

LAMPIRAN B
PERHITUNGAN

A. Perhitungan Bahan Baku *Crude Palm Oil*

1. Kadar FFA

Berat sampel	: 5.033 gr
Vol titran	: 13.067 ml
N NaOH	: 0,1 N
BE asam palmitat	: 256,42 gr/ek

Penyelesaian :

$$\begin{aligned}\% \text{ FFA} &= \frac{\text{BE asam Palmitat} \times \text{N NaOH} \times \text{Liter KOH}}{\text{Berat Sampel}} \\ &= \frac{256,42 \frac{\text{gr}}{\text{ek}} \times 0,1 \frac{\text{ek}}{\text{l}} \times 0,13067 \text{ liter}}{5,033 \text{ gr}} \\ &= 6,6476 \%\end{aligned}$$

2. Densitas

$\rho_{\text{air } 40^\circ \text{C}}$	= 0,9882 gr/ml
Berat Pikno kosong	= 60,2871 gr
Berat Pikno + air	= 160,4 gr
Berat air	= (160,4 – 60 2871) gr = 100,1183 gr

$$\begin{aligned}\text{Volume air} &= \frac{m}{\rho_{\text{air}}} = \frac{100,1183 \text{ gr}}{0,9882 \text{ gr/ml}} \\ &= 100,6214 \text{ ml}\end{aligned}$$

Berat pikno + CPO	= 149,7 gr
Berat CPO	= (149,7 – 60,2871) gr = 89,4183 gr

$$\begin{aligned}\text{Berat jenis CPO} &= \frac{\text{Berat sampel CPO}}{\text{Volume Piknometer}} = \frac{89,4183 \text{ gr}}{100,6214 \text{ ml}} \\ &= 0,8887 \text{ gr/ml}\end{aligned}$$

3. Viskositas

Konstanta Viskometer (K)	= 3,3
Densitas Bola (ρ_f)	= 8,02 gr/ml

$$\begin{aligned}
 \text{Densitas CPO} &= 0,8887 \text{ gr/ml} \\
 \text{Waktu (menit)} &= 1,4882 \text{ menit} \\
 \text{Viskositas dinamik } (\mu) &= K(\rho_f - \rho_{\text{CPO}}) \text{ waktu} \\
 &= 3,3 \times (8,02 - 0,8887) \text{ gr/ml} \times 1,4882 \\
 &\text{menit} \\
 &= 35,0256 \text{ cP} \\
 \text{Viskositas Kinematik} &= \text{Viskositas dinamik } (\mu) / \text{Densitas CPO} \\
 &= 35,0256 \text{ cP} / 0,8887 \text{ gr/ml} \\
 &= 39,4138 \text{ cSt}
 \end{aligned}$$

B. Perhitungan Bahan Baku CaO

1. Kadar CaO

$$\begin{aligned}
 \text{Volume Titran} &= 23,4 \text{ ml} \\
 \text{N HCL} &= 1 \\
 \text{Massa Sampel} &= 1 \text{ gr} \\
 \text{Kadar CaO (\%)} &= \frac{\text{Volume Titran} \times \text{N HCL} \times 2,804}{\text{gr sampel}} \\
 &= \frac{23,4 \text{ ml} \times 1 \text{ N} \times 2,804}{1 \text{ gr}} \\
 &= 65,6136 \%
 \end{aligned}$$

C. Perhitungan Produk Biodiesel

1. Densitas

$$\begin{aligned}
 &\text{Untuk sampel 1 (0,2 gr ; 0,5 gr)} \\
 \rho_{\text{air } 40^\circ\text{C}} &= 0,9882 \text{ gr/ml} \\
 \text{Berat Pikno kosong} &= 60,2871 \text{ gr} \\
 \text{Berat Pikno + air} &= 160,4 \text{ gr} \\
 \text{Berat air} &= (160,4 - 60,2871) \text{ gr} \\
 &= 100,1183 \text{ gr} \\
 \text{Volume air} &= \frac{m}{\rho_{\text{air}}} = \frac{100,1183 \text{ gr}}{0,9882 \text{ gr/ml}} \\
 &= 100,6214 \text{ ml}
 \end{aligned}$$

$$\begin{aligned}
 \text{Berat pikno + Biodiesel} &= 148,7099 \text{ gr} \\
 \text{Berat Biodiesel} &= (148,7099 - 60,2871) \text{ gr} \\
 &= 88,4282 \text{ gr} \\
 \text{Berat jenis Biodiesel} &= \frac{\text{Berat sampel CPO}}{\text{Volume Piknometer}} = \frac{88,4282 \text{ gr}}{100,6214 \text{ ml}} \\
 &= 0,8788 \text{ gr/ml}
 \end{aligned}$$

Dengan cara yang sama diatas, hasil perhitungan densitas biodiesel untuk masing-masing tertera pada tabel 5.

2. Viskositas

Untuk sampel 1 (0,2 gr ; 0,5 gr)

$$\begin{aligned}
 \text{Konstanta Viskometer (K)} &= 3,3 \\
 \text{Densitas Bola } (\rho_f) &= 8,02 \text{ gr/ml} \\
 \text{Densitas Biodiesel} &= 0,8788 \text{ gr/ml} \\
 \text{Waktu (menit)} &= 0,22083 \text{ menit} \\
 \text{Viskositas dinamik } (\mu) &= K(\rho_f - \rho_{\text{CPO}}) \text{ waktu} \\
 &= 3,3 \times (8,02 - 0,8788) \text{ gr/ml} \times 0,22083 \\
 &\quad \text{menit} \\
 &= 5,2041 \text{ cP} \\
 \text{Viskositas Kinematik} &= \text{Viskositas dinamik } (\mu) / \text{Densitas CPO} \\
 &= 5,2041 \text{ cP} / 0,8788 \text{ gr/ml} \\
 &= 5,9217 \text{ cSt}
 \end{aligned}$$

Dengan cara yang sama diatas, hasil perhitungan viskositas biodiesel untuk masing-masing tertera pada tabel 5.

3. Kadar Air

Untuk sampel 1 (0,2 gr ; 0,5 gr)

$$\begin{aligned}
 \text{Berat cawan kosong (C)} &= 47,1791 \text{ gr} \\
 \text{Berat cawan + biodiesel sebelum pemanasan (A)} &= 50,2231 \text{ gr} \\
 \text{Berat cawan + biodiesel sesudah pemanasan (B)} &= 50,0870 \text{ gr}
 \end{aligned}$$

Penyelesaian :

$$\begin{aligned}
 \text{Kandungan air} &= \frac{A-B}{A-C} \times 100\% \\
 &= \frac{(50,2231 - 50,0870) \text{ gr}}{(50,2231 - 47,1791) \text{ gr}} \times 100 \% \\
 &= 4,4711 \%
 \end{aligned}$$

Dengan cara yang sama diatas, hasil perhitungan viskositas biodiesel untuk masing-masing tertera pada tabel 5.

4. Angka Asam

Untuk sampel 1 (0,2 gr ; 0,5 gr)

Volume Titran = 0,4 ml

Normalitas KOH = 0,1 N

BE KOH = 56,1 gr/mek

Berat Sampel = 5,2 gr

$$\begin{aligned}
 \text{Bilangan Asam} &= \frac{\text{Volume titran} \times \text{normalitas KOH} \times \text{BM KOH}}{\text{Berat Sampel}} \\
 &= \frac{0,4 \text{ ml} \times 0,1 \text{ N} \times 56,1 \text{ gr /mek}}{5,2 \text{ gr}} = 0,4315
 \end{aligned}$$

Dengan cara yang sama diatas, hasil perhitungan viskositas biodiesel untuk masing-masing tertera pada tabel 5.