

Appendix I

Preliminary Heat Balance for Sublimation of As_2O_3 From Underground Crude Storage Dust

The attached heat balance was carried out to determine the temperature drop in roaster off-gas that would result from addition of sufficient crude As_2O_3 to meet a production target of 7000 t/y WAROX product. The balance is based on 3000 t/y As_2O_3 from current roaster operations and 4000 t/y from stockpiled dust.

Heat Balance Calculation

Crude Dust Treatment Rate Based On Gas Stream Temperature Drop
from 430 deg C to 376 deg C

Gas Flow (ACFM) 8630 (SCFM) 3658
Temp. In (deg K) 703
Temp. Out (deg K) 649
Gas Comp. % N₂= 100 mole/min. 4236.40
% O₂=

Specific Heat cal/o/mole
N₂ 6.66 +0.00102T
Heat Content 1681316. cal/min.

Heat available from inerts (Fe₂O₃)

11.0 t/d
7638.888 g/min
47.83274 moles/min.

Specific Heat cal/o/mole
Fe₂O₃ 23.49+0.0186T-355000T-2

Heat Content of Fe₂O₃ 91141.35 cal/min

Heat available from gaseous As₂O₃

11.0 t/d
7638.888 g/min
38.61925 moles/min.

Specific Heat of As₂O₃ vapour 21.5 cal/o/mole

Heat Content of As₂O₃ Fume 44836.95 cal/min.

Total heat available

N₂ 1681317
Fe₂O₃ 91141
As₂O₃ (g) 44837

1817294. cal/min

Calculation of heat required to raise crude As₂O₃ to 371 deg C
and sublime As₂O₃

(calculation for 1.0 kg dust)

Composition %As₂O₃ 50
%Fe₂O₃ 50
Moles As₂O₃ 2.53
Moles Fe₂O₃ 3.14

Heat required to raise solids temp. from 298 deg K to 644 deg K

Specific Heat cal/o/mole
As₂O₃(g) 21.5
As₂O₃(s) 8.37 +0.04860T

Heat Content of Solid As₂O₃ Product 27815.95 cal/kg dust