

REACTOR OPENING LOSS CALCULATIONS

Date: 3-28-79

Reactor: D-500 BLEND No. 38272

SAMPLE No. 41

RESIN TYPE: 5385

DATA:

TOTAL REACTOR VOLUME = 2512 FT³
REACTOR TEMPERATURE = 150 °F + 460 = 610 °R
REACTOR PRESSURE = 30.04 in. Hg X 25.4 = 763 mm Hg
VCM CHARGE AMOUNT = 623 COUNTS X 10 = 6230 GAL.
VCM DENSITY (T=50 °F) = 7.753 #/GAL
VCM TO PVC CONVERSION = 76 %
MEASURED VAPOR CONCENTRATION = 12,257 ppm
Avg. Measured Slurry Concentration = 38 # VCM / 111 # PVC
H₂O VAPOR PRESSURE @ Rx. Temp = 192 mm Hg

a) One mole of ideal gas occupies 359 cu. ft. at 32°F (492°R) and 760 mmHg

b) The volume correction at the reactor's temperature and pressure is:

$$V_c = 359 \times \frac{760}{763} \times \frac{610}{492} = 443.4 \text{ cu. ft./# mole}$$

c) Total moles in reactor at time of sampling:

$$M = \frac{\text{Reactor Volume}}{V_c} = \frac{2512}{443.4} = 5.67 \text{ # moles}$$

d) Moles of dry gas in reactor at time of sampling:

$$M_{\text{DRY}} = M \times \frac{(\text{Rx. PRESS} - \text{H}_2\text{O VAPOR PRESS})}{\text{REACTOR PRESSURE}} = 5.67 \times \frac{(763 - 192)}{763} = 4.24 \text{ # moles}$$

e) VCM EMISSIONS:

$$\begin{aligned} \# &= M \times 10^{-6} \times \text{Vapor Concentration} \times \text{VCM Molecular Weight} \\ &= 5.67 \times 10^{-6} \times 12,257 \times 62.499 = 4.34 \text{ # VCM} \end{aligned}$$

$$\begin{aligned} \#_{\text{DRY}} &= M_{\text{DRY}} \times 10^{-6} \times \text{VAPOR CONCENTRATION} \times \text{VCM MOLECULAR WEIGHT} \\ &= 4.24 \times 10^{-6} \times 12,257 \times 62.499 = 3.25 \text{ # VCM} \end{aligned}$$

f) Lbs. of PVC produced in reactor:

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$$\begin{aligned} R &= \text{VCM Charge Amount} \times \text{VCM DENSITY} \times \text{VCM TO PVC CONVERSION} \\ &= 6230 \times 7.753 \times .76 = 36,709 \text{ # PVC} \end{aligned}$$

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REACTOR OPENING LOSS CALCULATIONS (CONT.)

g) VCM Emissions in Vapor per MM lbs. PVC

$$E = \frac{\# \times 10^6}{R} = \frac{4.34 \times 10^6}{36709} = 118.3 \text{ \# VCM/MM \# PVC}$$

$$E_{\text{DRY}} = \frac{\#_{\text{DRY}} \times 10^6}{R} = \frac{3.25 \times 10^6}{36709} = 88.5 \text{ \# VCM/MM \# PVC}$$

h) Total VCM Emissions from reactor in vapor and slurry

$$T = E + \text{Avg. Slurry Concentration} = 118 + 38 = 156 \frac{\text{\# VCM}}{\text{MM \# PVC}}$$

$$T_{\text{DRY}} = E_{\text{DRY}} + \text{Avg. Slurry Concentration} = 89 + 38 = 127 \frac{\text{\# VCM}}{\text{MM \# PVC}}$$

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