0.93	131.41
C02	17.68	48.94	7.63	129.02			
H20		54.36	8.49	143.57			

WEIGHT BALANCE	#/hr	%	#/hr
Wet Gas	87.4		157.1
Oil	26.4		
Water	48.9		
Total	162.7	69.8	232.4

EFFLUENT RATIOS	
H2/H20	5.74
C02/CO	1.33
(H2) (C02) / (H20) (C0)	7.63

CONTRACTION: 46.2
C0 Conversion: 83.4
H2 Conversion: 53.7

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

THE TEXAS COMPANY — MONTEBELLO LABORATORY

DATA SUMMARY SHEET

Synthesis Run Number 28C From 11/5/47 Hr. 0700 to 11/8/47 Hr. 2400

FLOWS	SCFH	%
Oxygen	1750	
Nat. Gas	2440	
Total	4190	41.9
Fresh Feed	6980	
F. F. by C	7080	
Avg. F. F.		
Wet Gas	2440	
Contraction		65.5
Recycle	9150	
Bleed	254	
Total	9404	
Total Feed	16484	
Recycle/F.F.	1.33	
Inlet Vel.	1.26 Ft/sec	
Steam Flow		

RUN CONDITIONS	
Generator Press.	411
O_2 Preheat, °F	467
Gas Preheat, °F	704
Reactor Press.	400
Steam Back Press.	720
Temperatures, °F	
Heater Outlet	343
Catalyst #1	1059
#2	643
#3	585
#4	560
#5	523
Average	594
Product Separator	

DISTILLATIONS	A S T M
Prod.	6450
A.P.I.	50.2
I.B.P.	99
5%	
10%	136
20	158
30	182
40	230
50	246
60	262
70	279
80	310
90	348
95	378
E.P.	396
Rec.	98.0
Res.	
Loss	

Hempel Dist.	°F	%	A.P.I.
to 400		76.0	56.4
400-550		15.0	35.6
550+			

WATER	
Temp.	%
200	
203	
208	

CATALYST DATA	
In Reactor at Start of Period	361
Fresh Catalyst Charged	
Catalyst Recharged	
Total	361
Catalyst Taken Out	23.5
In Reactor at End of Period	337.5
Reactor d-P, H_2O	
Pounds in Reactor	232.0
Density, lbs./cu. ft.	96.0
Bed Height, Feet	
Space Vel. SCFH/lb. cat.	
Inventory Figures	21.3
From d-P Meters	31.0

CATALYST ANALYSIS	Particle Size				
	Screen			Sedimentation	
Frac.	M	%	M	%
On 40	420+	0.4	80+	
100	419-150	23.8	80-40	
150	149-105	18.5	40-20	
200	104-74	20.9	20-10	
250	73-62	4.9	10-0	
325	61-44	5.2		
<325	43-0	26.3		
Density, lbs./cu. ft			Chem. Anal.	
Aerated			% Fe	
Settled			% C	
Compacted			% Oil	
Sp. Grav.			Specific Surface	
				m^2 gm

NATURAL GAS	%
CO_2	1.49
CH_4	85.58
C_2H_6	9.51
C_3H_8	3.42
C_4H_{10}	
N_2	
O_2	

PRODUCT INSPECTION					
	Oil	Water	Product	Pour °F	SUS @ °F
Neut No.	49.5	41.54			
Sap No.	359	128.51			
Hydrox No.	252.0				
Bromine No.	—				
% Fe					
% Alc		12.8			

GENERATOR ELEMENTAL BALANCE

	IN ~~#/hr~~ ~~Mol %~~	IN ~~SCFH~~ m/hr	IN C	IN H	IN O	OUT Mol %	OUT ~~SCFH~~ m/hr	OUT C	OUT H	OUT O
O_2	147.74	4.617			9.234					
CO_2	4.22	.096	.096		.192	2.1	.393	.393		.786
CO						33.8	6.314	6.314		6.314
CH_4	88.16	5.510	5.510	22.040		3.7	.691	.691	2.764	
C_2H_6	18.36	.612	1.224	3.672						
C_3H_8	9.68	.280	.660	1.780						
C_4H_{10}										
N_2						60.2	11.245		22.490	
H_2O						0.2	.037			
Total									2.238	2.134
	268.16	11.055	7.490	27.492	9.234		18.680	7.398	27.492	9.234

loss H_2O 227.75

	FRESH FEED %	FRESH FEED m/hr	FRESH FEED #/hr	WET GAS %	WET GAS Measured m/hr	WET GAS Measured #/hr	WET GAS At Wt. Balance m/hr	WET GAS At Wt. Balance #/hr	RECYCLE m/hr	COMB. FEED m/hr	COMB. FEED %	EFFLUENT m/hr	EFFLUENT %
CO	33.8	6.31	176.68	10.54	.68	19.04	1.11	31.08	2.61	8.92	20.52	3.72	9.84
H2	60.2	11.25	28.50	49.19	3.17	6.34	5.17	10.34	12.20	23.45	53.95	17.37	45.96
CO2	2.1	.39	17.16	17.19	1.11	48.84	1.81	79.64	4.26	4.65	10.70	6.07	16.06
N2	0.2	.04	1.12	2.63	.17	4.76	.28	7.84	.65	.69	1.59	.93	2.46
CH4	3.7	.69	11.04	14.83	.96	15.36	1.56	24.96	3.68	4.37	10.05	5.24	13.87
C2H4				1.70	.11	3.08	.18	5.04	.42	.42	.97	.60	1.59
C2H6				.90	.06	1.80	.10	3.00	.22	.22	.51	.32	.85
C3H6				1.63	.10	4.20	.16	17.64	.40	.40	.92	.56	1.48
C3H8				.27	.02	.88	.03	1.32	.07	.07	.16	.10	.26
C4H8				.43	.03	1.68	.05	2.80	.11	.11	.25	.16	.42
C4H10				.23	.01	.58	.02	1.16	.06	.06	.14	.08	.21
C5H10				.33	.02	1.40	.03	2.10	.08	.08	.18	.11	.29
C6H12				.13	.01	.84	.02	1.68	.03	.03	.07	.05	.13
OIL								17.22				.12	.32
WATER												2.36	6.25
TOTAL		18.68	228.50		6.44	108.80				43.47		37.79	
H2+CO		17.56											
H2/CO		1.78					4.66			2.63		4.67	

NET CHANGE ON REACTION	Carbon m/hr	Carbon a/hr	Carbon %	Hydrogen a/hr	Hydrogen %	Oxygen a/hr	Ultimate Oil #/hr	Ultimate Oil #/gal	Ultimate Oil gal/hr	Unsats. %
CO	-5.20	-5.20	17.54			-5.20				
H2	-6.08			-12.16						
CO2	1.42	1.42	22.50			2.84				
N2	.24									
CH4	.87	.87	13.79	3.48						65.38
C2H4	.18	.36	5.71	.72						
C2H6	.10	.20	3.17	.60						
C3H6	.16	.48	7.61	.96			15.89		2.54	85.79
C3H8	.03	.09	1.43	.24						
C4H8	.05	.20	3.17	.40			2.66		.44	65.15
C4H10	.02	.08	1.27	.20			1.16		.24	
C5H10	.03	.15	2.38	.30			2.10		.39	
C6H12	.02	.12	1.90	.24			1.68			
OIL		1.23	19.49	2.46			17.22		2.65	
WATER				2.56		2.36 / 1.28				
TOTAL	8.64						40.71		6.06	
H2+CO										
H2/CO										

ULTIMATE YIELDS	% CO Fed	#/hr	H2/CO #/MCF	H2/CO g/M3	Gal/hr	H2/CO Gal/MCF	H2/CO cc/M3
C1+C2	22.67	21.96	3.30	55.80			
C3+	37.25	43.92	6.59	111.44			
C4+	28.21	24.96	3.75	63.41			
Ult. Oil		40.71	6.11	103.32	6.26	0.94	132.82
C02	22.50	62.48	9.38	158.62			
H20		42.48	6.38	107.89			

WEIGHT BALANCE	#/hr	%	#/hr
Wet Gas	108.8		176.5
Oil	15.6		
Water	36.4		
Total	160.8	70.2	228.5

EFFLUENT RATIOS	
H2/H20	7.36
C02/CO	1.63
(H2) (C02) / (H20) (CO)	1.20

CONTRACTION:	46.3
C0 Conversion:	82.41
H2 Conversion:	57.40

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