

LAMPIRAN 1

Perhitungan fraksi volume komposit

Perhitungan fraksi volume dilakukan untuk menentukan massa serat kenaf dan matriks PP/HDPE sebelum pada tahap pencetakan. Komposisi matriks dan fillernya adalah 70%:30% dengan variasi perbandingan matriks PP : HDPE masing masing 1:1, 2:1 dan 1:2

Diketahui :

$$\text{Massa jenis serat kenaf} = 1,45 \text{ gr/cm}^3$$

$$\text{Massa jenis Polypropylene} = 0,92 \text{ gr/cm}^3$$

$$\text{Massa jenis HDPE} = 0,96 \text{ gr/cm}^3$$

$$\text{Dimensi Cetakan : panjang (p)} = 17 \text{ cm}$$

$$\text{lebar (l)} = 2 \text{ cm}$$

$$\text{tebal (t)} = 0,3 \text{ cm}$$

1. Perbandingan fraksi volume matriks PP dan serat adalah 70%:30%,

$$\begin{aligned} \text{Volume cetakan, } V_c &= p \times l \times t \\ &= 17 \text{ cm} \times 9 \text{ cm} \times 0,3 \text{ cm} \\ &= 45,9 \text{ cm}^3 \end{aligned}$$

$$\begin{aligned} \text{Volume matriks, } V_m &= \frac{V_m}{100} \times V_c \\ &= \frac{70\%}{100} \times 45,9 \text{ cm}^3 \\ &= 32,13 \text{ cm}^3 \end{aligned}$$

$$\begin{aligned} \text{Volume serat kenaf, } V_s &= \frac{V_s}{100} \times V_c \\ &= \frac{30}{100} \times 45,9 \text{ cm}^3 \\ &= 13,77 \text{ cm}^3 \end{aligned}$$

$$\begin{aligned} \text{Massa serat kenaf, } m_{kenaf} &= V_{kenaf} \times \rho_{kenaf} \\ &= 13,77 \text{ cm}^3 \times 1,45 \text{ gr/cm}^3 \\ &= 19,96 \text{ gr} \end{aligned}$$

$$\begin{aligned}
\text{Massa PP, } m_{PP} &= V_m \times \rho_{PP} \\
&= 32,13 \times 0,92 \text{ gr/cm}^3 \\
&= 29,55 \text{ gr}
\end{aligned}$$

2. Perbandingan fraksi volume matriks HDPE dan serat adalah 70%:30%.

$$\begin{aligned}
\text{Volume cetakan, } V_c &= p \times l \times t \\
&= 17 \text{ cm} \times 9 \text{ cm} \times 0,3 \text{ cm} \\
&= 45,9 \text{ cm}^3
\end{aligned}$$

$$\begin{aligned}
\text{Volume matriks, } V_m &= \frac{V_m}{100} \times V_c \\
&= \frac{70\%}{100} \times 45,9 \text{ cm}^3 \\
&= 32,13 \text{ cm}^3
\end{aligned}$$

$$\begin{aligned}
\text{Volume serat kenaf, } V_s &= \frac{V_s}{100} \times V_c \\
&= \frac{30}{100} \times 45,9 \text{ cm}^3 \\
&= 13,77 \text{ cm}^3
\end{aligned}$$

$$\begin{aligned}
\text{Massa serat kenaf, } m_{kenaf} &= V_{kenaf} \times \rho_{kenaf} \\
&= 13,77 \text{ cm}^3 \times 1,45 \text{ gr/cm}^3 \\
&= 19,96 \text{ gr}
\end{aligned}$$

$$\begin{aligned}
\text{Massa PP, } m_{PP} &= V_m \times \rho_{HDPE} \\
&= 32,13 \times 0,96 \text{ gr/cm}^3 \\
&= 30,84 \text{ gr}
\end{aligned}$$

3. Fraksi volume PP : HDPE (1: 1)

$$\begin{aligned}
\text{Volume cetakan (} V_c \text{)} &= p \times l \times t \\
&= 17 \text{ cm} \times 9 \text{ cm} \times 0,3 \text{ cm} \\
&= 45,9 \text{ cm}^3
\end{aligned}$$

$$\begin{aligned}
\text{Volume matriks (} V_m \text{)} &= \frac{70\%}{100\%} \times 45,9 \text{ cm}^3 \\
&= 32,13 \text{ cm}^3
\end{aligned}$$

$$\begin{aligned}
\text{Volume serat kenaf (} V_s \text{)} &= \frac{30\%}{100\%} \times 45,9 \text{ cm}^3 \\
&= 13,77 \text{ cm}^3
\end{aligned}$$

$$\begin{aligned}
\text{Volume matriks PP (V}_{\text{pp}}) &= \frac{1}{2} \times 32,13 \text{ cm}^3 \\
&= 16,065 \text{ cm}^3 \\
\text{Volume matriks HDPE (V}_{\text{HDPE}}) &= \frac{1}{2} \times 32,13 \text{ cm}^3 \\
&= 16,065 \text{ cm}^3 \\
\text{Massa serat kenaf (m}_{\text{kenaf}}) &= V_{\text{kenaf}} \times \rho_{\text{kenaf}} \\
&= 13,77 \text{ cm}^3 \times 1,45 \text{ gr/cm}^3 \\
&= 19,9665 \text{ gr} \\
\text{Massa serat PP (m}_{\text{PP}}) &= V_{\text{PP}} \times \rho_{\text{PP}} \\
&= 16,065 \text{ cm}^3 \times 0,92 \text{ gr/cm}^3 \\
&= 14,77 \text{ gr} \\
\text{Massa serat HDPE (m}_{\text{HDPE}}) &= V_{\text{HDPE}} \times \rho_{\text{HDPE}} \\
&= 16,065 \text{ cm}^3 \times 0,96 \text{ gr/cm}^3 \\
&= 15,4224 \text{ gr}
\end{aligned}$$

4. Fraksi volume PP : HDPE (2 : 1)

$$\begin{aligned}
\text{Volume cetakan (V}_c) &= p \times l \times t \\
&= 17 \text{ cm} \times 9 \text{ cm} \times 0,3 \text{ cm} \\
&= 45,9 \text{ cm}^3 \\
\text{Volume matriks (V}_m) &= \frac{70\%}{100\%} \times 45,9 \text{ cm}^3 \\
&= 32,13 \text{ cm}^3 \\
\text{Volume serat kenaf (V}_s) &= \frac{30\%}{100\%} \times 45,9 \text{ cm}^3 \\
&= 13,77 \text{ cm}^3 \\
\text{Volume matriks PP (V}_{\text{pp}}) &= \frac{2}{3} \times 32,13 \text{ cm}^3 \\
&= 21,42 \text{ cm}^3 \\
\text{Volume matriks HDPE (V}_{\text{HDPE}}) &= \frac{1}{3} \times 32,13 \text{ cm}^3 \\
&= 10,71 \text{ cm}^3 \\
\text{Massa serat kenaf (m}_{\text{kenaf}}) &= V_{\text{kenaf}} \times \rho_{\text{kenaf}} \\
&= 13,77 \text{ cm}^3 \times 1,45 \text{ gr/cm}^3 \\
&= 19,9665 \text{ gr}
\end{aligned}$$

$$\begin{aligned}
\text{Massa serat PP (m}_{PP}\text{)} &= V_{PP} \times \rho_{PP} \\
&= 21,42 \text{ cm}^3 \times 0,92 \text{ gr/cm}^3 \\
&= 19,7064 \text{ gr}
\end{aligned}$$

$$\begin{aligned}
\text{Massa serat HDPE (m}_{HDPE}\text{)} &= V_{HDPE} \times \rho_{HDPE} \\
&= 10,71 \text{ cm}^3 \times 0,96 \text{ gr/cm}^3 \\
&= 10,2816 \text{ gr}
\end{aligned}$$

5. Fraksi volume PP : HDPE (2 : 1)

$$\begin{aligned}
\text{Volume cetakan (V}_c\text{)} &= p \times l \times t \\
&= 17 \text{ cm} \times 9 \text{ cm} \times 0,3 \text{ cm} \\
&= 45,9 \text{ cm}^3
\end{aligned}$$

$$\begin{aligned}
\text{Volume matriks (V}_m\text{)} &= \frac{70\%}{100\%} \times 45,9 \text{ cm}^3 \\
&= 32,13 \text{ cm}^3
\end{aligned}$$

$$\begin{aligned}
\text{Volume serat kenaf (V}_s\text{)} &= \frac{30\%}{100\%} \times 45,9 \text{ cm}^3 \\
&= 13,77 \text{ cm}^3
\end{aligned}$$

$$\begin{aligned}
\text{Volume matriks PP (V}_{PP}\text{)} &= \frac{1}{3} \times 32,13 \text{ cm}^3 \\
&= 10,71 \text{ cm}^3
\end{aligned}$$

$$\begin{aligned}
\text{Volume matriks HDPE (V}_{HDPE}\text{)} &= \frac{2}{3} \times 32,13 \text{ cm}^3 \\
&= 21,42 \text{ cm}^3
\end{aligned}$$

$$\begin{aligned}
\text{Massa serat kenaf (m}_{kenaf}\text{)} &= V_{kenaf} \times \rho_{kenaf} \\
&= 13,77 \text{ cm}^3 \times 1,45 \text{ gr/cm}^3 \\
&= 19,9665 \text{ gr}
\end{aligned}$$

$$\begin{aligned}
\text{Massa serat PP (m}_{PP}\text{)} &= V_{PP} \times \rho_{PP} \\
&= 10,71 \text{ cm}^3 \times 0,92 \text{ gr/cm}^3 \\
&= 9,8532 \text{ gr}
\end{aligned}$$

$$\begin{aligned}
\text{Massa serat HDPE (m}_{HDPE}\text{)} &= V_{HDPE} \times \rho_{HDPE} \\
&= 21,42 \text{ cm}^3 \times 0,96 \text{ gr/cm}^3 \\
&= 20,5632 \text{ gr}
\end{aligned}$$