

## LAMPIRAN

### A. Pengukuran pH NaOH 5 %





pH NaOH 5% setelah perendaman  
selama 150 menit



pH NaOH 5% setelah perendaman  
selama 210 menit



pH NaOH 5% setelah perendaman  
selama 270 menit

## B. Foto Perbandingan Warna Serat Sebelum dan Sesudah Alkalisasi

- 30 Menit



- 90 Menit



- 150 Menit



- 210 Menit



- 270 Menit



### C. Perhitungan

- Tegangan Tarik Maksimum

• Continous 30 menit

$$1. \sigma t_{max} = \frac{W_{max}}{A} = \frac{487,8 \text{ kg}}{(4,18 \text{ mm} \times 12,32 \text{ mm})} = \frac{4878 \text{ N}}{51,497 \text{ mm}^2} = 94,72 \text{ MPa}$$

$$2. \sigma t_{max} = \frac{W_{max}}{A} = \frac{473,4 \text{ kg}}{(4,05 \text{ mm} \times 12,51 \text{ mm})} = \frac{4734 \text{ N}}{50,665 \text{ mm}^2} = 93,44 \text{ MPa}$$

- Continuous 90 menit

$$1. \quad \sigma t_{max} = \frac{W_{max}}{A} = \frac{402,6 \text{ kg}}{(4,30 \text{ mm} \times 12,69 \text{ mm})} = \frac{4026 \text{ N}}{54,567 \text{ mm}^2} = 73,78 \text{ MPa}$$

$$2. \quad \sigma t_{max} = \frac{W_{max}}{A} = \frac{384,6 \text{ kg}}{(4,30 \text{ mm} \times 12,88 \text{ mm})} = \frac{3846 \text{ N}}{55,384 \text{ mm}^2} = 69,44 \text{ MPa}$$

- Continuous 150 menit

$$1. \quad \sigma t_{max} = \frac{W_{max}}{A} = \frac{382,4 \text{ kg}}{(4,20 \text{ mm} \times 12,66 \text{ mm})} = \frac{3824 \text{ N}}{53,172 \text{ mm}^2} = 71,92 \text{ MPa}$$

$$2. \quad \sigma t_{max} = \frac{W_{max}}{A} = \frac{360,4 \text{ kg}}{(4,07 \text{ mm} \times 12,80 \text{ mm})} = \frac{3604 \text{ N}}{52,096 \text{ mm}^2} = 69,18 \text{ MPa}$$

- Continuous 210 menit

$$1. \quad \sigma t_{max} = \frac{W_{max}}{A} = \frac{420,2 \text{ kg}}{(4,25 \text{ mm} \times 12,49 \text{ mm})} = \frac{4202 \text{ N}}{53,082 \text{ mm}^2} = 79,16 \text{ MPa}$$

$$2. \quad \sigma t_{max} = \frac{W_{max}}{A} = \frac{426 \text{ kg}}{(4,17 \text{ mm} \times 12,51 \text{ mm})} = \frac{4260 \text{ N}}{52,166 \text{ mm}^2} = 81,66 \text{ MPa}$$

- Continuous 270 menit

$$1. \quad \sigma t_{max} = \frac{W_{max}}{A} = \frac{447,6 \text{ kg}}{(4,27 \text{ mm} \times 12,79 \text{ mm})} = \frac{4476 \text{ N}}{54,613 \text{ mm}^2} = 81,96 \text{ MPa}$$

$$2. \quad \sigma t_{max} = \frac{W_{max}}{A} = \frac{439,6 \text{ kg}}{(4,18 \text{ mm} \times 12,52 \text{ mm})} = \frac{4396 \text{ N}}{52,333 \text{ mm}^2} = 84 \text{ MPa}$$

- Discontinuous 30 menit

$$1. \quad \sigma t_{max} = \frac{W_{max}}{A} = \frac{233 \text{ kg}}{(3,95 \text{ mm} \times 12,85 \text{ mm})} = \frac{2330 \text{ N}}{50,757 \text{ mm}^2} = 45,90 \text{ MPa}$$

$$2. \quad \sigma t_{max} = \frac{W_{max}}{A} = \frac{228,2 \text{ kg}}{(3,96 \text{ mm} \times 12,43 \text{ mm})} = \frac{2282 \text{ N}}{49,222 \text{ mm}^2} = 46,36 \text{ MPa}$$

- Discontinuous 90 menit

$$1. \quad \sigma t_{max} = \frac{W_{max}}{A} = \frac{264,2 \text{ kg}}{(4,05 \text{ mm} \times 12,50 \text{ mm})} = \frac{2642 \text{ N}}{50,625 \text{ mm}^2} = 52,19 \text{ MPa}$$

$$2. \quad \sigma t_{max} = \frac{W_{max}}{A} = \frac{235,2 \text{ kg}}{(4,03 \text{ mm} \times 12,36 \text{ mm})} = \frac{2352 \text{ N}}{49,810 \text{ mm}^2} = 47,22 \text{ MPa}$$

- Discontinuous 150 menit

$$1. \sigma_{t_{max}} = \frac{W_{max}}{A} = \frac{250,6 \text{ kg}}{(4,24 \text{ mm} \times 12,65 \text{ mm})} = \frac{2506 \text{ N}}{53,636 \text{ mm}^2} = 46,72 \text{ MPa}$$

$$2. \sigma_{t_{max}} = \frac{W_{max}}{A} = \frac{261,2 \text{ kg}}{(4,26 \text{ mm} \times 12,70 \text{ mm})} = \frac{2612 \text{ N}}{54,102 \text{ mm}^2} = 48,28 \text{ MPa}$$

- Discontinuous 210 menit

$$1. \sigma_{t_{max}} = \frac{W_{max}}{A} = \frac{217,6 \text{ kg}}{(4,00 \text{ mm} \times 12,87 \text{ mm})} = \frac{2176 \text{ N}}{51,48 \text{ mm}^2} = 42,27 \text{ MPa}$$

$$2. \sigma_{t_{max}} = \frac{W_{max}}{A} = \frac{212,8 \text{ kg}}{(4,23 \text{ mm} \times 12,50 \text{ mm})} = \frac{2128 \text{ N}}{52,875 \text{ mm}^2} = 40,25 \text{ MPa}$$

- Discontinuous 270 menit

$$1. \sigma_{t_{max}} = \frac{W_{max}}{A} = \frac{263,6 \text{ kg}}{(4,26 \text{ mm} \times 12,68 \text{ mm})} = \frac{2636 \text{ N}}{54,016 \text{ mm}^2} = 48,80 \text{ MPa}$$

$$2. \sigma_{t_{max}} = \frac{W_{max}}{A} = \frac{271,8 \text{ kg}}{(4,26 \text{ mm} \times 12,66 \text{ mm})} = \frac{2718 \text{ N}}{53,931 \text{ mm}^2} = 50,40 \text{ MPa}$$

- Regangan Tarik Maksimum

- Continous 30 menit

$$1. \varepsilon_{t_{max}} = \frac{\Delta L}{L_0} \times 100 \% = \frac{3,84 \text{ mm}}{60 \text{ mm}} \times 100 \% = 6,4 \%$$

$$2. \varepsilon_{t_{max}} = \frac{\Delta L}{L_0} \times 100 \% = \frac{3,40 \text{ mm}}{60 \text{ mm}} \times 100 \% = 5,66 \%$$

- Continous 90 menit

$$1. \varepsilon_{t_{max}} = \frac{\Delta L}{L_0} \times 100 \% = \frac{3,42 \text{ mm}}{60 \text{ mm}} \times 100 \% = 5,7 \%$$

$$2. \varepsilon_{t_{max}} = \frac{\Delta L}{L_0} \times 100 \% = \frac{3,25 \text{ mm}}{60 \text{ mm}} \times 100 \% = 5,41 \%$$

- Continuous 150 menit

1.  $\varepsilon t_{max} = \frac{\Delta L}{L_0} \times 100 \% = \frac{3,36 \text{ mm}}{60 \text{ mm}} \times 100 \% = 5,6 \%$

2.  $\varepsilon t_{max} = \frac{\Delta L}{L_0} \times 100 \% = \frac{3,36 \text{ mm}}{60 \text{ mm}} \times 100 \% = 5,6 \%$

- Continuous 210 menit

1.  $\varepsilon t_{max} = \frac{\Delta L}{L_0} \times 100 \% = \frac{3,38 \text{ mm}}{60 \text{ mm}} \times 100 \% = 5,63 \%$

2.  $\varepsilon t_{max} = \frac{\Delta L}{L_0} \times 100 \% = \frac{3,08 \text{ mm}}{60 \text{ mm}} \times 100 \% = 5,13 \%$

- Continuous 270 menit

1.  $\varepsilon t_{max} = \frac{\Delta L}{L_0} \times 100 \% = \frac{2,86 \text{ mm}}{60 \text{ mm}} \times 100 \% = 4,76 \%$

2.  $\varepsilon t_{max} = \frac{\Delta L}{L_0} \times 100 \% = \frac{4,16 \text{ mm}}{60 \text{ mm}} \times 100 \% = 6,93 \%$

- Disontinous 30 menit

1.  $\varepsilon t_{max} = \frac{\Delta L}{L_0} \times 100 \% = \frac{3,18 \text{ mm}}{60 \text{ mm}} \times 100 \% = 5,3 \%$

2.  $\varepsilon t_{max} = \frac{\Delta L}{L_0} \times 100 \% = \frac{2,69 \text{ mm}}{60 \text{ mm}} \times 100 \% = 4,48 \%$

- Disontinous 90 menit

1.  $\varepsilon t_{max} = \frac{\Delta L}{L_0} \times 100 \% = \frac{2,57 \text{ mm}}{60 \text{ mm}} \times 100 \% = 4,28 \%$

2.  $\varepsilon t_{max} = \frac{\Delta L}{L_0} \times 100 \% = \frac{3,07 \text{ mm}}{60 \text{ mm}} \times 100 \% = 5,11 \%$

- Disontinous 150 menit

1.  $\varepsilon t_{max} = \frac{\Delta L}{L_0} \times 100 \% = \frac{3,11 \text{ mm}}{60 \text{ mm}} \times 100 \% = 5,18 \%$

2.  $\varepsilon t_{max} = \frac{\Delta L}{L_0} \times 100 \% = \frac{2,68 \text{ mm}}{60 \text{ mm}} \times 100 \% = 4,46 \%$

- Disontinous 210 menit

$$1. \quad \varepsilon t_{max} = \frac{\Delta L}{L_0} \times 100 \% = \frac{2,89 \text{ mm}}{60 \text{ mm}} \times 100 \% = 4,81 \%$$

$$2. \quad \varepsilon t_{max} = \frac{\Delta L}{L_0} \times 100 \% = \frac{2,98 \text{ mm}}{60 \text{ mm}} \times 100 \% = 4,96 \%$$

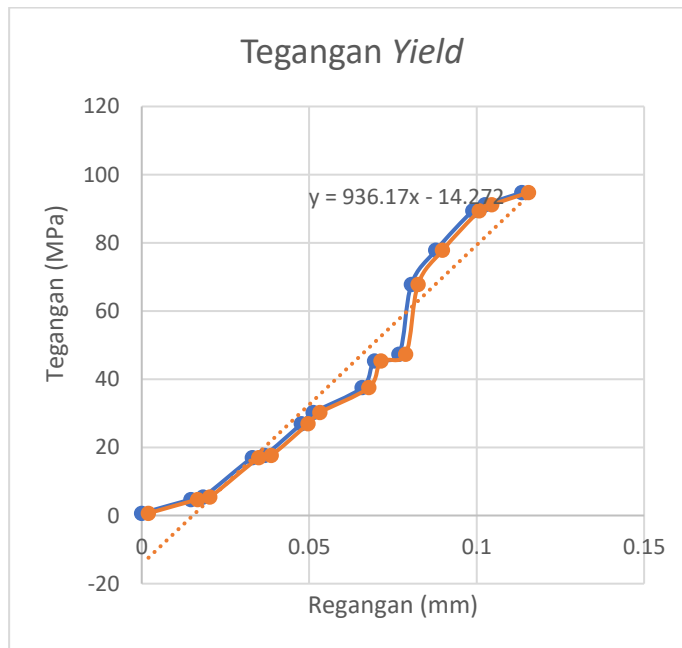
- Disontinous 270 menit

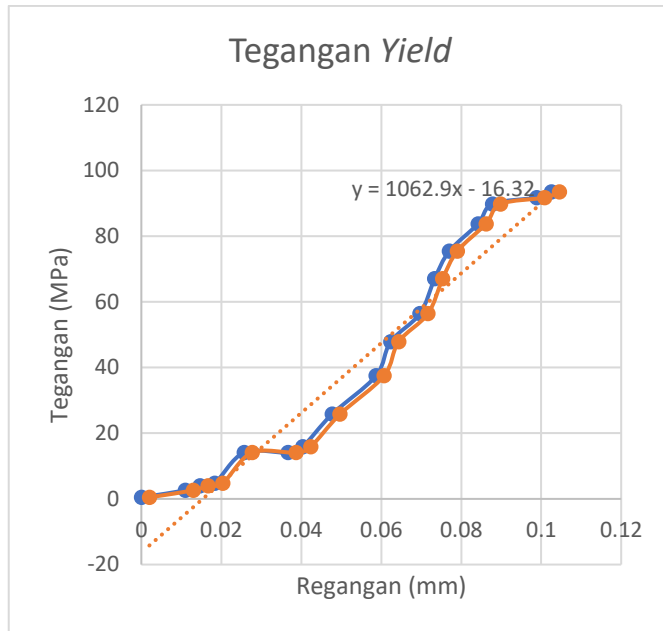
$$1. \quad \varepsilon t_{max} = \frac{\Delta L}{L_0} \times 100 \% = \frac{3,14 \text{ mm}}{60 \text{ mm}} \times 100 \% = 5,23 \%$$

$$2. \quad \varepsilon t_{max} = \frac{\Delta L}{L_0} \times 100 \% = \frac{3,21 \text{ mm}}{60 \text{ mm}} \times 100 \% = 5,35 \%$$

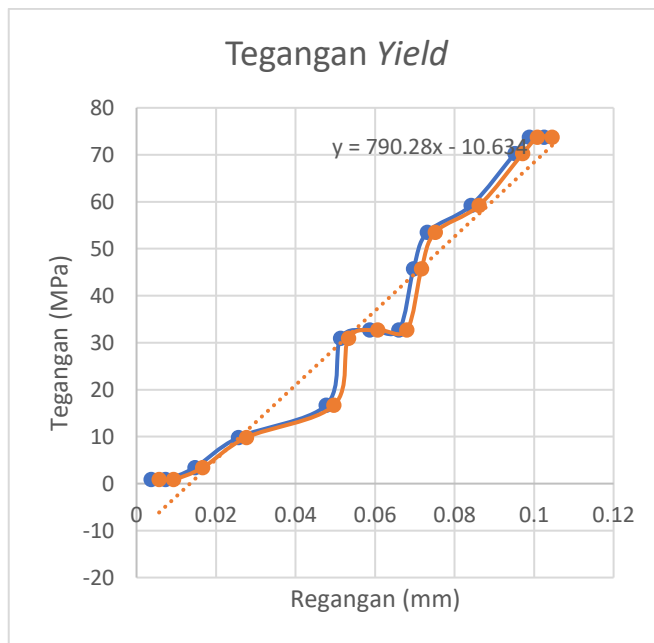
- Perhitungan Grafik Tegangan *Yield*

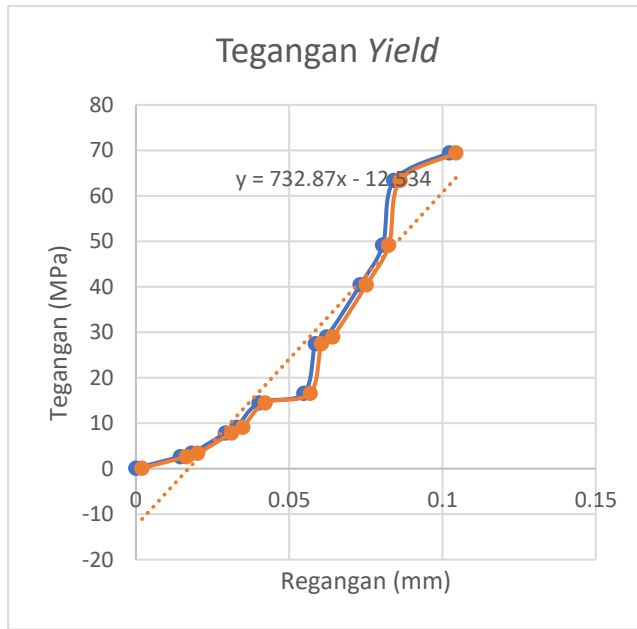
- *Continuous Randomly* 30 menit



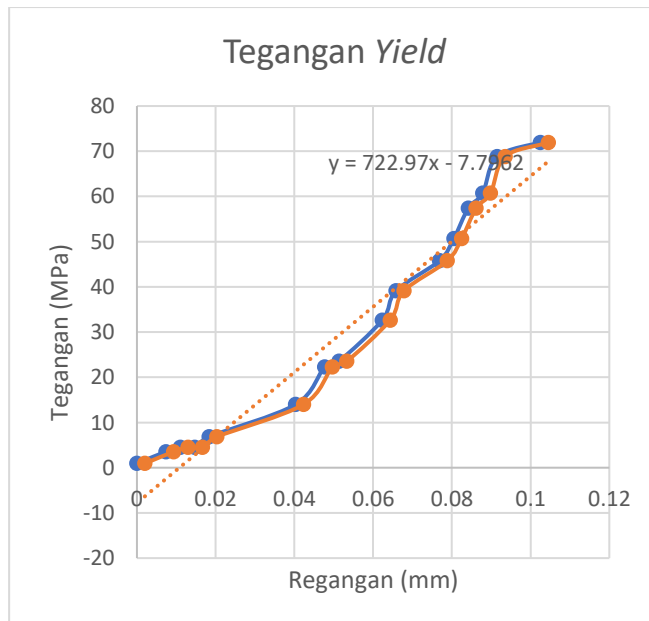


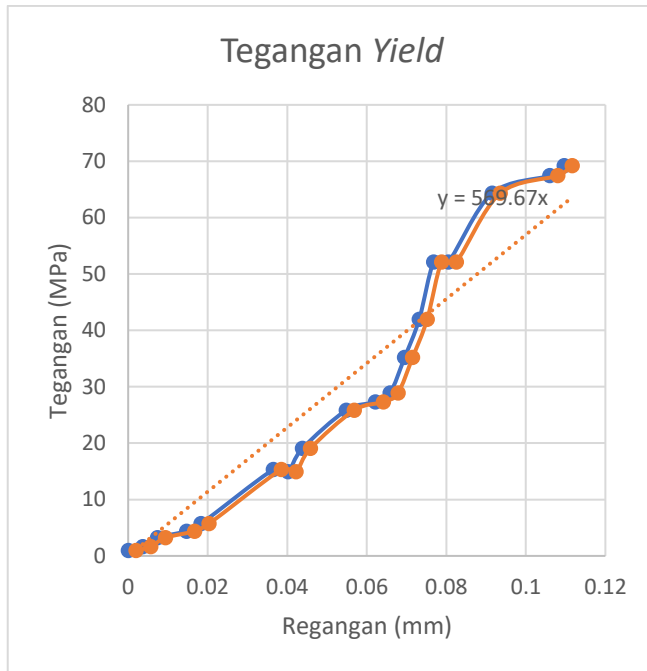
- *Continuous Randomly 90 menit*



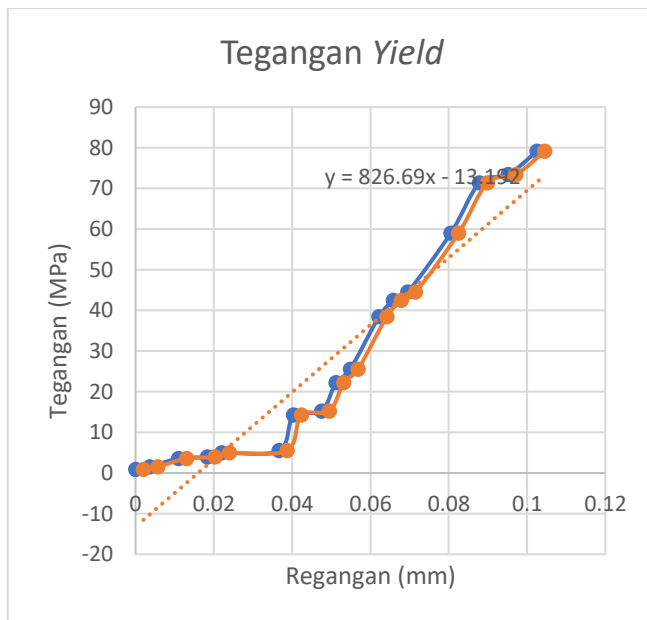


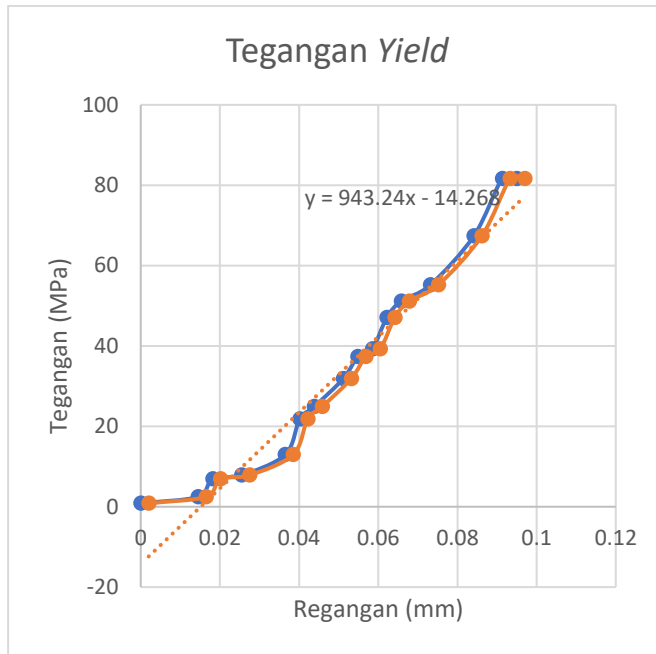
- *Continous Randomly 150 menit*



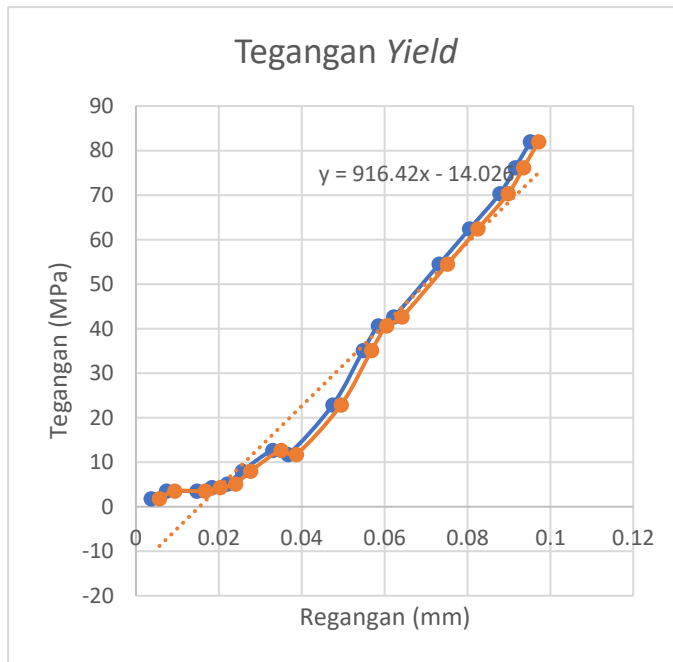


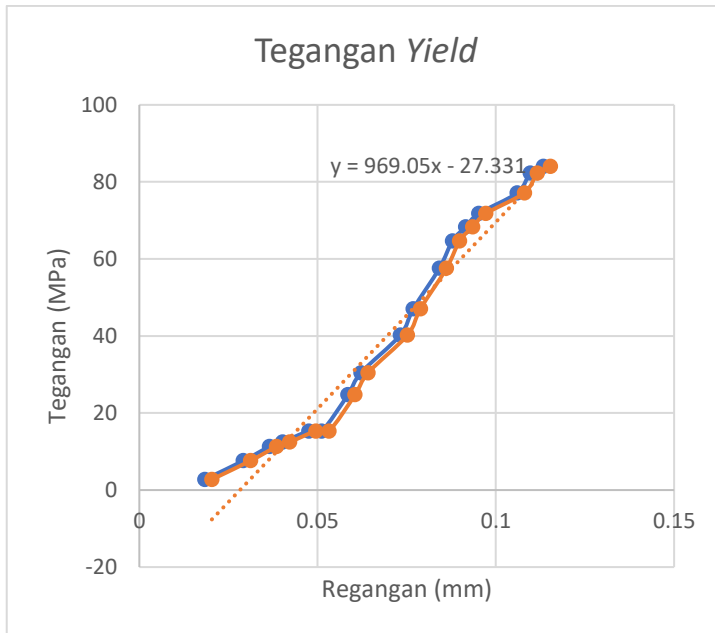
- *Continuous Randomly* 210 menit



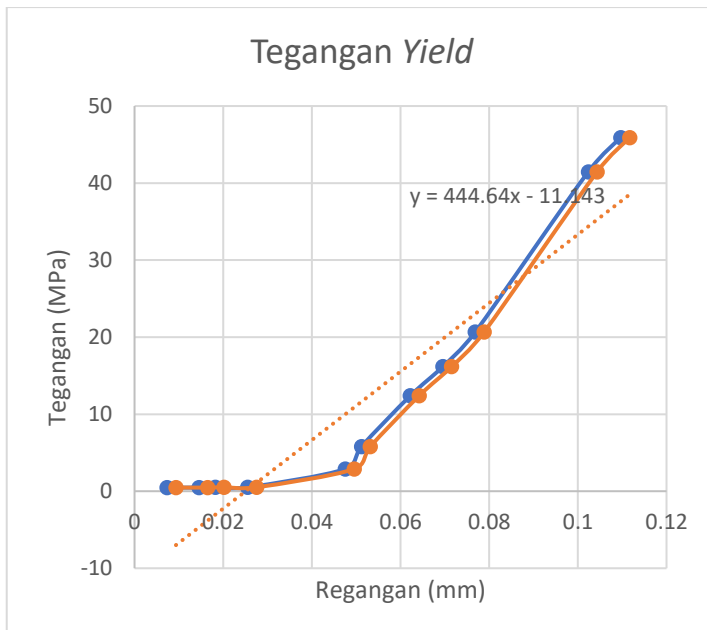


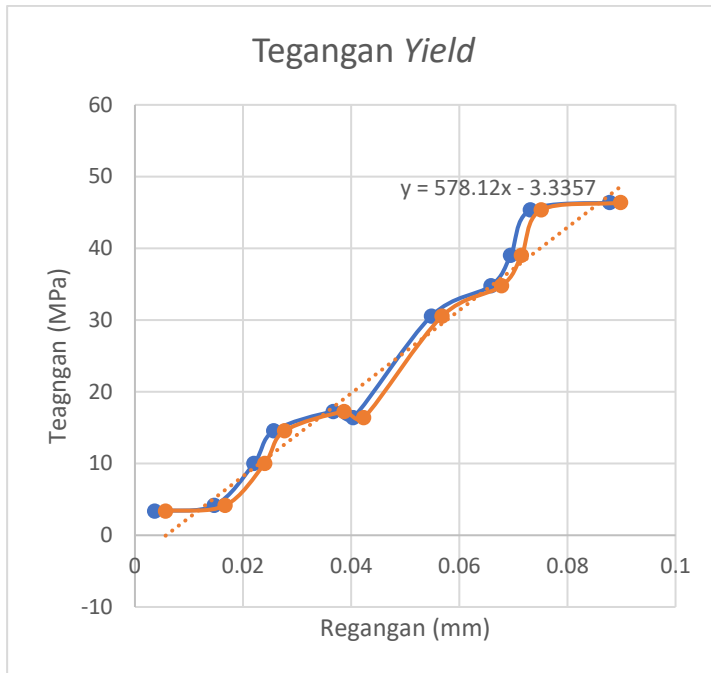
- *Continous Randomly 270 menit*



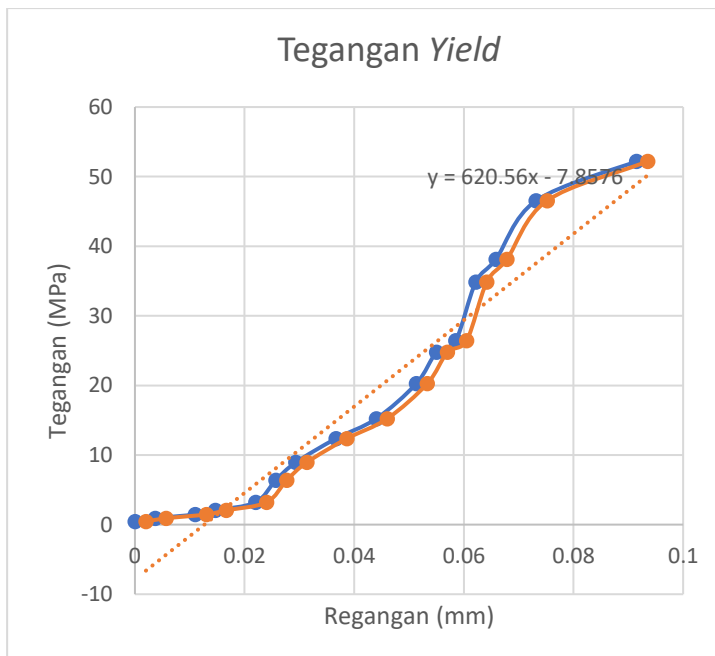


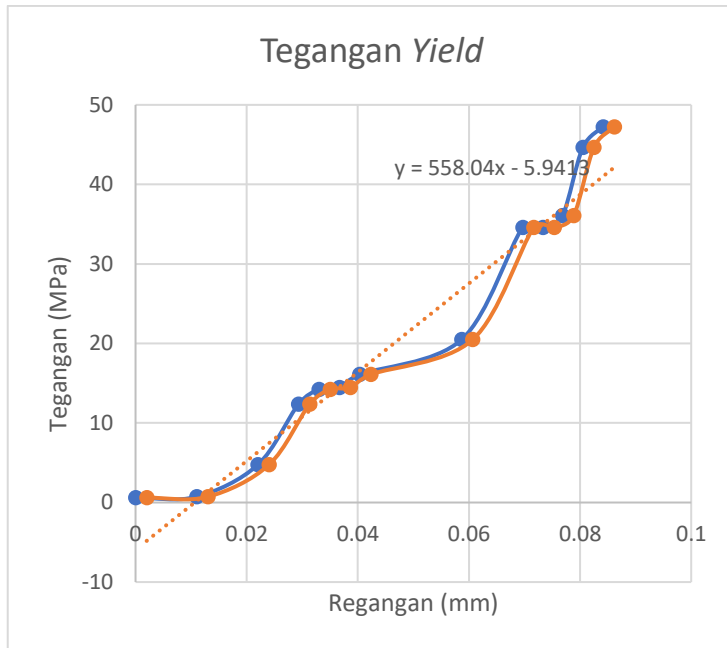
- *Discontinuous Randomly 30 menit*



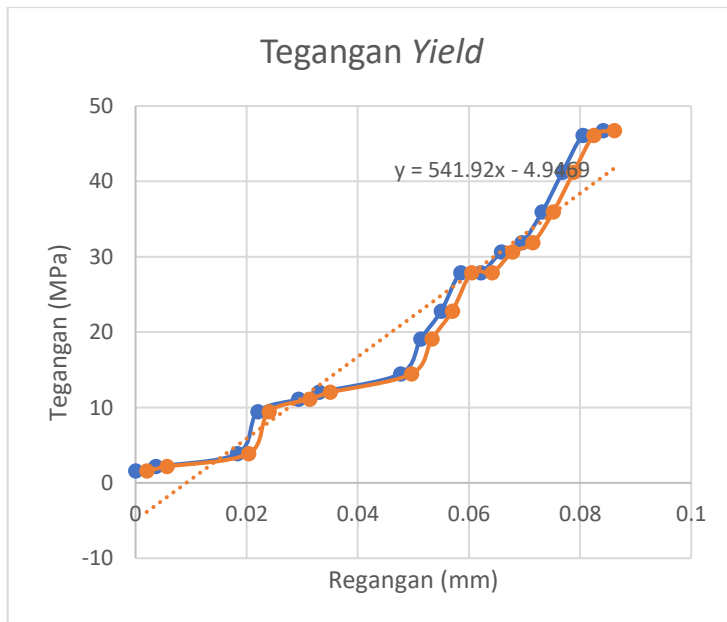


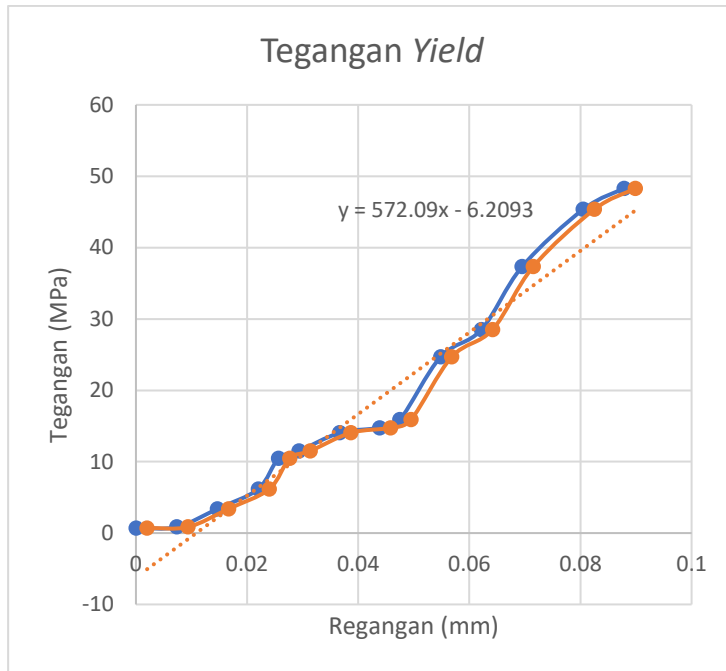
- *Discontinuous Randomly 90 menit*



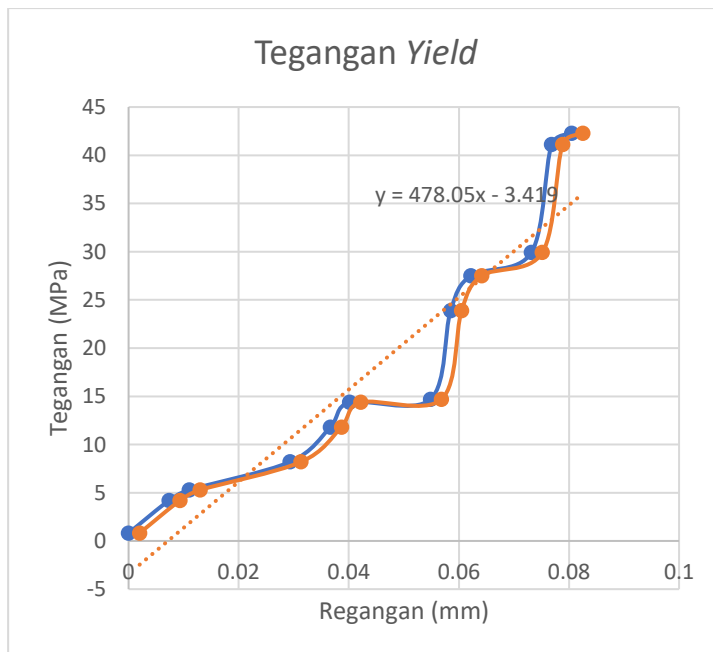


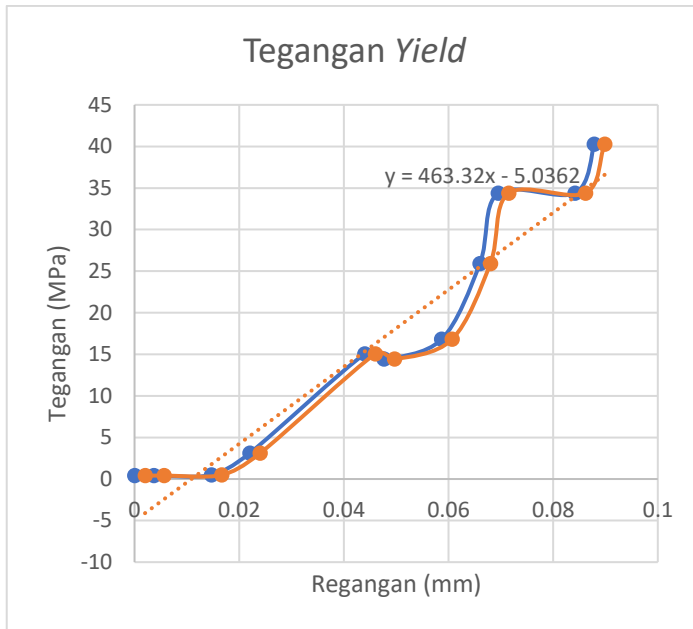
- *Discontinuous Randomly 150 menit*



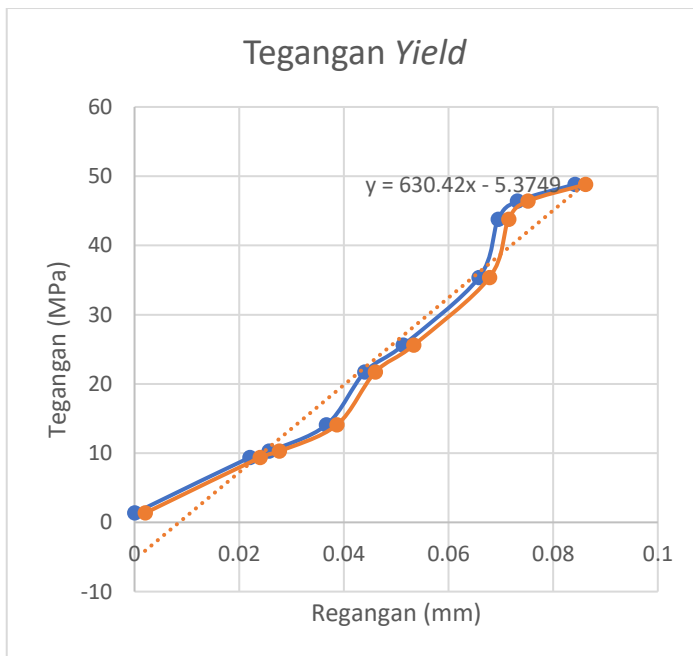


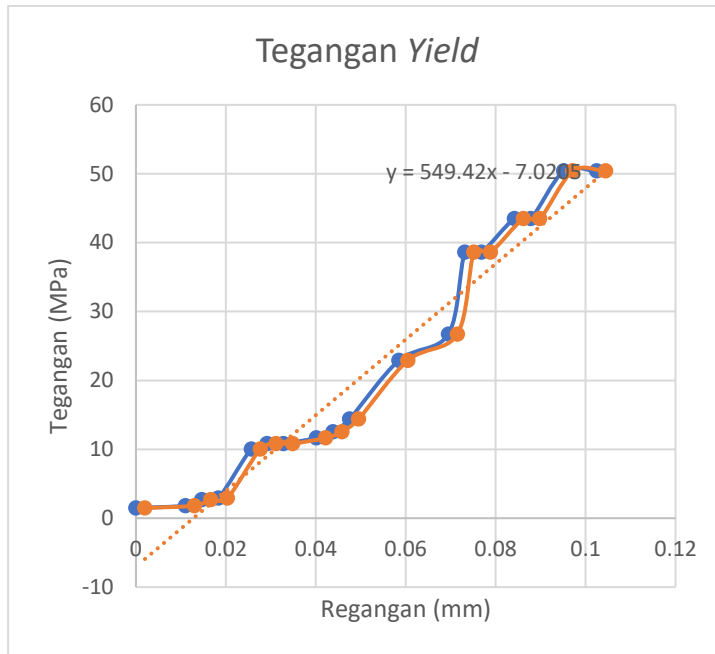
- *Discontinuous Randomly* 210 menit





- *Discontinous Randomly 270 menit*





D. Data Hasil Perhitungan

Susunan Serat	Waktu Alkalisasi (menit)	Spesimen	$\sigma_t$ Max (MPa)	$\epsilon_t$ Max (%)	Tegangan Yield (MPa)
<i>Continuous Randomly</i>	30	1	94,72	6,4	936,17
		2	93,44	5,66	1062,9
		Rata-rata	94,08	6,03	999,535
	90	1	73,78	5,7	790,28
		2	69,44	5,41	732,87
		Rata-rata	71,61	5,555	761,575
	150	1	71,92	5,6	722,97
		2	69,18	5,6	569,67
		Rata-rata	70,55	5,6	646,32
	210	1	79,16	5,63	826,69
		2	81,66	5,13	943,24
		Rata-rata	80,41	5,38	884,965
	270	1	81,96	4,76	916,42
		2	84	6,93	969,05
		Rata-rata	82,98	5,845	942,735

<i>Discontinuous Randomly</i>	30	1	45,90	5,3	444,64
		2	46,36	4,48	578,12
		Rata-rata	46,13	4,89	511,38
	90	1	52,19	4,28	620,56
		2	47,22	5,11	558,04
		Rata-rata	49,71	4,695	589,3
	150	1	46,72	5,18	541,92
		2	48,28	4,46	572,09
		Rata-rata	47,5	4,82	557,005
	210	1	42,27	4,81	478,05
		2	40,25	4,96	463,32
		Rata-rata	41,26	4,885	470,685
	270	1	48,80	5,23	630,42
		2	50,40	5,35	549,42
		Rata-rata	49,6	5,29	589,92

#### E. Persiapan Alat dan Bahan



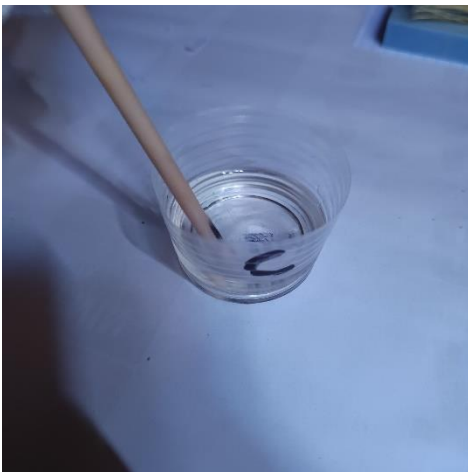


- Alat





F. Proses Pembuatan Spesimen





### G. Spesimen Yang Sudah Jadi

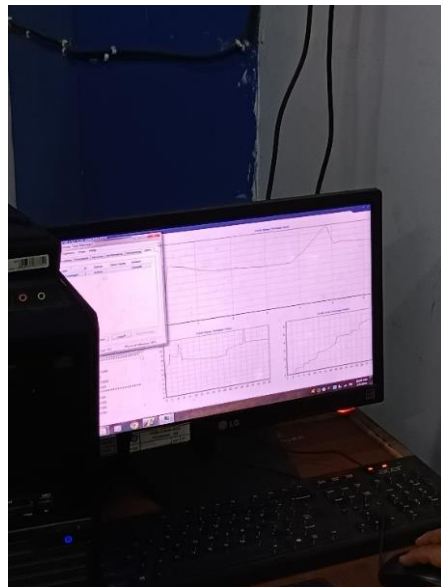
- *Continous Randomly*



- *Discontinuous Randomly*



#### H. Saat Pengujian Tarik





I. Surat Keterangan Pengujian



UNIVERSITAS 17 AGUSTUS 1945 SURABAYA  
PROGRAM STUDI D-III AGROINDUSTRI FAKULTAS VOKASI  
LABORATORIUM AGROINDUSTRI  
Jl. Semolowaru No. 45 Surabaya 60118 Telp. 031-5931800 ext. 3205  
Email: [agroindustri@untag-sby.ac.id](mailto:agroindustri@untag-sby.ac.id)

Surabaya, April 1 2024

**REPORT OF ANALYSIS**  
(002/ROA/LA/IV/24)

Principal : Lintang Dian Abimanyu dan Reyza Agus Setiawan  
Pemberi order (Fakultas Teknik Universitas 17 Agustus 1945 Surabaya)

Product : Serat Sisal  
Produk

Quantity : 5 sample(s)  
Jumlah

Date received : September 28, 2024  
Tanggal penerimaan

Tested for : Density  
Analisis/Uji

PARAMETER	Test Results	METHOD EQUIPMENT
	Density ( <i>Massa Jenis</i> )	
NaOH 5% 30 Minute	1,21 (gr/cm <sup>3</sup> )	Measuring cup 500 ml
NaOH 5% 90 Minute	1,27 (gr/cm <sup>3</sup> )	
NaOH 5% 150 Minute	1,34 (gr/cm <sup>3</sup> )	
NaOH 5% 210 Minute	1,39 (gr/cm <sup>3</sup> )	
NaOH 5% 270 Minute	1,54 (gr/cm <sup>3</sup> )	


*All analysis reported in certificates delivered/issued by us are carried out the best of our knowledge and ability. Our responsibility is only to the correctness of the result on samples analyzed.*

Approved by :  
Technical Manager,

  
Iza Richadus Widodo, MM  
NIP. 1983090940398

Analyst/Supervisor,

  
Tulus Yudi Widodo W. S.ST

	<b>Laboratorium Perlakuan dan Pengujian Bahan Teknik</b>
	<b>Jurusan Teknik Mesin</b>
	<b>POLITEKNIK NEGERI MALANG</b>

### SURAT KETERANGAN

Yang bertandatangan dibawah ini :

Nama : Rafik Djoenaidi,ST  
 N I P : 19780125200112 1 002  
 Jabatan : Pranata Laboratorium Pendidikan  
 Politeknik Negeri Malang

Menerangkan dengan sesungguhnya bahwa mahasiswa :

Nama : Lintang Dian Abimanyu  
 NIM : 1422000126  
 Instansi : Fakultas Teknik Program Studi Teknik Mesin  
 Universitas 17 Agustus 1945 Surabaya

Benar benar telah melaksanakan pengambilan data di Jurusan Teknik Mesin Politeknik Negeri Malang, guna keperluan penyusunan skripsi.

Demikian surat keterangan ini dibuat untuk dipergunakan sebagaimana mestinya.

Malang, 22 Mei 2024  
 Pranata Laboratorium Pendidikan  
 Politeknik Negeri Malang



Rafik Djoenaidi,ST  
 19780125 200112 1 002

	<b>Laboratorium Perlakuan dan Pengujian Bahan Teknik</b>
	<b>Jurusan Teknik Mesin</b>
	<b>POLITEKNIK NEGERI MALANG</b>

**SURAT KETERANGAN**

Yang bertandatangan dibawah ini :

Nama : Rafik Djoenaidi, ST  
 N I P : 19780125200112 1 002  
 Jabatan : Pranata Laboratorium Pendidikan  
 Politeknik Negeri Malang

Menerangkan dengan sesungguhnya bahwa mahasiswa :

Nama : Reyza Agus Setiawan  
 NIM : 1422000127  
 Instansi : Fakultas Teknik Program Studi Teknik Mesin  
 Universitas 17 Agustus 1945 Surabaya

Benar benar telah melaksanakan pengambilan data di Jurusan Teknik Mesin Politeknik Negeri Malang, guna keperluan penyusunan skripsi.

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Malang, 22 Mei 2024  
 Pranata Laboratorium Pendidikan  
 Politeknik Negeri Malang



Rafik Djoenaidi, ST  
 19780125 200112 1 002