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LAMPIRAN

1. Lampiran Gambar Pembuatan Spesimen



2. Lampiran Gambar Pengujian Spesimen





LABORATORIUM BAHAN TEKNIK
DEPARTEMEN TEKNIK MESIN SEKOLAH VOKASI
UNIVERSITAS GADJAH MADA

Keterangan

1. Pengujian dilakukan tanggal 14 Desember 2024
2. Pengujian menggunakan universal wear
3. Jarak pengausan 15 m, Beban pengujian 6,36 kg

Identitas :

Nama : Mokhamad Rera Setiawan
NPM : 6418500015
Institusi : Teknik Mesin Universitas Panca Sakti Tegal

Lembar asli, tidak untuk digandakan



Yogyakarta 14 Desember 2024
Staf Laboratorium Bahan Teknik

Pengujian & Analisa Material
Lab. Bahan Teknik
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HASIL PENGUJIAN KEKERASAN VICKERS

No	Variasi Spesimen	Diagonal		Kekerasan	Kekerasan
		D1 (mm)	D2 (mm)	(VHN)	rata-rata (VHN)
1	3%	0,70	0,70	75,7	68,0
2		0,76	0,77	63,4	
3		0,75	0,76	65,0	
4	4%	0,76	0,78	62,5	61,8
5		0,80	0,80	57,9	
6		0,75	0,76	65,0	
7	5%	0,73	0,75	67,7	57,9
8		0,82	0,82	55,1	
9		0,85	0,86	50,7	

Keterangan:

1. Pengujian dilakukan tanggal 7 Desember 2024
2. Menggunakan Hardness Micro Vickers dengan pembebanan 20 gf

Identitas :

Nama : Mokhamad Rera Setiawan
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Yogyakarta, 7 Desember 2024
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Dipindai dengan CamScanner



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HASIL PENGUJIAN TARIK

No.	Variasi Spesimen	Tebal (mm)	Lebar (mm)	Pmax (KN)	ΔL (mm)	Tegangan (MPa)	Regangan (%)
1	Al + SiC 3%_1	9.99	11.71	7.60	1.66	64.97	3.32
2	Al + SiC 3%_2	10.10	11.89	10.41	2.35	86.69	4.70
3	Al + SiC 3%_3	10.20	11.81	12.14	3.07	100.78	6.14
4	Al + SiC 4%_1	10.01	11.92	8.75	1.99	73.33	3.98
5	Al + SiC 4%_2	10.01	11.92	8.93	1.95	74.84	3.90
6	Al + SiC 4%_3	10.11	12.00	10.42	2.70	85.89	5.40
7	Al + SiC 5%_1	10.01	11.81	10.63	2.09	89.92	4.18
8	Al + SiC 5%_2	9.98	11.79	8.93	2.73	75.89	5.46
9	Al + SiC 5%_3	10.21	11.94	10.45	2.83	85.72	5.66

Lembar asli, tidak untuk digandakan

Keterangan:

1. Pengujian dilakukan tanggal 7 Desember 2024
2. Pengujian menggunakan Universal Testing Machine
3. Standar spesimen menggunakan ASTM E8

Identitas Penguji :

Nama : Mokhammad Rera Setiawan
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Yogyakarta, 7 Desember 2024
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HASIL PENGUJIAN KEAUSAN

Variasi Spesimen	Titik Uji	Tebal Disc (B;mm)	Jari-jari Disc (r;mm)	Panjang Wear (b;mm)	Volume Tergores (W;mm ³)	Keausan (Ws; mm ³ /kg.m)	Keausan rata-rata (Ws; mm ³ /kg.m)
3%_1	1	3.45	13.6	1.87	0.13750	0.00216	0.001366
	2	3.45	13.6	1.47	0.06669	0.00105	
	3	3.45	13.6	1.39	0.05637	0.00089	
3%_2	1	3.45	13.6	1.33	0.05011	0.00079	0.000516
	2	3.45	13.6	1.12	0.02970	0.00047	
	3	3.45	13.6	0.96	0.01870	0.00029	
3%_3	1	3.45	13.6	1.73	0.11009	0.00173	0.001760
	2	3.45	13.6	1.79	0.12057	0.00190	
	3	3.45	13.6	1.71	0.10509	0.00165	
4%_1	1	3.45	13.6	1.17	0.03415	0.00054	0.000690
	2	3.45	13.6	1.36	0.05318	0.00084	
	3	3.45	13.6	1.28	0.04433	0.00070	
4%_2	1	3.45	13.6	1.25	0.04162	0.00065	0.000577
	2	3.45	13.6	1.15	0.03187	0.00050	
	3	3.45	13.6	1.20	0.03653	0.00057	
4%_3	1	3.45	13.6	1.87	0.13750	0.00216	0.002456
	2	3.45	13.6	2.19	0.22103	0.00348	
	3	3.45	13.6	1.73	0.11009	0.00173	
5%_1	1	3.45	13.6	1.33	0.05011	0.00079	0.000717
	2	3.45	13.6	1.20	0.03653	0.00057	
	3	3.45	13.6	1.33	0.05011	0.00079	
5%_2	1	3.45	13.6	1.65	0.09554	0.00150	0.001300
	2	3.45	13.6	1.55	0.07821	0.00123	
	3	3.45	13.6	1.52	0.07424	0.00117	
5%_3	1	3.45	13.6	1.49	0.07040	0.00111	0.002206
	2	3.45	13.6	2.29	0.25498	0.00401	
	3	3.45	13.6	1.65	0.09554	0.00150	

Lembar asli, tidak untuk diandalkan



LAMPIRAN PERHITUNGAN DATA UJI KEKERASAN VICKERS

- a) Contoh Pengolahan data pengujian kekerasan vickers pada variasi Alumunium (Al) dengan penambahan Silikon Karbida (SiC) 3%.

- Titik uji ke 1

Diketahui :

$$P = 20 \text{ kgf}$$

$$D1 = 0,70 \text{ mm}$$

$$D2 = 0,70 \text{ mm}$$

$$D \text{ rata - rata} = \frac{D1 + D2}{2} = \frac{0,70 + 0,70}{2} = 0,70 \text{ mm}$$

Ditanya : VHN =.....?

Jawab :

$$\begin{aligned} VHN &= \frac{1,854 \times P}{D^2} \\ &= \frac{1,854 \times 20}{(0,70^2)} \\ &= 75,7 \end{aligned}$$

- Titik uji ke 2

Diketahui :

$$P = 20 \text{ kgf}$$

$$D1 = 0,76 \text{ mm}$$

$$D2 = 0,77 \text{ mm}$$

$$D \text{ rata - rata} = \frac{D1 + D2}{2} = \frac{0,76 + 0,77}{2} = 0,765 \text{ mm}$$

Ditanya : VHN =.....?

Jawab :

$$\begin{aligned} VHN &= \frac{1,854 \times P}{D^2} \\ &= \frac{1,854 \times 20}{(0,765^2)} \\ &= 63,4 \end{aligned}$$

- Titik uji ke 3

Diketahui :

$$P = 20 \text{ kgf}$$

$$D1 = 0,75 \text{ mm}$$

$$D2 = 0,76 \text{ mm}$$

$$D \text{ rata - rata} = \frac{D1 + D2}{2} = \frac{0,75 + 0,76}{2} = 0,755 \text{ mm}$$

Ditanya : VHN =.....?

Jawab :

$$\begin{aligned} VHN &= \frac{1,854 \times P}{D^2} \\ &= \frac{1,854 \times 20}{(0,755^2)} \\ &= 65,0 \end{aligned}$$

b) Pengolahan data pengujian kekerasan vickers pada variasi Alumunium (Al) dengan penambahan Silikon Karbida (SiC) 4%.

- Titik uji ke 1

Diketahui :

$$P = 20 \text{ kgf}$$

$$D1 = 0,76 \text{ mm}$$

$$D2 = 0,78 \text{ mm}$$

$$D \text{ rata - rata} = \frac{D1 + D2}{2} = \frac{0,76 + 0,78}{2} = 0,77 \text{ mm}$$

Ditanya : VHN =.....?

Jawab :

$$VHN = \frac{1,854 \times P}{D^2}$$

$$= \frac{1,854 \times 20}{(0,77^2)}$$

$$= 62,5$$

- Titik uji ke 2

Diketahui :

$$P = 20 \text{ kgf}$$

$$D1 = 0,80 \text{ mm}$$

$$D2 = 0,80 \text{ mm}$$

$$D \text{ rata - rata} = \frac{D1 + D2}{2} = \frac{0,80 + 0,80}{2} = 0,80 \text{ mm}$$

Ditanya : VHN =.....?

Jawab :

$$\begin{aligned} \text{VHN} &= \frac{1,854 \times P}{D^2} \\ &= \frac{1,854 \times 20}{(0,80^2)} \\ &= 57,9 \end{aligned}$$

- Titik uji ke 3

Diketahui :

P = 20 kgf

D1 = 0,75 mm

D2 = 0,76 mm

$$D \text{ rata - rata} = \frac{D1 + D2}{2} = \frac{0,75 + 0,76}{2} = 0,755 \text{ mm}$$

Ditanya : VHN =.....?

Jawab :

$$\begin{aligned} \text{VHN} &= \frac{1,854 \times P}{D^2} \\ &= \frac{1,854 \times 20}{(0,755^2)} \\ &= 65,0 \end{aligned}$$

c) Pengolahan data pengujian kekerasan vickers pada variasi Alumunium (Al) dengan penambahan Silikon Karbida (SiC) 5%.

- Titik uji ke 1

Diketahui :

$$P = 20 \text{ kgf}$$

$$D1 = 0,73 \text{ mm}$$

$$D2 = 0,75 \text{ mm}$$

$$D \text{ rata - rata} = \frac{D1 + D2}{2} = \frac{0,73 + 0,75}{2} = 0,74 \text{ mm}$$

Ditanya : VHN =.....?

Jawab :

$$\begin{aligned} VHN &= \frac{1,854 \times P}{D^2} \\ &= \frac{1,854 \times 20}{(0,74^2)} \\ &= 67,7 \end{aligned}$$

- Titik uji ke 2

Diketahui :

$$P = 20 \text{ kgf}$$

$$D1 = 0,82 \text{ mm}$$

$$D2 = 0,82 \text{ mm}$$

$$D \text{ rata - rata} = \frac{D1 + D2}{2} = \frac{0,82 + 0,82}{2} = 0,82 \text{ mm}$$

Ditanya : VHN =.....?

Jawab :

$$\text{VHN} = \frac{1,854 \times P}{D^2}$$

$$= \frac{1,854 \times 20}{(0,82^2)}$$

$$= 55,1$$

- Titik uji ke 3

Diketahui :

$$P = 20 \text{ kgf}$$

$$D1 = 0,85 \text{ mm}$$

$$D2 = 0,86 \text{ mm}$$

$$D \text{ rata - rata} = \frac{D1 + D2}{2} = \frac{0,85 + 0,86}{2} = 0,855 \text{ mm}$$

Ditanya : VHN =.....?

Jawab :

$$\text{VHN} = \frac{1,854 \times P}{D^2}$$

$$= \frac{1,854 \times 20}{(0,855^2)}$$

$$= 50,7$$

LAMPIRAN PERHITUNGAN DATA UJI TARIK

a) Pengolahan data pengujian tarik pada variasi Alumunium (Al) dengan penambahan Silikon Karbida (SiC) 3%.

- Spesimen ke 1

Diketahui :

$$P = 7,60 \text{ KN} = 7600 \text{ N}$$

$$\text{tebal} = 9,99 \text{ mm}$$

$$\text{lebar} = 11,71 \text{ mm}$$

$$L_0 = 50 \text{ mm}$$

$$\Delta L = 1,66 \text{ mm}$$

Ditanya : - $\sigma = ?$

- $\varepsilon = ?$

Jawab :

$$\begin{aligned}\sigma &= \frac{P}{A} \\ &= \frac{7600}{(9,99 \times 11,71)} \\ &= 64,97 \text{ Mpa}\end{aligned}$$

$$\begin{aligned}\varepsilon &= \frac{\Delta L}{L_0} \times 100\% \\ &= \frac{1,66}{50} \times 100\% \\ &= 3,32 \%\end{aligned}$$

- Spesimen 2

Diketahui :

$$P = 10,41 \text{ KN} = 10.410 \text{ N}$$

$$\text{tebal} = 10,10 \text{ mm}$$

$$\text{lebar} = 11,89 \text{ mm } L_0$$

$$= 50 \text{ mm}$$

$$\Delta L = 2,35 \text{ mm}$$

Ditanya : - $\sigma = ?$

- $\varepsilon = ?$

Jawab :

$$\begin{aligned}\sigma &= \frac{P}{A} \\ &= \frac{10.410}{(10,10 \times 11,89)} \\ &= 86,69 \text{ MPa}\end{aligned}$$

$$\varepsilon = \frac{\Delta L}{L_0} \times 100\%$$

$$\begin{aligned}\varepsilon &= \frac{2,35}{50} \times 100\% \\ &= 4,70 \%\end{aligned}$$

- Spesimen ke 3

Diketahui :

$$P = 12,14 \text{ KN} = 12.140 \text{ N}$$

$$\text{tebal} = 10,20 \text{ mm}$$

$$\text{lebar} = 11,81 \text{ mm}$$

$$L_o = 50 \text{ mm}$$

$$\Delta L = 3,07 \text{ mm}$$

Ditanya : - $\sigma = ?$

- $\varepsilon = ?$

Jawab :

$$\begin{aligned}\sigma &= \frac{P}{A} \\ &= \frac{12.140}{(10,20 \times 11,81)} \\ &= 100,78 \text{ MPa}\end{aligned}$$

$$\begin{aligned}\varepsilon &= \frac{\Delta L}{L_o} \times 100\% \\ &= \frac{3,07}{50} \times 100\% \\ &= 6,14 \%\end{aligned}$$

$$\begin{aligned}\text{- Nilai tarik rata - rata} &= \frac{64,97 + 86,69 + 100,78}{3} \\ &= 84,1 \text{ MPa}\end{aligned}$$

b) Pengolahan data pengujian tarik pada variasi Alumunium (Al) dengan penambahan Silikon Karbida (SiC) 4%.

- Spesimen ke 1

Diketahui :

$$P = 8,75 \text{ KN} = 8750 \text{ N}$$

$$\text{tebal} = 10,01 \text{ mm}$$

$$\text{lebar} = 11,92 \text{ mm}$$

$$L_0 = 50 \text{ mm}$$

$$\Delta L = 1,99 \text{ mm}$$

Ditanya : - $\sigma = ?$

$$- \varepsilon = ?$$

Jawab :

$$\begin{aligned}\sigma &= \frac{P}{A} \\ &= \frac{8750}{(10,01 \times 11,92)} \\ &= 73,33 \text{ Mpa}\end{aligned}$$

$$\begin{aligned}\varepsilon &= \frac{\Delta L}{L_0} \times 100\% \\ &= \frac{1,99}{50} \times 100\% \\ &= 3,98 \%\end{aligned}$$

- Spesimen ke 2

Diketahui :

$$P = 8,93 \text{ KN} = 8.930 \text{ N}$$

$$\text{tebal} = 10,01 \text{ mm}$$

$$\text{lebar} = 11,92 \text{ mm}$$

$$L_0 = 50 \text{ mm}$$

$$\Delta L = 1,95 \text{ mm}$$

Ditanya : - $\sigma = ?$

$$- \varepsilon = ?$$

Jawab :

$$\sigma = \frac{P}{A}$$
$$= \frac{8.930}{(10,01 \times 11,92)}$$

$$= 74,84 \text{ MPa}$$

$$\varepsilon = \frac{\Delta L}{L_0} \times 100\%$$

$$\varepsilon = \frac{1,95}{50} \times 100\%$$

$$= 3,90 \%$$

- Spesimen ke 3

Diketahui :

$$P = 10,42 \text{ KN} = 10.420 \text{ N}$$

$$\text{tebal} = 10,11 \text{ mm}$$

$$\text{lebar} = 12,00 \text{ mm } L_0$$

$$= 50 \text{ mm}$$

$$\Delta L = 2,70 \text{ mm}$$

Ditanya : - $\sigma = ?$

- $\varepsilon = ?$

Jawab :

$$\sigma = \frac{P}{A}$$
$$= \frac{10.420}{(10,11 \times 12,00)}$$

$$= 85,89 \text{ MPa}$$

$$\varepsilon = \frac{\Delta L}{L_o} \times 100\%$$

$$2,70$$

$$\varepsilon = \frac{2,70}{50} \times 100\%$$

$$= 5,40 \%$$

$$\text{- Nilai tarik rata - rata} = \frac{73,33 + 74,84 + 85,89}{3}$$

$$= 78,0 \text{ Mpa}$$

c) Pengolahan data pengujian tarik pada variasi Alumunium (Al) dengan penambahan Silikon Karbida (SiC) 5%.

- Spesimen ke 1

Diketahui :

$$P = 10,63 \text{ KN} = 10.630 \text{ N}$$

$$\text{tebal} = 10,01 \text{ mm}$$

$$\text{lebar} = 11,81 \text{ mm } L_o$$

$$= 50 \text{ mm}$$

$$\Delta L = 2,09 \text{ mm}$$

Ditanya : - $\sigma = ?$

- $\varepsilon = ?$

Jawab :

$$\sigma = \frac{P}{A}$$

$$= \frac{10.630}{(10,01 \times 11,81)}$$

$$= 89,92 \text{ Mpa}$$

$$\begin{aligned}\varepsilon &= \frac{\Delta L}{L_0} \times 100\% \\ &= \frac{2,09}{50} \times 100\% \\ &= 4,18 \%\end{aligned}$$

- Spesimen ke 2

Diketahui :

$$P = 8,93 \text{ KN} = 8.930 \text{ N}$$

$$\text{tebal} = 9,98 \text{ mm}$$

$$\text{lebar} = 11,79 \text{ mm}$$

$$L_0 = 50 \text{ mm}$$

$$\Delta L = 2,73 \text{ mm}$$

Ditanya : - $\sigma = ?$

- $\varepsilon = ?$

Jawab :

$$\begin{aligned}\sigma &= \frac{P}{A} \\ &= \frac{8.930}{(9,98 \times 11,79)} \\ &= 75,89 \text{ MPa}\end{aligned}$$

$$\begin{aligned}\varepsilon &= \frac{\Delta L}{L_0} \times 100\% \\ \varepsilon &= \frac{2,73}{50} \times 100\% \\ &= 4,46 \%\end{aligned}$$

- Spesimen ke 3

Diketahui :

$$P = 10,45 \text{ KN} = 10.450 \text{ N}$$

$$\text{tebal} = 10,21 \text{ mm}$$

$$\text{lebar} = 11,94 \text{ mm}$$

$$L_o = 50 \text{ mm}$$

$$\Delta L = 2,83 \text{ mm}$$

Ditanya : - $\sigma = ?$

- $\varepsilon = ?$

Jawab :

$$\begin{aligned}\sigma &= \frac{P}{A} \\ &= \frac{10.450}{(10,21 \times 11,94)} \\ &= 85,72 \text{ MPa}\end{aligned}$$

$$\begin{aligned}\varepsilon &= \frac{\Delta L}{L_o} \times 100\% \\ &= \frac{2,83}{50} \times 100\% \\ &= 5,66 \%\end{aligned}$$

- Nilai tarik rata – rata = $\frac{89,92 + 75,89 + 85,72}{3}$

= 83,8 Mpa

LAMPIRAN PERHITUNGAN DATA UJI KEAUSAN

1. Pengolahan data keausan pada variasi Alumunium (Al) dengan penambahan Silikon Karbida (SiC) 3%

a) Pengolahan data pengujian keausan pada variasi Alumunium (Al) dengan penambahan Silikon Karbida (SiC) 3% pada spesimen ke 1.

1) Titik Uji ke 1

Diketahui :

$$B = 3,45 \text{ mm}$$

$$r = 13,6 \text{ mm}$$

$$b = 1,87 \text{ mm}$$

$$P = 6,36 \text{ kg}$$

$$L_o = 15 \text{ m}$$

Ditanya : - W =.....?

- W_s =.....?

Jawab :

$$\begin{aligned} - W &= \frac{B \cdot b^3}{12 \cdot r} \\ &= \frac{3,45 \times (1,87)^3}{12 \times 13,6} \\ &= \frac{22,5602}{163,2} \\ &= 0,13750 \text{ mm}^3 \end{aligned}$$

$$\begin{aligned}
 - \quad W_s &= \frac{1,5 \cdot W}{P \cdot L_o} \\
 &= \frac{1,5 \times 0,13750}{6,36 \times 15} \\
 &= \frac{2,0625}{95,4} \\
 &= 0,00216 \text{ mm}^3/\text{kg.m}
 \end{aligned}$$

2) Titik Uji ke 2

Diketahui :

$$B = 3,45 \text{ mm}$$

$$r = 13,6 \text{ mm}$$

$$b = 1,47 \text{ mm}$$

$$P = 6,36 \text{ kg}$$

$$L_o = 15 \text{ m}$$

$$\text{Ditanya : } - W = \dots?$$

$$- W_s = \dots?$$

Jawab :

$$\begin{aligned}
 - \quad W &= \frac{B \cdot b^3}{12 \cdot r} \\
 &= \frac{3,45 \times (1,47)^3}{12 \times 13,6} \\
 &= \frac{10,9590}{163,2} \\
 &= 0,06669 \text{ mm}^3
 \end{aligned}$$

$$- \quad W_s = \frac{1,5 \cdot W}{P \cdot L_o}$$

$$\begin{aligned}
&= \frac{1,5 \times 0,06669}{6,36 \times 15} \\
&= \frac{0,10003}{95,4} \\
&= 0,00105 \text{ mm}^3/\text{kg.m}
\end{aligned}$$

3) Titik Uji ke 3

Diketahui :

$$B = 3,45 \text{ mm}$$

$$r = 13,6 \text{ mm}$$

$$b = 1,39 \text{ mm}$$

$$P = 6,36 \text{ kg}$$

$$Lo = 15 \text{ m}$$

$$\text{Ditanya : - } W = \dots?$$

$$\text{- } W_s = \dots?$$

Jawab :

$$\begin{aligned}
- \quad W &= \frac{B \cdot b^3}{12 \cdot r} \\
&= \frac{3,45 \times (1,39)^3}{12 \times 13,6} \\
&= \frac{9,2654}{163,2} \\
&= 0,05637 \text{ mm}^3
\end{aligned}$$

$$\begin{aligned}
- \quad W_s &= \frac{1,5 \cdot W}{P \cdot Lo} \\
&= \frac{1,5 \times 0,05637}{6,36 \times 15}
\end{aligned}$$

$$= \frac{0,08455}{95,4}$$

$$= 0,00089 \text{ mm}^3/\text{kg.m}$$

4) Perhitungan keausan rata rata spesimen ke 1

$$\text{Nilai keausan rata – rata} = \frac{0,00216 + 0,00105 + 0,00089}{3}$$

$$= 0,001366 \text{ mm}^3/\text{kg.m}$$

b) Pengolahan data pengujian keausan pada variasi Alumunium (Al) dengan penambahan Silikon Karbida (SiC) 3% pada spesimen ke 2.

1) Titik Uji ke 1

Diketahui :

$$B = 3,45 \text{ mm}$$

$$r = 13,6 \text{ mm}$$

$$b = 1,33 \text{ mm}$$

$$P = 6,36 \text{ kg}$$

$$L_o = 15 \text{ m}$$

Ditanya : - W =.....?

- W_s =.....?

Jawab :

$$- W = \frac{B \cdot b^3}{12 \cdot r}$$

$$= \frac{3,45 \times (1,33)^3}{12 \times 13,6}$$

$$= \frac{8,1165}{163,2}$$

$$= 0,05011 \text{ mm}^3$$

$$\begin{aligned} - \quad W_s &= \frac{1,5 \cdot W}{P \cdot L_o} \\ &= \frac{1,5 \times 0,05011}{6,36 \times 15} \\ &= \frac{0,07516}{95,4} \\ &= 0,00079 \text{ mm}^3/\text{kg.m} \end{aligned}$$

2) Titik Uji ke 2

Diketahui :

$$B = 3,45 \text{ mm}$$

$$r = 13,6 \text{ mm}$$

$$b = 1,12 \text{ mm}$$

$$P = 6,36 \text{ kg}$$

$$L_o = 15 \text{ m}$$

Ditanya : - W =.....?

- Ws =.....?

Jawab :

$$\begin{aligned} - \quad W &= \frac{B \cdot b^3}{12 \cdot r} \\ &= \frac{3,45 \times (1,12)^3}{12 \times 13,6} \end{aligned}$$

$$= \frac{4,8470}{163,2}$$

$$= 0,02970 \text{ mm}^3$$

$$\begin{aligned} - \quad W_s &= \frac{1,5 \cdot W}{P \cdot L_o} \\ &= \frac{1,5 \times 0,02970}{6,36 \times 15} \\ &= \frac{0,04455}{95,4} \\ &= 0,00047 \text{ mm}^3/\text{kg.m} \end{aligned}$$

3) Titik Uji ke 3

Diketahui :

$$B = 3,45 \text{ mm}$$

$$r = 13,6 \text{ mm}$$

$$b = 0,96 \text{ mm}$$

$$P = 6,36 \text{ kg}$$

$$L_o = 15 \text{ m}$$

$$\text{Ditanya : } - W = \dots?$$

$$- W_s = \dots?$$

Jawab :

$$\begin{aligned} - \quad W &= \frac{B \cdot b^3}{12 \cdot r} \\ &= \frac{3,45 \times (0,96)^3}{12 \times 13,6} \end{aligned}$$

$$= \frac{3,0523}{163,2}$$

$$= 0,01870 \text{ mm}^3$$

$$\begin{aligned} - \quad W_s &= \frac{1,5 \cdot W}{P \cdot L_o} \\ &= \frac{1,5 \times 0,01870}{6,36 \times 15} \\ &= \frac{0,02805}{95,4} \\ &= 0,00029 \text{ mm}^3/\text{kg.m} \end{aligned}$$

4) Perhitungan keausan rata rata spesimen ke 2

$$\begin{aligned} \text{Nilai keausan rata – rata} &= \frac{0,00079 + 0,00047 + 0,00029}{3} \\ &= 0,000516 \text{ mm}^3/\text{kg.m} \end{aligned}$$

c) Pengolahan data pengujian keausan pada variasi Alumunium (Al) dengan penambahan Silikon Karbida (SiC) 3% pada spesimen ke 3.

1) Titik Uji ke 1

Diketahui :

$$B = 3,45 \text{ mm}$$

$$r = 13,6 \text{ mm}$$

$$b = 1,73 \text{ mm}$$

$$P = 6,36 \text{ kg}$$

$$L_o = 15 \text{ m}$$

Ditanya : - W =.....?

$$- W_s = \dots?$$

Jawab :

$$\begin{aligned}
 - W &= \frac{B \cdot b^3}{12 \cdot r} \\
 &= \frac{3,45 \times (1,73)^3}{12 \times 13,6} \\
 &= \frac{17,8631}{163,2} \\
 &= 0,11009 \text{ mm}^3 \\
 - W_s &= \frac{1,5 \cdot W}{P \cdot L_o} \\
 &= \frac{1,5 \times 0,11009}{6,36 \times 15} \\
 &= \frac{0,1651}{95,4} \\
 &= 0,00173 \text{ mm}^3/\text{kg.m}
 \end{aligned}$$

2) Titik Uji ke 2

Diketahui :

$$B = 3,45 \text{ mm}$$

$$r = 13,6 \text{ mm}$$

$$b = 1,79 \text{ mm}$$

$$P = 6,36 \text{ kg}$$

$$L_o = 15 \text{ m}$$

$$\text{Ditanya : } - W = \dots?$$

$$- W_s = \dots?$$

Jawab :

$$\begin{aligned}- \quad W &= \frac{B \cdot b^3}{12 \cdot r} \\&= \frac{3,45 \times (1,79)^3}{12 \times 13,6} \\&= \frac{19,7869}{163,2} \\&= 0,12057 \text{ mm}^3 \\- \quad W_s &= \frac{1,5 \cdot W}{P \cdot L_o} \\&= \frac{1,5 \times 0,12057}{6,36 \times 15} \\&= \frac{0,18085}{95,4} \\&= 0,00190 \text{ mm}^3/\text{kg.m}\end{aligned}$$

3) Titik Uji ke 3

Diketahui :

$$B = 3,45 \text{ mm}$$

$$r = 13,6 \text{ mm}$$

$$b = 1,71 \text{ mm}$$

$$P = 6,36 \text{ kg}$$

$$L_o = 15 \text{ m}$$

Ditanya : - W =.....?

- Ws =.....?

Jawab :

$$\begin{aligned} - \quad W &= \frac{B \cdot b^3}{12 \cdot r} \\ &= \frac{3,45 \times (1,71)^3}{12 \times 13,6} \\ &= \frac{17,2507}{163,2} \\ &= 0,10509 \text{ mm}^3 \end{aligned}$$

$$\begin{aligned} - \quad W_s &= \frac{1,5 \cdot W}{P \cdot L_o} \\ &= \frac{1,5 \times 0,10509}{6,36 \times 15} \\ &= \frac{0,1576}{95,4} \\ &= 0,00165 \text{ mm}^3/\text{kg.m} \end{aligned}$$

4) Perhitungan keausan rata rata spesimen ke 3

$$\begin{aligned} \text{Nilai keausan rata – rata} &= \frac{0,00173 + 0,00190 + 0,00165}{3} \\ &= 0,001760 \text{ mm}^3/\text{kg.m} \end{aligned}$$

d) Nilai keausan rata – rata pada variasi Alumunium (Al) dengan penambahan Silikon Karbida (SiC) 3%.

$$\begin{aligned} \text{Nilai keausan rata – rata} &= \frac{0,001366 + 0,000516 + 0,001760}{3} \\ &= 0,0012140 \text{ mm}^3/\text{kg.m} \end{aligned}$$

2. Pengolahan data keausan pada variasi Alumunium (Al) dengan penambahan

Silikon Karbida (SiC) 4 %

- a) Pengolahan data pengujian keausan pada variasi Alumunium (Al) dengan penambahan Silikon Karbida (SiC) 4% pada spesimen ke 1.

1) Titik Uji ke 1

Diketahui :

$$B = 3,45 \text{ mm}$$

$$r = 13,6 \text{ mm}$$

$$b = 1,17 \text{ mm}$$

$$P = 6,36 \text{ kg}$$

$$L_o = 15 \text{ m}$$

Ditanya : - W =.....?

- W_s =.....?

Jawab :

$$\begin{aligned} - W &= \frac{B \cdot b^3}{12 \cdot r} \\ &= \frac{3,45 \times (1,17)^3}{12 \times 13,6} \\ &= \frac{5,5255}{163,2} \\ &= 0,03415 \text{ mm}^3 \end{aligned}$$

$$- W_s = \frac{1,5 \cdot W}{P \cdot L_o}$$

$$\begin{aligned}
&= \frac{1,5 \times 0,03415}{6,36 \times 15} \\
&= \frac{0,05122}{95,4} \\
&= 0,00054 \text{ mm}^3/\text{kg.m}
\end{aligned}$$

2) Titik Uji ke 2

Diketahui :

$$B = 3,45 \text{ mm}$$

$$r = 13,6 \text{ mm}$$

$$b = 1,36 \text{ mm}$$

$$P = 6,36 \text{ kg}$$

$$L_o = 15 \text{ m}$$

$$\text{Ditanya : - } W = \dots?$$

$$\text{- } W_s = \dots?$$

Jawab :

$$\begin{aligned}
\text{- } W &= \frac{B \cdot b^3}{12 \cdot r} \\
&= \frac{3,45 \times (1,36)^3}{12 \times 13,6} \\
&= \frac{8,6783}{163,2} \\
&= 0,05318 \text{ mm}^3
\end{aligned}$$

$$\text{- } W_s = \frac{1,5 \cdot W}{P \cdot L_o}$$

$$\begin{aligned}
&= \frac{1,5 \times 0,05318}{6,36 \times 15} \\
&= \frac{0,07977}{95,4} \\
&= 0,00084 \text{ mm}^3/\text{kg.m}
\end{aligned}$$

3) Titik Uji ke 3

Diketahui :

$$B = 3,45 \text{ mm}$$

$$r = 13,6 \text{ mm}$$

$$b = 1,28 \text{ mm}$$

$$P = 6,36 \text{ kg}$$

$$L_o = 15 \text{ m}$$

$$\text{Ditanya : - } W = \dots?$$

$$\text{- } W_s = \dots?$$

Jawab :

$$\begin{aligned}
\text{- } W &= \frac{B \cdot b^3}{12 \cdot r} \\
&= \frac{3,45 \times (1,28)^3}{12 \times 13,6} \\
&= \frac{7,2351}{163,2} \\
&= 0,04433 \text{ mm}^3
\end{aligned}$$

$$\text{- } W_s = \frac{1,5 \cdot W}{P \cdot L_o}$$

$$\begin{aligned}
&= \frac{1,5 \times 0,04433}{6,36 \times 15} \\
&= \frac{0,06649}{95,4} \\
&= 0,00070 \text{ mm}^3/\text{kg.m}
\end{aligned}$$

4) Perhitungan keausan rata rata spesimen ke 1

$$\begin{aligned}
\text{Nilai keausan rata – rata} &= \frac{0,00054 + 0,00084 + 0,00070}{3} \\
&= 0,000690 \text{ mm}^3/\text{kg.m}
\end{aligned}$$

b) Pengolahan data pengujian keausan pada variasi Alumunium (Al) dengan penambahan Silikon Karbida (SiC) 4% pada spesimen ke 2.

1) Titik Uji ke 1

Diketahui :

$$B = 3,45 \text{ mm}$$

$$r = 13,6 \text{ mm}$$

$$b = 1,25 \text{ mm}$$

$$P = 6,36 \text{ kg}$$

$$L_o = 15 \text{ m}$$

Ditanya : - W =.....?

- W_s =.....?

Jawab :

$$- W = \frac{B \cdot b^3}{12 \cdot r}$$

$$= \frac{3,45 \times (1,25)^3}{12 \times 13,6}$$

$$= \frac{6,7382}{163,2}$$

$$= 0,04162 \text{ mm}^3$$

$$\text{- } W_s = \frac{1,5 \cdot W}{P \cdot L_o}$$

$$= \frac{1,5 \times 0,04162}{6,36 \times 15}$$

$$= \frac{0,06243}{95,4}$$

$$= 0,00065 \text{ mm}^3/\text{kg.m}$$

2) Titik Uji ke 2

Diketahui :

$$B = 3,45 \text{ mm}$$

$$r = 13,6 \text{ mm}$$

$$b = 1,15 \text{ mm}$$

$$P = 6,36 \text{ kg}$$

$$L_o = 15 \text{ m}$$

$$\text{Ditanya : - } W = \dots?$$

$$\text{- } W_s = \dots?$$

Jawab :

$$\text{- } W = \frac{B \cdot b^3}{12 \cdot r}$$

$$= \frac{3,45 \times (1,15)^3}{12 \times 13,6}$$

$$= \frac{5,2470}{163,2}$$

$$= 0,03187 \text{ mm}^3$$

$$- \quad W_s = \frac{1,5 \cdot W}{P \cdot L_o}$$

$$= \frac{1,5 \times 0,03187}{6,36 \times 15}$$

$$= \frac{0,04780}{95,4}$$

$$= 0,00050 \text{ mm}^3/\text{kg.m}$$

3) Titik Uji ke 3

Diketahui :

$$B = 3,45 \text{ mm}$$

$$r = 13,6 \text{ mm}$$

$$b = 1,20 \text{ mm}$$

$$P = 6,36 \text{ kg}$$

$$L_o = 15 \text{ m}$$

$$\text{Ditanya : } - W = \dots?$$

$$- W_s = \dots?$$

Jawab :

$$- \quad W = \frac{B \cdot b^3}{12 \cdot r}$$

$$= \frac{3,45 \times (1,20)^3}{12 \times 13,6}$$

$$= \frac{5,9616}{163,2}$$

$$= 0,03653 \text{ mm}^3$$

$$\begin{aligned} - \quad W_s &= \frac{1,5 \cdot W}{P \cdot L_o} \\ &= \frac{1,5 \times 0,03653}{6,36 \times 15} \end{aligned}$$

$$= \frac{0,05479}{95,4}$$

$$= 0,00057 \text{ mm}^3/\text{kg.m}$$

4) Perhitungan keausan rata rata spesimen ke 2

$$\text{Nilai keausan rata – rata} = \frac{0,00065 + 0,00050 + 0,00057}{3}$$

$$= 0,000577 \text{ mm}^3/\text{kg.m}$$

c) Pengolahan data pengujian keausan pada variasi Alumunium (Al) dengan penambahan Silikon Karbida (SiC) 4% pada spesimen ke 3.

1) Titik Uji ke 1

Diketahui :

$$B = 3,45 \text{ mm}$$

$$r = 13,6 \text{ mm}$$

$$b = 1,87 \text{ mm}$$

$$P = 6,36 \text{ kg}$$

$$L_o = 15 \text{ m}$$

$$\text{Ditanya : - } W = \dots?$$

$$\text{- } W_s = \dots?$$

Jawab :

$$\begin{aligned} \text{- } W &= \frac{B \cdot b^3}{12 \cdot r} \\ &= \frac{3,45 \times (1,87)^3}{12 \times 13,6} \\ &= \frac{22,5602}{163,2} \\ &= 0,13750 \text{ mm}^3 \end{aligned}$$

$$\begin{aligned} \text{- } W_s &= \frac{1,5 \cdot W}{P \cdot L_o} \\ &= \frac{1,5 \times 0,1375}{6,36 \times 15} \\ &= \frac{0,2062}{95,4} \\ &= 0,00216 \text{ mm}^3/\text{kg.m} \end{aligned}$$

2) Titik Uji ke 2

Diketahui :

$$B = 3,45 \text{ mm}$$

$$r = 13,6 \text{ mm}$$

$$b = 2,19 \text{ mm}$$

$$P = 6,36 \text{ kg}$$

$$L_o = 15 \text{ m}$$

$$\text{Ditanya : - } W = \dots?$$

$$\text{- } W_s = \dots?$$

Jawab :

$$\begin{aligned} \text{- } W &= \frac{B \cdot b^3}{12 \cdot r} \\ &= \frac{3,45 \times (2,19)^3}{12 \times 13,6} \end{aligned}$$

$$= \frac{36,2369}{163,2}$$

$$= 0,22103 \text{ mm}^3$$

$$\begin{aligned} \text{- } W_s &= \frac{1,5 \cdot W}{P \cdot L_o} \\ &= \frac{1,5 \times 0,22103}{6,36 \times 15} \end{aligned}$$

$$= \frac{0,3315}{95,4}$$

$$= 0,00348 \text{ mm}^3/\text{kg.m}$$

3) Titik Uji ke 3

Diketahui :

$$B = 3,45 \text{ mm}$$

$$r = 13,6 \text{ mm}$$

$$b = 1,73 \text{ mm}$$

$$P = 6,36 \text{ kg}$$

$$L_o = 15 \text{ m}$$

Ditanya : - W =.....?

- W_s =.....?

Jawab :

$$\begin{aligned} - W &= \frac{B \cdot b^3}{12 \cdot r} \\ &= \frac{3,45 \times (1,73)^3}{12 \times 13,6} \\ &= \frac{17,8631}{163,2} \\ &= 0,11009 \text{ mm}^3 \\ - W_s &= \frac{1,5 \cdot W}{P \cdot L_o} \\ &= \frac{1,5 \times 0,11009}{6,36 \times 15} \\ &= \frac{0,1651}{95,4} \\ &= 0,00173 \text{ mm}^3/\text{kg.m} \end{aligned}$$

4) Perhitungan keausan rata rata spesimen ke 3

$$\begin{aligned} \text{Nilai keausan rata – rata} &= \frac{0,00216 + 0,00348 + 0,00173}{3} \\ &= 0,002456 \text{ mm}^3/\text{kg.m} \end{aligned}$$

d) Nilai keausan rata – rata pada variasi Alumunium (Al) dengan penambahan Silikon Karbida (SiC) 4%.

$$\text{Nilai keausan rata – rata} = \frac{0,000690 + 0,000577 + 0,002456}{3}$$

$$= 0,001241 \text{ mm}^3/\text{kg.m}$$

3. Pengolahan data keausan pada variasi Alumunium (Al) dengan penambahan Silikon Karbida (SiC) 5 %

a) Pengolahan data pengujian keausan pada variasi Alumunium (Al) dengan penambahan Silikon Karbida (SiC) 5% pada spesimen ke 1.

1) Titik Uji ke 1

Diketahui :

$$B = 3,45 \text{ mm}$$

$$r = 13,6 \text{ mm}$$

$$b = 1,33 \text{ mm}$$

$$P = 6,36 \text{ kg}$$

$$L_o = 15 \text{ m}$$

Ditanya : - W =.....?

- W_s =.....?

Jawab :

$$\begin{aligned} - W &= \frac{B \cdot b^3}{12 \cdot r} \\ &= \frac{3,45 \times (1,33)^3}{12 \times 13,6} \\ &= \frac{8,1165}{163,2} \\ &= 0,05011 \text{ mm}^3 \end{aligned}$$

$$- W_s = \frac{1,5 \cdot W}{P \cdot L_o}$$

$$\begin{aligned}
&= \frac{1,5 \times 0,05011}{6,36 \times 15} \\
&= \frac{0,0751}{95,4} \\
&= 0,00079 \text{ mm}^3/\text{kg.m}
\end{aligned}$$

2) Titik Uji ke 2

Diketahui :

$$B = 3,45 \text{ mm}$$

$$r = 13,6 \text{ mm}$$

$$b = 1,20 \text{ mm}$$

$$P = 6,36 \text{ kg}$$

$$L_o = 15 \text{ m}$$

$$\text{Ditanya : - } W = \dots?$$

$$\text{- } W_s = \dots?$$

Jawab :

$$\begin{aligned}
\text{- } W &= \frac{B \cdot b^3}{12 \cdot r} \\
&= \frac{3,45 \times (1,20)^3}{12 \times 13,6} \\
&= \frac{5,9616}{163,2} \\
&= 0,03653 \text{ mm}^3
\end{aligned}$$

$$\text{- } W_s = \frac{1,5 \cdot W}{P \cdot L_o}$$

$$\begin{aligned}
&= \frac{1,5 \times 0,03653}{6,36 \times 15} \\
&= \frac{0,0547}{95,4} \\
&= 0,00057 \text{ mm}^3/\text{kg.m}
\end{aligned}$$

3) Titik Uji ke 3

Diketahui :

$$B = 3,45 \text{ mm}$$

$$r = 13,6 \text{ mm}$$

$$b = 1,33 \text{ mm}$$

$$P = 6,36 \text{ kg}$$

$$L_o = 15 \text{ m}$$

$$\text{Ditanya : - } W = \dots?$$

$$\text{- } W_s = \dots?$$

Jawab :

$$\begin{aligned}
\text{- } W &= \frac{B \cdot b^3}{12 \cdot r} \\
&= \frac{3,45 \times (1,33)^3}{12 \times 13,6} \\
&= \frac{8,1165}{163,2} \\
&= 0,05011 \text{ mm}^3
\end{aligned}$$

$$\text{- } W_s = \frac{1,5 \cdot W}{P \cdot L_o}$$

$$= \frac{1,5 \times 0,05011}{6,36 \times 15}$$

$$= \frac{0,0751}{95,4}$$

$$= 0,00079 \text{ mm}^3/\text{kg.m}$$

4) Perhitungan keausan rata rata spesimen ke 1

$$\text{Nilai keausan rata - rata} = \frac{0,00079 + 0,00057 + 0,00079}{3}$$

$$= 0,000717 \text{ mm}^3/\text{kg.m}$$

b) Pengolahan data pengujian keausan pada variasi Alumunium (Al) dengan penambahan Silikon Karbida (SiC) 4% pada spesimen ke 2.

1) Titik Uji ke 1

Diketahui :

$$B = 3,45 \text{ mm}$$

$$r = 13,6 \text{ mm}$$

$$b = 1,65 \text{ mm}$$

$$P = 6,36 \text{ kg}$$

$$L_o = 15 \text{ m}$$

Ditanya : - W =.....?

- W_s =.....?

Jawab :

$$- W = \frac{B \cdot b^3}{12 \cdot r}$$

$$= \frac{3,45 \times (1,65)^3}{12 \times 13,6}$$

$$= \frac{15,4978}{163,2}$$

$$= 0,09554 \text{ mm}^3$$

$$- \quad W_s = \frac{1,5 \cdot W}{P \cdot L_o}$$

$$= \frac{1,5 \times 0,09554}{6,36 \times 15}$$

$$= \frac{0,1433}{95,4}$$

$$= 0,00150 \text{ mm}^3/\text{kg.m}$$

2) Titik Uji ke 2

Diketahui :

$$B = 3,45 \text{ mm}$$

$$r = 13,6 \text{ mm}$$

$$b = 1,55 \text{ mm}$$

$$P = 6,36 \text{ kg}$$

$$L_o = 15 \text{ m}$$

$$\text{Ditanya : } - W = \dots?$$

$$- W_s = \dots?$$

Jawab :

$$- \quad W = \frac{B \cdot b^3}{12 \cdot r}$$

$$= \frac{3,45 \times (1,55)^3}{12 \times 13,6}$$

$$= \frac{12,8473}{163,2}$$

$$= 0,07821 \text{ mm}^3$$

$$\text{- } W_s = \frac{1,5 \cdot W}{P \cdot L_o}$$

$$= \frac{1,5 \times 0,07821}{6,36 \times 15}$$

$$= \frac{0,1173}{95,4}$$

$$= 0,00123 \text{ mm}^3/\text{kg.m}$$

3) Titik Uji ke 3

Diketahui :

$$B = 3,45 \text{ mm}$$

$$r = 13,6 \text{ mm}$$

$$b = 1,52 \text{ mm}$$

$$P = 6,36 \text{ kg}$$

$$L_o = 15 \text{ m}$$

$$\text{Ditanya : - } W = \dots?$$

$$\text{- } W_s = \dots?$$

Jawab :

$$\text{- } W = \frac{B \cdot b^3}{12 \cdot r}$$

$$= \frac{3,45 \times (1,52)^3}{12 \times 13,6}$$

$$= \frac{12,1157}{163,2}$$

$$= 0,07424 \text{ mm}^3$$

$$- \quad W_s = \frac{1,5 \cdot W}{P \cdot L_o}$$

$$= \frac{1,5 \times 0,07424}{6,36 \times 15}$$

$$= \frac{0,1113}{95,4}$$

$$= 0,00117 \text{ mm}^3/\text{kg.m}$$

4) Perhitungan keausan rata rata spesimen ke 2

$$\text{Nilai keausan rata – rata} = \frac{0,00150 + 0,00123 + 0,00117}{3}$$

$$= 0,001300 \text{ mm}^3/\text{kg.m}$$

c) Pengolahan data pengujian keausan pada variasi Alumunium (Al) dengan penambahan Silikon Karbida (SiC) 4% pada spesimen ke 3.

1) Titik Uji ke 1

Diketahui :

$$B = 3,45 \text{ mm}$$

$$r = 13,6 \text{ mm}$$

$$b = 1,49 \text{ mm}$$

$$P = 6,36 \text{ kg}$$

$$L_o = 15 \text{ m}$$

$$\text{Ditanya : - } W = \dots?$$

$$\text{- } W_s = \dots?$$

Jawab :

$$\begin{aligned} \text{- } W &= \frac{B \cdot b^3}{12 \cdot r} \\ &= \frac{3,45 \times (1,49)^3}{12 \times 13,6} \end{aligned}$$

$$= \frac{11,4124}{163,2}$$

$$= 0,07040 \text{ mm}^3$$

$$\begin{aligned} \text{- } W_s &= \frac{1,5 \cdot W}{P \cdot L_o} \\ &= \frac{1,5 \times 0,07040}{6,36 \times 15} \end{aligned}$$

$$= \frac{0,1056}{95,4}$$

$$= 0,00111 \text{ mm}^3/\text{kg.m}$$

2) Titik Uji ke 2

Diketahui :

$$B = 3,45 \text{ mm}$$

$$r = 13,6 \text{ mm}$$

$$b = 2,29 \text{ mm}$$

$$P = 6,36 \text{ kg}$$

$$L_o = 15 \text{ m}$$

Ditanya : - W =.....?

- W_s =.....?

Jawab :

$$\begin{aligned}- W &= \frac{B \cdot b^3}{12 \cdot r} \\&= \frac{3,45 \times (2,29)^3}{12 \times 13,6} \\&= \frac{41,4310}{163,2} \\&= 0,25498 \text{ mm}^3 \\- W_s &= \frac{1,5 \cdot W}{P \cdot L_o} \\&= \frac{1,5 \times 0,25498}{6,36 \times 15} \\&= \frac{0,3824}{95,4} \\&= 0,00401 \text{ mm}^3/\text{kg.m}\end{aligned}$$

3) Titik Uji ke 3

Diketahui :

$$B = 3,45 \text{ mm}$$

$$r = 13,6 \text{ mm}$$

$$b = 1,65 \text{ mm}$$

$$P = 6,36 \text{ kg}$$

$$L_o = 15 \text{ m}$$

Ditanya : - W =.....?

$$- W_s = \dots?$$

Jawab :

$$\begin{aligned}
 - W &= \frac{B \cdot b^3}{12 \cdot r} \\
 &= \frac{3,45 \times (1,65)^3}{12 \times 13,6} \\
 &= \frac{15,4978}{163,2} \\
 &= 0,09554 \text{ mm}^3 \\
 - W_s &= \frac{1,5 \cdot W}{P \cdot L_o} \\
 &= \frac{1,5 \times 0,09554}{6,36 \times 15} \\
 &= \frac{0,1433}{95,4} \\
 &= 0,00150 \text{ mm}^3/\text{kg.m}
 \end{aligned}$$

4) Perhitungan keausan rata rata spesimen ke 3

$$\begin{aligned}
 \text{Nilai keausan rata – rata} &= \frac{0,00111 + 0,00401 + 0,00150}{3} \\
 &= 0,002206 \text{ mm}^3/\text{kg.m}
 \end{aligned}$$

d) Nilai keausan rata – rata pada variasi Alumunium (Al) dengan penambahan

Silikon Karbida (SiC) 4%.

$$\begin{aligned}
 \text{Nilai keausan rata – rata} &= \frac{0,000717 + 0,001300 + 0,002206}{3} \\
 &= 0,001408 \text{ mm}^3/\text{kg.m}
 \end{aligned}$$