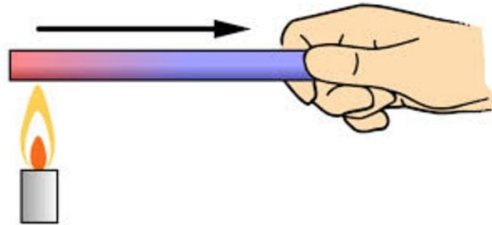


tersebut bergetar, Ketika partikel ini bergetar mereka memindahkan energi kinetik mereka satu sama lain yang mengakibatkan perpindahan energi panas. Mekanisme konduksi ini merupakan perpindahan yang paling umum terjadi dalam bahan padat[9].



Gambar 2.7 Perpindahan panas Konduksi

Secara matematis untuk perpindahan panas konduksi dapat dituliskan sebagai berikut:

$$Q = -k \cdot A \cdot \frac{\Delta T}{d} \dots\dots\dots (2.1)$$

Di mana:

Q = tingkat perpindahan panas (W).

k = koefisien konduktivitas termal bahan (W/m·K).

A = luas permukaan yang panasnya sedang berpindah (m²).

ΔT = perbedaan suhu antara dua ujung bahan (K).

d = ketebalan bahan (m).

2. Perpindahan Panas Konveksi

Perpindahan panas konveksi adalah perpindahan panas yang terjadi Ketika panas dipindahkan menggunakan media penghantar berupa fluida yang mengalir disekitar sumber panas [7]. Ketika fluida di dekat sumber panas menjadi lebih hangat sehingga fluida tersebut menjadi kurang padat dan naik ke atas, sedangkan bagian dari fluida yang lebih dingin dan lebih padat turun ke bawah. Hal ini menciptakan sirkulasi aliran yang mengangkut panas dari satu tempat ke tempat lain

LAMPIRAN

A. Perhitungan

1. Kalor jenis larutan gula (c_p)

a. Perhitungan dengan metode Interpolasi nilai brix

$$cp_{air} = 4,18 kJ/kg^{\circ}C$$

$$cp_{glukosa} = 1,55 kJ/kg^{\circ}C$$

$$brix = 28$$

$$\begin{aligned} cp_{campuran} &= (0,72 \times 4,18) + (0,28 \times 1,55) \\ &= 3,44155 kJ/kg^{\circ}C \end{aligned}$$

b. Perhitungan menggunakan rumus kalor

$$Q = m \times cp \times \Delta T$$

Dimana

$$Q = \text{energi panas yang diberikan} = \text{daya} \times \text{waktu}$$

$$Q = 550W \times (75 \times 60 \text{ detik})$$

$$Q = 2475000J$$

$$cp = \frac{Q}{m \times \Delta T}$$

$$cp = \frac{2475000J}{20 \times 35}$$

$$cp = 3535,71 \approx 3,53571 kJ/kg^{\circ}C$$

2. Luas Permukaan Kontak Heater

- Heater Tubular

Diketahui:

- Panjang total pipa $L = 60 \text{ cm} = 0,6 \text{ m}$

- Diameter luar pipa $d = 1,3 \text{ cm} = 0,013 \text{ m}$

$$A_{tabung} = \pi \cdot d \cdot L$$

$$A_{tabung} = \pi \cdot 0,013 \cdot 0,6$$

$$= 0,0245 \text{ m}^2$$

- *Heater Spiral*

Diketahui:

- Panjang total pipa spiral: $L = 230 \text{ cm} = 2,3 \text{ m}$
- Diameter luar pipa: $d = 0,8 \text{ cm} = 0,008 \text{ m}$

$$A_{tabung} = \pi \cdot d \cdot L$$

$$\begin{aligned} A_{tabung} &= \pi \cdot 0,008 \cdot 2,3 \\ &= 0,0578 \text{ m}^2 \end{aligned}$$

- *Heater Tubular Fin*

Diketahui:

- Panjang total pipa: $L = 60 \text{ cm}$
- Diameter luar pipa: $d_1 = 1,3 \text{ cm}$
- Jumlah *fin*: $n = 100$ buah
- Ukuran tiap *fin*: $d_2 = 2,8; t = 0,5 \text{ mm}$

$$A_{tabung} = (n(2\pi(r_2^2 - r_1^2) + 2\pi \times r_2 \times t) + (\pi \times d_1 \times L))$$

$$\begin{aligned} A_{tabung} &= (100(2\pi(1,4^2 - 0,65^2) + 2\pi \times 1,4 \times 0,05) \\ &\quad + (\pi \times 1,3 \times 230)) \end{aligned}$$

$$A_{tabung} = 1112 \text{ cm}^2 = 0,1112 \text{ m}^2$$

3. Efisiensi Termal

$$\eta = \frac{Q_{digunakan}}{Q_{nput}} \times 100$$

$$\eta = \frac{m \times c \times \Delta T}{Q_{nput}} \times 100$$

- *Heater Tubular*[24]

$$\eta = \frac{20,56 \times 3,44 \times 31,8}{0,86 \times 3600} \times 100 = 72,6\%$$

- *Heater Spiral*

$$\eta = \frac{20,48 \times 3,44 \times 31,9}{0,84 \times 3600} \times 100 = 74,3\%$$

- *Heater Tubular Fin*

$$\eta = \frac{20,46 \times 3,44 \times 31,8}{0,77 \times 3600} \times 100 = 78,9\%$$

4. Laju Evaporasi

$$\dot{m} = \frac{\Delta m}{\Delta t}$$

- *Heater Tubular*

$$\dot{m} = \frac{0,08}{2 \times 3600} = 1,1 \times 10^{-5} kg/s$$

- *Heater Spiral*

$$\dot{m} = \frac{0,12}{2 \times 3600} = 1,67 \times 10^{-5} kg/s$$

- *Heater Tubular Fin*

$$\dot{m} = \frac{0,11}{2 \times 3600} = 1,53 \times 10^{-5} kg/s$$

5. Efisiensi Evaporasi

$$\eta = \frac{Q_{evap}}{Q_{input}} \times 100$$

$$\eta = \frac{\Delta m \times L_v}{Q_{input}} \times 100$$

asumsi

$L_v = 2,26 \times 10^6 J/kg$, yaitu kalor laten penguapan nira (diasumsikan setara dengan air)

- *Heater Tubular*

$$\eta = \frac{0,08 \times 2,26 \times 10^6}{3.132.000} \times 100 = 5,77\%$$

- *Heater Spiral*

$$\eta = \frac{0,12 \times 2,26 \times 10^6}{3.168.000} \times 100 = 8,56\%$$

- *Heater Tubular Fin*

$$\eta = \frac{0,11 \times 2,26 \times 10^6}{3.276.000} \times 100 = 7,59\%$$

B. Dokumentasi Pengambilan Data



Setup experiment

- Pengujian *Heater Tubular*



Hasil pengujian dimenit ke 120

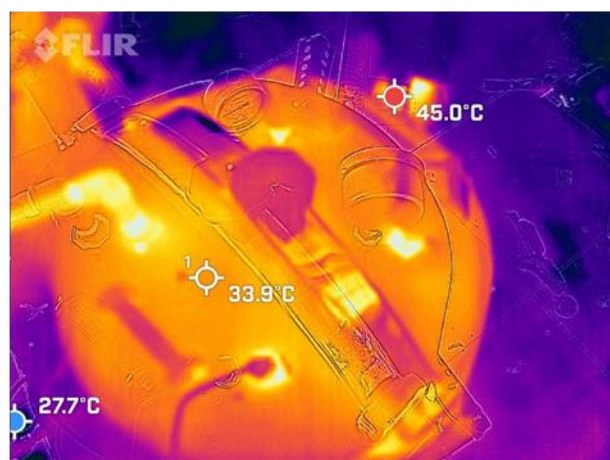
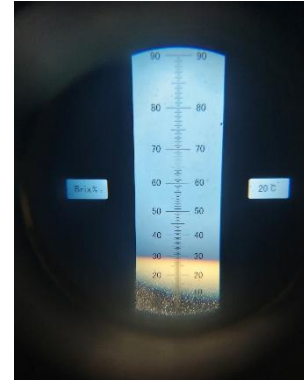


Foto Thermal di suhu 40°C

- Pengujian *Heater Tubular*



Hasil pengujian dimenit ke 120

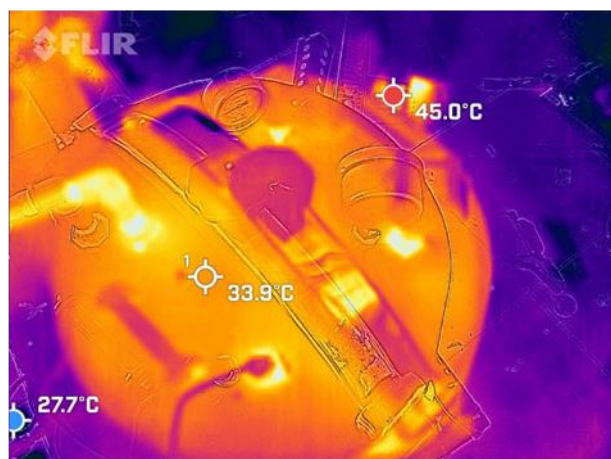
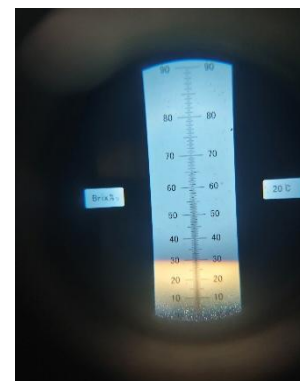


Foto Thermal di suhu 40°C

- Pengujian *Heater Tubular Fin*



Hasil pengujian dimenit ke 120

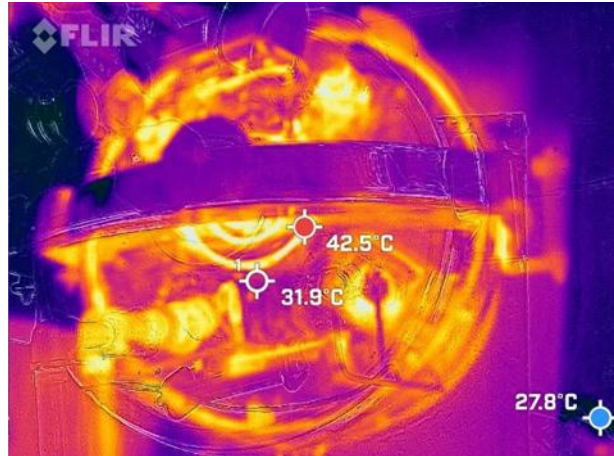
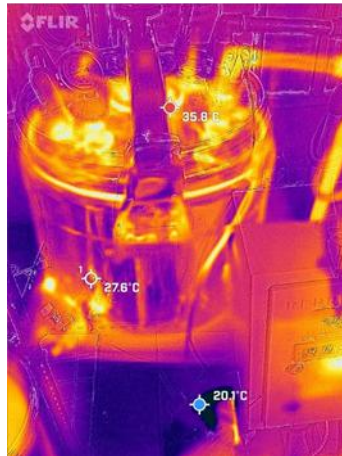


Foto Thermal di suhu 40°C

C. Data Hasil Pengujian

a. Hasil Pengujian *Heater U Finn*

Waktu (Menit)	Suhu Produksi		Konsumsi daya <i>Heater</i>		Tekanan Panci	
	Suhu Dalam Panci (°C)	Suhu Luar Panci (°C)	Watt	Kwh	Pressure Digital (Bar)	Pressure Analog (Bar)
0	33.1	32.4	574.3	0	0	0.1
1	33.4	32.8	573.8	0.01	-0.038	0.3
2	33.7	33	573	0.02	-0.188	0.5
3	33.9	33.3	573	0.03	-0.322	0.55
4	34.2	33.6	574	0.04	-0.408	0.65
5	34.5	34	573.8	0.05	-0.466	0.675
6	34.8	34.3	573.5	0.06	-0.506	0.7
7	35.2	34.6	573.3	0.07	-0.534	0.7
8	35.5	34.9	588.1	0.08	-0.529	0.7
9	35.9	35.3	588.4	0.09	-0.463	0.7
10	36.2	35.7	572.8	0.1	-0.489	0.7
11	36.6	36.1	572.5	0.11	-0.522	0.7
12	37	36.4	572.5	0.12	-0.549	0.7
13	37.3	36.7	588.4	0.13	-0.487	0.7
14	37.7	37.1	567.4	0.14	-0.473	0.7
15	38	37.5	563.8	0.15	-0.513	0.7
16	38.4	37.9	566.7	0.16	-0.542	0.7
17	38.8	38.2	581.2	0.18	-0.502	0.7
18	39.1	38.5	563.1	0.2	-0.462	0.7
19	39.5	38.9	563.6	0.21	-0.508	0.7
20	39.9	39.2	563.1	0.22	-0.54	0.7
21	40.3	39.5	581.2	0.23	-0.5	0.7
22	40.6	39.8	563.3	0.24	-0.45	0.7
23	41	40.2	563.8	0.25	-0.503	0.7
24	41.4	40.5	564.1	0.26	-0.536	0.7
25	41.8	40.9	582	0.27	-0.517	0.7
26	42.2	41.1	581.7	0.28	-0.453	0.7
27	42.5	41.4	566.7	0.29	-0.5	0.7
28	43	41.7	563.8	0.3	-0.536	0.7
29	43.4	42	581.7	0.31	-0.515	0.7
30	43.7	42.2	582	0.32	-0.451	0.7
31	44.1	42.5	567.2	0.33	-0.504	0.7
32	44.5	42.9	566.9	0.34	-0.538	0.7
33	44.9	43.2	582.5	0.35	-0.511	0.7
34	45.3	43.6	566.9	0.36	-0.449	0.7
35	45.6	44	567.2	0.37	-0.507	0.7
36	46.1	44.3	567.2	0.38	-0.541	0.7
37	46.5	44.6	585	0.39	-0.503	0.7
38	46.8	45	567.7	0.4	-0.464	0.7
39	47.2	45.3	567.9	0.41	-0.514	0.7
40	47.7	45.7	566.7	0.42	-0.547	0.7
41	48.1	46	581	0.43	-0.488	0.7
42	48.5	46.3	566.7	0.44	-0.477	0.7
43	48.8	46.7	566.9	0.45	-0.523	0.7
44	49.3	47	581.7	0.46	-0.536	0.7
45	49.7	47.5	581.5	0.47	-0.471	0.7
46	50.1	47.8	563.6	0.48	-0.494	0.7
47	50.5	48.2	563.3	0.49	-0.536	0.7

48	51	48.6	580.7	0.5	-0.512	0.7
49	51.5	48.8	563.6	0.51	-0.449	0.7
50	51.9	49.2	563.1	0.52	-0.511	0.7
51	52.3	49.6	562.6	0.53	-0.548	0.7
52	52.8	50	580.7	0.54	-0.484	0.7
53	53.3	50.3	562.6	0.55	-0.482	0.7
54	53.6	50.7	561.8	0.56	-0.53	0.7
55	54.3	51	577.6	0.57	-0.518	0.7
56	54.7	51.4	577.6	0.58	-0.542	0.7
57	55.4	51.8	562.3	0.59	-0.511	0.7
58	55.7	52	562.8	0.6	-0.55	0.7
59	56.4	52.3	577.6	0.61	-0.478	0.7
60	57	52.6	563.6	0.62	-0.491	0.7
61	57.3	52.9	563.3	0.63	-0.538	0.7
62	58.1	53.3	581.7	0.64	-0.499	0.7
63	58.7	53.7	563.6	0.65	-0.469	0.7
64	59.1	54	563.8	0.66	-0.528	0.7
65	60.2	54.4	581.5	0.67	-0.513	0.7
66	61	54.7	566.8	0.68	-0.449	0.7
67	61.2	55.1	563.6	0.69	-0.52	0.7
68	62.7	55.5	576.5	0.7	-0.525	0.7
69	63.4	55.8	581.2	0.71	-0.457	0.7
70	63.3	56.1	562.3	0.72	-0.517	0.7
71	64	56.5	580.7	0.73	-0.526	0.7
72	64.4	56.9	581.7	0.74	-0.459	0.7
73	64.6	57.2	563.3	0.75	-0.518	0.7
74	64.7	57.7	581	0.76	-0.523	0.7
75	64.9	58	577.4	0.77	-0.468	0.7
76	65	58.3	0	0.77	-0.518	0.7
77	64.9	58.7	0	0.77	-0.52	0.7
78	64.6	59.3	0	0.77	-0.522	0.7
79	64.4	59.4	0	0.77	-0.531	0.7
80	64.1	59.6	0	0.77	-0.525	0.7
81	63.9	59.5	0	0.77	-0.455	0.7
82	63.7	59.5	0	0.77	-0.507	0.7
83	63.5	59.4	0	0.77	-0.512	0.7
84	63.3	59.4	0	0.77	-0.46	0.7
85	63.1	59.3	0	0.77	-0.529	0.7
86	62.9	59.2	0	0.77	-0.503	0.7
87	62.7	59.2	0	0.77	-0.455	0.7
88	62.6	59.1	0	0.77	-0.536	0.7
89	62.5	59.1	0	0.77	-0.472	0.7
90	62.4	59	0	0.77	-0.543	0.7
91	62.3	58.9	0	0.77	-0.488	0.7
92	62.2	58.8	0	0.77	-0.484	0.7
93	62.1	58.8	0	0.77	-0.546	0.7
94	62.1	58.7	0	0.77	-0.487	0.7
95	62.1	58.7	559.3	0.78	-0.487	0.7
96	62.6	58.6	576.9	0.79	-0.547	0.7
97	63	58.6	563.8	0.8	-0.486	0.7
98	63.3	58.5	567.2	0.82	-0.484	0.7
99	63.8	58.6	564.8	0.83	-0.539	0.7
100	64.1	58.9	582.2	0.84	-0.493	0.7
101	64.3	59.2	562.8	0.85	-0.481	0.7
102	64.8	59.5	564.1	0.86	-0.535	0.7

103	65	59.8	582.2	0.87	-0.499	0.7
104	65.2	60	566.9	0.88	-0.476	0.7
105	65.2	60.4	563.8	0.9	-0.534	0.7
106	65	61.1	563.8	0.91	-0.471	0.7
107	64.9	61.3	0	0.91	-0.512	0.7
108	64.8	61.4	0	0.91	-0.497	0.7
109	64.7	61.3	0	0.91	-0.545	0.7
110	64.6	61.3	0	0.91	-0.484	0.7
111	64.4	61.2	0	0.91	-0.493	0.7
112	64.2	61.1	0	0.91	-0.542	0.7
113	64	61	0	0.91	-0.474	0.7
114	63.8	60.9	0	0.91	-0.514	0.7
115	63.6	60.6	0	0.91	-0.467	0.7
116	63.3	60.5	0	0.91	-0.509	0.7
117	63	60.3	0	0.91	-0.533	0.7
118	62.8	60.2	0	0.91	-0.486	0.7
119	62.6	60	0	0.91	-0.499	0.7
120	62.4	59.9	0	0.91	-0.526	0.7

b. Hasil Pengujian *Heater Spiral*

Waktu (Menit)	Suhu Produksi		Konsumsi daya <i>Heater</i>		Tekanan Panci	
	Suhu Dalam Panci (°C)	Suhu Luar Panci (°C)	Watt	Kwh	Pressure Digital (Bar)	Pressure Analog (Bar)
0	33.1	31.3	562.6	0	0	0.1
1	33.4	31.4	564.3	0.01	-0.063	0.3
2	33.7	31.5	564.5	0.02	-0.148	0.5
3	33.9	31.5	564.3	0.03	-0.265	0.5
4	34.2	31.6	564.5	0.04	-0.312	0.55
5	34.5	31.7	564.5	0.05	-0.388	0.6
6	34.8	31.9	563.3	0.06	-0.421	0.6
7	35.2	32.2	563.3	0.07	-0.473	0.675
8	35.7	32.6	563.1	0.08	-0.502	0.7
9	36.1	32.9	563.1	0.09	-0.522	0.7
10	36.5	33.3	559.8	0.1	-0.538	0.7
11	37	33.8	562.1	0.11	-0.549	0.7
12	37.3	34.1	580.3	0.12	-0.532	0.7
13	37.7	34.5	581.1	0.13	-0.497	0.7
14	38.2	35	582.5	0.14	-0.461	0.7
15	38.6	35.3	582.3	0.15	-0.488	0.7
16	38.9	35.9	562.6	0.16	-0.505	0.7
17	39.5	36.2	561.1	0.17	-0.537	0.7
18	39.8	36.5	583.1	0.18	-0.522	0.7
19	40.2	36.9	579.2	0.19	-0.498	0.7
20	40.7	37.3	572.9	0.2	-0.462	0.7
21	41.1	37.7	562.4	0.21	-0.465	0.7
22	41.5	38	562.4	0.22	-0.503	0.7
23	41.9	38.4	559.1	0.23	-0.529	0.7
24	42.3	38.8	562.4	0.24	-0.545	0.7
25	42.8	39.1	577.2	0.25	-0.487	0.7
26	43.1	39.5	562.4	0.26	-0.48	0.7
27	43.5	39.9	559.1	0.27	-0.514	0.7
28	44	40.2	558.8	0.28	-0.538	0.7
29	44.3	40.5	581.5	0.29	-0.516	0.7

30	44.7	41	563.1	0.3	-0.468	0.7
31	45.1	41.2	562.6	0.31	-0.504	0.7
32	45.6	41.7	558.8	0.32	-0.531	0.7
33	45.9	42.1	571.2	0.33	-0.546	0.7
34	46.3	42.4	577	0.34	-0.456	0.7
35	46.6	42.3	561.9	0.35	-0.496	0.7
36	47	43.1	562.1	0.36	-0.528	0.7
37	47.4	43.5	558.8	0.37	-0.549	0.7
38	47.9	43.9	572.4	0.38	-0.468	0.7
39	48.3	44.2	559.1	0.39	-0.496	0.7
40	48.6	44.6	561.6	0.4	-0.528	0.7
41	49.1	45	576.7	0.41	-0.548	0.7
42	49.5	45.3	571.4	0.42	-0.455	0.7
43	49.9	45.7	563.3	0.43	-0.501	0.7
44	50.3	46	563.3	0.44	-0.532	0.7
45	50.6	46.4	582.3	0.44	-0.524	0.7
46	50.9	46.7	564.1	0.45	-0.453	0.7
47	51.4	47.1	562.6	0.46	-0.505	0.7
48	51.8	47.5	563.3	0.47	-0.537	0.7
49	52.2	47.9	581.3	0.48	-0.504	0.7
50	52.6	48.2	557.1	0.49	-0.473	0.7
51	52.9	48.5	561.4	0.5	-0.515	0.7
52	53.3	48.8	558.8	0.51	-0.541	0.7
53	53.7	49.2	576.5	0.52	-0.483	0.7
54	54.1	49.6	562.4	0.53	-0.489	0.7
55	54.4	49.9	561.9	0.54	-0.527	0.7
56	54.8	40.2	577.4	0.55	-0.534	0.7
57	55.2	50.6	562.4	0.56	-0.448	0.7
58	55.5	50.9	557.4	0.57	-0.507	0.7
59	56	51.2	562.9	0.58	-0.54	0.7
60	56.2	51.6	572.9	0.59	-0.495	0.7
61	56.6	52	559.1	0.6	-0.482	0.7
62	57	52.3	563.6	0.61	-0.528	0.7
63	57.3	52.7	577.7	0.62	-0.532	0.7
64	57.7	53	567	0.63	-0.55	0.7
65	58	53.4	453.6	0.64	-0.509	0.7
66	58.4	53.6	560.4	0.65	-0.543	0.7
67	58.7	54	577.9	0.66	-0.477	0.7
68	59.1	54.4	561.9	0.67	-0.495	0.7
69	59.5	54.7	562.9	0.68	-0.535	0.7
70	59.8	55.1	572.4	0.69	-0.499	0.7
71	60.1	55.5	576.6	0.7	-0.483	0.7
72	60.6	55.7	558.6	0.71	-0.517	0.7
73	61	56.4	562.9	0.72	-0.542	0.7
74	61.4	55.8	562.1	0.73	-0.479	0.7
75	61.7	57.1	580.8	0.74	-0.516	0.7
76	61.9	57.2	580.5	0.75	-0.477	0.7
77	62.1	57.5	562.9	0.76	-0.481	0.7
78	62.5	57.8	563.6	0.77	-0.534	0.7
79	62.8	58.1	580.8	0.78	-0.496	0.7
80	63.1	58.5	563.8	0.79	-0.488	0.7
81	63.5	58.7	562.4	0.8	-0.54	0.7
82	63.8	59.1	580.8	0.81	-0.485	0.7
83	64.2	59.5	563.3	0.82	-0.499	0.7
84	64.5	59.8	562.9	0.83	-0.547	0.7

85	64.7	60.2	577.2	0.84	-0.49	0.7
86	65	60.6	0	0.84	-0.513	0.7
87	65.1	60.9	0	0.84	-0.576	0.7
88	65	61.3	0	0.84	-0.538	0.7
89	64.8	61.3	0	0.84	-0.485	0.7
90	64.7	61.3	0	0.84	-0.502	0.7
91	64.6	61.3	0	0.84	-0.527	0.7
92	64.5	61.3	0	0.84	-0.455	0.7
93	64.4	61.2	0	0.84	-0.534	0.7
94	64.3	61.1	0	0.84	-0.489	0.7
95	64.2	61	0	0.84	-0.496	0.7
96	64.1	61	0	0.84	-0.535	0.7
97	64	60.9	0	0.84	-0.461	0.7
98	63.9	60.8	0	0.84	-0.522	0.7
99	63.8	60.7	0	0.84	-0.507	0.7
100	63.7	60.6	0	0.84	-0.468	0.7
101	63.6	60.5	0	0.84	-0.531	0.7
102	63.5	60.4	0	0.84	-0.471	0.7
103	63.4	60.3	0	0.84	-0.515	0.7
104	63.2	60.3	0	0.84	-0.52	0.7
105	63.2	60.3	0	0.84	-0.45	0.7
106	63.1	60.2	0	0.84	-0.517	0.7
107	63	60.1	0	0.84	-0.513	0.7
108	62.9	60	0	0.84	-0.452	0.7
109	62.8	60	0	0.84	-0.533	0.7
110	62.7	60	0	0.84	-0.49	0.7
111	62.6	59.8	0	0.84	-0.55	0.7
112	62.5	59.7	0	0.84	-0.469	0.7
113	62.4	59.6	0	0.84	-0.511	0.7
114	62.3	59.5	0	0.84	-0.52	0.7
115	62.1	59.4	0	0.84	-0.529	0.7
116	62	59.3	0	0.84	-0.489	0.7
117	62.1	59.2	549.5	0.85	-0.478	0.7
118	62.4	59.1	563.6	0.86	-0.542	0.7
119	62.8	59.2	558.4	0.87	-0.521	0.7
120	63	59.2	576.7	0.88	-0.488	0.7

c. Hasil Pengujian *Heater* U

Waktu (Menit)	Suhu Produksi		Konsumsi daya <i>Heater</i>		Tekanan Panci	
	Suhu Dalam Panci (°C)	Suhu Luar Panci (°C)	Watt	Kwh	Pressure Digital (Bar)	Pressure Analog (Bar)
0	33.2	32.8	568.3	0	0	0.1
1	33.4	32.8	565.2	0.01	-0.064	0.3
2	33.6	32.9	560.1	0.02	-0.196	0.5
3	33.6	32.9	565	0.03	-0.349	0.5
4	33.8	32.9	564.5	0.03	-0.444	0.6
5	34.4	33	563.6	0.04	-0.506	0.7
6	34.8	33	563.6	0.05	-0.548	0.7
7	35.2	32.9	573	0.06	-0.488	0.7
8	35.7	32.9	560.1	0.07	-0.479	0.7
9	36.1	32.9	564.1	0.08	-0.53	0.7
10	37	33	581.6	0.09	-0.518	0.7
11	37.5	33	579.2	0.1	-0.454	0.7

12	38.1	33.1	559.5	0.11	-0.464	0.7
13	38.5	33.1	563.8	0.12	-0.504	0.7
14	38.8	33.2	569.5	0.13	-0.533	0.7
15	39.3	33.3	587.4	0.14	-0.548	0.7
16	39.8	33.4	587.4	0.15	-0.482	0.7
17	40.4	33.5	573.5	0.16	-0.479	0.7
18	40.9	33.6	567.3	0.17	-0.521	0.7
19	41.4	33.8	582.6	0.18	-0.549	0.7
20	41.8	33.9	577.1	0.19	-0.488	0.7
21	42.2	34.1	560.3	0.2	-0.47	0.7
22	42.8	34.3	563.6	0.21	-0.516	0.7
23	43.2	34.5	559.7	0.22	-0.547	0.7
24	43.7	34.6	576.8	0.23	-0.497	0.7
25	44.1	34.8	565	0.24	-0.46	0.7
26	44.5	35	567.1	0.25	-0.51	0.7
27	45	35.3	567.3	0.26	-0.544	0.7
28	45.4	35.5	577.8	0.27	-0.502	0.7
29	45.9	35.7	567.8	0.28	-0.454	0.7
30	46.3	36	565.2	0.29	-0.508	0.7
31	46.7	36.3	562.9	0.29	-0.544	0.7
32	47	36.5	574	0.3	-0.501	0.7
33	47.3	36.8	564.5	0.31	-0.455	0.7
34	47.7	37.1	568.8	0.32	-0.502	0.7
35	48.1	37.3	567.3	0.33	-0.544	0.7
36	48.5	37.6	582.8	0.34	-0.5	0.7
37	48.9	38	562.9	0.35	-0.459	0.7
38	49.3	38.2	564.5	0.36	-0.512	0.7
39	49.7	38.5	564.5	0.37	-0.547	0.7
40	50	38.8	579.5	0.38	-0.496	0.7
41	50.3	39.2	565	0.39	-0.466	0.7
42	50.7	39.5	559	0.4	-0.516	0.7
43	51.1	39.8	574.1	0.41	-0.55	0.7
44	51.4	40.2	582.8	0.42	-0.488	0.7
45	51.8	40.5	565	0.43	-0.475	0.7
46	52.1	40.9	564.8	0.44	-0.523	0.7
47	52.4	41.2	577.1	0.45	-0.537	0.7
48	52.8	41.6	578.5	0.46	-0.476	0.7
49	53.2	41.9	569.5	0.47	-0.488	0.7
50	53.5	42.3	568.8	0.48	-0.536	0.7
51	53.8	42.6	581.6	0.49	-0.519	0.7
52	54.1	43.1	591.4	0.5	-0.46	0.7
53	54.4	43.5	574.5	0.51	-0.503	0.7
54	54.8	43.9	573.5	0.52	-0.541	0.7
55	55.1	44.3	586.9	0.53	-0.5	0.7
56	55.5	44.6	573.8	0.54	-0.46	0.7
57	55.8	45.1	573	0.55	-0.517	0.7
58	56	45.5	587.6	0.56	-0.544	0.7
59	56.2	45.9	577.3	0.57	-0.481	0.7
60	56.6	46.3	555.2	0.58	-0.483	0.7
61	56.9	46.8	558.3	0.59	-0.533	0.7
62	57.1	47.2	577.3	0.6	-0.515	0.7
63	57.3	47.8	577.8	0.61	-0.456	0.7
64	57.7	48.3	559.9	0.62	-0.51	0.7
65	58	48.9	569	0.62	-0.55	0.7
66	58.1	49.6	579	0.63	-0.468	0.7

67	58.5	50.3	564.1	0.64	-0.484	0.7
68	58.7	51	563.6	0.65	-0.534	0.7
69	58.8	51.8	578.3	0.66	-0.511	0.7
70	59.1	52.7	579.2	0.67	-0.453	0.7
71	59.5	53.5	564.3	0.68	-0.512	0.7
72	59.7	54.4	577.8	0.69	-0.544	0.7
73	59.9	55.2	582.3	0.7	-0.479	0.7
74	60.2	55.9	565.2	0.71	-0.491	0.7
75	60.5	56.4	560.3	0.72	-0.539	0.7
76	60.6	57	578.3	0.73	-0.498	0.7
77	61	57.4	564.1	0.74	-0.468	0.7
78	61.4	57.7	559.9	0.75	-0.527	0.7
79	61.6	58.2	581.6	0.76	-0.515	0.7
80	62	58.5	579.2	0.77	-0.454	0.7
81	62.4	58.8	565	0.78	-0.518	0.7
82	62.6	59.3	577.3	0.79	-0.526	0.7
83	63	59.7	578.5	0.8	-0.461	0.7
84	63.3	60	564.8	0.81	-0.516	0.7
85	63.7	60.3	568.1	0.82	-0.548	0.7
86	63.9	60.8	583	0.83	-0.484	0.7
87	64.3	61	565.2	0.84	-0.498	0.7
88	64.6	61.1	568.9	0.85	-0.524	0.7
89	64.7	61.2	579.1	0.86	-0.464	0.7
90	65	61.2	559.3	0.86	-0.521	0.7
91	65.1	61.2	0	0.86	-0.521	0.7
92	65	61.1	0	0.86	-0.506	0.7
93	64.9	61.1	0	0.86	-0.45	0.7
94	64.8	61	0	0.86	-0.536	0.7
95	64.8	60.8	0	0.86	-0.494	0.7
96	64.7	60.7	0	0.86	-0.472	0.7
97	64.6	60.5	0	0.86	-0.544	0.7
98	64.5	60.5	0	0.86	-0.587	0.7
99	64.4	60.4	0	0.86	-0.487	0.7
100	64.3	60.3	0	0.86	-0.549	0.7
101	64.2	60.2	0	0.86	-0.482	0.7
102	64.1	60.1	0	0.86	-0.494	0.7
103	63.9	60	0	0.86	-0.476	0.7
104	63.8	59.8	0	0.86	-0.533	0.7
105	63.7	59.7	0	0.86	-0.473	0.7
106	63.6	59.7	0	0.86	-0.503	0.7
107	63.4	59.5	0	0.86	-0.473	0.7
108	63.3	59.4	0	0.86	-0.502	0.7
109	63.1	59.2	0	0.86	-0.475	0.7
110	63	59.1	0	0.86	-0.536	0.7
111	62.9	59	0	0.86	-0.476	0.7
112	62.8	59	0	0.86	-0.498	0.7
113	62.7	58.8	0	0.86	-0.541	0.7
114	62.6	58.8	0	0.86	-0.48	0.7
115	62.5	58.8	0	0.86	-0.494	0.7
116	62.5	58.8	0	0.86	-0.497	0.7
117	62.3	58.6	0	0.86	-0.546	0.7
118	62.2	58.5	0	0.86	-0.487	0.7
119	62.1	58.5	0	0.86	-0.527	0.7
120	62	58.4	559.3	0.87	-0.451	0.7