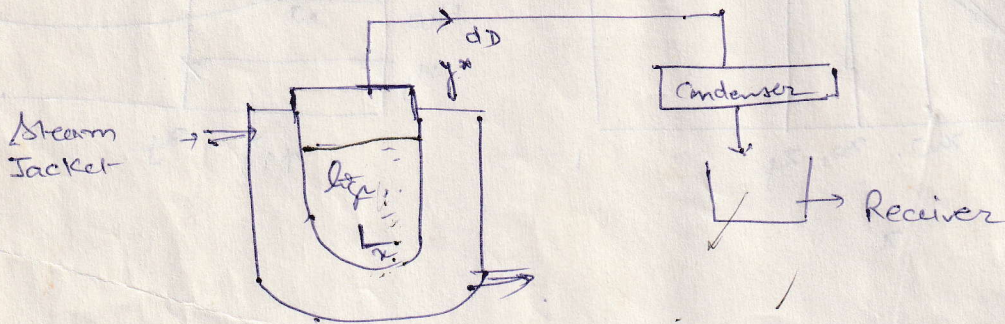


Differential or Simple Distillation } batch operation

An infinite number of successive flash vaporization of liquid
 And each time only an infinitesimal portion of the
 liquid were flashed.



liquid is boiled slowly \rightarrow vap issuing from liquid would at all
 time be in eqm with the liquid.
 the distillate can therefore be collected in several separate
 batches called cuts, to give a series of distilled products
 of various purities.

Binary mixture \rightarrow
$$\frac{dM}{dt} = \dot{m}_i - \dot{m}_o + R_g - R_c$$

Total material balance

$\frac{dL}{dt} = \frac{dD}{dt} + \frac{dL}{dt}$

mole in = mole out + Accumulation.

$0 = dD + dL$

Accumulation = $-dD$ ✓

Component balance

$$\begin{aligned} 0 &= y^* dD + \cancel{L} d(Lx) \\ &= y^* dD + L dx + x dL \\ &= y^* dD + L dx + x(-dD) \end{aligned}$$

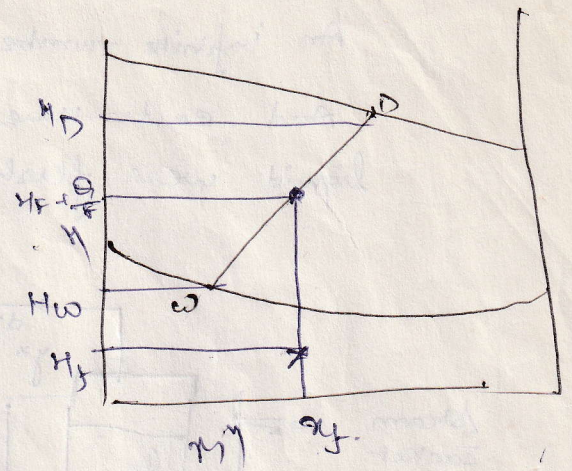
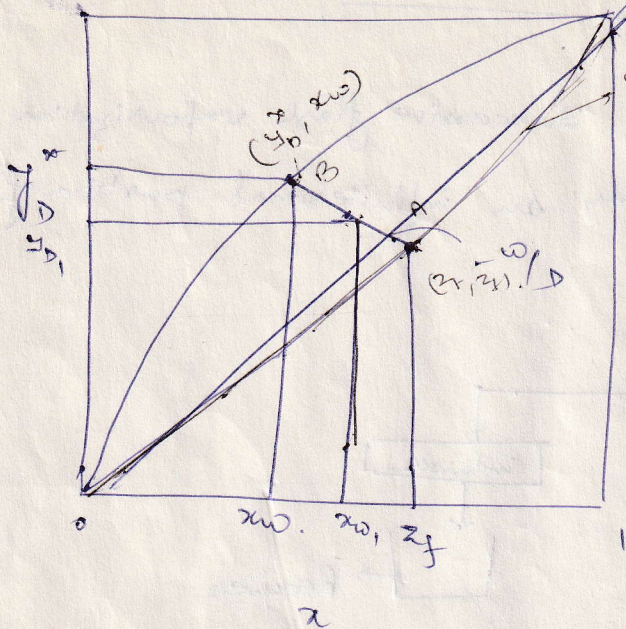
$-dD(y^* - x) \leftarrow R = dD(y^* - x) + L dx$
 $G dL(y^* - x) = L dx$

$$\int_{\frac{F}{W}}^{\frac{F}{W}} \frac{dL}{L} = \int_{x_w}^{x_F} \frac{dx}{(y^* - x)} = \ln \frac{F}{W} = \int_{x_w}^{x_F} \frac{dx}{y^* - x}$$

Physical significance

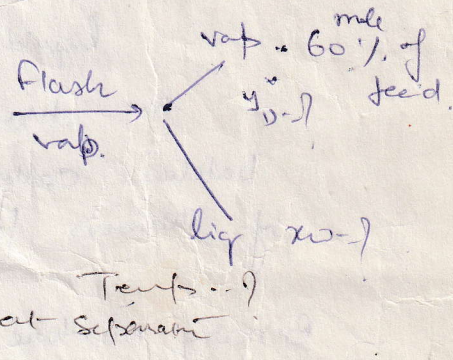
$d(yD) + d(Lx)$
 $y dD + D dy + L dx + x dL$

Rayleigh eqn



ex

n-Heptane - (A) 50% mole } T = 30°C
 n-Octane - (B) 50% mole } P = 1 Std Press
 atm

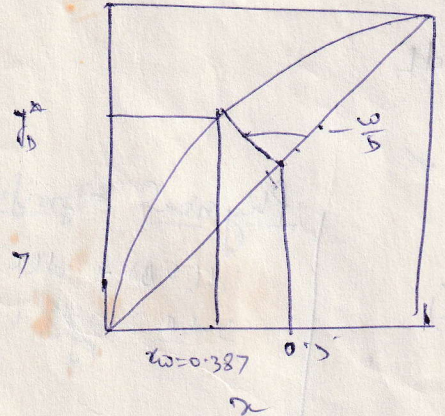


Soln

f = 100 mol, z_f = 0.5
 D = 60 mole, w = 40 mol

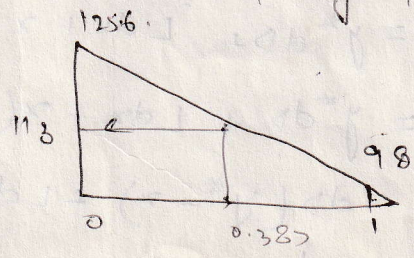
$$-\frac{w}{D} = \frac{40}{60} = -0.667$$

0.575 = y



T = 13°C

temp. can be obtained from temp graph at x_w = 0.387



a)

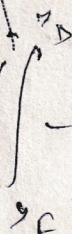
$$x^x dL + d(yD)$$

$$x^x dL + y dD + D dy$$

$$-x^x dD + y dD + D dy = 0$$

$$(y - x^x) dD + D dy = 0$$

$$-(y - x^x) dD + D dy$$



$$-\frac{dy}{(y - x^x)} = \frac{dD}{D}$$

$$= \ln \frac{D}{F}$$

(+ve) with distance

$$\int_{y_f}^{y_D} \frac{dy}{(y - x^x)} = \ln \frac{F}{D}$$