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LAMPIRAN 1

Dalam perhitungan perancangan alat distilasi menggunakan contoh jurnal berjudul "Pengambilan minyak atsiri dari daun dan batang sereh wangi menggunakan metode distilasi uap air dengan pemanasan *microwave*". Dapat diketahui yaitu :

Massa bahan = 2,5 kg cengkeh = 2500 gram

Suhuoperasi (T) = 105^0C

Tekanan (P) = 1 atm

Waktu = ±2 jam

Pelarut (air) = 2 liter

% rendemen = 0,29% - 1,52%

Densitas = 0,872 - 0,882 gr/cm^3

Indeks bias = 1,415 - 1,472

Bilangan asam = 2,805 - 3,366

Penyelesaian :

Menghitung kolom diameter (Kapasitas)

Gas flow rate = $\frac{Massa\ Benda}{Waktu}$

$= \frac{2{,}5\ kg}{1\ h}$= 2,5 kg/h

$= \frac{2{,}5\ kg/h}{29\ mol}$= 0,086 kmol/h

Liquid flow rate $= \frac{29{,}0}{\%\ Rendemen}$

$= \frac{29{,}0}{0{,}29\ \%}$*x* 0,086 kmol/h

= 8,6kmol/h x 17,9885

= 154,671 kg/h = $\frac{154{,}671\ \text{kg/h}}{3600\ s}$= 0,00819 kg/s

Select 38mm ($1^1/_2$ in) *ceramixintalax Saddles,* F*ρ*= 52 (*From table* 11.2)

Gas density at 105^0C = $\frac{29}{Ketetapan}$x$\frac{273^0\text{F}}{Suhu\ bahan\ (^0\text{F})}$

= $\frac{29}{22{,}4}$x $\frac{273^0\text{F}}{(105+273)^0\text{F}}$

= 0,935 kg/m^2

Liquid density = 1000 kg/m^3

Liquid viscosity = 10^{-3} Ns/m^3

$\frac{Lw^*}{Gw^*}\sqrt{\frac{\rho v}{\rho L}}$ $= \frac{154{,}671}{2{,}5}\sqrt{\frac{0{,}935}{10^3}}$

= 1,89

Design for a pressure drop of 20 mm H_2O/m *packing* (Dari buku *Chemical Engineering* halaman 495)

K_4 = 0,35 (*From table* 11.4)

At Floading K_4 = 0,8

% *Floading* = $\sqrt{\frac{0,35}{0,8}}$x 100%

= 66 %

From table 11.18 Vw* = $\left[\frac{K4\ \rho v\ (\rho v - \rho L)}{42,9\ F\rho\ \left(\frac{\mu L}{\rho L}\right)^{0,1}}\right]^{1/2}$

= $\left[\frac{0,35\ x\ 0,935\ (1000-0,935)}{42,9\ x\ 52\left(\frac{10^{-3}}{10^{3}}\right)^{0,1}}\right]^{1/2}$

= $\left[\frac{326,94}{69,69}\right]^{1/2}$

= 2,167 kg/m^2h

Column area required = $\frac{2,5}{1,89}$ = 1,32 m^2(dibulatkan menjadi 1,5 m)

Diameter = $\sqrt{\frac{4}{\pi}}$x *column area required*

$= \sqrt{\frac{4}{3,14}}$x 1,32

= 1,29 m (dibulatkan menjadi 1,3 m)

Column area $= \frac{\pi}{4}$ x $1,29^2$

= 1,30 m

Packing size to column diameter ratio $= \frac{1,3}{38 \text{ x } 10^{-3}}$

= 34

% Floding at selected diameter = % floding x $\frac{\text{diameter}}{\text{colom area}}$

= 66 x$\frac{1,29}{1,3}$

= 65 %

Clod consider reducing column diameter estimations of Hob

- Cornell's methud

  DL = 1,7 x $10^{-9}m^2/s$

  Dv = 1,45 x $10^{-5}m^2/s$

$$\mu v = 0,018\, x\, 10^{-3} Ns/m^2$$

(Sc)v = $\frac{0,081\, x\, 10^{-3}}{0,935\, x\, 1,45\, x\, 10^{-3}}$

= 1,27

(Sv) = $\frac{10^{-3}}{1000\ x\ 1{,}7\ x\ 10^{-9}}$

= 588

Lw* = $\frac{154{,}671}{1{,}30}$

= 118,9 kg/m^{2}h → : 3600 (s) = 0,033 kg/m^2

- From fig. 11.41 at Gs percent floding ,k3 = 0,79
- From fig 11.42 at Gs percent floding = 57
- From fig 11.48 at Lw* = 0,033, $\emptyset n = 0{,}01$

Cornell's method

Persamaan 11.11

HL = 3,05$\emptyset n\ (\ Sc\ )l\ 0{,}5\ k3\ \frac{₴}{3{,}05}$. 0,15

Size 50 (2 in) mm , HETP, in 0,9m

HL = 0,35 x 0,01 (588)^{0,5} x 0,79 $\frac{0{,}9}{3{,}05}$

HL = 0,028 M

HG = 0,11 x 57 (1,27)^{0,5} (2.3) $\frac{0{,}9}{3{,}05}^{0{,}33}$ / (0,033)^{0,5}

HG = 0,67 m

Dibutuhkan menjadi = 0,7m

Optimumnya antara 0,6 sampai 0,8 diambil 0,7

Persamaan 11.105

HOG = Hg + $\frac{m6\ m}{Lm}$ H_2

HOG = 0,67 + 0,7 x 0,028

= 0,68 m

Z = 0,9 x 0,7 = 0,63 m

Nilai tinggi (higher) dengan menggunakan metode cornell's didapatkan sekitar = 0,63 m

LAMPIRAN 2

PERHITUNGAN % HASIL RENDEMEN MINYAK ATSIRI KUNYIT

% RENDEMEN PADA AMPAS KUNYIT

$$\% \text{ Rendemen} = \frac{jumlah\ minyak\ yang\ dihasikan}{jumlah\ bahan\ sebelum\ diolah} \times 100\%$$

$$\% \text{ Rendemen} = \frac{15{,}74-14{,}88}{4000} \times 100\% = 0{,}0215$$

$$\% \text{ Rendemen} = \frac{16{,}34-14{,}88}{4000} \times 100\% = 0{,}0365$$

$$\% \text{ Rendemen} = \frac{16{,}98-14{,}88}{4000} \times 100\% = 0{,}0215$$

% RENDEMEN PADA RIMPANG KUNYIT

$$\% \text{ Rendemen} = \frac{jumlah\ minyak\ yang\ dihasikan}{jumlah\ bahan\ sebelum\ diolah} \times 100\%$$

$$\% \text{ Rendemen} = \frac{15{,}78-14{,}88}{4000} \times 100\% = 0{,}0225$$

$$\% \text{ Rendemen} = \frac{16{,}43-14{,}88}{4000} \times 100\% = 0{,}03875$$

$$\% \text{ Rendemen} = \frac{16{,}95-14{,}88}{4000} \times 100\% = 0{,}05175$$