

# Chapter 10

D11

$$D = 2250 \text{ lb/day}$$

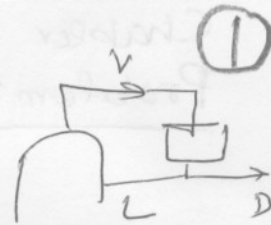
$$X_{\text{dist}} = 0.8$$

$$\frac{L}{D} = 2.0 \text{ (assume it to be mass ratio)}$$

$$P = 1 \text{ atm}$$

Packed Column with 5/8" Plastic Pall Rings

$$T = 176 \text{ F} = 353 \text{ K}$$



$$L/D = 2.0$$

$$\therefore L = 2D = 2 \times 2250 = 4500 \text{ lb/day}$$

$$V = L + D = 2D + D = 3D = 6750 \text{ lb/day}$$

$$F_{LV} = \frac{L}{V} \left( \frac{\rho_g}{\rho_L} \right)^{0.5} = \frac{4500}{6750} \times$$

$$\rho_g = \text{Vapor density} = \frac{n}{V} = \frac{P}{RT} = \frac{1 \text{ atm}}{0.082057 \times 353 \text{ K}} = 0.034523 \frac{\text{mol}}{\text{L}}$$

$$= 1.1 \text{ g/L}$$

$$\rho_L = 0.82 = 51.168 \text{ lb/ft}^3$$

$$= 1.1 \times 10^{-3} \text{ g/ml}$$

$$= 0.0686 \text{ lb/ft}^3$$

$$\therefore F_{LV} = \frac{L}{V} \left( \frac{\rho_g}{\rho_L} \right)^{0.5} = \frac{4500}{6750} \times \left[ \frac{1.1 \times 10^{-3}}{0.82} \right]^{0.5} = 0.0244$$

(a) % Flooding = 75%

$$\frac{\text{For 100% Flooding}}{G^2 F \psi N^{0.2}} = 0.02 \text{ from Figure 10.25 at 100% flooding}$$

$$\frac{1}{\rho_g \rho_L \rho_c}$$

For 5/8" Pall rings,  $F = 70$ ,  $\alpha = 0.43$ ,  $\beta = 0.17$

$$\psi = \frac{\rho_w}{\rho_L} = \frac{1}{0.82} = 1.22$$

$$G^2 = \frac{0.02 \times \rho_g \times \rho_L \times \rho_c}{F \psi N^{0.2}} = \frac{0.02 \times 0.0686 \times 51.168 \times 32.2}{70 \times 1.22 \times (0.52)^{0.2}}$$

$$G = 0.5549 \text{ lb/ft}^2 \cdot \text{s at 100% floody}$$

$$\therefore G \text{ at 75% floody} = 0.5549 \times 0.7 = 0.3885 \text{ lb/ft}^2 \cdot \text{s}$$

Q. 10-D-11. Contd.

(2)

$$\text{Area} = \frac{V}{G} = \frac{6750 \frac{\text{lb}}{\text{day}}}{0.3842 \frac{\text{ft}^2 \cdot \text{S}}{\text{lb}}} * \frac{1 \text{ day}}{24 * 3600 \text{ S}}$$
$$= 0.2033 \text{ ft}^2$$

$$D = 0.5088 \text{ ft} = 6.105''$$

(b)  $\Delta P = 0.25$  inch water/ft

From fig 10.25 at 0.25 pr. drop.

$$\frac{G^2 F \rho N^{0.2}}{S_s \rho L \rho_c} = 0.035$$

$$\therefore G^2 = 0.2301 \text{ lb/ft}^2$$

$$\therefore \text{Area} = \frac{6750}{0.2301 * 24 * 3600} = 0.3395$$

$$\therefore D = 0.657 \text{ ft} = 7.89 \text{ inch}$$