7.6 SENSITIVITY CASES

The unit costs calculated for the sensitivity cases are reported in Table 7.6.1.

7.6.1 Sensitivity Case I-A

Not surprising, the thermal unit cost for methanol production is about 10% lower than the cost for gasoline (via fluid-bed operation). The fuel methanol cost ranges from 29 to 40 ¢/gal, depending upon the financing basis. Since the values placed on SNG are identical to the thermal product unit costs for this case, there is no cost increase when the calculation is on the multiple products basis.

7.6.2 Sensitivity Case I-B

If SNG is a valuable and marketable product, converting the Lurgi gasifier methane into additional synthesis gas is not an economical scheme to increase gasoline production. The gasoline cost increases to a range of 85 to 125 ¢/gal, depending primarily on the financing basis. The cost spread for the multiple products calculation is small because of the relatively insignificant C_3 and C_4 yields. The SNG breakeven value for Base Case I below which methane reforming does become economical is about 4.45 $/MM Btu (equity) and 3.25 $/MM Btu (utility).

7.6.3 Sensitivity Case I-C

Fluid-bed operation as projected for this study has an economic advantage, up to 5 ¢/gal, over the fixed-bed unit. Furthermore, if the fixed-bed butane yield in excess of the requirements for gasoline pressuring can be marketed only as an LPG, the fluid-bed advantage increases by an additional 1½ ¢/gal.

7.6.4 Sensitivity Case II-A

The projected operation and yields indicate that the Mobil direct route technology has the potential of being as economical on a thermal yield basis as the Mobil methanol conversion technology. Hence, it is a significant improvement to the commercial F-T technology. Its poorer gasoline selectivity relative to the methanol route - though superior to F-T -, however, leads to higher gasoline costs on a multiple products basis; 75 to 110 ¢/gal vs. 65 to 100 ¢/gal.

Laboratory studies indicate that direct conversion can occur at a H_2/CO ratio of unity, as opposed to the 2/1 ratio required for the methanol and Fischer-Tropsch syntheses. Consequently, this technology has the possibility of being an excellent partner with the advanced, high capacity gasifiers which generally yield low H_2/CO ratios.

TABLE 7.6.1
UNIT COSTS FOR SENSITIVITY CASES

Case Products	I (Base) SNG & Gasoline	I-A SNG & Methanol	I-B Gasoline Only	I-C(3) SNG & Gasoline	II (Base) SNG & Gasoline	II-A SNG & Gasoline
Equity Basis @ 12% DCF						
Thermal Product						
$/MM Btu	6.99	6.15	9.98	6.80	7.78	6.99
Equivalent Gasoline, ¢/gal(1)	85	40(2)	121	83	93	85
Multiple Products						
Gasoline, ¢/gal	98	40(2)	124	93	133	106
Utility Basis						
Thermal Product						
$/MM Btu	5.08	4.47	7.24	4.94	5.67	5.09
Equivalent Gasoline, ¢/gal(1)	62	29(2)	88	60	68	62
Multiple Products						
Gasoline, ¢/gal	71	29(2)	90	67	94	76

(1) At 5.1 MM Btu/Bbl (Cases I, I-B, I-C & II-A); 5.0 MM Btu/Bbl (Case II)

(2) Methanol

(3) Fluid-Bed Operation

SECTION 8
CONCLUSIONS

1. In all areas, the Mobil methanol conversion technology is superior to the commercial Fischer-Tropsch technology for the manufacture of gasoline; i.e., it has an advantage in processing complexity, thermal efficiency, product selectivity, investment and gasoline quality. The gasoline unit cost advantage ranges from 6 to 40 ¢/gal, depending upon the pricing and financing assumptions.

2. With SNG coproduction, the October, 1977 gasoline cost for the Mobil methanol conversion technology is estimated to range between 60 to 100 ¢/gal, depending upon the pricing and financing assumptions, for the adopted study bases. Optimistic bases, such as recommended in the "Coal Gasification Commercial Concepts Gas Cost Guidelines", however, yield a gasoline cost range of 50 to 80 ¢/gal, or about 20% lower.

3. If SNG is a valuable product, it is not economical to convert the Lurgi gasifier methane into additional gasoline. For the gasoline-only operation, the gasoline cost increases by 15 to 25 ¢/gal.

4. The projected fluid-bed operation of the Mobil methanol conversion technology has an economic advantage over the fixed-bed operation. This advantage ranges from 2 to 7 ¢/gal, depending principally on the values assigned to SNG, C_3 LPG, and excess butanes. Fluid-bed operation has an advantage in engineering complexity, thermal efficiency, gasoline selectivity, gasoline octane and investment.

5. The Mobil direct route technology has the potential of being, at least, as economical as the methanol conversion technology. Presently, however, its poorer gasoline selectivity results in a higher gasoline unit cost of about 10 ¢/gal when the coproducts are valued below gasoline.

6. For large plants, it is economically advantageous to process the gasifier liquids into finished products, instead of burning them in the coal-fired boiler. The incremental cost required for upgrading is relatively small compared to the improvement in the thermal yield.

SECTION 9
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APPENDIX A

MATERIAL BALANCE - BASE CASE I

MATERIAL BALANCE

BASE CASE I

STREAM Nº		1	2.1	2	3	4
		Mined Coal	Fine coal to be sold	Fine coal to Unit 122	Well sized coal	Oxygen
CO_2	44.010 lbmol/hr					
H_2S	34.076 lbmol/hr					
COS	60.070 lbmol/hr					
C_2H_4	28.054 lbmol/hr					
CO	28.010 lbmol/hr					
H_2	2.016 lbmol/hr					
CH_4	16.043 lbmol/hr					
C_2H_6	30.070 lbmol/hr					
N_2+INERTS	28.013 lbmol/hr					277.9
O_2	32.000 lbmol/hr					14 060.0
TOTAL DRY GAS	lbmol/hr					14 337.9
H_2O	18.016 lbmol/hr					
METHANOL	32.042 lbmol/hr					
TOTAL WET GAS	lbmol/hr					14 337.9
TOTAL DRY GAS	lb/hr					457 697
H_2O	lb/hr	637 815	28 700	76 725	532 390	
METHANOL	lb/hr					
TAR	lb/hr					
OIL	lb/hr					
NAPHTHA	lb/hr					
CRUDE PHENOLS	lb/hr					
ANHYDR. AMMONIA	lb/hr					
SULPHUR	lb/hr					
OTHERS	lb/hr					
MINERALS	lb/hr	116 172	5 228	13 973	96 971	
COAL DAF	lb/hr	1 523 837	68 572	183 382	1 271 963	
SULPHUR ORGANIC	lb/hr					
NITROGEN ORGANIC	lb/hr					
FATTY ACIDS	lb/hr					
ACETONE	lb/hr					
C_6+	lb/hr					
TOTAL	lb/hr	2 277 824	102 500	274 000	1 901 324	457 697

MATERIAL BALANCE

BASE CASE I

STREAM Nº		5	5.1	6	6.1	6.2
		MP Steam	BFW	Ash to disposal	Ash from Unit 129	Ash from Unit 122
CO_2 44.010	lbmol/hr					
H_2S 34.076	lbmol/hr					
COS 60.070	lbmol/hr					
C_2H_4 28.054	lbmol/hr					
CO 28.010	lbmol/hr					
H_2 2.016	lbmol/hr					
CH_4 16.043	lbmol/hr					
C_2H_6 30.070	lbmol/hr					
N_2 + INERTS 28.013	lbmol/hr					
O_2 32.000	lbmol/hr					
TOTAL DRY GAS	lbmol/hr					
H_2O 18.016	lbmol/hr	94 379.2	10 591.2	1 110.12	1 110.12	
METHANOL 32.042	lbmol/hr					
TOTAL WET GAS	lbmol/hr	94 379.2	10 591.2			
TOTAL DRY GAS	lb/hr					
H_2O	lb/hr	1 700 335	190 811	20 000	20 000	
METHANOL	lb/hr					
TAR	lb/hr					
OIL	lb/hr					
NAPHTHA	lb/hr					
CRUDE PHENOLS	lb/hr					
ANHYDR. AMMONIA	lb/hr					
SULPHUR (without SO_2)	lb/hr			79	66	13
OTHERS	lb/hr					
MINERALS	lb/hr			110 944	96 971	13 973
COAL	lb/hr			7 038	7 038	
SULPHUR ORGANIC	lb/hr					
NITROGEN ORGANIC	lb/hr					
FATTY ACIDS	lb/hr					
ACETONE	lb/hr					
C_6+	lb/hr					
SO_2 (1)				2 026		
TOTAL	lb/hr	1 700 335	190 811	140 087	124 075	13 986

1) Mineralized but balanced as SO_2

MATERIAL BALANCE

BASE CASE I

STREAM Nº			7	8	9	10	11
			Dusty gas Liquor	Unit 103 gas liquor	Unit 104 gas liquor	Unit 105 gas liquor	Unit 107 feed
CO_2	44.010	lbmol/hr	1.73				1.73
H_2S	34.076	lbmol/hr	0.88				0.88
COS	60.070	lbmol/hr					
C_2H_4	28.054	lbmol/hr					
CO	28.010	lbmol/hr					
H_2	2.016	lbmol/hr					
CH_4	16.043	lbmol/hr					
C_2H_6	30.070	lbmol/hr					
N_2+INERTS	28.013	lbmol/hr					
O_2	32.000	lbmol/hr					
TOTAL DRY GAS		lbmol/hr	2.61				2.61
H_2O	18.016	lbmol/hr	54 541.8	18 895.0	12 041.4	134.3	85 612.5
METHANOL	32.042	lbmol/hr					
TOTAL WET GAS		lbmol/hr					
TOTAL DRY GAS		lb/hr	106				106
H_2O		lb/hr	982 625	340 413	216 938	2 420	1 542 396
METHANOL		lb/hr					
TAR		lb/hr	31 951	3 604	836		36 391
OIL		lb/hr	13 444	31 221	7 246		51 911
NAPHTHA		lb/hr					
CRUDE PHENOLS		lb/hr	9 959	4 248	986		15 193
ANHYDR. AMMONIA		lb/hr	1 734	6 556	1 522		9 812
SULPHUR		lb/hr					
OTHERS		lb/hr					
MINERALS		lb/hr					
COAL DUST		lb/hr	4 113				4 113
SULPHUR ORGANIC		lb/hr					
NITROGEN ORGANIC		lb/hr					
FATTY ACIDS		lb/hr	1 770	835	194		2 799
ACETONE		lb/hr					
C_6+		lb/hr					
TOTAL		lb/hr	1 045 702	386 877	227 722	2 420	1 662 721

MATERIAL BALANCE

BASE CASE I

STREAM Nº			12	13	14	15	16
			Tar to Boiler	Oil from Unit 107	Unit 108 Feed	Phenols to Boiler	Unit 109 Feed
CO_2	44.010	lbmol/hr			1.73		1.73
H_2S	34.076	lbmol/hr			0.88		0.88
COS	60.070	lbmol/hr					
C_2H_4	28.054	lbmol/hr					
CO	28.010	lbmol/hr					
H_2	2.016	lbmol/hr					
CH_4	16.043	lbmol/hr					
C_2H_6	30.070	lbmol/hr					
N_2+INERTS	28.013	lbmol/hr					
O_2	32.000	lbmol/hr					
TOTAL DRY GAS		lbmol/hr			2.61		2.61
H_2O	18.016	lbmol/hr			85 482.29		85 801.34
METHANOL	32.042	lbmol/hr					
TOTAL WET GAS		lbmol/hr					
TOTAL DRY GAS		lb/hr			106		106
H_2O		lb/hr	2 347		1 540 049	452	1 545 797
METHANOL		lb/hr					
TAR		lb/hr	36 391				
OIL		lb/hr		51 711	200	200	
NAPHTHA		lb/hr					
CRUDE PHENOLS		lb/hr			15 193	14 606	587
ANHYDR. AMMONIA		lb/hr			9 812		9 812
SULPHUR		lb/hr					
OTHERS		lb/hr					
MINERALS		lb/hr					
COAL DUST		lb/hr	4 113				
SULPHUR ORGANIC		lb/hr					
NITROGEN ORGANIC		lb/hr					
FATTY ACIDS		lb/hr			2 799		2 799
ACETONE		lb/hr					
C_6+		lb/hr					
TOTAL		lb/hr	42 851	51 711	1 568 159	15 258	1 559 101

MATERIAL BALANCE

BASE CASE I

STREAM Nº			17	18	18.1	18.2	18.3
			NH_3 Product	Water to Unit 135	Water from Unit 109	Water from Unit 105	Unit 105 Make up water
CO_2	44.010	lbmol/hr		1.73	1.73		
H_2S	34.076	lbmol/hr		0.88	0.88		
COS	60.070	lbmol/hr					
C_2H_4	28.054	lbmol/hr					
CO	28.010	lbmol/hr					
H_2	2.016	lbmol/hr					
CH_4	16.043	lbmol/hr					
C_2H_6	30.070	lbmol/hr					
N_2+INERTS	28.013	lbmol/hr					
O_2	32.000	lbmol/hr					
TOTAL DRY GAS		lbmol/hr		2.61	2.61		
H_2O	18.016	lbmol/hr		89 535.80	85 799.12	3 736.68	3.736.68
METHANOL	32.042	lbmol/hr					
TOTAL WET GAS		lbmol/hr					
TOTAL DRY GAS		lb/hr		106	106		
H_2O		lb/hr	40	1 613 077	1 545 757	67 320	67 320
METHANOL		lb/hr					
TAR		lb/hr					
OIL		lb/hr					
NAPHTHA		lb/hr					
CRUDE PHENOLS		lb/hr		587	587		
ANHYDR. AMMONIA		lb/hr	8 521	1 291	1 291		
SULPHUR		lb/hr					
OTHERS		lb/hr					
MINERALS		lb/hr					
COAL		lb/hr					
SULPHUR ORGANIC		lb/hr					
NITROGEN ORGANIC		lb/hr					
FATTY ACIDS		lb/hr		2 799	2 799		
ACETONE		lb/hr					
C_6+		lb/hr					
TOTAL		lb/hr	8 561	1 617 860	1 550 540	67 320	67 320

MATERIAL BALANCE

BASE CASE I

STREAM Nº			19	20	21	22	23
			Raw gas from Unit 101	Raw gas to Unit 103	Raw gas from Unit 103	Raw gas to Unit 102	Shift gas to Unit 104
CO_2	44.010	lbmol/hr	33 722.0	27 369.5	27 369.5	6 352.5	9 176.8
H_2S	34.076	lbmol/hr	157.3	127.7	127.7	29.6	29.6
COS	60.070	lbmol/hr	2.0	1.6	1.6	0.4	0.4
C_2H_4	28.054	lbmol/hr	85.5	69.4	69.4	16.1	16.1
CO	28.010	lbmol/hr	21 458.5	17 416.1	17 416.1	4 042.4	1 218.1
H_2	2.016	lbmol/hr	44 332.0	35 972.6	35 972.6	8 359.4	11 183.7
CH_4	16.043	lbmol/hr	12 866.0	10 442.3	10 442.3	2 423.7	2 423.7
C_2H_6	30.070	lbmol/hr	614.0	498.3	498.3	115.7	115.7
N_2+INERTS	28.013	lbmol/hr	310.3	251.8	251.8	58.5	58.5
O_2	32.000	lbmol/hr					
TOTAL DRY GAS		lbmol/hr	113 547.6	92 149.3	92 149.3	21 398.3	24 222.6
H_2O	18.016	lbmol/hr	79 122.8	64 217.6	137.3	14 905.2	12 080.8
METHANOL	32.042	lbmol/hr					
TOTAL WET GAS		lbmol/hr	192 670.4	156 366.9	92 286.6	36 303.5	36 303.4
TOTAL DRY GAS		lb/hr	2 415 949	1 960 831	1 960 831	455 118	506 001
H_2O		lb/hr	1 425 476	1 156 945	2 474	268 531	217 648
METHANOL		lb/hr					
TAR		lb/hr	4 440	3 604		836	836
OIL		lb/hr	38 467	31 221		7 246	7 246
NAPHTHA		lb/hr	15 675	12 722	12 722	2 953	2 953
CRUDE PHENOLS		lb/hr	5 234	4 248		986	986
ANHYDR. AMMONIA		lb/hr	8 078	6 556		1 522	1 522
SULPHUR		lb/hr					
OTHERS		lb/hr					
MINERALS		lb/hr					
COAL		lb/hr					
SULPHUR ORGANIC		lb/hr	75	61	61	14	14
NITROGEN ORGANIC		lb/hr	14	11	11	3	3
FATTY ACIDS		lb/hr	1 029	835		194	194
ACETONE		lb/hr					
C_6+		lb/hr					
TOTAL		lb/hr	3 914 437	3 177 034	1 976 099	737 403	737 403

MATERIAL BALANCE

BASE CASE I

STREAM Nº			24	25	26	27
			Shift gas from Unit 104	Feed to Unit 105	Naphtha to Unit 151	Acid gas to Unit 106
CO_2	44.010	lbmol/hr	9 176.8	36 546.3		33 646.3
H_2S	34.076	lbmol/hr	29.6	157.3		157.3
COS	60.070	lbmol/hr	0.4	2.0		2.0
C_2H_4	28.054	lbmol/hr	16.1	85.5		64.5
CO	28.010	lbmol/hr	1 218.1	18 634.2		134.2
H_2	2.016	lbmol/hr	11 183.7	47 156.3		171.3
CH_4	16.043	lbmol/hr	2 423.7	12 866.0		406
C_2H_6	30.070	lbmol/hr	115.7	614.0		337
N_2+INERTS	28.013	lbmol/hr	58.5	310.3		1.3
O_2	32.000	lbmol/hr				
TOTAL DRY GAS		lbmol/hr	24 222.6	116 371.9		34 919.9
H_2O	18.016	lbmol/hr	39.4	176.7		42.4
METHANOL	32.042	lbmol/hr				14.45
TOTAL WET GAS		lbmol/hr	24 262.0	116 548.6		34 976.75
TOTAL DRY GAS		lb/hr	506 001	2 466 832		1 508 846
H_2O		lb/hr	710	3 184		764
METHANOL		lb/hr			158	463
TAR		lb/hr				
OIL		lb/hr				
NAPHTHA		lb/hr	2 953	15 675	15 675	
CRUDE PHENOLS		lb/hr				
ANHYDR. AMMONIA		lb/hr				
SULPHUR		lb/hr				
OTHERS		lb/hr				
MINERALS		lb/hr				
COAL		lb/hr				
SULPHUR ORGANIC		lb/hr	14	75	75	
NITROGEN ORGANIC		lb/hr	3	14	14	
FATTY ACIDS		lb/hr				
ACETONE		lb/hr				
C_6+		lb/hr				
TOTAL		lb/hr	509 681	2 485 780	15 922	1 510 073

MATERIAL BALANCE

BASE CASE I

STREAM Nº			28	29	30	31
			Unit 106 Off gas	Sulphur Prod.	Feed to Unit 110	Unit 101 Quench Water
CO_2	44.010	lbmol/hr	33 646.30		2 900	
H_2S	34.076	lbmol/hr	2.02			
COS	60.070	lbmol/hr	2.00			
C_2H_4	28.054	lbmol/hr	64.50		21	
CO	28.010	lbmol/hr	134.20		18 500	
H_2	2.016	lbmol/hr	174.13		46 985	
CH_4	16.043	lbmol/hr	410.64		12 460	
C_2H_6	30.070	lbmol/hr	337.82		277	
N_2 +INERT	28.013	lbmol/hr	1.30		309	
O_2	32.000	lbmol/hr				
TOTAL DRY GAS (1)		lbmol/hr	34 773.99		81 452	
H_2O	18.016	lbmol/hr	2 330.82			45 185.3
METHANOL	32.042	lbmol/hr	14.45		1.31	
TOTAL WET GAS (1)		lbmol/hr	37 119.26		81 453.31	
TOTAL DRY GAS		lb/hr	1 503 723		957 986	
H_2O		lb/hr	41 992			814 058
METHANOL		lb/hr	463		42	
C_3H_6	42.08	lbmol/hr				
C_3H_8	44.09	lbmol/hr	0.18			
iC_4H_{10}	58.12	lbmol/hr				
$1C_4H_8$	56.10	lbmol/hr				
nC_4H_{10}	58.12	lbmol/hr	0.83			
iC_5H_{12}	72.15	lbmol/hr				
$1C_5H_{10}$	70.13	lbmol/hr				
nC_5H_{12}	72.15	lbmol/hr	0.07			
C_6+	(2)	lbmol/hr				
NAPHTHA		lb/hr				
SULPHUR		lb/hr		5 051		
TOTAL		lb/hr	1 546 178	5 051	958 028	814 058

(1) C_3+ INCLUDED
(2) MW OF C_6+

MATERIAL BALANCE

BASE CASE I

STREAM Nº			32	33	34	35	36
			Incineration gas to Unit122	H_2 to Unit 151	H_2S from Unit 151	Expansion gas from Unit 110	Unit 105 solvent make up
CO_2	44.010	lbmol/hr	34 238.72			240.00	
H_2S	34.076	lbmol/hr	2.03		2.25		
COS	60.070	lbmol/hr	2.00				
C_2H_4	28.054	lbmol/hr	64.50			1.00	
CO	28.010	lbmol/hr	134.20			28.80	
H_2	2.016	lbmol/hr	201.21	96.22	2.83	75.76	
CH_4	16.043	lbmol/hr	432.92	1.37	4.64	484.00	
C_2H_6	30.070	lbmol/hr	338.14		0.82	9.00	
N_2+INERT	28.013	lbmol/hr	571.14			4.97	
O_2	32.000	lbmol/hr	21.75				
TOTAL DRY GAS (1)		lbmol/hr	36 007.96	97.59	11.62	843.53	
H_2O	18.016	lbmol/hr	2 501.45			2.00	1.6
METHANOL	32.042	lbmol/hr	14.45			155.00	20.7
TOTAL WET GAS (1)		lbmol/hr	38 523.86			1 000.53	
TOTAL DRY GAS		lb/hr	1 547 356	216	242	19 725	
H_2O		lb/hr	45 066			36	29
METHANOL		lb/hr	463			4 966	663
C_3H_6	42.08	lbmol/hr					
C_3H_8	44.09	lbmol/hr	0.20		0.18		
iC_4H_{10}	58.12	lbmol/hr	0.01				
$1C_4H_8$	56.10	lbmol/hr	0.01				
nC_4H_{10}	58.12	lbmol/hr	0.92		0.83		
iC_5H_{12}	72.15	lbmol/hr			0.07		
$1C_5H_{10}$	70.13	lbmol/hr					
nC_5H_{12}	72.15	lbmol/hr	0.21				
C_6+	(2)	lbmol/hr					
NAPHTHA		lb/hr					
TOTAL		lb/hr	1 592 422	216	242	24 727	692

(1) C_3+ INCLUDED
(2) MW OF C_6+

MATERIAL BALANCE

BASE CASE I

STREAM Nº			37	38	39	40	41
			Feed to Unit 150	Purge gas from Unit 110	Feed to Unit 112	Feed to Unit 111	Off gas from Unit 111
CO_2	44.010	lbmol/hr	32.00	1 243.00	1 483.00	23.99	23.99
H_2S	34.076	lbmol/hr					
COS	60.070	lbmol/hr					
C_2H_4	28.054	lbmol/hr		20.00	21.00	0.39	0.39
CO	28.010	lbmol/hr	0.20	1 240.00	1 268.80	23.93	23.93
H_2	2.016	lbmol/hr	0.24	8 309.00	8 288.54	160.34	64.12
CH_4	16.043	lbmol/hr	8.00	11 968.00	12 450.63	230.99	229.62
C_2H_6	30.070	lbmol/hr	2.00	266.00	275.00	5.13	5.13
N_2+INERTS	28.013	lbmol/hr	0.03	304.00	308.97	5.87	5.87
O_2	32.000	lbmol/hr					
TOTAL DRY GAS		lbmol/hr	42.47	23 350.00	24 095.94	450.64	353.05
H_2O	18.016	lbmol/hr	1 382.40	1.00	3.00	0.02	0.02
METHANOL	32.042	lbmol/hr	18 360.30	78.00	233.00	1.50	1.50
TOTAL WET GAS		lbmol/hr	19 785.17	23 429.00	24 331.94	452.16	354.57
TOTAL DRY GAS		lb/hr	1 604	315 266	334 774	6 084	5 986
H_2O		lb/hr	24 904	18	54		
METHANOL		lb/hr	588 301	2 499	7 466	48	48
TAR		lb/hr					
OIL		lb/hr					
NAPHTHA		lb/hr					
CRUDE PHENOLS		lb/hr					
ANHYDR. AMMONIA		lb/hr					
SULPHUR		lb/hr					
OTHERS		lb/hr					
MINERALS		lb/hr					
COAL		lb/hr					
SULPHUR ORGANIC		lb/hr					
NITROGEN ORGANIC		lb/hr					
FATTY ACIDS		lb/hr					
ACETONE		lb/hr					
C_6+		lb/hr					
TOTAL		lb/hr	614 809	317 783	342 294	6 133	5 917

MATERIAL BALANCE

BASE CASE I

STREAM Nº			42	43	44	45	46
			Off gas to Unit 112	Steam to Unit 112	Unit 112 Product Gas	Fuel to Unit 114	Feed to Unit 114
CO_2	44.010	lbmol/hr	263.99		567.08	0.76	85.00
H_2S	34.076	lbmol/hr					
COS	60.070	lbmol/hr					
C_2H_4	28.054	lbmol/hr	1.39			0.05	3.12
CO	28.010	lbmol/hr	52.73		0.98	0.23	3.24
H_2	2.016	lbmol/hr	139.88		271.42	0.66	275.95
CH_4	16.043	lbmol/hr	713.62		15 459.37	5.18	15 566.75
C_2H_6	30.070	lbmol/hr	14.13			0.40	34.83
N_2+INERT	28.013	lbmol/hr	10.84		308.97		308.67
O_2	32.000	lbmol/hr					
TOTAL DRY GAS (1)		lbmol/hr	1 196.58		16 607.82	10.27	16 304.96
H_2O	18.016	lbmol/hr	2.02	2 400	13.32	0.17	17.43
METHANOL	32.042	lbmol/hr	156.50				
TOTAL WET GAS (1)		lbmol/hr	1 355.10		16 621.14	10.44	16 322.39
TOTAL DRY GAS		lb/hr	25 593		282 201		265 340
H_2O		lb/hr	36		240		314
METHANOL		lb/hr	5 014				
C_3H_6	42.08	lbmol/hr				0.05	0.68
C_3H_8	44.09	lbmol/hr				1.12	13.34
iC_4H_{10}	58.12	lbmol/hr				0.84	7.99
$1C_4H_8$	56.10	lbmol/hr				0.09	0.85
nC_4H_{10}	58.12	lbmol/hr				0.20	1.77
iC_5H_{12}	72.15	lbmol/hr				0.36	2.18
$1C_5H_{10}$	70.13	lbmol/hr				0.06	0.30
nC_5H_{12}	72.15	lbmol/hr				0.03	0.14
C_6+	(2)	lbmol/hr				0.24	0.15
NAPHTHA		lb/hr					
TOTAL		lb/hr	30 644	43 238	282 441	311	265 654
(1) C_3+ INCLUDED							
(2) MW OF C_6+							85.97

MATERIAL BALANCE

BASE CASE I

STREAM Nº			47	48	49	50	51
			Stack gas from Unit 114	Unit 113 Off gas	SNG Product	Gasoline Product	Unit 112 Condensate
CO_2	44.010	lbmol/hr	18.79	514.39	85.00		
H_2S	34.076	lbmol/hr					
COS	60.070	lbmol/hr					
C_2H_4	28.054	lbmol/hr			3.12		
CO	28.010	lbmol/hr			3.24		
H_2	2.016	lbmol/hr		0.29	275.95		
CH_4	16.043	lbmol/hr		16.25	15 566.75		
C_2H_6	30.070	lbmol/hr		0.04	34.83		
N_2 +INERT	28.013	lbmol/hr	144.42	0.32	308.67		
O_2	32.000	lbmol/hr	7.01				
TOTAL DRY GAS (1)		lbmol/hr	168.22	531.31	16 304.96		5 722
H_2O	18.016	lbmol/hr	31.55	41.19	1.33		
METHANOL	32.042	lbmol/hr					
TOTAL WET GAS (1)		lbmol/hr	199.77	572.50	16 306.29		
TOTAL DRY GAS		lb/hr	5 097	22 911	265 340		
H_2O		lb/hr	568	742	24		103 088
METHANOL		lb/hr					
C_3H_6	42.08	lbmol/hr			0.68		
C_3H_8	44.09	lbmol/hr			13.34	0.01	
iC_4H_{10}	58.12	lbmol/hr		0.01	7.99	84.47	
$1C_4H_8$	56.10	lbmol/hr		0.01	0.85	2.41	
nC_4H_{10}	58.12	lbmol/hr			1.77	45.80	
iC_5H_{12}	72.15	lbmol/hr			2.18	430.71	
$1C_5H_{10}$	70.13	lbmol/hr			0.30	79.31	
nC_5H_{12}	72.15	lbmol/hr			0.14	48.99	
C_6+	(2)	lbmol/hr			0.15	1 645.73	
NAPHTHA		lb/hr				15 541	
TOTAL		lb/hr	5 666	23 653	265 364	235 668	103 088
(1) C_3+ INCLUDED							
(2) MW OF C_6+					85.97	104.65	

MATERIAL BALANCE

BASE CASE I

STREAM Nº			52	53	54	55	56
			Fuel to Unit 151	Stack gas fr.Unit 151	Light gas to SNG	Water make up to Unit 113	Steam from Unit 114
CO_2	44.010	lbmol/hr	0.24	5.81	32.21		
H_2S	34.076	lbmol/hr					
COS	60.070	lbmol/hr					
C_2H_4	28.054	lbmol/hr	0.01		3.12		
CO	28.010	lbmol/hr	0.07		2.26		
H_2	2.016	lbmol/hr	0.21		4.82		
CH_4	16.043	lbmol/hr	1.61		123.63		
C_2H_6	30.070	lbmol/hr	0.12		34.87		
N_2+INERT	28.013	lbmol/hr		41.98	0.02		
O_2	32.000	lbmol/hr		1.46			
TOTAL DRY GAS (1)		lbmol/hr	3.19	49.25	228.45		
H_2O	18.016	lbmol/hr	0.05	9.69	12.80	43.39	16.10
METHANOL	32.042	lbmol/hr					
TOTAL WET GAS (1)		lbmol/hr	3.24	58.94	230.36		
TOTAL DRY GAS		lb/hr	96	1 478	6 049		
H_2O		lb/hr	1	175	231	782	290
METHANOL		lb/hr					
C_3H_6	42.08	lbmol/hr	0.02		0.68		
C_3H_8	44.09	lbmol/hr	0.35		13.35		
iC_4H_{10}	58.12	lbmol/hr	0.26		8.00		
$1C_4H_8$	56.10	lbmol/hr	0.03		0.85		
nC_4H_{10}	58.12	lbmol/hr	0.06		1.77		
iC_5H_{12}	72.15	lbmol/hr	0.11		2.18		
$1C_5H_{10}$	70.13	lbmol/hr	0.02		0.30		
nC_5H_{12}	72.15	lbmol/hr	0.01		0.14		
C_6+	(2)	lbmol/hr	0.07		0.15		
NAPHTHA		lb/hr					
TOTAL		lb/hr	97	1 653	6 280	782	290
(1) C_3+ INCLUDED							
(2) MW OF C_6+					85.97		

MATERIAL BALANCE

BASE CASE I

STREAM Nº			57	58	59	60	
			Light Gas from Unit 152	Condensate from Unit 113	Oil to Unit 122/123	Oil to Unit 124	
CO_2	44.010	lbmol/hr	35.61	3.30			
H_2S	34.076	lbmol/hr					
COS	60.070	lbmol/hr					
C_2H_4	28.054	lbmol/hr	3.52	0.40			
CO	28.010	lbmol/hr	2.34	0.08			
H_2	2.016	lbmol/hr	4.90	0.08			
CH_4	16.043	lbmol/hr	129.71	6.08			
C_2H_6	30.070	lbmol/hr	39.97	5.10			
N_2+INERT	28.013	lbmol/hr	0.02				
O_2	32.000	lbmol/hr					
TOTAL DRY GAS (1)		lbmol/hr	258.48	30.03			
H_2O	18.016	lbmol/hr	12.80				
METHANOL	32.042	lbmol/hr					
TOTAL WET GAS (1)		lbmol/hr	271.28				
TOTAL DRY GAS		lb/hr	7 336	1 287			
H_2O		lb/hr	231				
METHANOL		lb/hr					
C_3H_6	42.08	lbmol/hr	0.88	0.20			
C_3H_8	44.09	lbmol/hr	17.57	4.22			
iC_4H_{10}	58.12	lbmol/hr	12.82	4.82			
$1C_4H_8$	56.10	lbmol/hr	1.38	0.53			
nC_4H_{10}	58.12	lbmol/hr	2.94	1.17			
iC_5H_{12}	72.15	lbmol/hr	4.60	2.42			
$1C_5H_{10}$	70.13	lbmol/hr	0.74	0.44			
nC_5H_{12}	72.15	lbmol/hr	0.36	0.22			
C_6+	(2)	lbmol/hr	1.12	0.97			
NAPHTHA		lb/hr					
OIL		lb/hr			35 903	15 808	
TOTAL		lb/hr	7 567	1 287	35 903	15 808	
(1) C_3+ INCLUDED							
(2) MW OF C_6+			85.97	86.17			

MATERIAL BALANCE

BASE CASE I

STREAM Nº			62	63	64	65
			Unit 124 Stack gas	Units 122/123 Stack gas	SO_2 from Unit 126	Stack gas to Atmosphere
CO_2	44.010	lbmol/hr	1 111.20	53 359.23		54 470.43
H_2S	34.076	lbmol/hr				
SO_2	60.070	lbmol/hr	2.02	40.71	31.63	11.10
C_2H_4	28.054	lbmol/hr				
CO	28.010	lbmol/hr				
H_2	2.016	lbmol/hr				
CH_4	16.043	lbmol/hr				
C_2H_6	30.070	lbmol/hr				
N_2+INERTS	28.013	lbmol/hr	6 225.97	92 550.80		98 776.77
O_2	32.000	lbmol/hr	215.77	1 643.76		1 859.53
TOTAL dry gas		lbmol/hr	7 554.96	147 594.50		155 117.83
H_2O	18.016	lbmol/hr	902.48	19 928.34		20 830.82
METHANOL	32.042	lbmol/hr				
TOTAL WET GAS		lbmol/hr	8 457.44	167 522.84		175 948.65
TOTAL DRY GAS		lb/hr	230 346	4 996 174	2 026	5 224 494
H_2O		lb/hr	16 259	359 029		375 288
METHANOL		lb/hr				
TAR		lb/hr				
OIL		lb/hr				
NAPHTHA		lb/hr				
CRUDE PHENOLS		lb/hr				
ANHYDR. AMMONIA		lb/hr				
SULPHUR		lb/hr				
OTHERS		lb/hr				
MINERALS		lb/hr				
COAL		lb/hr				
SULPHUR ORGANIC		lb/hr				
NITROGEN ORGANIC		lb/hr				
FATTY ACIDS		lb/hr				
ACETONE		lb/hr				
C_6+		lb/hr				
TOTAL		lb/hr	246 605	5 355 203	2 026	5 599 782

MATERIAL BALANCE

BASE CASE I

STREAM Nº			66	67	68	69	70
			N_2 to Atmosphere	Air to Plant	Air to Units 122/123	Stack gas to Unit 122	Air to Unit 121
CO_2	44.010	lbmol/hr				592.42	
H_2S	34.076	lbmol/hr				0.01	
COS	60.070	lbmol/hr					
C_2H_4	28.054	lbmol/hr					
CO	28.010	lbmol/hr					
H_2	2.016	lbmol/hr				27.08	
CH_4	16.043	lbmol/hr				22.28	
C_2H_6	30.070	lbmol/hr				0.32	
N_2+INERT	28.013	lbmol/hr	55 553.58	154 538.43	91 914.23	569.84	55 831.48
O_2	32.000	lbmol/hr	781.28	41 079.84	24 432.90	21.75	14 841.28
TOTAL DRY GAS (1)		lbmol/hr	56 334.86	195 618.27	116 347.13	1 233.97	70 672.76
H_2O	18.016	lbmol/hr	641.87	4 867.58	2 895.03	170.63	1 758.61
METHANOL	32.042	lbmol/hr					
TOTAL WET GAS (1)		lbmol/hr	56 976.73	200 485.58	119 242.16	1 404.60	72 431.37
TOTAL DRY GAS		lb/hr	1 581 223	5 643 638	3 356 645	43 170	2 038 923
H_2O		lb/hr	11 564	87 694	52 157	3 074	31 683
METHANOL		lb/hr					
C_3H_6	42.08	lbmol/hr					
C_3H_8	44.09	lbmol/hr				0.02	
iC_4H_{10}	58.12	lbmol/hr				0.01	
$1C_4H_8$	56.10	lbmol/hr				0.01	
nC_4H_{10}	58.12	lbmol/hr				0.09	
iC_5H_{12}	72.15	lbmol/hr					
$1C_5H_{10}$	70.13	lbmol/hr					
nC_5H_{12}	72.15	lbmol/hr				0.14	
C_6+	(2)	lbmol/hr					
NAPHTHA		lb/hr					
TOTAL		lb/hr	1 592 787	5 731 332	3 408 802	46 244	2 070 606

(1) C_3+ INCLUDED
(2) MW OF C_6+

MATERIAL BALANCE

BASE CASE I

STREAM Nº			71	72	73	74	75
			Water from Unit 121	Air to Unit 135	Air to Unit 114	Air to Unit 151	Unit 150 Acid Water
CO_2	44.010	lbmol/hr					6.28
H_2S	34.076	lbmol/hr					
COS	60.070	lbmol/hr					
C_2H_4	28.054	lbmol/hr					
CO	28.010	lbmol/hr					0.11
H_2	2.016	lbmol/hr					
CH_4	16.043	lbmol/hr					
C_2H_6	30.070	lbmol/hr					
N_2+INERT	28.013	lbmol/hr		9 437.32	144.42	41.98	
O_2	32.000	lbmol/hr		2 508.66	38.39	11.16	
TOTAL DRY GAS (1)		lbmol/hr		11 945.98	182.81	53.14	6.39
H_2O	18.016	lbmol/hr	1 116.73	297.25	4.55	1.32	19 627.00
METHANOL	32.042	lbmol/hr					
TOTAL WET GAS (1)		lbmol/hr		12 243.23	187.36	54.46	
TOTAL DRY GAS		lb/hr		344 645	5 274	1 533	279
H_2O		lb/hr	20 119	5 355	82	24	353 600
METHANOL		lb/hr					
C_3H_6	42.08	lbmol/hr					
C_3H_8	44.09	lbmol/hr					
iC_4H_{10}	58.12	lbmol/hr					
$1C_4H_8$	56.10	lbmol/hr					
nC_4H_{10}	58.12	lbmol/hr					
iC_5H_{12}	72.15	lbmol/hr					
$1C_5H_{10}$	70.13	lbmol/hr					
nC_5H_{12}	72.15	lbmol/hr					
C_6+	(2)	lbmol/hr					
NAPHTHA		lb/hr					
ACETONE		lb/hr					1 377
ACID		lb/hr					1 379
C_6+		lb/hr					423
TOTAL		lb/hr	20 119	350 000	5 356	1 557	357 058

(1) C_3+ INCLUDED
(2) MW OF C_6+

MATERIAL BALANCE

BASE CASE I

STREAM Nº			76	77	78		
			Water from Unit 151	Acid water to Unit 135	Steam to Unit 108		
CO_2	44.010	lbmol/hr		6.28			
H_2S	34.076	lbmol/hr	1.0	1.00			
COS	60.070	lbmol/hr					
C_2H_4	28.054	lbmol/hr					
CO	28.010	lbmol/hr		0.11			
H_2	2.016	lbmol/hr					
CH_4	16.043	lbmol/hr					
C_2H_6	30.070	lbmol/hr					
N_2+INERTS	28.013	lbmol/hr					
O_2	32.000	lbmol/hr					
TOTAL DRY GAS		lbmol/hr		7.39			
H_2O	18.016	lbmol/hr	449.43	20 076.43	344.14		
METHANOL	32.042	lbmol/hr					
TOTAL WET GAS		lbmol/hr					
TOTAL DRY GAS		lb/hr	34	313			
H_2O		lb/hr	8 097	361 697	6 200		
METHANOL		lb/hr					
TAR		lb/hr					
OIL		lb/hr					
NAPHTHA		lb/hr					
CRUDE PHENOLS		lb/hr					
ANHYDR. AMMONIA		lb/hr	17	17			
SULPHUR		lb/hr					
OTHERS		lb/hr					
MINERALS		lb/hr					
COAL		lb/hr					
SULPHUR ORGANIC		lb/hr					
NITROGEN ORGANIC		lb/hr					
FATTY ACIDS		lb/hr		1 379			
ACETONE		lb/hr		1 377			
C_6+		lb/hr		423			
TOTAL		lb/hr	8 148	365 206	6 200		

MATERIAL BALANCE

BASE CASE I

STREAM Nº			79	80			
			Unit 151 Purge Gas	Treated Water			
CO_2	44.010	lbmol/hr					
H_2S	34.076	lbmol/hr	0.01				
COS	60.070	lbmol/hr					
C_2H_4	28.054	lbmol/hr					
CO	28.010	lbmol/hr					
H_2	2.016	lbmol/hr	26.79				
CH_4	16.043	lbmol/hr	6.03				
C_2H_6	30.070	lbmol/hr	0.28				
N_2+INERT	28.013	lbmol/hr					
O_2	32.000	lbmol/hr					
TOTAL DRY GAS (1)		lbmol/hr	33.36				
H_2O	18.016	lbmol/hr	0.05	110 742.3			
METHANOL	32.042	lbmol/hr					
TOTAL WET GAS (1)		lbmol/hr	33.41				
TOTAL DRY GAS		lb/hr	176				
H_2O		lb/hr	1	1 994 893			
METHANOL		lb/hr					
C_3H_6	42.08	lbmol/hr					
C_3H_8	44.09	lbmol/hr	0.02				
iC_4H_{10}	58.12	lbmol/hr					
$1C_4H_8$	56.10	lbmol/hr					
nC_4H_{10}	58.12	lbmol/hr	0.09				
iC_5H_{12}	72.15	lbmol/hr					
$1C_5H_{10}$	70.13	lbmol/hr					
nC_5H_{12}	72.15	lbmol/hr	0.14				
C_6+	(2)	lbmol/hr					
NAPHTHA		lb/hr					
TOTAL		lb/hr	177	1 994 893			

(1) C_3+ INCLUDED
(2) MW OF C_6+

MATERIAL BALANCE

BASE CASE I

STREAM Nº			81	82	84	85.1	85.2
			BFW to Unit 106	Water from Unit 113	Air to Unit 124	Air to Unit 106	Air from Unit 106
CO_2	44.010	lbmol/hr					
H_2S	34.076	lbmol/hr					
COS	60.070	lbmol/hr				Air surplus	Air surplus
C_2H_4	28.054	lbmol/hr				+ N_2	+ N_2
CO	28.010	lbmol/hr				not balanced	not balanced
H_2	2.016	lbmol/hr					
CH_4	16.043	lbmol/hr					
C_2H_6	30.070	lbmol/hr					
N_2 +INERTS	28.013	lbmol/hr			6 223.21		
O_2	32.000	lbmol/hr			1 654.27	78.88	
TOTAL DRY GAS		lbmol/hr			7 877.48		
H_2O	18.016	lbmol/hr	2 130.88	13.30	196.00		
METHANOL	32.042	lbmol/hr					
TOTAL WET GAS		lbmol/hr			8 073.48		
TOTAL DRY GAS		lb/hr			227 267	2 524	
H_2O		lb/hr	38 390	240	3 531		
METHANOL		lb/hr					
TAR		lb/hr					
OIL		lb/hr					
NAPHTHA		lb/hr					
CRUDE PHENOLS		lb/hr					
ANHYDR. AMMONIA		lb/hr					
SULPHUR		lb/hr					
OTHERS		lb/hr					
MINERALS		lb/hr					
COAL		lb/hr					
SULPHUR ORGANIC		lb/hr					
NITROGEN ORGANIC		lb/hr					
FATTY ACIDS		lb/hr					
ACETONE		lb/hr					
C_6+		lb/hr					
TOTAL		lb/hr	38 390	240	230 798	2 524	0

MATERIAL BALANCE

BASE CASE I

STREAM Nº			86	87	88	89	90
			BFW Make Up Water	BFW Blow Down	C.W. Make Up	Evaporation + Spray Losses from Unit 133	Unit 135 Air
CO_2	44.010	lbmol/hr					8.01
H_2S	34.076	lbmol/hr					1.88
COS	60.070	lbmol/hr					
C_2H_4	28.054	lbmol/hr					
CO	28.010	lbmol/hr					0.11
H_2	2.016	lbmol/hr					
CH_4	16.043	lbmol/hr					
C_2H_6	30.070	lbmol/hr					
N_2+INERTS	28.013	lbmol/hr					9 437.32
O_2	32.000	lbmol/hr					2 508.66
TOTAL DRY GAS		lbmol/hr					11 955.98
H_2O	18.016	lbmol/hr	117 501.11	8 597.91	56 993.78	128 863.23	297.25
METHANOL	32.042	lbmol/hr					
TOTAL WET GAS		lbmol/hr					
TOTAL DRY GAS		lb/hr					345 064
H_2O		lb/hr	2 116 900	154 900	1 026 800	2 321 600	5 355
METHANOL		lb/hr					
TAR		lb/hr					
OIL		lb/hr					
NAPHTHA		lb/hr					
CRUDE PHENOLS		lb/hr					587
ANHYDR. AMMONIA		lb/hr					1 308
SULPHUR		lb/hr					
OTHERS		lb/hr					
MINERALS		lb/hr					
COAL		lb/hr					
SULPHUR ORGANIC		lb/hr					
NITROGEN ORGANIC		lb/hr					
FATTY ACIDS		lb/hr					4 178
ACETONE		lb/hr					1 377
C_6+		lb/hr					423
TOTAL		lb/hr	2 116 900	154 900	1 017 800	2 321 600	358 292

MATERIAL BALANCE

BASE CASE I

STREAM Nº			91	92	93	94	95
			CW Blow Down	Make Up Water to Unit 129	Sluice Vent	Steam to Unit 151	Deaerator Losses
CO_2	44.010	lbmol/hr					
H_2S	34.076	lbmol/hr			Air not		
COS	60.070	lbmol/hr			balanced		
C_2H_4	28.054	lbmol/hr					
CO	28.010	lbmol/hr					
H_2	2.016	lbmol/hr					
CH_4	16.043	lbmol/hr					
C_2H_6	30.070	lbmol/hr					
N_2+INERT	28.013	lbmol/hr					
O_2	32.000	lbmol/hr					
TOTAL DRY GAS (1)		lbmol/hr					
H_2O	18.016	lbmol/hr	36 334.37	2 525.53	1 415.41	394.09	555.06
METHANOL	32.042	lbmol/hr					
TOTAL WET GAS (1)		lbmol/hr					
TOTAL DRY GAS		lb/hr					
H_2O		lb/hr	654 600	45 500	25 500	7 100	10 000
METHANOL		lb/hr					
C_3H_6	42.08	lbmol/hr					
C_3H_8	44.09	lbmol/hr					
iC_4H_{10}	58.12	lbmol/hr					
$1C_4H_8$	56.10	lbmol/hr					
nC_4H_{10}	58.12	lbmol/hr					
iC_5H_{12}	72.15	lbmol/hr					
$1C_5H_{10}$	70.13	lbmol/hr					
nC_5H_{12}	72.15	lbmol/hr					
C_6+	(2)	lbmol/hr					
NAPHTHA		lb/hr					
TOTAL		lb/hr	654 600	45 500	25 500	7 100	10 000

(1) C_3+ INCLUDED
(2) MW OF C_6+

MATERIAL BALANCE

BASE CASE I

STREAM Nº			96	97	98	99	100
			Unit 150 Regeneration Purge Gas	Unit 150 Off Gas	Unit 150 HC Product	Stabilized gasoline from Unit 152	Naphtha from Unit 151
CO_2	44.010	lbmol/hr		3.16	32.31		
H_2S	34.076	lbmol/hr					
COS	60.070	lbmol/hr					
C_2H_4	28.054	lbmol/hr		0.19	3.12		
CO	28.010	lbmol/hr		0.95	2.26		
H_2	2.016	lbmol/hr		2.77	4.82		
CH_4	16.043	lbmol/hr		21.51	123.63		
C_2H_6	30.070	lbmol/hr		1.63	35.85		
N_2+INERT	28.013	lbmol/hr		0.01	0.02		
O_2	32.000	lbmol/hr					
TOTAL DRY GAS (1)		lbmol/hr		42.67	3 194.84		
H_2O	18.016	lbmol/hr		0.71	12.80		
METHANOL	32.042	lbmol/hr					
TOTAL WET GAS (1)		lbmol/hr		43.38	3 207.64		
TOTAL DRY GAS		lb/hr		1 282			
H_2O		lb/hr		13			
METHANOL		lb/hr					
C_3H_6	42.08	lbmol/hr		0.23	11.54		
C_3H_8	44.09	lbmol/hr		4.65	266.32	0.01	
iC_4H_{10}	58.12	lbmol/hr		3.49	392.66	8.43	
$1C_4H_8$	56.10	lbmol/hr		0.39	49.25	2.41	
nC_4H_{10}	58.12	lbmol/hr		0.83	121.42	13.12	1.98
iC_5H_{12}	72.15	lbmol/hr		1.47	431.08	421.50	158.43
$1C_5H_{10}$	70.13	lbmol/hr		0.26	79.71	78.80	
nC_5H_{12}	72.15	lbmol/hr		0.14	49.13	48.96	
C_6+	(2)	lbmol/hr		0.99	1 591.72	1 591.57	
COKE MWT 12.82		lb/hr	300				
NAPHTHA		lb/hr					15 541
TOTAL		lb/hr	300	1 295	256 156	207 023	15 541
(1) C_3+ INCLUDED							
(2) MW OF C_5+				90.14	104.40	104.40	

MATERIAL BALANCE

BASE CASE I

STREAM Nº			101	102	103	104	105
			Fuel to Unit 150	Propane LPG Product	Mixed Butane Product	Alkylate to Unit 154	Feed to Unit 153
CO_2	44.010	lbmol/hr	2.16				
H_2S	34.076	lbmol/hr					
COS	60.070	lbmol/hr					
C_2H_4	28.054	lbmol/hr	0.13				
CO	28.010	lbmol/hr	0.65				
H_2	2.016	lbmol/hr	1.90				
CH_4	16.043	lbmol/hr	14.72				
C_2H_6	30.070	lbmol/hr	1.11	0.98			0.98
N_2+INERT	28.013	lbmol/hr	0.01				
O_2	32.000	lbmol/hr					
TOTAL DRY GAS (1)		lbmol/hr	29.21	259.81	314.01		801.59
H_2O	18.016	lbmol/hr	0.49				
METHANOL	32.042	lbmol/hr	29.70				
TOTAL WET GAS (1)		lbmol/hr					
TOTAL DRY GAS		lb/hr	878	11 501	18 277		
H_2O		lb/hr	9				
METHANOL		lb/hr					
C_3H_6	42.08	lbmol/hr	0.16				10.86
C_3H_8	44.09	lbmol/hr	3.18	254.58			252.96
iC_4H_{10}	58.12	lbmol/hr	2.39	4.24	238.11	2.35	376.23
$1C_4H_8$	56.10	lbmol/hr	0.27	0.01			45.99
nC_4H_{10}	58.12	lbmol/hr	0.57		73.95	9.80	106.53
iC_5H_{12}	72.15	lbmol/hr	1.00		1.85	8.64	7.40
$1C_5H_{10}$	70.13	lbmol/hr	0.18		0.10	0.48	0.61
nC_5H_{12}	72.15	lbmol/hr	0.10			0.03	0.03
C_6+	(2)	lbmol/hr	0.68			54.16	
NAPHTHA		lb/hr					
TOTAL		lb/hr	887	11 501	18 277	7 448.	42 856
(1) C_3+ INCLUDED							
(2) MW OF C_5+			90.14			112.28	

MATERIAL BALANCE

BASE CASE I

STREAM Nº			107	108	109	110	111
			Wash Water to Unit 151	Stack Gas from Unit 150	Air to Unit 150	Mixed Butanes to Unit 154	Unit 132 Blow Down
CO_2	44.010	lbmol/hr		53.43			
H_2S	34.076	lbmol/hr					
COS	60.070	lbmol/hr					
C_2H_4	28.054	lbmol/hr					
CO	28.010	lbmol/hr					
H_2	2.016	lbmol/hr					
CH_4	16.043	lbmol/hr					
C_2H_6	30.070	lbmol/hr					
N_2 + INERT	28.013	lbmol/hr		383.12	383.11		
O_2	32.000	lbmol/hr		13.28	101.84		
TOTAL DRY GAS (1)		lbmol/hr		449.83	484.95	97.17	
H_2O	18.016	lbmol/hr	48.29	88.15	12.07		959.87
METHANOL	32.042	lbmol/hr					
TOTAL WET GAS (1)		lbmol/hr		537.98	497.02		
TOTAL DRY GAS		lb/hr		13 508	13 991	5 656	
H_2O		lb/hr	870	1 588	217		17 293
METHANOL		lb/hr					
C_3H_6	42.08	lbmol/hr					
C_3H_8	44.09	lbmol/hr					
iC_4H_{10}	58.12	lbmol/hr					
$1C_4H_8$	56.10	lbmol/hr				73.69	
nC_4H_{10}	58.12	lbmol/hr				22.88	
iC_5H_{12}	72.15	lbmol/hr				0.57	
$1C_5H_{10}$	70.13	lbmol/hr				0.03	
nC_5H_{12}	72.15	lbmol/hr					
C_6+	(2)	lbmol/hr					
NAPHTHA		lb/hr					
TOTAL		lb/hr	870	15 096	14 208	5 656	17 293
(1) C_3+ INCLUDED							
(2) MW OF C_6+							

MATERIAL BALANCE

BASE CASE I

STREAM Nº			112				
			Unit 135 Stripping Str.				
CO_2	44.010	lbmol/hr					
H_2S	34.076	lbmol/hr					
COS	60.070	lbmol/hr					
C_2H_4	28.054	lbmol/hr					
CO	28.010	lbmol/hr					
H_2	2.016	lbmol/hr					
CH_4	16.043	lbmol/hr					
C_2H_6	30.070	lbmol/hr					
N_2 +INERTS	28.013	lbmol/hr					
O_2	32.000	lbmol/hr					
TOTAL DRY FLOW (1)		lbmol/hr					
H_2O	18.016	lbmol/hr	499.56				
METHANOL	32.042	lbmol/hr					
TOTAL WET FLOW (1)		lbmol/hr					
ETHANOL	46.07	lbmol/hr					
HEAVY ALCOHOLS (2)		lbmol/hr					
ACIDS	63.24	lbmol/hr					
NH_3	17.03	lbmol/hr					
Fe_3O_4		lb/hr					
Fe CATALYST		lb/hr					
TOTAL		lb/hr	9 000				

(1) ETHANOL, ALCOHOLS & ACIDS INCLUDED

(2) MW OF HEAVY ALCOHOLS