APPENDIX B

MATERIAL BALANCE - BASE CASE II

# MATERIAL BALANCE

## BASE CASE II

| STREAM Nº | | | 1 | 2 | 3 | 4 | 5 |
|---|---|---|---|---|---|---|---|
| | | | Mined Coal | Fine Coal to Unit 222 | Well sized coal | Oxygen | MP Steam |
| $CO_2$ | 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 | |
| TOTAL DRY GAS | | lbmol/hr | | | | 14 337.9 | |
| $H_2O$ | 18.016 | lbmol/hr | | | | | 94 379.2 |
| METHANOL | 32.042 | lbmol/hr | | | | | |
| TOTAL WET GAS | | lbmol/hr | | | | | 94 379.2 |
| TOTAL DRY GAS | | lb/hr | | | | 457 697 | |
| $H_2O$ | | lb/hr | 648 487 | 116 097 | 532 390 | | 1700 335 |
| 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 | 118 117 | 21 146 | 96 971 | | |
| COAL | | lb/hr | 1549 420 | 277 457 | 1271 963 | | |
| SULPHUR ORGANIC | | lb/hr | | | | | |
| NITROGEN ORGANIC | | lb/hr | | | | | |
| FATTY ACIDS | | lb/hr | | | | | |
| ACETONE | | lb/hr | | | | | |
| $C_8$+ | | lb/hr | | | | | |
| TOTAL | | lb/hr | 2316 024 | 414 700 | 1901 324 | 457 697 | 1700 335 |

# MATERIAL BALANCE

## BASE CASE II

| STREAM Nº | | | 5.1 | 6 | 6.1 | 6.2 | 6.3 |
|---|---|---|---|---|---|---|---|
| | | | BFW to Unit 201 | Ash to Disposal | Ash from Unit 201 | Ash from Unit 222 | Make Up Water to Unit 229 |
| $CO_2$ | 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 | 10 591 | 1 110.12 | 1 110.12 | | 2 525.53 |
| METHANOL | 32.042 | lbmol/hr | | | | | |
| TOTAL WET GAS | | lbmol/hr | 10 591 | | | | |
| TOTAL DRY GAS | | lb/hr | | | | | |
| $H_2O$ | | lb/hr | 190 811 | 20 000 | 20 000 | | 45 500 |
| METHANOL | | lb/hr | | | | | |
| TAR | | lb/hr | | | | | |
| OIL | | lb/hr | | | | | |
| NAPHTHA | | lb/hr | | | | | |
| CRUDE PHENOLS | | lb/hr | | | | | |
| ANHYDR. AMMONIA | | lb/hr | | | | | |
| SULPHUR | | lb/hr | | 66 | 66 | | |
| OTHERS | | lb/hr | | | | | |
| MINERALS | | lb/hr | | 118 121 | 96 971 | 21 150 | |
| COAL | | lb/hr | | 7 038 | | | |
| SULPHUR ORGANIC | | lb/hr | | | | | |
| NITROGEN ORGANIC | | lb/hr | | | | | |
| FATTY ACIDS | | lb/hr | | | | | |
| ACETONE | | lb/hr | | | | | |
| $C_6$+ | | lb/hr | | | | | |
| $SO_2$ 1) | | | | 2 577 | | | |
| TOTAL | | lb/hr | 190 811 | 147 802 | 124 075 | 21 150 | 45 500 |

1) mineralized, but balanced as $SO_2$

# MATERIAL BALANCE

## BASE CASE II

| STREAM Nº | | | 7 | 8 | 9 | 10 | 11 |
|---|---|---|---|---|---|---|---|
| | | | Dusty Gas liquor | Unit 203 Gas liquor | Unit 204 Gas liquor | Unit 205 Gas liquor | Unit 207 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 | 54541.8 | 18895.0 | 12041.4 | 134.3 | 85612.57 |
| METHANOL | 32.042 | lbmol/hr | | | | | |
| TOTAL WET GAS | | lbmol/hr | | | | | |
| TOTAL DRY GAS | | lb/hr | 106 | | | | 106 |
| $H_2O$ | | lb/hr | 982625 | 340413 | 216938 | 2420 | 1542396 |
| METHANOL | | lb/hr | | | | | |
| TAR | | lb/hr | 31951 | 3604 | 836 | | 36391 |
| OIL | | lb/hr | 13444 | 31221 | 7246 | | 51911 |
| NAPHTHA | | lb/hr | | | | | |
| CRUDE PHENOLS | | lb/hr | 9959 | 4248 | 986 | | 15193 |
| ANHYDR. AMMONIA | | lb/hr | 1734 | 6556 | 1522 | | 9812 |
| SULPHUR | | lb/hr | | | | | |
| OTHERS | | lb/hr | | | | | |
| MINERALS | | lb/hr | | | | | |
| COAL | | lb/hr | 4113 | | | | 4113 |
| SULPHUR ORGANIC | | lb/hr | | | | | |
| NITROGEN ORGANIC | | lb/hr | | | | | |
| FATTY ACIDS | | lb/hr | 1770 | 835 | 194 | | 2799 |
| ACETONE | | lb/hr | | | | | |
| $C_6$+ | | lb/hr | | | | | |
| TOTAL | | lb/hr | 1045702 | 386877 | 227722 | 2420 | 1662721 |

# MATERIAL BALANCE

## BASE CASE II

| STREAM Nº | | | 12 | 13 | 14 | 15 | 16 |
|---|---|---|---|---|---|---|---|
| | | | Tar to Unit 222/223 | Oil from Unit 207 | Unit 208 Feed | Phenols to Boiler 222/223 | Unit 209 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 | | 1540049 | 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 | | 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 | 1568 159 | 15 258 | 1 559 101 |

# MATERIAL BALANCE

## BASE CASE II

| STREAM Nº | | 17 | 18 | 18.1 | 18.2 | 18.3 |
|---|---|---|---|---|---|---|
| | | $NH_3$ Product | Water to Unit 235 | Water from Unit 209 | Water from Unit 205 | Unit 205 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 | | 89 535.8 | 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 | 1613077 | 1 545757 | 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 II

| STREAM Nº | | 19 | 20 | 21 | 22 | 23 |
|---|---|---|---|---|---|---|
| | | Raw gas from Unit 201 | Raw gas to Unit 203 | Raw gas from Unit 203 | Raw gas to Unit 202 | Shift gas to Unit 204 |
| $CO_2$ 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 | 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 | 35 972.6 | 35 972.6 | 8 359.4 | 11 183.7 |
| $CH_4$ 16.043 | lbmol/hr | 12 866 | 10 442.3 | 10 442.3 | 2 423.7 | 2 423.7 |
| $C_2H_6$ 30.070 | lbmol/hr | 614 | 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 | 1029 | 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 II

| STREAM Nº | | | 24 | 25 | 26 | 27 | |
|---|---|---|---|---|---|---|---|
| | | | Shift gas from Unit 204 | Feed to Unit 205 | Naphtha to Unit 251 | Acid gas to Unit 206 | |
| $CO_2$ | 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 | | 2 | |
| $C_2H_4$ | 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 | | 406 | |
| $C_2H_6$ | 30.070 | lbmol/hr | 115.7 | 614 | | 337 | |
| $N_2$+INERTS | 28.013 | lbmol/hr | 58.5 | 310.3 | | 1.3 | |
| $O_2$ | 32.000 | lbmol/hr | | | | 14.45 | |
| 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 | | | | | |
| 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 II

| STREAM Nº | | | 28 | 29 | 30 | 31 | |
|---|---|---|---|---|---|---|---|
| | | | Unit 206 Off Gas | Sulphur Prod. | Feed to Unit 250 | Unit 201 Quench water | |
| $CO_2$ | 44.010 | lbmol/hr | 33 646.3 | | 2 900 | | |
| $H_2S$ | 34.076 | lbmol/hr | 2.02 | | | | |
| COS | 60.070 | lbmol/hr | 2 | | | | |
| $C_2H_4$ | 28.054 | lbmol/hr | 64.5 | | 21 | | |
| CO | 28.010 | lbmol/hr | 134.2 | | 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 | | | | | |
| $iC_4H_8$ | 56.10 | lbmol/hr | | | | | |
| $nC_4H_{10}$ | 58.12 | lbmol/hr | 0.83 | | | | |
| $iC_5H_{12}$ | 72.15 | lbmol/hr | | | | | |
| $iC_5H_{10}$ | 70.13 | lbmol/hr | | | | | |
| $nC_5H_{12}$ | 72.15 | lbmol/hr | 0.07 | | | | |
| $C_6$+ | (2) | lbmol/hr | | | | | |
| NAPHTHA | | lb/hr | | | | | |
| SULPHUR | | | | 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 II

| STREAM Nº | | | 32 | 33 | 34 | | |
|---|---|---|---|---|---|---|---|
| | | | Inc. gas to unit 222 | Unit 211 Productgas | $H_2S$ from Unit 251 | | |
| $CO_2$ | 44.010 | lbmol/hr | 36 006.31 | 3.45 | 0.29 | | |
| $H_2S$ | 34.076 | lbmol/hr | 2.03 | | 2.25 | | |
| COS | 60.070 | lbmol/hr | 2.00 | | | | |
| $C_2H_4$ | 28.054 | lbmol/hr | 65.00 | | | | |
| CO | 28.010 | lbmol/hr | 134.24 | | | | |
| $H_2$ | 2.016 | lbmol/hr | 203.62 | 1 131.99 | 2.83 | | |
| $CH_4$ | 16.043 | lbmol/hr | 464.74 | 13.79 | 4.55 | | |
| $C_2H_6$ | 30.070 | lbmol/hr | 339.30 | | 0.82 | | |
| $N_2$+INERTS | 28.013 | lbmol/hr | 5236.06 | | | | |
| $O_2$ | 32.000 | lbmol/hr | 176.67 | | | | |
| TOTAL DRY FLOW (1) | | lbmol/hr | 42631.76 | 1 149.23 | 11.82 | | |
| $H_2O$ | 18.016 | lbmol/hr | 3683.94 | | | | |
| METHANOL | 32.042 | lbmol/hr | 14.45 | | | | |
| TOTAL WET FLOW (1) | | lbmol/hr | 46330.15 | | | | |
| $C_3H_6$ | 42.08 | lbmol/hr | 0.50 | | | | |
| $C_3H_8$ | 44.09 | lbmol/hr | 0.25 | | 0.18 | | |
| $iC_4H_8$ | 56.10 | lbmol/hr | | | | | |
| $iC_4H_8$ | 56.10 | lbmol/hr | | | | | |
| $iC_4H_{10}$ | 58.12 | lbmol/hr | | | | | |
| $nC_4H_{10}$ | 58.12 | lbmol/hr | 0.83 | | 0.83 | | |
| $iC_5H_{10}$ | 70.13 | lbmol/hr | | | | | |
| $iC_5H_{10}$ | 70.13 | lbmol/hr | | | | | |
| $iC_5H_{12}$ | 72.15 | lbmol/hr | | | | | |
| $nC_5H_{12}$ | 72.15 | lbmol/hr | 0.21 | | 0.07 | | |
| $iC_6H_{12}$ | 84.16 | lbmol/hr | | | | | |
| $iC_6H_{12}$ | 84.16 | lbmol/hr | | | | | |
| $iC_6H_{14}$ | 86.17 | lbmol/hr | | | | | |
| $nC_6H_{14}$ | 86.17 | lbmol/hr | | | | | |
| C6+ | (2) | lbmol/hr | | | | | |
| $C_7$+ | (3) | lbmol/hr | | | | | |
| ALCOHOLS | 46.61 | lbmol/hr | | | | | |
| TOTAL | | lb/hr | 1 827 738 | 2 655 | 254 | | |

(1) $C_3$+ INCLUDED
(2) MW OF C6+
(3) MW OF C7+

# MATERIAL BALANCE

BASE CASE II

| STREAM Nº | | | 35 | 36 | | | |
|---|---|---|---|---|---|---|---|
| | | | METHANOL MAKE UP | UNIT 206 SOLVENT MAKEUP | | | |
| $CO_2$ | 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 | | | | | |
| METHANOL | 32.042 | lbmol/hr | 9.03 | 20.7 | | | |
| TOTAL WET FLOW (1) | | lbmol/hr | | | | | |
| | | | | | | | |
| ETHANOL | 46.07 | lbmol/hr | | 0.11 | | | |
| 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 | 289 | 668 | | | |

(1) ETHANOL, ALCOHOLS & ACIDS INCLUDED

(2) MW OF HEAVY ALCOHOLS

# MATERIAL BALANCE

## BASE CASE II

| STREAM Nº | | | 37 | 38 | 39 | 40 | 41 |
|---|---|---|---|---|---|---|---|
| | | | UNIT 210 OFF STREAMS | UNIT 210 PRODUCT GAS | UNIT 212 FEED | UNIT 211 FEED | UNIT 211 OFF GAS |
| $CO_2$ | 44.010 | lbmol/hr | 1 070.00 | 2 014.66 | 2 011.21 | 409.35 | 405.90 |
| $H_2S$ | 34.076 | lbmol/hr | | | | | |
| COS | 60.070 | lbmol/hr | | | | | |
| $C_2H_4$ | 28.054 | lbmol/hr | 194.13 | 184.00 | 184.00 | 37.39 | 37.39 |
| CO | 28.010 | lbmol/hr | 9.00 | 474.04 | 474.04 | 96.32 | 96.32 |
| $H_2$ | 2.016 | lbmol/hr | 49.00 | 9 285.26 | 8 153.27 | 1 886.65 | 754.66 |
| $CH_4$ | 16.043 | lbmol/hr | 1 010.00 | 13 217.78 | 13 203.99 | 2 685.69 | 2 671.90 |
| $C_2H_6$ | 30.070 | lbmol/hr | 460.76 | 350.00 | 350.00 | 71.12 | 71.12 |
| $N_2$+INERTS | 28.013 | lbmol/hr | 5.00 | 303.79 | 303.79 | 61.73 | 61.73 |
| $O_2$ | 32.000 | lbmol/hr | | | | | |
| TOTAL DRY FLOW (1) | | lbmol/hr | 4 507.48 | 25 829.53 | 24 680.30 | 5 248.25 | 4 099.02 |
| $H_2O$ | 18.016 | lbmol/hr | 117.26 | | | | |
| METHANOL | 32.042 | lbmol/hr | | | | | |
| TOTAL WET FLOW (1) | | lbmol/hr | 4 624.74 | | | | |
| $C_3H_6$ | 42.08 | lbmol/hr | 728.15 | | | | |
| $C_3H_8$ | 44.09 | lbmol/hr | 121.20 | | | | |
| $1C_4H_8$ | 56.10 | lbmol/hr | 352.49 | | | | |
| $iC_4H_8$ | 56.10 | lbmol/hr | 18.78 | | | | |
| $iC_4H_{10}$ | 58.12 | lbmol/hr | 2.43 | | | | |
| $nC_4H_{10}$ | 58.12 | lbmol/hr | 45.29 | | | | |
| $1C_5H_{10}$ | 70.13 | lbmol/hr | 139.52 | | | | |
| $iC_5H_{10}$ | 70.13 | lbmol/hr | 47.68 | | | | |
| $iC_5H_{12}$ | 72.15 | lbmol/hr | 8.06 | | | | |
| $nC_5H_{12}$ | 72.15 | lbmol/hr | 23.09 | | | | |
| $1C_6H_{12}$ | 84.16 | lbmol/hr | 63.09 | | | | |
| $iC_6H_{12}$ | 84.16 | lbmol/hr | 28.33 | | | | |
| $iC_6H_{14}$ | 86.17 | lbmol/hr | 6.66 | | | | |
| $nC_6H_{14}$ | 86.17 | lbmol/hr | 13.92 | | | | |
| C6 + | (2) | lbmol/hr | | | | | |
| $C_7$+ | (3) | lbmol/hr | 60.90 | 5.00 | 5.00 | 0.20 | 0.20 |
| ALCOHOLS | 46.61 | lbmol/hr | 50.00 | | | | |
| TOTAL | | lb/hr | 178 420 | 357 411 | 354 756 | 72 540 | 69 885 |
| (1) $C_3$+ INCLUDED | | | | | | | |
| (2) MW OF C6+ | | | | | | | |
| (3) MW OF C7+ | | | | 100.00 | 100.00 | 100.00 | 100.00 |

# MATERIAL BALANCE

## BASE CASE II

| STREAM Nº | | | 42 | 43 | 44 | 45 | 46 |
|---|---|---|---|---|---|---|---|
| | | | $H_2$ TO UNIT 251 | STEAM TO UNIT 212 | UNIT 212 PRODUCT GAS | FUEL TO UNIT 214 | UNIT 114 FEED |
| $CO_2$ | 44.010 | lbmol/hr | 0.10 | | 680.17 | 0.89 | 85.00 |
| $H_2S$ | 34.076 | lbmol/hr | | | | | |
| COS | 60.070 | lbmol/hr | | | | | |
| $C_2H_4$ | 28.054 | lbmol/hr | | | | 0.16 | 187.58 |
| CO | 28.010 | lbmol/hr | | | 4.26 | 0.01 | 13.14 |
| $H_2$ | 2.016 | lbmol/hr | 96.22 | | 671.77 | 1.82 | 718.83 |
| $CH_4$ | 16.043 | lbmol/hr | 1.37 | | 16 107.81 | 1.89 | 17 055.10 |
| $C_2H_6$ | 30.070 | lbmol/hr | | | | 2.37 | 445.37 |
| $N_2$+INERTS | 28.013 | lbmol/hr | | | 303.79 | | 307.97 |
| $O_2$ | 32.000 | lbmol/hr | | | | | |
| TOTAL DRY FLOW (1) | | lbmol/hr | 97.69 | | 17 767.80 | 8.60 | 19 021.79 |
| $H_2O$ | 18.016 | lbmol/hr | | 3 099.86 | 81.43 | 0.20 | 126.90 |
| METHANOL | 32.042 | lbmol/hr | | | | | |
| TOTAL WET FLOW (1) | | lbmol/hr | | | 17 849.23 | 8.80 | 19 148.69 |
| $C_3H_6$ | 42.08 | lbmol/hr | | | | 0.16 | 189.49 |
| $C_3H_8$ | 44.09 | lbmol/hr | | | | 0.87 | 18.25 |
| $1C_4H_8$ | 56.10 | lbmol/hr | | | | | 0.24 |
| $iC_4H_8$ | 56.10 | lbmol/hr | | | | | |
| $iC_4H_{10}$ | 58.12 | lbmol/hr | | | | 0.19 | 0.06 |
| $nC_4H_{10}$ | 58.12 | lbmol/hr | | | | 0.13 | 0.03 0.04 |
| $1C_5H_{10}$ | 70.13 | lbmol/hr | | | | | |
| $iC_5H_{10}$ | 70.13 | lbmol/hr | | | | | |
| $iC_5H_{12}$ | 72.15 | lbmol/hr | | | | 0.04 | |
| $nC_5H_{12}$ | 72.15 | lbmol/hr | | | | 0.06 | 0.01 |
| $1C_6H_{12}$ | 84.16 | lbmol/hr | | | | | 0.01 |
| $iC_6H_{12}$ | 84.16 | lbmol/hr | | | | | |
| $iC_6H_{14}$ | 86.17 | lbmol/hr | | | | | 0.01 |
| $nC_6H_{14}$ | 86.17 | lbmol/hr | | | | 0.01 | 0.01 |
| $C_6$ + | (2) | lbmol/hr | | | | | |
| $C_7$+ | (3) | lbmol/hr | | | | | 0.65 |
| ALCOHOLS | 46.61 | lbmol/hr | | | | | |
| TOTAL | | lb/hr | 220 | 55 847 | 299 803 | 225 | 317 644 |

(1) $C_3$+ INCLUDED
(2) MW OF $C_6$+
(3) MW OF $C_7$+ 153.24

# MATERIAL BALANCE

## BASE CASE II

| STREAM Nº | | 47 | 48 | 49 | 50 | 51 |
|---|---|---|---|---|---|---|
| | | STACK GAS FR. UNIT 214 | UNIT 113 OFFGAS | SNG PRODUCT | GASOLINE PRODUCT | UNIT 112 CONDENSATE |
| $CO_2$ | 44.010 lbmol/hr | 12.78 | 1 635.42 | 85.00 | | |
| $H_2S$ | 34.076 lbmol/hr | | | | | |
| COS | 60.070 lbmol/hr | | | | | |
| $C_2H_4$ | 28.054 lbmol/hr | | 0.50 | 187.58 | | |
| CO | 28.010 lbmol/hr | | 0.04 | 13.14 | | |
| $H_2$ | 2.016 lbmol/hr | | 2.70 | 718.83 | | |
| $CH_4$ | 16.043 lbmol/hr | | 48.18 | 17 055.10 | | |
| $C_2H_6$ | 30.070 lbmol/hr | | 1.20 | 445.37 | | |
| $N_2$+INERTS | 28.013 lbmol/hr | 93.11 | 0.80 | 307.97 | | |
| $O_2$ | 32.000 lbmol/hr | 3.23 | | | | |
| TOTAL DRY FLOW (1) | lbmol/hr | 109.12 | 1 689.39 | 19 021.79 | | |
| $H_2O$ | 18.016 lbmol/hr | 22.39 | 101.57 | 1.50 | | 6 150.09 |
| METHANOL | 32.042 lbmol/hr | | | | | |
| TOTAL WET FLOW (1) | lbmol/hr | 131.51 | 1 790.96 | 19 023.29 | | |
| $C_3H_6$ | 42.08 lbmol/hr | | 0.50 | 189.49 | | |
| $C_3H_8$ | 44.09 lbmol/hr | | 0.05 | 18.25 | | |
| $iC_4H_8$ | 56.10 lbmol/hr | | | 0.24 | 4.68 | |
| $iC_4H_8$ | 56.10 lbmol/hr | | | | | |
| $iC_4H_{10}$ | 58.12 lbmol/hr | | | 0.06 | 1.32 | |
| $nC_4H_{10}$ | 58.12 lbmol/hr | | | 0.03 | 89.05 | |
| $iC_5H_{10}$ | 70.13 lbmol/hr | | | 0.04 | 7.55 | |
| $iC_5H_{10}$ | 70.13 lbmol/hr | | | | | |
| $iC_5H_{12}$ | 72.15 lbmol/hr | | | | 305.63 | |
| $nC_5H_{12}$ | 72.15 lbmol/hr | | | 0.01 | 55.53 | |
| $iC_6H_{12}$ | 84.16 lbmol/hr | | | 0.01 | | |
| $iC_6H_{12}$ | 84.16 lbmol/hr | | | | 173.67 | |
| $iC_6H_{14}$ | 86.17 lbmol/hr | | | 0.01 | 30.72 | |
| $nC_6H_{14}$ | 86.17 lbmol/hr | | | 0.01 | | |
| $C_6$+ | (2) lbmol/hr | | | | | |
| $C_7$+ | (3) lbmol/hr | | | 0.65 | | |
| NAPHTHA | 97.36 lbmol/hr | | | | 158.43 | |
| ALKYLATE | 102.51 lbmol/hr | | | | 332.07 | |
| CAT POLY GASOLINE | lbmol/hr | | | | 350.88 | |
| TOTAL | (118.145 | 3 677 | 74 680 | 315 385 | 140 918 | 110 800 |
| (1) $C_3$+ INCLUDED | | | | | | |
| (2) MW OF $C_6$+ | | | | | | |
| (3) MW OF $C_7$+ | | | | 153.24 | | |

# MATERIAL BALANCE

## BASE CASE II

| STREAM Nº | | | 55 | 56 | 57 | | |
|---|---|---|---|---|---|---|---|
| | | | WATER MAKE UP TO UNIT 213 | STEAM FROM UNIT 214 | LIGHT GAS TO UNIT 213 | | |
| $CO_2$ | 44.010 | lbmol/hr | | | 1.040.25 | | |
| $H_2S$ | 34.076 | lbmol/hr | | | | | |
| COS | 60.070 | lbmol/hr | | | | | |
| $C_2H_4$ | 28.054 | lbmol/hr | | | 188.08 | | |
| CO | 28.010 | lbmol/hr | | | 8.92 | | |
| $H_2$ | 2.016 | lbmol/hr | | | 49.76 | | |
| $CH_4$ | 16.043 | lbmol/hr | | | 995.47 | | |
| $C_2H_6$ | 30.070 | lbmol/hr | | | 446.57 | | |
| $N_2$+INERTS | 28.013 | lbmol/hr | | | 4.98 | | |
| $O_2$ | 32.000 | lbmol/hr | | | | | |
| TOTAL DRY FLOW (1) | | lbmol/hr | | | 2 943.32 | | |
| $H_2O$ | 18.016 | lbmol/hr | 183.56 | 125.4 | 111.79 | | |
| METHANOL | 32.042 | lbmol/hr | | | | | |
| TOTAL WET FLOW (1) | | lbmol/hr | | | 3 055.11 | | |
| $C_3H_6$ | 42.08 | lbmol/hr | | | 189.99 | | |
| $C_3H_8$ | 44.09 | lbmol/hr | | | 18.30 | | |
| $iC_4H_8$ | 56.10 | lbmol/hr | | | 0.24 | | |
| $iC_4H_8$ | 56.10 | lbmol/hr | | | | | |
| $iC_4H_{10}$ | 58.12 | lbmol/hr | | | 0.06 | | |
| $nC_4H_{10}$ | 58.12 | lbmol/hr | | | 0.03 | | |
| $iC_5H_{10}$ | 70.13 | lbmol/hr | | | 0.04 | | |
| $iC_5H_{10}$ | 70.13 | lbmol/hr | | | | | |
| $iC_5H_{12}$ | 72.15 | lbmol/hr | | | | | |
| $nC_5H_{12}$ | 72.15 | lbmol/hr | | | 0.01 | | |
| $iC_6H_{12}$ | 84.16 | lbmol/hr | | | 0.01 | | |
| $iC_6H_{12}$ | 84.16 | lbmol/hr | | | | | |
| $iC_6H_{14}$ | 86.17 | lbmol/hr | | | 0.01 | | |
| $nC_6H_{14}$ | 86.17 | lbmol/hr | | | 0.01 | | |
| C6 + | (2) | lbmol/hr | | | | | |
| $C_7$+ | (3) | lbmol/hr | | | 0.65 | | |
| ALCOHOLS | 46.61 | lbmol/hr | | | | | |
| TOTAL | | lb/hr | 3 307 | 2 259 | 91 879 | | |

(1) $C_3$+ INCLUDED

(2) MW OF C6+ 153.24

(3) MW OF $C_7$+

# MATERIAL BALANCE

## BASE CASE II

| STREAM Nº | | | 59 | 60 | | | |
|---|---|---|---|---|---|---|---|
| | | | OIL TO UNIT 222/223 | OIL TO UNIT 224 | | | |
| $CO_2$ | 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 | | lbmol/hr | | | | | |
| $H_2O$ | 18.016 | lbmol/hr | | | | | |
| METHANOL | 32.042 | lbmol/hr | | | | | |
| TOTAL WET GAS | | lbmol/hr | | | | | |
| TOTAL DRY GAS | | lb/hr | | | | | |
| $H_2O$ | | lb/hr | | | | | |
| METHANOL | | lb/hr | | | | | |
| TAR | | lb/hr | | | | | |
| OIL | | lb/hr | 46 353 | 5 358 | | | |
| 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 | 46 353 | 5 358 | | | |

# MATERIAL BALANCE

## BASE CASE II

| STREAM Nº | | | 62 | 63 | 64 | 65 | 66 |
|---|---|---|---|---|---|---|---|
| | | | UNIT 224 STACKGAS | UNIT 223/222 STACKGAS | SO2 FROM UNIT 226 | STACKGAS TO ATMOSPHERE | N2 TO ATMOSPHERE |
| $CO_2$ | 44.010 | lbmol/hr | 358.85 | 61 895.55 | | 62 254.46 | |
| SO2 | 64.046 | lbmol/hr | 0.65 | 54.75 | 40.28 | 15.12 | |
| 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 | 2 010.60 | 127 685.79 | | 129 696.39 | 55 553.58 |
| $O_2$ | 32.000 | lbmol/hr | 69.68 | 2 157.04 | | 2 226.72 | 781.28 |
| TOTAL DRY FLOW (1) | | lbmol/hr | 2 439.78 | 191 793.13 | | 194 192.69 | 56 334.86 |
| $H_2O$ | 18.016 | lbmol/hr | 291.45 | 27 332.67 | | 27 624.12 | 641.87 |
| METHANOL | 32.042 | lbmol/hr | | | | | |
| TOTAL WET FLOW (1) | | lbmol/hr | 2 731.23 | 219 125.80 | | 221 816.81 | 56 976.73 |
| $C_3H_6$ | 42.08 | lbmol/hr | | | | | |
| $C_3H_8$ | 44.09 | lbmol/hr | | | | | |
| $iC_4H_8$ | 56.10 | lbmol/hr | | | | | |
| $iC_4H_8$ | 56.10 | lbmol/hr | | | | | |
| $iC_4H_{10}$ | 58.12 | lbmol/hr | | | | | |
| $nC_4H_{10}$ | 58.12 | lbmol/hr | | | | | |
| $iC_5H_{10}$ | 70.13 | lbmol/hr | | | | | |
| $iC_5H_{10}$ | 70.13 | lbmol/hr | | | | | |
| $iC_5H_{12}$ | 72.15 | lbmol/hr | | | | | |
| $nC_5H_{12}$ | 72.15 | lbmol/hr | | | | | |
| $iC_6H_{12}$ | 84.16 | lbmol/hr | | | | | |
| $iC_6H_{12}$ | 84.16 | lbmol/hr | | | | | |
| $iC_6H_{14}$ | 86.17 | lbmol/hr | | | | | |
| $nC_6H_{14}$ | 86.17 | lbmol/hr | | | | | |
| C6 + | (2) | lbmol/hr | | | | | |
| $C_7$+ | (3) | lbmol/hr | | | | | |
| ALCOHOLS | 46.61 | lbmol/hr | | | | | |
| TOTAL | | lb/hr | 81 432 | 6 865 883 | 2 577 | 6 942 944 | 1 592 787 |

(1) $C_3$+ INCLUDED
(2) MW OF $C_6$+
(3) MW OF $C_7$+

# MATERIAL BALANCE

## BASE CASE II

| STREAM Nº | | | 67 | 68 | 69 | 70 | 71 |
|---|---|---|---|---|---|---|---|
| | | | Air | Air to Units 222/223 | Stackgas | Air to Unit 221 | Water from Unit 221 |
| $CO_2$ | 44.010 | lbmol/hr | | | 2360.01 | | |
| $H_2S$ | 34.076 | lbmol/hr | | | 0.01 | | |
| COS | 60.070 | lbmol/hr | | | | | |
| $C_2H_4$ | 28.054 | lbmol/hr | | | 0.50 | | |
| CO | 28.010 | lbmol/hr | | | 0.04 | | |
| $H_2$ | 2.016 | lbmol/hr | | | 29.49 | | |
| $CH_4$ | 16.043 | lbmol/hr | | | 54.10 | | |
| $C_2H_6$ | 30.070 | lbmol/hr | | | 1.48 | | |
| $N_2$+INERTS | 28.013 | lbmol/hr | 185 432.79 | 122 357.89 | 5 234.76 | 55 831.48 | |
| $O_2$ | 32.000 | lbmol/hr | 49 292.26 | 32 525.51 | 176.67 | 14 841.28 | |
| TOTAL DRY FLOW (1) | | lbmol/hr | 234 725.05 | 154 883.40 | 7 857.77 | 70 672.76 | |
| $H_2O$ | 18.016 | lbmol/hr | 5 840.63 | 3 853.91 | 1 353.12 | 1 758.61 | 1 116.73 |
| METHANOL | 32.042 | lbmol/hr | | | | | |
| TOTAL WET FLOW (1) | | lbmol/hr | 240 565.68 | 158 737.31 | 9 210.89 | 72 431.37 | |
| $C_3H_6$ | 42.08 | lbmol/hr | | | 0.50 | | |
| $C_3H_8$ | 44.09 | lbmol/hr | | | 0.07 | | |
| $iC_4H_8$ | 56.10 | lbmol/hr | | | | | |
| $1C_4H_8$ | 56.10 | lbmol/hr | | | | | |
| $iC_4H_{10}$ | 58.12 | lbmol/hr | | | | | |
| $nC_4H_{10}$ | 58.12 | lbmol/hr | | | | | |
| $1C_5H_{10}$ | 70.13 | lbmol/hr | | | | | |
| $1C_5H_{10}$ | 70.13 | lbmol/hr | | | | | |
| $iC_5H_{12}$ | 72.15 | lbmol/hr | | | | | |
| $nC_5H_{12}$ | 72.15 | lbmol/hr | | | 0.14 | | |
| $1C_6H_{12}$ | 84.16 | lbmol/hr | | | | | |
| $iC_6H_{12}$ | 84.16 | lbmol/hr | | | | | |
| $iC_6H_{14}$ | 86.17 | lbmol/hr | | | | | |
| $nC_6H_{14}$ | 86.17 | lbmol/hr | | | | | |
| C6 + | (2) | lbmol/hr | | | | | |
| $C_7$+ | (3) | lbmol/hr | | | | | |
| ALCOHOLS | 46.61 | lbmol/hr | | | | | |
| TOTAL | | lb/hr | 6877 107 | 4 537 860 | 281 560 | 2070 606 | 20 119 |

(1) $C_3$+ INCLUDED
(2) MW OF C6 +
(3) MW OF C7 +

# MATERIAL BALANCE

## BASE CASE II

| STREAM Nº | | 72 | 73 | | | |
|---|---|---|---|---|---|---|
| | | Air to Unit 235 | Air to Unit 214 | | | |
| $CO_2$ | 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 | | 93.11 | | | |
| $O_2$ | 32.000 lbmol/hr | | 24.75 | | | |
| TOTAL DRY FLOW (1) | lbmol/hr | | 117.86 | | | |
| $H_2O$ | 18.016 lbmol/hr | | 2.93 | | | |
| METHANOL | 32.042 lbmol/hr | | | | | |
| TOTAL WET FLOW (1) | lbmol/hr | | 120.79 | | | |
| $C_3H_6$ | 42.08 lbmol/hr | | | | | |
| $C_3H_8$ | 44.09 lbmol/hr | | | | | |
| $1C_4H_8$ | 56.10 lbmol/hr | | | | | |
| $iC_4H_8$ | 56.10 lbmol/hr | | | | | |
| $iC_4H_{10}$ | 58.12 lbmol/hr | | | | | |
| $nC_4H_{10}$ | 58.12 lbmol/hr | | | | | |
| $1C_5H_{10}$ | 70.13 lbmol/hr | | | | | |
| $iC_5H_{10}$ | 70.13 lbmol/hr | | | | | |
| $iC_5H_{12}$ | 72.15 lbmol/hr | | | | | |
| $nC_5H_{12}$ | 72.15 lbmol/hr | | | | | |
| $1C_6H_{12}$ | 84.16 lbmol/hr | | | | | |
| $iC_6H_{12}$ | 84.16 lbmol/hr | | | | | |
| $iC_6H_{14}$ | 86.17 lbmol/hr | | | | | |
| $nC_6H_{14}$ | 86.17 lbmol/hr | | | | | |
| £C6 + | (2) lbmol/hr | | | | | |
| $C_7$+ | (3) lbmol/hr | | | | | |
| ALCOHOLS | 46.61 lbmol/hr | | | | | |
| TOTAL | lb/hr | 440 000 | 3 453 | | | |

(1) $C_3$+ INCLUDED
(2) MW OF $C_6$+
(3) MW OF $C_7$+

# MATERIAL BALANCE

BASE CASE II

| STREAM Nº | | | 76 | 77 | | | |
|---|---|---|---|---|---|---|---|
| | | | Water from from Unit 251 | Acid Water to Unit 235 | | | |
| $CO_2$ | 44.010 | lbmol/hr | | | | | |
| $H_2S$ | 34.076 | lbmol/hr | 1 | 1 | | | |
| 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 | 449.43 | 26 655.46 | | | |
| METHANOL | 32.042 | lbmol/hr | | | | | |
| TOTAL WET FLOW (1) | | lbmol/hr | 451.43 | 26 743.94 | | | |
| | | | | | | | |
| ETHANOL | 46.07 | lbmol/hr | | | | | |
| HEAVY ALCOHOLS (2) | | lbmol/hr | | | | | |
| ACIDS | 63.24 | lbmol/hr | | 86.48 | | | |
| $NH_3$ | 17.03 | lbmol/hr | 1 | 1 | | | |
| $Fe_3O_4$ | | lb/hr | | | | | |
| Fe CATALYST | | lb/hr | | | | | |
| TOTAL | | lb/hr | 8 148 | 485 190 | | | |

(1) ETHANOL, ALCOHOLS & ACIDS INCLUDED

(2) MW OF HEAVY ALCOHOLS

# MATERIAL BALANCE

## BASE CASE II

| STREAM Nº | | | 78 | 79 | 80 | 81 |
|---|---|---|---|---|---|---|
| | | | Steam to Unit 208 | Unit 251 Purge Gas | Treated Water | BFW to Unit 206 |
| $CO_2$ | 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 | | 5.92 | | |
| $C_2H_6$ | 30.070 | lbmol/hr | | 0.28 | | |
| $N_2$+INERTS | 28.013 | lbmol/hr | | | | |
| $O_2$ | 32.000 | lbmol/hr | | | | |
| TOTAL DRY FLOW (1) | | lbmol/hr | | 33.25 | | |
| $H_2O$ | 18.016 | lbmol/hr | 344.14 | 0.05 | 108 900.25 | 2 130.88 |
| METHANOL | 32.042 | lbmol/hr | | | | |
| TOTAL WET FLOW (1) | | lbmol/hr | | 33.30 | | |
| $C_3H_6$ | 42.08 | lbmol/hr | | | | |
| $C_3H_8$ | 44.09 | lbmol/hr | | 0.02 | | |
| $iC_4H_8$ | 56.10 | lbmol/hr | | | | |
| $iC_4H_8$ | 56.10 | lbmol/hr | | | | |
| $iC_4H_{10}$ | 58.12 | lbmol/hr | | | | |
| $nC_4H_{10}$ | 58.12 | lbmol/hr | | | | |
| $iC_5H_{10}$ | 70.13 | lbmol/hr | | | | |
| $iC_5H_{10}$ | 70.13 | lbmol/hr | | | | |
| $iC_5H_{12}$ | 72.15 | lbmol/hr | | | | |
| $nC_5H_{12}$ | 72.15 | lbmol/hr | | 0.14 | | |
| $iC_6H_{12}$ | 84.16 | lbmol/hr | | | | |
| $iC_6H_{12}$ | 84.16 | lbmol/hr | | | | |
| $iC_6H_{14}$ | 86.17 | lbmol/hr | | | | |
| $nC_6H_{14}$ | 86.17 | lbmol/hr | | | | |
| $C_6$+ | (2) | lbmol/hr | | | | |
| $C_7$+ | (3) | lbmol/hr | | | | |
| ALCOHOLS | 46.61 | lbmol/hr | | | | |
| TOTAL | | lb/hr | 6 200 | 169 | 1 961 947 | 38 390 |

(1) $C_1$+ INCLUDED
(2) MW OF $C_6$+
(3) MW OF $C_7$+

# MATERIAL BALANCE

## BASE CASE II

| STREAM Nº | | | 82 | 84 | 85.1 | 85.2 | 86 |
|---|---|---|---|---|---|---|---|
| | | | Water from Unit 213 | Air to Unit 224 | Air to Unit 206 | Air from Unit 206 | BFW Make Up Water |
| $CO_2$ | 44.010 | lbmol/hr | | | | | |
| $H_2S$ | 34.076 | lbmol/hr | | | | | |
| COS | 60.070 | lbmol/hr | | | | | |
| $C_2H_4$ | 28.054 | lbmol/hr | | | air surplus | Air surplus | |
| CO | 28.010 | lbmol/hr | | | + N 2 | + N 2 | |
| $H_2$ | 2.016 | lbmol/hr | | | not | not | |
| $CH_4$ | 16.043 | lbmol/hr | | | balanced | balanced | |
| $C_2H_6$ | 30.070 | lbmol/hr | | | | | |
| $N_2$ +INERTS | 28.013 | lbmol/hr | | 2 009.71 | | | |
| $O_2$ | 32.000 | lbmol/hr | | 534.23 | 78.88 | | |
| TOTAL DRY FLOW (1) | | lbmol/hr | | 2 543.94 | | | |
| $H_2O$ | 18.016 | lbmol/hr | 148.31 | 63.30 | | | 118 805.51 |
| METHANOL | 32.042 | lbmol/hr | | | | | |
| TOTAL WET FLOW (1) | | lbmol/hr | | 2 607.24 | | | |
| $C_3H_6$ | 42.08 | lbmol/hr | | | | | |
| $C_3H_8$ | 44.09 | lbmol/hr | | | | | |
| $iC_4H_8$ | 56.10 | lbmol/hr | | | | | |
| $iC_4H_8$ | 56.10 | lbmol/hr | | | | | |
| $iC_4H_{10}$ | 58.12 | lbmol/hr | | | | | |
| $nC_4H_{10}$ | 58.12 | lbmol/hr | | | | | |
| $iC_5H_{10}$ | 70.13 | lbmol/hr | | | | | |
| $iC_5H_{10}$ | 70.13 | lbmol/hr | | | | | |
| $iC_5H_{12}$ | 72.15 | lbmol/hr | | | | | |
| $nC_5H_{12}$ | 72.15 | lbmol/hr | | | | | |
| $iC_6H_{12}$ | 84.16 | lbmol/hr | | | | | |
| $iC_6H_{12}$ | 84.16 | lbmol/hr | | | | | |
| $iC_6H_{14}$ | 86.17 | lbmol/hr | | | | | |
| $nC_6H_{14}$ | 86.17 | lbmol/hr | | | | | |
| C6 + | (2) | lbmol/hr | | | | | |
| $C_7$+ | (3) | lbmol/hr | | | | | |
| ALCOHOLS | 46.61 | lbmol/hr | | | | | |
| TOTAL | | lb/hr | 2 672 | 76 212 | 2 524 | 0 | 2 140 400 |

(1) $C_3$+ INCLUDED
(2) MW OF $C_6$+
(3) MW OF $C_7$+

# MATERIAL BALANCE

## BASE CASE II

| STREAM Nº | | | 87 | 88 | 89 | 90 | 91 |
|---|---|---|---|---|---|---|---|
| | | | BLOW DOWN FROM UNIT 222 | C.W. MAKE UP WATER | EVAPORATION LOSSES OF U233 | WASTE AIR UNIT 235 | C.W. BLOW DOWN |
| $CO_2$ | 44.010 | lbmol/hr | | | | 313.89 | |
| SO 2 | 64.046 | lbmol/hr | | | | 1.88 | |
| 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 | | | | 11 632.83 | |
| $O_2$ | 32.000 | lbmol/hr | | | | 2 703.65 | |
| TOTAL DRY GAS | | lbmol/hr | | | | 14 652.25 | |
| $H_2O$ | 18.016 | lbmol/hr | 8 603.46 | 65 480.68 | 133 936.50 | 776.05 | 37 907.80 |
| METHANOL | 32.042 | lbmol/hr | | | | | |
| TOTAL WET GAS | | lbmol/hr | | | | 15 428.30 | |
| TOTAL DRY GAS | | lb/hr | | | | 426 322 | |
| $H_2O$ | | lb/hr | 155 000 | 1179 700 | 2413 000 | 13 981 | 682 947 |
| METHANOL | | lb/hr | | | | | |
| TAR | | lb/hr | | | | | |
| OIL | | lb/hr | | | | | |
| NAPHTHA | | lb/hr | | | | Air surplus | |
| CRUDE PHENOLS | | lb/hr | | | | not balanced | |
| 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 | 155 000 | 1179 700 | 2413 000 | 440 303 | 682 947 |

# MATERIAL BALANCE

## BASE CASE II

| STREAM Nº | | | 92 | 93 | 94 | 95 | 96 |
|---|---|---|---|---|---|---|---|
| | | | | Sluice Vent | Steam to Unit 251 | Deaerator losses | UNIT 232 Blow Down |
| $CO_2$ | 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 | | Air not | | | |
| $N_2$+INERTS | 28.013 | lbmol/hr | | | | | |
| $O_2$ | 32.000 | lbmol/hr | | balanced | | | |
| TOTAL DRY FLOW (1) | | lbmol/hr | | | | | |
| $H_2O$ | 18.016 | lbmol/hr | 2 525.53 | 1 415.41 | 394.09 | 555.06 | 962.87 |
| METHANOL | 32.042 | lbmol/hr | | | | | |
| TOTAL WET FLOW (1) | | lbmol/hr | | | | | |
| $C_3H_6$ | 42.08 | lbmol/hr | | | | | |
| $C_3H_8$ | 44.09 | lbmol/hr | | | | | |
| $iC_4H_8$ | 56.10 | lbmol/hr | | | | | |
| $iC_4H_8$ | 56.10 | lbmol/hr | | | | | |
| $iC_4H_{10}$ | 58.12 | lbmol/hr | | | | | |
| $nC_4H_{10}$ | 58.12 | lbmol/hr | | | | | |
| $iC_5H_{10}$ | 70.13 | lbmol/hr | | | | | |
| $iC_5H_{10}$ | 70.13 | lbmol/hr | | | | | |
| $iC_5H_{12}$ | 72.15 | lbmol/hr | | | | | |
| $nC_5H_{12}$ | 72.15 | lbmol/hr | | | | | |
| $iC_6H_{12}$ | 84.16 | lbmol/hr | | | | | |
| $iC_6H_{12}$ | 84.16 | lbmol/hr | | | | | |
| $iC_6H_{14}$ | 86.17 | lbmol/hr | | | | | |
| $nC_6H_{14}$ | 86.17 | lbmol/hr | | | | | |
| C6+ | (2) | lbmol/hr | | | | | |
| $C_7$+ | (3) | lbmol/hr | | | | | |
| ALCOHOLS | 46.61 | lbmol/hr | | | | | |
| TOTAL | | lb/hr | 45 500 | 25 500 | 7 100 | 10 000 | 17 347 |

(1) $C_3$+ INCLUDED
(2) MW OF $C_6$+
(3) MW OF $C_7$+

# MATERIAL BALANCE

## BASE CASE II

| STREAM Nº | | | 97 | | | | |
|---|---|---|---|---|---|---|---|
| | | | UNIT 235 STRIPPINGSTEAM | | | | |
| $CO_2$ | 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 | | | | | |
| $C_3H_6$ | 42.08 | lbmol/hr | | | | | |
| $C_3H_8$ | 44.09 | lbmol/hr | | | | | |
| $1C_4H_8$ | 56.10 | lbmol/hr | | | | | |
| $iC_4H_8$ | 56.10 | lbmol/hr | | | | | |
| $iC_4H_{10}$ | 58.12 | lbmol/hr | | | | | |
| $nC_4H_{10}$ | 58.12 | lbmol/hr | | | | | |
| $1C_5H_{10}$ | 70.13 | lbmol/hr | | | | | |
| $iC_5H_{10}$ | 70.13 | lbmol/hr | | | | | |
| $iC_5H_{12}$ | 72.15 | lbmol/hr | | | | | |
| $nC_5H_{12}$ | 72.15 | lbmol/hr | | | | | |
| $1C_6H_{12}$ | 84.16 | lbmol/hr | | | | | |
| $iC_6H_{12}$ | 84.16 | lbmol/hr | | | | | |
| $iC_6H_{14}$ | 86.17 | lbmol/hr | | | | | |
| $nC_6H_{14}$ | 86.17 | lbmol/hr | | | | | |
| $C_6$ + | (2) | lbmol/hr | | | | | |
| $C_7$+ | (3) | lbmol/hr | | | | | |
| ALCOHOLS | 46.61 | lbmol/hr | | | | | |
| TOTAL | | lb/hr | 9 000 | | | | |

(1) $C_3$+ INCLUDED
(2) MW OF $C_6$+
(3) MW OF $C_7$+

# MATERIAL BALANCE

## BASE CASE II

| STREAM Nº | | | 100 | 101 | 102 | 103 | 104 |
|---|---|---|---|---|---|---|---|
| | | | NAPHTHA FROM UNIT 251 | WASH WATER TO UNIT 251 | FEED TO UNIT 210 | LIGHT OIL UNIT 250 | HEAVY OIL FROM UNIT 250 |
| $CO_2$ | 44.010 | lbmol/hr | | | 3 084.66 | 16.87 | 0.35 |
| $H_2S$ | 34.076 | lbmol/hr | | | | | |
| COS | 60.070 | lbmol/hr | | | | | |
| $C_2H_4$ | 28.054 | lbmol/hr | | | 378.13 | 2.41 | 0.06 |
| CO | 28.010 | lbmol/hr | | | 483.04 | 0.29 | 0.03 |
| $H_2$ | 2.016 | lbmol/hr | | | 9 334.26 | 2.71 | 0.30 |
| $CH_4$ | 16.043 | lbmol/hr | | | 14 227.78 | 29.52 | 0.90 |
| $C_2H_6$ | 30.070 | lbmol/hr | | | 810.76 | 6.81 | 0.13 |
| $N_2$+INERTS | 28.013 | lbmol/hr | | | 308.79 | 0.19 | 0.02 |
| $O_2$ | 32.000 | lbmol/hr | | | | | |
| TOTAL DRY FLOW (1) | | lbmol/hr | 160.41 | | 30 292.01 | 730.70 | 35.75 |
| $H_2O$ | 18.016 | lbmol/hr | | 48.29 | 117.29 | | |
| METHANOL | 32.042 | lbmol/hr | | | | | |
| TOTAL WET FLOW (1) | | lbmol/hr | | | 30 409.30 | | |
| $C_3H_6$ | 42.08 | lbmol/hr | | | 728.15 | 16.95 | 0.20 |
| $C_3H_8$ | 44.09 | lbmol/hr | | | 121.20 | 3.21 | 0.04 |
| $1C_4H_8$ | 56.10 | lbmol/hr | | | 371.27 | 28.84 | 0.19 |
| $iC_4H_8$ | 56.10 | lbmol/hr | | | | | |
| $iC_4H_{10}$ | 58.12 | lbmol/hr | | | 2.43 | 0.17 | |
| $nC_4H_{10}$ | 58.12 | lbmol/hr | 1.98 | | 45.29 | 4.01 | 0.03 |
| $1C_5H_{10}$ | 70.13 | lbmol/hr | | | 187.20 | 43.85 | 0.17 |
| $iC_5H_{10}$ | 70.13 | lbmol/hr | | | | | |
| $iC_5H_{12}$ | 72.15 | lbmol/hr | | | 8.06 | 1.83 | 0.01 |
| $nC_5H_{12}$ | 72.15 | lbmol/hr | | | 23.09 | 6.60 | 0.02 |
| $1C_6H_{12}$ | 84.16 | lbmol/hr | | | 91.42 | 60.95 | 0.14 |
| $iC_6H_{12}$ | 84.16 | lbmol/hr | | | | | |
| $iC_6H_{14}$ | 86.17 | lbmol/hr | | | 6.66 | 4.50 | 0.01 |
| $nC_6H_{14}$ | 86.17 | lbmol/hr | | | 13.92 | 12.14 | 0.02 |
| $C_6$+ | (2) | lbmol/hr | | | | | |
| $C_7$+ | (3) | lbmol/hr | | | 65.90 | 488.85 | 33.13 |
| ALCOHOLS | 46.61 | lbmol/hr | | | | | |
| NAPHTHA | 97.30 | | 158.43 | | | | |
| TOTAL | | lb/hr | 15 541 | 870 | 533 527 | 84 738 | 11 399 |
| (1) $C_3$+ INCLUDED | | | | | | | |
| (2) MW OF $C_6$+ | | | | | | | |
| (3) MW OF $C_7$+ | | | | | 106.10 | 143.74 | 341.39 |

# MATERIAL BALANCE

BASE CASE II

| STREAM Nº | | | 105 | | | | |
|---|---|---|---|---|---|---|---|
| | | | FEED TO UNIT 262 | | | | |
| $CO_2$ | 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 | 25 010.71 | | | | |
| METHANOL | 32.042 | lbmol/hr | 11.67 | | | | |
| TOTAL WET FLOW (1) | | lbmol/hr | 25 560.50 | | | | |
| ETHANOL | 46.07 | lbmol/hr | 286,56 | | | | |
| HEAVY ALCOHOLS (2) | | lbmol/hr | 86.48 | | | | |
| ACIDS | 63.24 | lbmol/hr | | | | | |
| $NH_3$ | 17.03 | lbmol/hr | | | | | |
| $Fe_3O_4$ | | lb/hr | | | | | |
| Fe CATALYST | | lb/hr | | | | | |
| OTHERS | | | 4 558 | | | | |
| TOTAL | | lb/hr | 479 848 | | | | |
| (1) ETHANOL, ALCOHOLS & ACIDS INCLUDED | | | | | | | |
| (2) MW OF HEAVY ALCOHOLS | | | 65.00 | | | | |

# MATERIAL BALANCE

## BASE CASE II

| STREAM Nº | | | 106 | 107 | 108 | 109 | |
|---|---|---|---|---|---|---|---|
| | | | LIGHT GAS FR. UNIT 252 | FEED TO UNIT 257 | FEED TO UNIT 253 | VACUUM RESIDUAL TO UNIT222 | |
| $CO_2$ | 44.010 | lbmol/hr | 1 087.22 | | | | |
| $H_2S$ | 34.076 | lbmol/hr | | | | | |
| COS | 60.070 | lbmol/hr | | | | | |
| $C_2H_4$ | 28.054 | lbmol/hr | 196.57 | | | | |
| CO | 28.010 | lbmol/hr | 9.32 | | | | |
| $H_2$ | 2.016 | lbmol/hr | 52.01 | | | | |
| $CH_4$ | 16.043 | lbmol/hr | 1 040.42 | | | | |
| $C_2H_6$ | 30.070 | lbmol/hr | 466.73 | 1.00 | | | |
| $N_2$+INERTS | 28.013 | lbmol/hr | 5.21 | | | | |
| $O_2$ | 32.000 | lbmol/hr | | | | | |
| TOTAL DRY FLOW (1) | | lbmol/hr | 3 076.23 | 1 093.06 | 1 100.41 | 4.23 | |
| $H_2O$ | 18.016 | lbmol/hr | 116.86 | 0.42 | | | |
| METHANOL | 32.042 | lbmol/hr | | | | | |
| TOTAL WET FLOW (1) | | lbmol/hr | 3 193.09 | 1 093.48 | | | |
| $C_3H_6$ | 42.08 | lbmol/hr | 198.57 | 546.73 | | | |
| $C_3H_8$ | 44.09 | lbmol/hr | 19.13 | 105.32 | | | |
| $iC_4H_8$ | 56.10 | lbmol/hr | 0.25 | 384.64 | 15.41 | | |
| $iC_4H_8$ | 56.10 | lbmol/hr | | | | | |
| $iC_4H_{10}$ | 58.12 | lbmol/hr | 0.01 | 2.52 | 0.07 | | |
| $nC_4H_{10}$ | 58.12 | lbmol/hr | 0.03 | 44.29 | 5.01 | | |
| $iC_5H_{10}$ | 70.13 | lbmol/hr | 0.04 | 7.55 | 223.63 | | |
| $iC_5H_{10}$ | 70.13 | lbmol/hr | | | | | |
| $iC_5H_{12}$ | 72.15 | lbmol/hr | | 0.75 | 9.15 | | |
| $nC_5H_{12}$ | 72.15 | lbmol/hr | 0.01 | 0.26 | 29.44 | | |
| $iC_6H_{12}$ | 84.16 | lbmol/hr | 0.01 | | 152.50 | | |
| $iC_6H_{12}$ | 84.16 | lbmol/hr | | | | | |
| $iC_6H_{14}$ | 86.17 | lbmol/hr | 0.01 | | 11.16 | | |
| $nC_6H_{14}$ | 86.17 | lbmol/hr | 0.01 | | | | |
| $C_6$+ | (2) | lbmol/hr | | | 26.07 | | |
| $C_7$+ | (3) | lbmol/hr | 0.68 | | 577.97 | 4.23 | |
| ALCOHOLS | 51.24 | lbmol/hr | | | 50 | | |
| TOTAL | | lb/hr | 96 028 | 52 589 | 123 922 | 2 019 | |
| (1) $C_3$+ INCLUDED | | | | | | | |
| (2) MW OF $C_6$+ | | | | | | | |
| (3) MW OF $C_7$+ | | | 153.24 | | 148.29 | 477.30 | |

# MATERIAL BALANCE

## BASE CASE II

| STREAM Nº | | | 110 | 111 | 112 | 113 | 114 |
|---|---|---|---|---|---|---|---|
| | | | $H_2$ TO UNIT 253 | $H_2$ to UNIT 259 | FEED TO UNIT 254 | WASTE WATER FROM UNIT 253 | STRIPPINGSTEAM TO UNIT 254 |
| $CO_2$ | 44.010 | lbmol/hr | 3.15 | 2.55 | 0.60 | | |
| $H_2S$ | 34.076 | lbmol/hr | | | | | |
| COS | 60.070 | lbmol/hr | | | | | |
| $C_2H_2$ | 28.054 | lbmol/hr | | | | | |
| CO | 28.010 | lbmol/hr | | | | | |
| $H_2$ | 2.016 | lbmol/hr | 1 444.55 | 362.12 | 44.19 | | |
| $CH_4$ | 16.043 | lbmol/hr | 56.50 | 37.32 | 24.66 | | |
| $C_2H_6$ | 30.070 | lbmol/hr | 13.50 | 18.87 | 49.56 | | |
| $N_2$+INERTS | 28.013 | lbmol/hr | | | | | |
| $O_2$ | 32.000 | lbmol/hr | | | | | |
| TOTAL DRY FLOW (1) | | lbmol/hr | 1 518.53 | 427.73 | 1 204.68 | | |
| $H_2O$ | 18.016 | lbmol/hr | | 0.80 | 7.75 | 135.10 | 62.17 |
| METHANOL | 32.042 | lbmol/hr | | | | | |
| TOTAL WET FLOW (1) | | lbmol/hr | | 428.53 | 1 212.43 | 135.10 | 62.17 |
| $C_3H_6$ | 42.08 | lbmol/hr | | | | | |
| $C_3H_8$ | 44.09 | lbmol/hr | 0.62 | 0.91 | 7.37 | | |
| $1C_4H_8$ | 56.10 | lbmol/hr | | | | | |
| $iC_4H_8$ | 56.10 | lbmol/hr | | | | | |
| $iC_4H_{10}$ | 58.12 | lbmol/hr | 0.03 | 0.23 | 4.37 | | |
| $nC_4H_{10}$ | 58.12 | lbmol/hr | | 0.93 | 24.92 | | |
| $1C_5H_{10}$ | 70.13 | lbmol/hr | | | | | |
| $iC_5H_{10}$ | 70.13 | lbmol/hr | | | | | |
| $iC_5H_{12}$ | 72.15 | lbmol/hr | 0.14 | 0.74 | 48.14 | | |
| $nC_5H_{12}$ | 72.15 | lbmol/hr | | 2.84 | 235.13 | | |
| $1C_6H_{12}$ | 84.16 | lbmol/hr | | | | | |
| $iC_6H_{12}$ | 84.16 | lbmol/hr | | | | | |
| $iC_6H_{14}$ | 86.17 | lbmol/hr | 0.04 | 0.32 | 61.51 | | |
| $nC_6H_{14}$ | 86.17 | lbmol/hr | | | | | |
| C6+ | (2) | lbmol/hr | | 0.61 | 150.67 | | |
| $C_7$+ | (3) | lbmol/hr | | 0.29 | 553.56 | | |
| ALCOHOLS | 46.61 | lbmol/hr | | | | | |
| TOTAL | | lb/hr | 4 411 | 2 500 | 123 398 | 2 434 | 1 120 |
| (1) $C_3$+ INCLUDED | | | | | | | |
| (2) MW OF C6+ | | | | | | | |
| (3) MW OF $C_7$+ | | | | 103.00 | 145.03 | | |

# MATERIAL BALANCE

## BASE CASE II

| STREAM Nº | | | 115 | 116 | 117 | 118 | 119 |
|---|---|---|---|---|---|---|---|
| | | | FEED TO UNIT 260 | WASTE WATER FR.UNIT 254 | DISTILLATE FUELOIL PROD. | HEAVY FUELOIL PRODUCT | FEED TO UNIT 260 |
| $CO_2$ | 44.010 | lbmol/hr | 0.52 | | | | 0.08 |
| $H_2S$ | 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 | 43.62 | | | | 0.57 |
| $CH_4$ | 16.043 | lbmol/hr | 22.39 | | | | 2.27 |
| $C_2H_6$ | 30.070 | lbmol/hr | 34.85 | | | | 14.71 |
| $N_2$+INERTS | 28.013 | lbmol/hr | | | | | |
| $O_2$ | 32.000 | lbmol/hr | | | | | |
| TOTAL DRY FLOW (1) | | lbmol/hr | 134.48 | | 129.79 | 22.81 | 44.21 |
| $H_2O$ | 18.016 | lbmol/hr | 5.27 | 62.17 | 1.98 | 0.50 | |
| METHANOL | 32.042 | lbmol/hr | | | | | |
| TOTAL WET FLOW (1) | | lbmol/hr | 139.75 | 62.17 | 131.77 | 23.31 | |
| $C_3H_6$ | 42.08 | lbmol/hr | | | | | |
| $C_3H_8$ | 44.09 | lbmol/hr | 3.08 | | | | 4.29 |
| $iC_4H_8$ | 56.10 | lbmol/hr | | | | | |
| $iC_4H_8$ | 56.10 | lbmol/hr | | | | | |
| $iC_4H_{10}$ | 58.12 | lbmol/hr | 0.97 | | | | 3.34 |
| $nC_4H_{10}$ | 58.12 | lbmol/hr | 4.31 | | | | 18.26 |
| $iC_5H_{10}$ | 70.13 | lbmol/hr | | | | | |
| $iC_5H_{10}$ | 70.13 | lbmol/hr | | | | | |
| $iC_5H_{12}$ | 72.15 | lbmol/hr | 3.73 | | | | 0.41 |
| $nC_5H_{12}$ | 72.15 | lbmol/hr | 14.55 | | 0.02 | | 0.28 |
| $iC_6H_{12}$ | 84.16 | lbmol/hr | | | | | |
| $iC_6H_{12}$ | 84.16 | lbmol/hr | | | | | |
| $iC_6H_{14}$ | 86.17 | lbmol/hr | 1.69 | | 0.02 | | |
| $nC_6H_{14}$ | 86.17 | lbmol/hr | | | 0.05 | | |
| C6 + | (2) | lbmol/hr | 3.18 | | | | |
| $C_7$+ | (3) | lbmol/hr | 1.59 | | 129.70 | 24.32 | |
| ALCOHOLS | 46.61 | lbmol/hr | | | | | |
| TOTAL | | lb/hr | 3 959 | 1 120 | 25 425 | 7 445 | 1 978 |
| (1) $C_3$+ INCLUDED | | | | | | | |
| (2) MW OF $C_6$+ | | | | | | | |
| (3) MW OF $C_7$+ | | | 103.82 | | 195.70 | 326.00 | |

# MATERIAL BALANCE

## BASE CASE II

| STREAM Nº | | | 120 | 121 | 122 | 123 | 124 |
|---|---|---|---|---|---|---|---|
| | | | FEED TO UNIT 256 | FEED TO UNIT 255 | FEED TO UNIT 261 | UNIT 255 OFF GAS | FEED TO UNIT 260 |
| $CO_2$ | 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 | | | 373.07 | 2.04 | 0.64 |
| $CH_4$ | 16.043 | lbmol/hr | | | 36.80 | 0.75 | 1.21 |
| $C_2H_6$ | 30.070 | lbmol/hr | | | 42.38 | 1.35 | 7.95 |
| $N_2$+INERTS | 28.013 | lbmol/hr | | | | | |
| $O_2$ | 32.000 | lbmol/hr | | | | | |
| TOTAL DRY FLOW (1) | | lbmol/hr | 474.45 | 397.43 | 552.35 | 7.86 | 103.43 |
| $H_2O$ | 18.016 | lbmol/hr | | | | | |
| METHANOL | 32.042 | lbmol/hr | | | | | |
| TOTAL WET FLOW (1) | | lbmol/hr | | | | | |
| $C_3H_6$ | 42.08 | lbmol/hr | | | | | |
| $C_3H_8$ | 44.09 | lbmol/hr | | | 54.00 | 2.22 | 35.82 |
| $iC_4H_6$ | 56.10 | lbmol/hr | | | | | |
| $iC_4H_8$ | 56.10 | lbmol/hr | | | | | |
| $iC_4H_{10}$ | 58.12 | lbmol/hr | 0.06 | | 18.48 | 0.91 | 31.17 |
| $nC_4H_{10}$ | 58.12 | lbmol/hr | 2.35 | | 12.58 | 0.59 | 26.64 |
| $iC_5H_{10}$ | 70.13 | lbmol/hr | | | | | |
| $iC_5H_{10}$ | 70.13 | lbmol/hr | | | | | |
| $iC_5H_{12}$ | 72.15 | lbmol/hr | 44.00 | | 7.28 | | |
| $nC_5H_{12}$ | 72.15 | lbmol/hr | 220.28 | | 3.56 | | |
| $iC_6H_{12}$ | 84.16 | lbmol/hr | | | | | |
| $iC_6H_{12}$ | 84.16 | lbmol/hr | | | | | |
| $iC_6H_{14}$ | 86.17 | lbmol/hr | 59.77 | 0.03 | | | |
| $nC_6H_{14}$ | 86.17 | lbmol/hr | 146.74 | 0.70 | | | |
| $C_6$+ | (2) | lbmol/hr | | | 4.20 | | |
| $C_7$+ | (3) | lbmol/hr | 1.25 | 396.70 | | | |
| | | lbmol/hr | | | | | |
| TOTAL | | lb/hr | 37 128 | 46 972 | 7 981 | 242 | 5 199 |
| (1) $C_3$+ INCLUDED | | | | | | | |
| (2) MW OF $C_6$+ | | | | | 94.00 | | |
| (3) MW OF $C_7$+ | | | 100.20 | 116.22 | | | |

# MATERIAL BALANCE

## BASE CASE II

| STREAM Nº | | | 125 | 126 | 127 | 128 | 129 |
|---|---|---|---|---|---|---|---|
| | | | REFORMATE FR. UNIT 255 | $H_2$ TO UNIT 256 | ISOMERATE FR. UNIT 256 | ISOMERATE FR. UNIT 256 | $H_2$ RICH OFF FR. UNIT 256 |
| $CO_2$ | 44.010 | lbmol/hr | | 0.03 | | | 0.06 |
| $H_2S$ | 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 | | 18.98 | | | 3.89 |
| $CH_4$ | 16.043 | lbmol/hr | | 0.76 | | | 0.02 |
| $C_2H_6$ | 30.070 | lbmol/hr | | 0.16 | | | 0.02 |
| $N_2$+INERTS | 28.013 | lbmol/hr | | | | | |
| $O_2$ | 32.000 | lbmol/hr | | | | | |
| TOTAL DRY FLOW (1) | | lbmol/hr | 349.87 | 19.95 | 237.34 | 213.86 | 4.17 |
| $H_2O$ | 18.016 | lbmol/hr | | | | | |
| METHANOL | 32.042 | lbmol/hr | | | | | |
| TOTAL WET FLOW (1) | | lbmol/hr | | | | | |
| $C_3H_6$ | 42.08 | lbmol/hr | | | | | |
| $C_3H_8$ | 44.09 | lbmol/hr | | 0.02 | | | 0.02 |
| $iC_4H_8$ | 56.10 | lbmol/hr | | | | | |
| $iC_4H_8$ | 56.10 | lbmol/hr | | | | | |
| $iC_4H_{10}$ | 58.12 | lbmol/hr | 0.18 | | 0.70 | | 0.01 |
| $nC_4H_{10}$ | 58.12 | lbmol/hr | 2.65 | | 3.29 | | |
| $iC_5H_{10}$ | 70.13 | lbmol/hr | | | | | |
| $iC_5H_{10}$ | 70.13 | lbmol/hr | | | | | |
| $iC_5H_{12}$ | 72.15 | lbmol/hr | 42.74 | | 225.59 | 6.65 | 0.14 |
| $nC_5H_{12}$ | 72.15 | lbmol/hr | 26.69 | | 7.76 | 2.83 | |
| $iC_6H_{12}$ | 84.16 | lbmol/hr | | | | | |
| $iC_6H_{12}$ | 84.16 | lbmol/hr | | | | | |
| $iC_6H_{14}$ | 86.17 | lbmol/hr | | | | 173.67 | 0.04 |
| $nC_6H_{14}$ | 86.17 | lbmol/hr | | | | 30.71 | |
| C6+ | (2) | lbmol/hr | 277.61 | | | | |
| $C_7$+ | (3) | lbmol/hr | | | | | |
| ALCOHOLS | 46.61 | lbmol/hr | | | | | |
| TOTAL | | lb/hr | 33 551 | 58 | 17 068 | 18 295 | 25 |
| (1) $C_3$+ INCLUDED | | | | | | | |
| (2) MW OF $C_6$+ | | | 102.22 | | | | |
| (3) MW OF $C_7$+ | | | | | | | |

# MATERIAL BALANCE

BASE CASE II

| STREAM Nº | | | 130 | 131 | | | |
|---|---|---|---|---|---|---|---|
| | | | FEED TO UNIT 261 | FEED TO UNIT 260 | | | |
| $CO_2$ | 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 | 9.48 | 0.42 | | | |
| $CH_4$ | 16.043 | lbmol/hr | 0.63 | 0.11 | | | |
| $C_2H_6$ | 30.070 | lbmol/hr | 0.73 | 0.57 | | | |
| $N_2$+INERTS | 28.013 | lbmol/hr | | | | | |
| $O_2$ | 32.000 | lbmol/hr | | | | | |
| TOTAL DRY FLOW (1) | | lbmol/hr | 13.61 | 24.22 | | | |
| $H_2O$ | 18.016 | lbmol/hr | | | | | |
| METHANOL | 32.042 | lbmol/hr | | | | | |
| TOTAL WET FLOW (1) | | lbmol/hr | | | | | |
| $C_3H_6$ | 42.08 | lbmol/hr | | | | | |
| $C_3H_8$ | 44.09 | lbmol/hr | 1.10 | 2.54 | | | |
| $iC_4H_8$ | 56.10 | lbmol/hr | | | | | |
| $iC_4H_8$ | 56.10 | lbmol/hr | | | | | |
| $iC_4H_{10}$ | 58.12 | lbmol/hr | 0.43 | 2.15 | | | |
| $nC_4H_{10}$ | 58.12 | lbmol/hr | 0.09 | 0.59 | | | |
| $1C_5H_{10}$ | 70.13 | lbmol/hr | | | | | |
| $iC_5H_{10}$ | 70.13 | lbmol/hr | | | | | |
| $iC_5H_{12}$ | 72.15 | lbmol/hr | 1.12 | 17.05 | | | |
| $nC_5H_{12}$ | 72.15 | lbmol/hr | 0.02 | 0.44 | | | |
| $1C_6H_{12}$ | 84.16 | lbmol/hr | | | | | |
| $iC_6H_{12}$ | 84.16 | lbmol/hr | | | | | |
| $iC_6H_{14}$ | 86.17 | lbmol/hr | 0.01 | 0.35 | | | |
| $nC_6H_{14}$ | 86.17 | lbmol/hr | | | | | |
| C6 + | (2) | lbmol/hr | | | | | |
| $C_7$+ | (3) | lbmol/hr | | | | | |
| ALCOHOLS | 46.61 | lbmol/hr | | | | | |
| TOTAL | | lb/hr | 213 | 1 583 | | | |

(1) $C_3$+ INCLUDED
(2) MW OF $C_6$+
(3) MW OF $C_7$+

# MATERIAL BALANCE

## BASE CASE II

| STREAM Nº | | | 132 | 133 | 134 | 135 | 136 |
|---|---|---|---|---|---|---|---|
| | | | FEED TO UNIT 258 | FUEL GAS FR. UNIT252 | LT.CAT.POLY GASOLINE | FEED TO UNIT 259 | FEED TO UNIT 261 |
| $CO_2$ | 44.010 | lbmol/hr | | 46.97 | | | 2.55 |
| $H_2S$ | 34.076 | lbmol/hr | | | | | |
| COS | 60.070 | lbmol/hr | | | | | |
| $C_2H_2$ | 28.054 | lbmol/hr | | 8.49 | | | |
| CO | 28.010 | lbmol/hr | | 0.40 | | | |
| $H_2$ | 2.016 | lbmol/hr | | 2.25 | | | 227.12 |
| $CH_4$ | 16.043 | lbmol/hr | | 44.95 | | | 37.32 |
| $C_2H_6$ | 30.070 | lbmol/hr | 1.00 | 20.16 | | | 18.87 |
| $N_2$+INERTS | 28.013 | lbmol/hr | | 0.23 | | | |
| $O_2$ | 32.000 | lbmol/hr | | | | | |
| TOTAL DRY FLOW (1) | | lbmol/hr | 210.05 | 132.91 | 241.45 | 135.00 | 292.73 |
| $H_2O$ | 18.016 | lbmol/hr | | 5.05 | | | 0.80 |
| METHANOL | 32.042 | lbmol/hr | | | | | |
| TOTAL WET FLOW (1) | | lbmol/hr | | 137.96 | | | 293.53 |
| $C_3H_6$ | 42.08 | lbmol/hr | 54.67 | 8.58 | | | |
| $C_3H_8$ | 44.09 | lbmol/hr | 105.32 | 0.83 | | | 0.91 |
| $iC_4H_8$ | 56.10 | lbmol/hr | 19.26 | 0.01 | | | |
| $iC_4H_8$ | 56.10 | lbmol/hr | | | | | |
| $iC_4H_{10}$ | 58.12 | lbmol/hr | 2.15 | 0.01 | 0.37 | | 0.23 |
| $nC_4H_{10}$ | 58.12 | lbmol/hr | 27.65 | | 16.64 | | 0.93 |
| $iC_5H_{10}$ | 70.13 | lbmol/hr | | | 7.55 | | |
| $iC_5H_{10}$ | 70.13 | lbmol/hr | | | | | |
| $iC_5H_{12}$ | 72.15 | lbmol/hr | | | 0.75 | | 0.74 |
| $nC_5H_{12}$ | 72.15 | lbmol/hr | | | 0.26 | | 2.84 |
| $iC_6H_{12}$ | 84.16 | lbmol/hr | | | | | |
| $iC_6H_{12}$ | 84.16 | lbmol/hr | | | | | |
| $iC_6H_{14}$ | 86.17 | lbmol/hr | | | | | |
| $nC_6H_{14}$ | 86.17 | lbmol/hr | | | | | |
| $C_6+$ | (2) | lbmol/hr | | | | | |
| $C_7+$ | (3) | lbmol/hr | | 0.03 | | | 1.22 |
| ALCOHOLS | 46.61 | lbmol/hr | | | | | |
| CAT. POLY GASOLINE | | lbmol/hr | | | 215.88 | 135.00 | |
| TOTAL | | lb/hr | 9 787 | 4 149 | 22 952 | 19 482 | 2 227 |
| (4) MW OF CAT. POLY GAS. | | | | | 98.95 | 146.98 | |
| (1) $C_3+$ INCLUDED | | | | | | | |
| (2) MW OF $C_6+$ | | | | | | | |
| (3) MW OF $C_7+$ | | | | 153.24 | | | 90.17 |

# MATERIAL BALANCE

## BASE CASE II

| STREAM Nº | | | 137 | 138 | 139 | 140 | 141 |
|---|---|---|---|---|---|---|---|
| | | | HVY POLY GAS FROM UNIT 259 | PROPANE LPG PRODUCT | NORMAL BUTANE PRODUCT | NORMAL BUTANE TO UNIT 270 | FUEL GAS FROM UNIT 160 |
| $CO_2$ | 44.010 | lbmol/hr | | | | | 0.82 |
| $H_2S$ | 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 | | | | | 94.02 |
| $CH_4$ | 16.043 | lbmol/hr | | | | | 56.11 |
| $C_2H_6$ | 30.070 | lbmol/hr | | 1.06 | | | 106.36 |
| $N_2$+INERTS | 28.013 | lbmol/hr | | | | | |
| $O_2$ | 32.000 | lbmol/hr | | | | | |
| TOTAL DRY FLOW (1) | | lbmol/hr | 135 | 186.89 | 21.48 | 65.10 | 323.02 |
| $H_2O$ | 18.016 | lbmol/hr | | | | | 5.85 |
| METHANOL | 32.042 | lbmol/hr | | | | | |
| TOTAL WET FLOW (1) | | lbmol/hr | | | | | 328.87 |
| $C_3H_6$ | 42.08 | lbmol/hr | | 17.71 | | | |
| $C_3H_8$ | 44.09 | lbmol/hr | | 168.12 | | | 43.83 |
| $iC_4H_8$ | 56.10 | lbmol/hr | | | 1.55 | 4.68 | |
| $iC_4H_8$ | 56.10 | lbmol/hr | | | | | |
| $iC_4H_{10}$ | 58.12 | lbmol/hr | | | | | 9.32 |
| $nC_4H_{10}$ | 58.12 | lbmol/hr | | | 19.93 | 60.42 | 6.63 |
| $iC_5H_{10}$ | 70.13 | lbmol/hr | | | | | |
| $iC_5H_{10}$ | 70.13 | lbmol/hr | | | | | |
| $iC_5H_{12}$ | 72.15 | lbmol/hr | | | | | 2.38 |
| $nC_5H_{12}$ | 72.15 | lbmol/hr | | | | | 3.10 |
| $iC_6H_{12}$ | 84.16 | lbmol/hr | | | | | |
| $iC_6H_{12}$ | 84.16 | lbmol/hr | | | | | |
| $iC_6H_{14}$ | 86.17 | lbmol/hr | | | | | 0.01 |
| $nC_6H_{14}$ | 86.17 | lbmol/hr | | | | | 0.01 |
| C6 + | (2) | lbmol/hr | | | | | 0.43 |
| $C_7$+ | (3) | lbmol/hr | | | | | |
| ALCOHOLS | 46.61 | lbmol/hr | | | | | |
| CAT. POLY GASOLINE | | lbmol/hr | 135 | | | | |
| TOTAL | | lb/hr | 20 115 | 8 190 | 1 245 | 3 774 | 7 725 |
| (4) MW OF CAT. POLY GAS. | | | 149 | | | | |
| (1) $C_3$+ INCLUDED | | | | | | | |
| (2) MW OF $C_6$+ | | | | | | | |
| (3) MW OF $C_7$+ | | | | | | | |

# MATERIAL BALANCE

## BASE CASE II

| STREAM Nº | | 142 | 143 | 144 | 145 | 146 |
|---|---|---|---|---|---|---|
| | | ALKYLATE FROM UNIT 258 | ISOBUTANE FROM UNIT 260 | LT. GASOLINE FROM UNIT 260 | FEED TO UNIT 260 | HYDROGEN FROM UNIT 261 |
| $CO_2$ | 44.010 lbmol/hr | | | | 0.22 | |
| $H_2S$ | 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 | | | | 48.77 | 560.90 |
| $CH_4$ | 16.043 lbmol/hr | | | | 30.13 | 44.62 |
| $C_2H_6$ | 30.070 lbmol/hr | | | | 48.34 | 13.64 |
| $N_2$+INERTS | 28.013 lbmol/hr | | 0.06 | | | |
| $O_2$ | 32.000 lbmol/hr | | | | | |
| TOTAL DRY FLOW (1) | lbmol/hr | 55.33 | 166.11 | 53.77 | 236.56 | 619.80 |
| $H_2O$ | 18.016 lbmol/hr | | | | 0.58 | |
| METHANOL | 32.042 lbmol/hr | | | | | |
| TOTAL WET FLOW (1) | lbmol/hr | | | | 237.14 | |
| $C_3H_6$ | 42.08 lbmol/hr | | | | | |
| $C_3H_8$ | 44.09 lbmol/hr | | 57.29 | | 55.39 | 0.62 |
| $1C_4H_8$ | 56.10 lbmol/hr | | | | | |
| $iC_4H_8$ | 56.10 lbmol/hr | | | | | |
| $iC_4H_{10}$ | 58.12 lbmol/hr | | 47.36 | 0.07 | 19.12 | 0.02 |
| $nC_4H_{10}$ | 58.12 lbmol/hr | 2.05 | 54.75 | 2.02 | 13.60 | |
| $1C_5H_{10}$ | 70.13 lbmol/hr | | | | | |
| $iC_5H_{10}$ | 70.13 lbmol/hr | | | | | |
| $iC_5H_{12}$ | 72.15 lbmol/hr | 9.99 | 6.04 | 21.91 | 9.14 | |
| $nC_5H_{12}$ | 72.15 lbmol/hr | 0.60 | 0.60 | 17.99 | 6.42 | |
| $1C_6H_{12}$ | 84.16 lbmol/hr | | | | | |
| $iC_6H_{12}$ | 84.16 lbmol/hr | | | | | |
| $iC_6H_{14}$ | 86.17 lbmol/hr | | | | | |
| $nC_6H_{14}$ | 86.17 lbmol/hr | 0.01 | 0.01 | | | |
| C6+ | (2) lbmol/hr | | | 11.78 | 5.43 | |
| $C_7$+ | (3) lbmol/hr | | | | | |
| ALCOHOLS | 46.61 lbmol/hr | | | | | |
| ALKYLATE | 108.60 lbmol/hr | 42.68 | | | | |
| TOTAL | lb/hr | 5 519 | 8 942 | 4 078 | 8 028 | 2 287 |

(1) $C_3$+ INCLUDED
(2) MW OF C6+
(3) MW OF C7+

# MATERIAL BALANCE

## BASE CASE II

| STREAM Nº | | 150 | 151 | 153 | 154 | |
|---|---|---|---|---|---|---|
| | | ACID WATER FR.UNIT 262 | METHANOL FROM UNIT 262 | STRIPPING STEAM TO UN262 | HYDROGEN TO UNIT 262 | |
| $CO_2$ | 44.010 lbmol/hr | | | | 0.26 | |
| $H_2S$ | 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 | | | | 86.80 | |
| $CH_4$ | 16.043 lbmol/hr | | | | 1.06 | |
| $C_2H_6$ | 30.070 lbmol/hr | | | | | |
| $N_2$+INERTS | 28.013 lbmol/hr | | | | | |
| $O_2$ | 32.000 lbmol/hr | | | | | |
| TOTAL DRY FLOW (1) | lbmol/hr | | 11.78 | | 88.12 | |
| $H_2O$ | 18.016 lbmol/hr | 25 843.30 | | 832.54 | | |
| METHANOL | 32.042 lbmol/hr | | 11.67 | | | |
| TOTAL WET FLOW (1) | lbmol/hr | 25 929.78 | | 832.54 | | |
| ETHANOL | 46.07 lbmol/hr | | 0.11 | | | |
| HEAVY ALCOHOLS (2) | lbmol/hr | | | | | |
| ACIDS | 63.24 lbmol/hr | 86.48 | | | | |
| $NH_3$ | 17.03 lbmol/hr | | | | | |
| $Fe_3O_4$ | lb/hr | | | | | |
| Fe CATALYST | lb/hr | | | | | |
| TOTAL | lb/hr | 471.062 | 379 | 15 000 | 204 | |

(1) ETHANOL, ALCOHOLS & ACIDS INCLUDED

(2) MW OF HEAVY ALCOHOLS

# MATERIAL BALANCE

## BASE CASE II

| STREAM Nº | | | 155 | 156 | 157 | 158 | 159 |
|---|---|---|---|---|---|---|---|
| | | | Hydrogen from Unit 262 | Heavy Alcoh. Product | Alcohols to Unit 210 | Raw Iron Ore to Unit 271 | Raw Iron Ore fr. UNIT271 |
| $CO_2$ | 44.010 | lbmol/hr | 0.26 | | | | |
| $H_2S$ | 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 | 8.68 | | | | |
| $CH_4$ | 16.043 | lbmol/hr | 1.06 | | | | |
| $C_2H_6$ | 30.070 | lbmol/hr | | | | | |
| $N_2$+INERTS | 28.013 | lbmol/hr | | | | | |
| $O_2$ | 32.000 | lbmol/hr | | | | | |
| TOTAL DRY FLOW (1) | | lbmol/hr | 10.00 | 401.53 | 50.00 | | |
| $H_2O$ | 18.016 | lbmol/hr | | | | 42.30 | |
| METHANOL | 32.042 | lbmol/hr | | | | | |
| TOTAL WET FLOW (1) | | lbmol/hr | | | | | |
| ETHANOL | 46.07 | lbmol/hr | | 254.61 | 48.01 | | |
| HEAVY ALCOHOLS (2) | | lbmol/hr | | 146.92 | 1.99 | | |
| ACIDS | 63.24 | lbmol/hr | | | | | |
| $NH_3$ | 17.03 | lbmol/hr | | | | | |
| $Fe_3O_4$ | | lb/hr | | | | 6 854 | 3 427 |
| Fe CATALYST | | lb/hr | | | | | |
| TOTAL | | lb/hr | 46 | 21 233 | 2 331 | 7 616 | 3 427 |
| (1) ETHANOL, ALCOHOLS & ACIDS INCLUDED | | | | | | | |
| (2) MW OF HEAVY ALCOHOLS | | | | 64.69 | 60.12 | | |

# MATERIAL BALANCE

## BASE CASE II

| STREAM Nº | | | 160 | 161 | 162 | 163 | 164 |
|---|---|---|---|---|---|---|---|
| | | | Reduced Catalyst to Unit | $H_2$ to Unit 271 | Spent catalyst fr. Unit 250 | Dirty water to Unit 235 | Purge Gas to Unit 262 |
| $CO_2$ | 44.010 | lbmol/hr | 250 | 0.20 | | | 0.20 |
| $H_2S$ | 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 | | 65.46 | | | 6.55 |
| $CH_4$ | 16.043 | lbmol/hr | | 0.80 | | | 0.80 |
| $C_2H_6$ | 30.070 | lbmol/hr | | | | | |
| $N_2$+INERTS | 28.013 | lbmol/hr | | | | | |
| $O_2$ | 32.000 | lbmol/hr | | | | | |
| TOTAL DRY FLOW (1) | | lbmol/hr | | 66.46 | | | 7.55 |
| $H_2O$ | 18.016 | lbmol/hr | | | | 17.15 | 0.01 |
| METHANOL | 32.042 | lbmol/hr | | | | | |
| TOTAL WET FLOW (1) | | lbmol/hr | | | | 17.15 | 7.56 |
| 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 | 2 480 | | 2 480 | | |
| TOTAL | | lb/hr | 2 480 | 154 | 2 480 | 309 | 36 |

(1) ETHANOL, ALCOHOLS & ACIDS INCLUDED

(2) MW OF HEAVY ALCOHOLS

# MATERIAL BALANCE

BASE CASE II

| STREAM Nº | | 165 | 166 | | | |
|---|---|---|---|---|---|---|
| | | Hot Air from Unit 271 | Hot Air to 271 | | | |
| $CO_2$ | 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 | Air not | Air not | | | |
| $CH_4$ | 16.043 lbmol/hr | balanced | balanced | | | |
| $C_2H_6$ | 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 | | | | | |
| 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 | 1 519 | | | | |

(1) ETHANOL, ALCOHOLS & ACIDS INCLUDED

(2) MW OF HEAVY ALCOHOLS

# MATERIAL BALANCE

## BASE CASE II

| STREAM Nº | | | 171 | 172 | 173.1 | 173.2 | 174 |
|---|---|---|---|---|---|---|---|
| | | | FUEL TO UNIT 251 | FUEL TO UNIT 252 | FUEL TO UNIT 253 | FUEL TO UNIT 253 | FUEL TO UNIT 254 |
| $CO_2$ | 44.010 | lbmol/hr | 0.27 | 27.45 | 2.67 | | 8.49 |
| $H_2S$ | 34.076 | lbmol/hr | | | | | |
| COS | 60.070 | lbmol/hr | | | | | |
| $C_2H_4$ | 28.054 | lbmol/hr | 0.05 | 4.87 | 0.48 | | 1.51 |
| CO | 28.010 | lbmol/hr | | 0.24 | 0.02 | | 0.07 |
| $H_2$ | 2.016 | lbmol/hr | 0.57 | 56.49 | 5.49 | | 17.46 |
| $CH_4$ | 16.043 | lbmol/hr | 0.58 | 58.49 | 5.70 | | 18.08 |
| $C_2H_6$ | 30.070 | lbmol/hr | 0.74 | 73.46 | 7.15 | | 22.71 |
| $N_2$+INERTS | 28.013 | lbmol/hr | | 0.14 | 0.01 | | 0.04 |
| $O_2$ | 32.000 | lbmol/hr | | | | | |
| TOTAL DRY FLOW (1) | | lbmol/hr | 2.66 | 266.49 | 25.93 | 1.51 | 82.38 |
| $H_2O$ | 18.016 | lbmol/hr | 0.06 | 6.26 | 0.61 | | 1.94 |
| METHANOL | 32.042 | lbmol/hr | | | | | |
| TOTAL WET FLOW (1) | | lbmol/hr | 2.72 | 272.75 | 26.54 | | 84.32 |
| $C_3H_6$ | 42.08 | lbmol/hr | 0.05 | 4.93 | 0.48 | | 1.52 |
| $C_3H_8$ | 44.09 | lbmol/hr | 0.27 | 26.92 | 2.62 | | 8.33 |
| $1C_4H_8$ | 56.10 | lbmol/hr | | 0.01 | | | |
| $iC_4H_8$ | 56.10 | lbmol/hr | | | | | |
| $iC_4H_{10}$ | 58.12 | lbmol/hr | 0.06 | 5.88 | 0.58 | | 1.82 |
| $nC_4H_{10}$ | 58.12 | lbmol/hr | 0.04 | 4.16 | 0.40 | | 1.28 |
| $1C_5H_{10}$ | 70.13 | lbmol/hr | | | | | |
| $iC_5H_{10}$ | 70.13 | lbmol/hr | | | | | |
| $iC_5H_{12}$ | 72.15 | lbmol/hr | 0.01 | 1.36 | 0.13 | | 0.43 |
| $nC_5H_{12}$ | 72.15 | lbmol/hr | 0.02 | 1.80 | 0.17 | | 0.56 |
| $1C_6H_{12}$ | 84.16 | lbmol/hr | | | | | |
| $iC_6H_{12}$ | 84.16 | lbmol/hr | | | | | |
| $iC_5H_{14}$ | 86.17 | lbmol/hr | | | | | |
| $nC_6H_{14}$ | 86.17 | lbmol/hr | | 0.26 | | | |
| C6 + | (2) | lbmol/hr | | | 0.03 | | 0.08 |
| $C_7$+ | (3) | lbmol/hr | | 0.03 | | 1.51 | |
| ALCOHOLS | 46.61 | lbmol/hr | | | | | |
| TOTAL | | lb/hr | 69 | 6 963 | 678 | 492 | 2 153 |
| (1) $C_3$+ INCLUDED | | | | | | | |
| (2) MW OF C6+ | | | | | | | |
| (3) MW OF C7+ | | | | 153.24 | | 326 | |

# MATERIAL BALANCE

## BASE CASE II

| STREAM Nº | | | 175 | 176 | 177 | 178 | 179 |
|---|---|---|---|---|---|---|---|
| | | | Fuel to Unit 255 | Fuel to Unit 256 | Fuel to Unit 259 | Fuel to Unit 271 | Air to Unit 251 |
| $CO_2$ | 44.010 | lbmol/hr | 4.48 | 0.48 | 0.32 | 2.72 | |
| $H_2S$ | 34.076 | lbmol/hr | | | | | |
| COS | 60.070 | lbmol/hr | | | | | |
| $C_2H_4$ | 28.054 | lbmol/hr | 0.79 | 0.09 | 0.06 | 0.48 | |
| CO | 28.010 | lbmol/hr | 0.04 | | | 0.02 | |
| $H_2$ | 2.016 | lbmol/hr | 9.22 | 0.99 | 0.66 | 5.60 | |
| $CH_4$ | 16.043 | lbmol/hr | 9.56 | 1.02 | 0.69 | 5.80 | |
| $C_2H_6$ | 30.070 | lbmol/hr | 12.00 | 1.28 | 0.85 | 7.29 | |
| $N_2$+INERTS | 28.013 | lbmol/hr | 0.03 | 0.01 | | 0.01 | 30.02 |
| $O_2$ | 32.000 | lbmol/hr | | | | | 7.98 |
| TOTAL DRY FLOW (1) | | lbmol/hr | 43.54 | 4.66 | 3.11 | 26.42 | 38.00 |
| $H_2O$ | 18.016 | lbmol/hr | 1.02 | 0.11 | 0.07 | 0.62 | 0.95 |
| METHANOL | 32.042 | lbmol/hr | | | | | |
| TOTAL WET FLOW (1) | | lbmol/hr | 44.56 | 4.77 | 3.18 | 27.04 | 38.95 |
| $C_3H_6$ | 42.08 | lbmol/hr | 0.81 | 0.09 | 0.06 | 0.49 | |
| $C_3H_8$ | 44.09 | lbmol/hr | 4.40 | 0.47 | 0.32 | 2.67 | |
| $1C_4H_8$ | 56.10 | lbmol/hr | | | | | |
| $iC_4H_8$ | 56.10 | lbmol/hr | | | | | |
| $iC_4H_{10}$ | 58.12 | lbmol/hr | 0.97 | 0.10 | 0.07 | 0.58 | |
| $nC_4H_{10}$ | 58.12 | lbmol/hr | 0.67 | 0.07 | 0.05 | 0.41 | |
| $1C_5H_{10}$ | 70.13 | lbmol/hr | | | | | |
| $iC_5H_{10}$ | 70.13 | lbmol/hr | | | | | |
| $iC_5H_{12}$ | 72.15 | lbmol/hr | 0.23 | 0.03 | 0.01 | 0.14 | |
| $nC_5H_{12}$ | 72.15 | lbmol/hr | 0.30 | 0.03 | 0.02 | 0.18 | |
| $1C_6H_{12}$ | 84.16 | lbmol/hr | | | | | |
| $iC_6H_{12}$ | 84.16 | lbmol/hr | | | | | |
| $1C_6H_{14}$ | 86.17 | lbmol/hr | | | | | |
| $nC_6H_{14}$ | 86.17 | lbmol/hr | | | | | |
| $C_6$+ | (2) | lbmol/hr | 0.04 | | | | |
| $C_7$+ | (3) | lbmol/hr | | | | 0.03 | |
| ALCOHOLS | 46.61 | lbmol/hr | | | | | |
| TOTAL | | lb/hr | 1137 | 122 | 81 | 690 | 1 113 |

(1) $C_3$+ INCLUDED
(2) MW OF $C_6$+
(3) MW OF $C_7$+

# MATERIAL BALANCE

## BASE CASE II

| STREAM Nº | | | 180 | 181 | 182 | 183 | 184 |
|---|---|---|---|---|---|---|---|
| | | | AIR TO UNIT 252 | AIR TO UNIT 253 | AIR TO UNIT 254 | AIR TO UNIT 255 | AIR TO UNIT 256 |
| $CO_2$ | 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 | 2 865.59 | 510.08 | 892.66 | 471.88 | 30.42 |
| $O_2$ | 32.000 | lbmol/hr | 761.74 | 135.59 | 237.29 | 125.44 | 13.40 |
| TOTAL DRY FLOW (1) | | lbmol/hr | 3 627.33 | 645.67 | 1 129.95 | 597.32 | 63.82 |
| $H_2O$ | 18.016 | lbmol/hr | 90.26 | 16.06 | 28.11 | 14.86 | 1.59 |
| METHANOL | 32.042 | lbmol/hr | | | | | |
| TOTAL WET FLOW (1) | | lbmol/hr | 3 717.59 | 661.73 | 1 158.06 | 612.18 | 65.41 |
| $C_3H_6$ | 42.08 | lbmol/hr | | | | | |
| $C_3H_8$ | 44.09 | lbmol/hr | | | | | |
| $iC_4H_8$ | 56.10 | lbmol/hr | | | | | |
| $iC_4H_8$ | 56.10 | lbmol/hr | | | | | |
| $iC_4H_{10}$ | 58.12 | lbmol/hr | | | | | |
| $nC_4H_{10}$ | 58.12 | lbmol/hr | | | | | |
| $iC_5H_{10}$ | 70.13 | lbmol/hr | | | | | |
| $iC_5H_{10}$ | 70.13 | lbmol/hr | | | | | |
| $iC_5H_{12}$ | 72.15 | lbmol/hr | | | | | |
| $nC_5H_{12}$ | 72.15 | lbmol/hr | | | | | |
| $iC_6H_{12}$ | 84.16 | lbmol/hr | | | | | |
| $iC_6H_{12}$ | 84.16 | lbmol/hr | | | | | |
| $iC_6H_{14}$ | 86.17 | lbmol/hr | | | | | |
| $nC_6H_{14}$ | 86.17 | lbmol/hr | | | | | |
| C6 + | (2) | lbmol/hr | | | | | |
| $C_7$+ | (3) | lbmol/hr | | | | | |
| ALCOHOLS | 46.61 | lbmol/hr | | | | | |
| TOTAL | | lb/hr | 106 276. | 18 917 | 33 106 | 17 500 | 1 870 |

(1) $C_3$+ INCLUDED
(2) MW OF C6+
(3) MW OF $C_7$+

# MATERIAL BALANCE

## BASE CASE II

| STREAM Nº | | | 190 | 191 | 192 | 193 | 194 |
|---|---|---|---|---|---|---|---|
| | | | STACKGAS FROM 254 | STACKGAS FROM UNIT 255 | STACKGAS FROM UNIT 256 | STACKGAS FROM UNIT 259 | STACKGAS FROM UNIT 271 |
| $CO_2$ | 44.010 | lbmol/hr | 122.54 | 64.74 | 6.90 | 4.60 | 39.28 |
| $H_2S$ | 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 | 892.70 | 471.92 | 50.43 | 33.56 | 286.40 |
| $O_2$ | 32.000 | lbmol/hr | 30.95 | 16.39 | 1.78 | 1.17 | 9.93 |
| TOTAL DRY FLOW (1) | | lbmol/hr | 1 046.19 | 553.05 | 59.11 | 39.33 | 335.61 |
| $H_2O$ | 18.016 | lbmol/hr | 214.70 | 113.49 | 12.11 | 8.08 | 68.90 |
| METHANOL | 32.042 | lbmol/hr | | | | | |
| TOTAL WET FLOW (1) | | lbmol/hr | 1 260.89 | 666.54 | 71.22 | 47.41 | 404.51 |
| $C_3H_6$ | 42.08 | lbmol/hr | | | | | |
| $C_3H_8$ | 44.09 | lbmol/hr | | | | | |
| $iC_4H_8$ | 56.10 | lbmol/hr | | | | | |
| $iC_4H_8$ | 56.10 | lbmol/hr | | | | | |
| $iC_4H_{10}$ | 58.12 | lbmol/hr | | | | | |
| $nC_4H_{10}$ | 58.12 | lbmol/hr | | | | | |
| $iC_5H_{10}$ | 70.13 | lbmol/hr | | | | | |
| $iC_5H_{10}$ | 70.13 | lbmol/hr | | | | | |
| $iC_5H_{12}$ | 72.15 | lbmol/hr | | | | | |
| $nC_5H_{12}$ | 72.15 | lbmol/hr | | | | | |
| $iC_6H_{12}$ | 84.16 | lbmol/hr | | | | | |
| $iC_6H_{12}$ | 84.16 | lbmol/hr | | | | | |
| $iC_6H_{14}$ | 86.17 | lbmol/hr | | | | | |
| $nC_6H_{14}$ | 86.17 | lbmol/hr | | | | | |
| C6 + | (2) | lbmol/hr | | | | | |
| $C_7$+ | (3) | lbmol/hr | | | | | |
| ALCOHOLS | 46.61 | lbmol/hr | | | | | |
| TOTAL | | lb/hr | 35 259 | 18 637 | 1 992 | 1 326 | 11 312 |

(1) $C_3$+ INCLUDED
(2) MW OF $C_6$+
(3) MW OF $C_7$+

# MATERIAL BALANCE — BASE CASE II

| STREAM Nº | | | 195 | 196 | 197 | | |
|---|---|---|---|---|---|---|---|
| | | | WATER TO UNIT 250 | WATER TO UNIT 257 | WATER FROM UNIT 257 | | |
| $CO_2$ | 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 | 5 634.99 | 2 775.31 | 2 775.31 | | |
| METHANOL | 32.042 | lbmol/hr | | | | | |
| TOTAL WET FLOW (1) | | lbmol/hr | 5 634.99 | 2 775.31 | 2 775.31 | | |
| $C_3H_6$ | 42.08 | lbmol/hr | | | | | |
| $C_3H_8$ | 44.09 | lbmol/hr | | | | | |
| $iC_4H_8$ | 56.10 | lbmol/hr | | | | | |
| $iC_4H_8$ | 56.10 | lbmol/hr | | | | | |
| $iC_4H_{10}$ | 58.12 | lbmol/hr | | | | | |
| $nC_4H_{10}$ | 58.12 | lbmol/hr | | | | | |
| $iC_5H_{10}$ | 70.13 | lbmol/hr | | | | | |
| $iC_5H_{10}$ | 70.13 | lbmol/hr | | | | | |
| $iC_5H_{12}$ | 72.15 | lbmol/hr | | | | | |
| $nC_5H_{12}$ | 72.15 | lbmol/hr | | | | | |
| $iC_6H_{12}$ | 84.16 | lbmol/hr | | | | | |
| $iC_6H_{12}$ | 84.16 | lbmol/hr | | | | | |
| $iC_6H_{14}$ | 86.17 | lbmol/hr | | | | | |
| $nC_6H_{14}$ | 86.17 | lbmol/hr | | | | | |
| $C_6$+ | (2) | lbmol/hr | | | | | |
| $C_7$+ | (3) | lbmol/hr | | | | | |
| ALCOHOLS | 46.61 | lbmol/hr | | | | | |
| TOTAL | | lb/hr | 101 520 | 50 000 | 50 000 | | |

(1) $C_3$+ INCLUDED
(2) MW OF $C_6$+
(3) MW OF $C_7$+