Material Balance

Feed In (pet coke) = 2000 ton/day = 4,000,000 lbm

Oxygen IN ( 95 % O2)= ?

Steam In = ?

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| **Component** | **Weight Percent** | **lbm** | **lbm-moles** | **Column1** |
| **Carbon** | 83.3 | 3332000 | 277435.47 |  |
| **Hydrogen** | 4 | 160000 | 79207.92 | (H2) |
| **Nitrogen** | 1.49 | 59600 | 2128.57 | (N2) |
| **Sulfur** | 6.14 | 245600 | 7659.44 |  |
| **Oxygen** | 4.44 | 177600 | 5550 | (O2) |
| **V** | 325-2300 | 1300-9200 | 25.52- 180.6 |  |
| **Ni** | 165-580 | 660-2320 | 11.24- 39.52 |  |
| **F** | 11 | 44 | 2.2002 |  |
| **Cu** | 3.5 | 14 | 0.2203 |  |
| **Mg** | 2.4 | 9.6 | 0.3950 |  |
| **Se** | <2 | <8 | 0.1013 |  |
| **Be** | 1.5 | 6 | 0.6658 |  |
| **Pb** | 0.6 | 2.4 | 0.0116 |  |
| **As** | 0.3 | 1.2 | 0.0160 |  |
| **Cd** | 0.1 | 0.4 | 0.0036 |  |
| **Hg** | <0.1 | 0.04 | 0.0002 |  |

Composition of the syngas

|  |  |  |
| --- | --- | --- |
| Component | Volume percent |  |
| CO | 62.63 |  |
| H2 | 26.14 |  |
| CO2 | 2.17 |  |
| H2O | 3.22 |  |
| H2S | 0.77 |  |
| COS | 0.04 |  |
| N2 | 4.94 |  |
| Total | 99.7 |  |

Only 99.5 % Carbon conversion

0.5 % C unreacted

Carbon out with the ash = (3332000\* 0.005) =166600 lbm

= 13871.77 lbm-moles

* Total Moles of Carbon in Syngas = 0.6263+0.0217+0.0004= 0.6484 lbm
* Total moles of COS = (277435.47-13871.77)-253816.68-8794.22 = 952.8 lbm- moles
* Total moles of sulphur used in COS = 952.8 lbm-moles
* Total moles of H2S in syn gas = 7659.44 -952.8 = 6706.64 lbm-moles

|  |  |  |  |
| --- | --- | --- | --- |
| Component | Volume percent | lbm-moles | Weight (U.S. ton) |
| CO | 62.63 |  | 3554.70 |
| H2 | 26.14 | (?) |  |
| CO2 | 2.17 |  | 193.52 |
| H2O | 3.22 | 79207.92 (?) |  |
| H2S | 0.77 | 6706.64 | 114.30 |
| COS | 0.04 | 952.8 | 28.62 |
| N2 | 4.94 | 2128.57 (?) |  |
| Total | 99.7 |  |  |