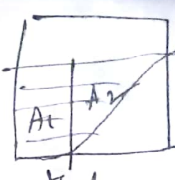


Exam - TE Chemical sem VI (BGT Dec 2017)
 Subject - Mass Transfer operation II

Exam Date - 27/11/2017

Q.P. Code - 13667

Q. 2b) $\ln \frac{y_1}{w_1 x_1} = \alpha \ln \frac{F(x_1 - x_2)}{w_1(x_1 - x_2)}$
 * butane in distillate = 0.135
 * butane in bottom = 0.015
 $\ln \frac{0.135}{0.015} = \alpha \ln \frac{1 \times 0.85}{w_1(x_1 - x_2)}$
 $w_1(x_1 - x_2) = 0.44 \text{ kmol}$
 Amt pentane removed = $0.85 - 0.44 = 0.41$ (5)
 Amt of residual liquid left = $0.015 + 0.44 = 0.455 \text{ kmol}$
 Composition of liquid remaining
 butane in still = 3.57% (0.455)
 pentane in still = 96.7% (5)

Q. 2c) 
 $A_1 + A_2 = A = 5.16 = t + 3.65$
 $t = 1.51 \text{ hr}$
 $H_{UMB} = \left(1 - \frac{t}{t_f}\right) H_f$
 $= \left(1 - \frac{1.51}{5.16}\right) H_f$
 $= 4.1 \text{ cm}$
 height of liquid = $14 - 4.1 = 9.9 \text{ cm}$

Q. 6b) $F = 100 \text{ kg/h}$ plot $y' \rightarrow x'$ form
 $A = 990$ data - then get slope of minimum ABM line
 $y' = 0$
 $x' = \frac{0.01}{1 - 0.01} = 0.0101$
 $x'_{np} = \frac{0.01}{1 - 0.01} = 0.0101$
 $A/B_m = \frac{0.0101}{0.0101 - 0.01} = 1021$ (marked)
 (A) $B_m = \frac{A}{1021} = \frac{990}{1021} = 0.97 \text{ kg/h}$ by balance (5)
 (b) $B = 1150$, $\frac{y'}{x' - x'_{np}} = \frac{y'}{0.0101 - 0.0101} = 0.86$ (5)
 $\frac{y'}{x' - x'_{np}} = \frac{y'}{0.0101 - 0.0101} = 0.86$
 $y' = 0.00782$
 stages = 2.3

Sat capacity -
 Arr rate = $774 \times 3.65 \times 0.00135 = 3122 \text{ gmol/h}$
 Total Alcohol adsorbed = $\frac{600}{106} \times 3122 \times 5.16 = 9.67 \text{ gmol/day}$
 Sat capacity = $\frac{9.67}{29.2} = 0.331 \text{ gmol/kg}$
 The fraction of new bed used to break pur = $\frac{0.165}{20.5} = 0.797$

Q. 5b - Basis - 5000 kg of Na_2CO_3
 $0.75 \times 5000 = \text{Water of crystallization} + \text{water in M.L.} + \text{water evaporated}$
 $0.25 \times 5000 = \frac{106}{106 + 80} \cdot C + \frac{215}{1215} \text{ mL}$
 $+ 0.05 \times 0.75 \times 5000$
 $\Rightarrow 1062.5 = 0.37C + 0.176 \text{ mL}$
 $\Rightarrow 1888.5 = C + \text{ML}$
 $C = 1110.8 \text{ kg}$