

LAMPIRAN PERHITUNGAN

1. Perhitungan Densitas dan Viskositas

- berat piknometer kosong = 27,87 gr
- volume piknometer = 25 ml

- $\rho = \frac{\text{berat piknometer isi} - \text{berat piknometer kosong}}{\text{volume piknometer}}$

- $\mu_x = \frac{t_x \times \rho_x}{t_0 \times \rho_0} \times \mu_0$

a. Variabel 1(15 menit)

- $\rho_1 = \frac{(55,80 - 27,87) \text{ gr}}{25 \text{ ml}}$
 $\rho_1 = 1,117 \text{ gr/ml}$

- $\mu_1 = \frac{1,67 \text{ s} \times 1,117 \text{ gr/ml}}{1 \times 1} \times 1$
 $\mu_1 = 1,8657 \text{ Cp}$

- $\rho_2 = \frac{(55,51 - 27,87) \text{ gr}}{25 \text{ ml}}$
 $\rho_2 = 1,1056 \text{ gr/ml}$

- $\mu_2 = \frac{1,59 \text{ s} \times 1,1056 \text{ gr/ml}}{1 \times 1} \times 1$
 $\mu_2 = 1,7579 \text{ Cp}$

- $\rho_3 = \frac{(55,31 - 27,87) \text{ gr}}{25 \text{ ml}}$
 $\rho_3 = 1,0976 \text{ gr/ml}$

- $\mu_3 = \frac{1,37 \text{ s} \times 1,0976 \text{ gr/ml}}{1 \times 1} \times 1$
 $\mu_3 = 1,0976 \text{ gr/ml}$

- $\rho_4 = \frac{(55,15 - 27,87) \text{ gr}}{25 \text{ ml}}$
 $\rho_4 = 1,0912 \text{ gr/ml}$

- $\mu_4 = \frac{1,21 \text{ s} \times 1,0912 \text{ gr/ml}}{1 \times 1} \times 1$
 $\mu_4 = 1,3204 \text{ gr/ml}$

- $\rho_5 = \frac{(55,03 - 27,87) \text{ gr}}{25 \text{ ml}}$
 $\rho_5 = 1,0864 \text{ gr/ml}$

- $\mu_5 = \frac{1,10 \text{ s} \times 1,0864 \text{ gr/ml}}{1 \times 1} \times 1$
 $\mu_5 = 1,1950 \text{ gr/ml}$

b. Variabel 2 (30 menit)

- $\rho_1 = \frac{(55,61 - 27,87) \text{ gr}}{25 \text{ ml}}$
 $\rho_1 = 1,1096 \text{ gr/ml}$

- $\mu_1 = \frac{1,63 \text{ s} \times 1,1096 \text{ gr/ml}}{1 \times 1} \times 1$
 $\mu_1 = 1,8086 \text{ Cp}$

- $\rho_2 = \frac{(55,42 - 27,87) \text{ gr}}{25 \text{ ml}}$
 $\rho_2 = 1,1020 \text{ gr/ml}$

- $\mu_2 = \frac{1,54 \text{ s} \times 1,1020 \text{ gr/ml}}{1 \times 1} \times 1$
 $\mu_2 = 1,6971 \text{ Cp}$

- $\rho_3 = \frac{(55,29 - 27,87) \text{ gr}}{25 \text{ ml}}$
 $\rho_3 = 1,0968 \text{ gr/ml}$

- $\mu_3 = \frac{1,33 \text{ s} \times 1,0968 \text{ gr/ml}}{1 \times 1} \times 1$
 $\mu_3 = 1,4587 \text{ gr/ml}$

$$\begin{aligned} - \rho_4 &= \frac{(55,13-27,87)gr}{25 ml} \\ \rho_4 &= 1,0904 \text{ gr/ml} \end{aligned}$$

$$\begin{aligned} - \rho_5 &= \frac{(55,01-27,87)gr}{25 ml} \\ \rho_5 &= 1,0856 \text{ gr/ml} \end{aligned}$$

$$\begin{aligned} - \mu_4 &= \frac{1,17 s \times 1,0904 \text{ gr/ml}}{1 \times 1} \times 1 \\ \mu_4 &= 1,2758 \text{ gr/ml} \end{aligned}$$

$$\begin{aligned} - \mu_5 &= \frac{0,98 s \times 1,0856 \text{ gr/ml}}{1 \times 1} \times 1 \\ \mu_5 &= 1,0639 \text{ gr/ml} \end{aligned}$$

b. Variabel 3 (45 menit)

$$\begin{aligned} - \rho_1 &= \frac{(55,44-27,87)gr}{25 ml} \\ \rho_1 &= 1,1028 \text{ gr/ml} \end{aligned}$$

$$\begin{aligned} - \rho_2 &= \frac{(55,23-27,87)gr}{25 ml} \\ \rho_2 &= 1,0944 \text{ gr/ml} \end{aligned}$$

$$\begin{aligned} - \rho_3 &= \frac{(55,14-27,87)gr}{25 ml} \\ \rho_3 &= 1,0908 \text{ gr/ml} \end{aligned}$$

$$\begin{aligned} - \rho_4 &= \frac{(55,02-27,87)gr}{25 ml} \\ \rho_4 &= 1,0860 \text{ gr/ml} \end{aligned}$$

$$\begin{aligned} - \rho_5 &= \frac{(54,97-27,87)gr}{25 ml} \\ \rho_5 &= 1,0840 \text{ gr/ml} \end{aligned}$$

$$\begin{aligned} - \mu_1 &= \frac{1,61 s \times 1,1028 \text{ gr/ml}}{1 \times 1} \times 1 \\ \mu_1 &= 1,7755 \text{ Cp} \end{aligned}$$

$$\begin{aligned} - \mu_2 &= \frac{1,50 s \times 1,0944 \text{ gr/ml}}{1 \times 1} \times 1 \\ \mu_2 &= 1,6416 \text{ Cp} \end{aligned}$$

$$\begin{aligned} - \mu_3 &= \frac{1,29 s \times 1,0068 \text{ gr/ml}}{1 \times 1} \times 1 \\ \mu_3 &= 1,4071 \text{ gr/ml} \end{aligned}$$

$$\begin{aligned} - \mu_4 &= \frac{1,14 s \times 1,0860 \text{ gr/ml}}{1 \times 1} \times 1 \\ \mu_4 &= 1,2380 \text{ gr/ml} \end{aligned}$$

$$\begin{aligned} - \mu_5 &= \frac{0,95 s \times 1,0840 \text{ gr/ml}}{1 \times 1} \times 1 \\ \mu_5 &= 1,0298 \text{ gr/ml} \end{aligned}$$

c. Variabel 4 (60 menit)

$$\begin{aligned} - \rho_1 &= \frac{(55,25-27,87)gr}{25 ml} \\ \rho_1 &= 1,0952 \text{ gr/ml} \end{aligned}$$

$$\begin{aligned} - \rho_2 &= \frac{(55,16-27,87)gr}{25 ml} \\ \rho_2 &= 1,0916 \text{ gr/ml} \end{aligned}$$

$$\begin{aligned} - \rho_3 &= \frac{(54,96-27,87)gr}{25 ml} \\ \rho_3 &= 1,0836 \text{ gr/ml} \end{aligned}$$

$$\begin{aligned} - \rho_4 &= \frac{(54,87-27,87)gr}{25 ml} \\ \rho_4 &= 1,0800 \text{ gr/ml} \end{aligned}$$

$$\begin{aligned} - \rho_5 &= \frac{(54,63-27,87)gr}{25 ml} \\ \rho_5 &= 1,0704 \text{ gr/ml} \end{aligned}$$

$$\begin{aligned} - \mu_1 &= \frac{1,58 s \times 1,0952 \text{ gr/ml}}{1 \times 1} \times 1 \\ \mu_1 &= 1,7304 \text{ Cp} \end{aligned}$$

$$\begin{aligned} - \mu_2 &= \frac{1,47 s \times 1,0916 \text{ gr/ml}}{1 \times 1} \times 1 \\ \mu_2 &= 1,6047 \text{ Cp} \end{aligned}$$

$$\begin{aligned} - \mu_3 &= \frac{1,23 s \times 1,0836 \text{ gr/ml}}{1 \times 1} \times 1 \\ \mu_3 &= 1,3328 \text{ gr/ml} \end{aligned}$$

$$\begin{aligned} - \mu_4 &= \frac{1,09 s \times 1,0800 \text{ gr/ml}}{1 \times 1} \times 1 \\ \mu_4 &= 1,1772 \text{ gr/ml} \end{aligned}$$

$$\begin{aligned} - \mu_5 &= \frac{0,91 s \times 1,0704 \text{ gr/ml}}{1 \times 1} \times 1 \\ \mu_5 &= 1,09741 \text{ gr/ml} \end{aligned}$$

d. Variabel 5 (75 menit)

$$\begin{aligned} - \rho_1 &= \frac{(54,99-27,87)gr}{25 \text{ ml}} \\ \rho_1 &= 1,0848 \text{ gr/ml} \end{aligned}$$

$$\begin{aligned} - \rho_2 &= \frac{(54,76-27,87)gr}{25 \text{ ml}} \\ \rho_2 &= 1,0756 \text{ gr/ml} \end{aligned}$$

$$\begin{aligned} - \rho_3 &= \frac{(54,53-27,87)gr}{25 \text{ ml}} \\ \rho_3 &= 1,0664 \text{ gr/ml} \end{aligned}$$

$$\begin{aligned} - \rho_4 &= \frac{(54,33-27,87)gr}{25 \text{ ml}} \\ \rho_4 &= 1,0584 \text{ gr/ml} \end{aligned}$$

$$\begin{aligned} - \rho_5 &= \frac{(54,17-27,87)gr}{25 \text{ ml}} \\ \rho_5 &= 1,0520 \text{ gr/ml} \end{aligned}$$

$$\begin{aligned} - \mu_1 &= \frac{1,56 \text{ s} \times 1,0848 \text{ gr/ml}}{1 \times 1} \times 1 \\ \mu_1 &= 1,6923 \text{ Cp} \end{aligned}$$

$$\begin{aligned} - \mu_2 &= \frac{1,43 \text{ s} \times 1,0756 \text{ gr/ml}}{1 \times 1} \times 1 \\ \mu_2 &= 1,5381 \text{ Cp} \end{aligned}$$

$$\begin{aligned} - \mu_3 &= \frac{1,20 \text{ s} \times 1,0664 \text{ gr/ml}}{1 \times 1} \times 1 \\ \mu_3 &= 1,2797 \text{ gr/ml} \end{aligned}$$

$$\begin{aligned} - \mu_4 &= \frac{1,03 \text{ s} \times 1,0584 \text{ gr/ml}}{1 \times 1} \times 1 \\ \mu_4 &= 1,0902 \text{ gr/ml} \end{aligned}$$

$$\begin{aligned} - \mu_5 &= \frac{0,87 \text{ s} \times 1,0520 \text{ gr/ml}}{1 \times 1} \times 1 \\ \mu_5 &= 0,9152 \text{ gr/ml} \end{aligned}$$

2. Perhitungan Cake Basah dan Cake Kering

- Berat Basah =
(Berat cawan porselin + Cake basah) – Berat cawan porselin kosong
- Berat Kering =
(Berat cawan porselin + Cake kering) – Berat cawan porselin kosong

a. Variabel 1 (15 menit)

- Cake Basah

$$\begin{aligned} - \text{Berat basah 1} &= (47,78 - 44,86)gr \\ &= 2,92 \text{ gr} \end{aligned}$$

$$\begin{aligned} - \text{Berat basah 2} &= (47,00 - 44,42)gr \\ &= 2,58 \text{ gr} \end{aligned}$$

$$\begin{aligned} - \text{Berat basah 3} &= (46,20 - 43,83)gr \\ &= 2,37 \text{ gr} \end{aligned}$$

$$\begin{aligned} - \text{Berat basah 4} &= (46,10 - 43,81)gr \\ &= 2,29 \text{ gr} \end{aligned}$$

- Cake Kering

$$\begin{aligned} - \text{Berat kering 1} &= (47,53 - 44,86)gr \\ &= 2,67 \text{ gr} \end{aligned}$$

$$\begin{aligned} - \text{Berat kering 2} &= (46,77 - 44,42)gr \\ &= 2,35 \text{ gr} \end{aligned}$$

$$\begin{aligned} - \text{Berat kering 3} &= (46,02 - 43,83)gr \\ &= 2,19 \text{ gr} \end{aligned}$$

$$\begin{aligned} - \text{Berat kering 4} &= (45,90 - 43,81)gr \\ &= 2,09 \text{ gr} \end{aligned}$$

b. Variabel 2 (30 menit)

• Cake Basah

- Berat basah 1 = $(48,53 - 44,86)$ gr
= 3,67 gr

- Berat basah 2 = $(48,05 - 44,42)$ gr
= 3,63 gr

- Berat basah 3 = $(47,10 - 43,83)$ gr
= 3,27 gr

- Berat basah 4 = $(46,92 - 43,81)$ gr
= 3,11 gr

• Cake Kering

- Berat kering 1 = $(48,30 - 44,86)$ gr
= 3,44 gr

- Berat kering 2 = $(47,80 - 44,42)$ gr
= 3,38 gr

- Berat kering 3 = $(46,90 - 43,83)$ gr
= 3,07 gr

- Berat kering 4 = $(46,79 - 43,81)$ gr
= 2,98 gr

c. Variabel 3 (45 menit)

• Cake Basah

- Berat basah 1 = $(48,84 - 44,86)$ gr
= 3,98 gr

- Berat basah 2 = $(47,95 - 44,42)$ gr
= 3,53 gr

- Berat basah 3 = $(47,22 - 43,83)$ gr
= 3,39 gr

- Berat basah 4 = $(46,98 - 43,81)$ gr
= 3,17 gr

• Cake Kering

- Berat kering 1 = $(48,63 - 44,86)$ gr
= 3,77 gr

- Berat kering 2 = $(47,84 - 44,42)$ gr
= 3,42 gr

- Berat kering 3 = $(47,01 - 43,83)$ gr
= 3,18 gr

- Berat kering 4 = $(46,81 - 43,81)$ gr
= 3,00 gr

d. Variabel 4(60 menit)

• Cake Basah

- Berat basah 1 = $(48,90 - 44,86)$ gr
= 4,04 gr

- Berat basah 2 = $(48,30 - 44,42)$ gr
= 3,88 gr

- Berat basah 3 = $(47,57 - 43,83)$ gr
= 3,74 gr

- Berat basah 4 = $(47,15 - 43,81)$ gr
= 3,34 gr

• Cake Kering

- Berat kering 1 = $(48,75 - 44,86)$ gr
= 3,89 gr

- Berat kering 2 = $(48,10 - 44,42)$ gr
= 3,68 gr

- Berat kering 3 = $(47,36 - 43,83)$ gr
= 3,53 gr

- Berat kering 4 = $(47,04 - 43,81)$ gr
= 3,23 gr

e. Variabel 5 (75 menit)

• Cake Basah

- Berat basah 1 = $(49,01 - 44,86)\text{gr}$
= 4,15 gr

- Berat basah 2 = $(48,50 - 44,42)\text{gr}$
= 4,08 gr

- Berat basah 3 = $(47,75 - 43,83)\text{gr}$
= 3,92 gr

- Berat basah 4 = $(47,30 - 43,81)\text{gr}$
= 3,49 gr

• Cake Kering

- Berat kering 1 = $(48,80 - 44,86)\text{gr}$
= 3,94 gr

- Berat kering 2 = $(48,27 - 44,42)\text{gr}$
= 3,85 gr

- Berat kering 3 = $(47,40 - 43,83)\text{gr}$
= 3,57 gr

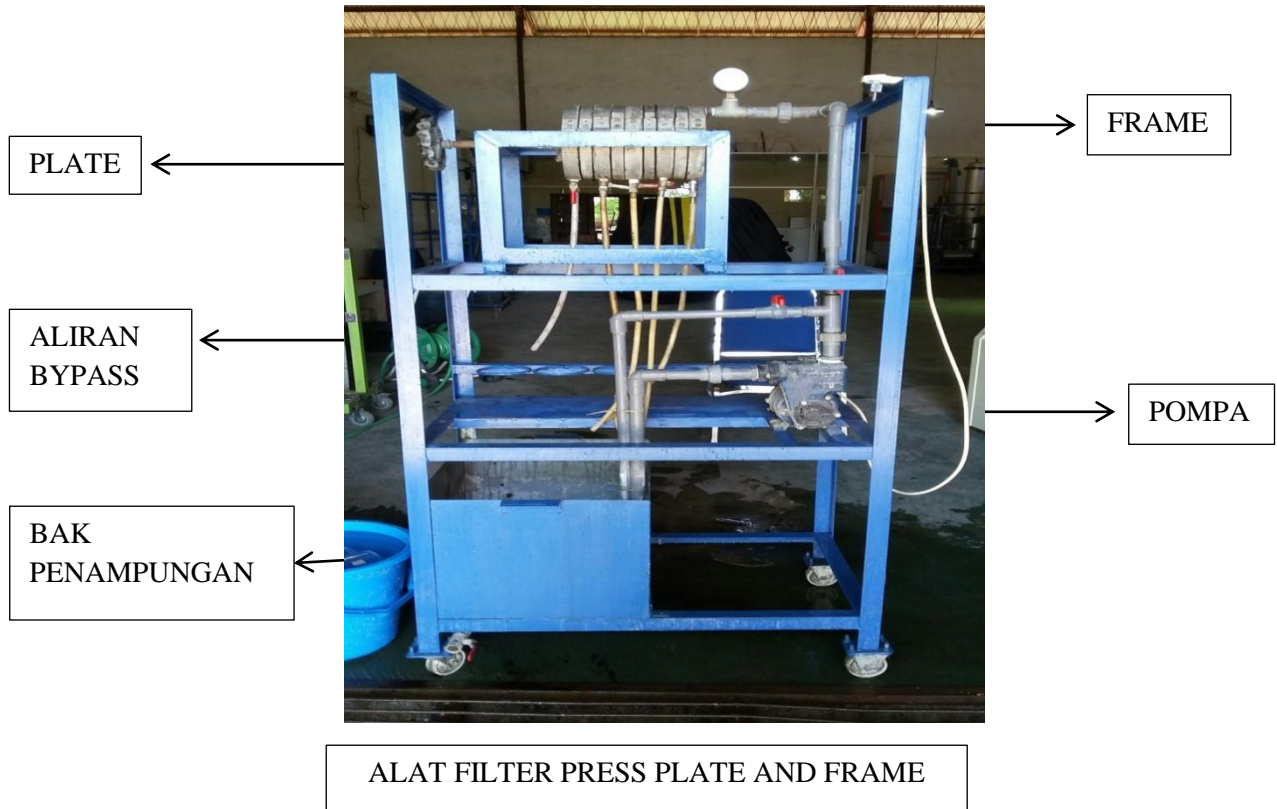
- Berat kering 4 = $(47,10 - 43,81)\text{gr}$
= 3,29 gr

3. Efisiensi Alat

$$\begin{aligned} Efisiensi &= \frac{\text{jumlah masa cake kering}}{\text{masa jahe}} \times 100\% \\ &= \frac{5,9 \times 5000 \text{ gr}}{5000 \text{ gr}} \times 100\% \\ &= 59\% \end{aligned}$$

LAMPIRAN GAMBAR

1. Foto Alat *Plate and Frame Filter Press*



2. Foto

Foto	Keterangan
	Jahe Gajah
	Pengukuran volume filtrat
	Cake Basah
	Cake Kering