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LAMPIRAN

Lampiran 1 Data Hasil Penelitian

Tabel 12 Data Temperatur Rata-Rata pada Jarak 3mm dan Kemiringan 0°

V	Daya Heater (W)	$T_{ambient}$	T_{heater}	T_{before}	T_{after}	$T_{evaporator}$	$T_{condenser}$	T_{wall}
25	114	27.38	38.5	30.02	29.64	29.32	29.01	28.73
50	227	27.25	55.5	32.14	31.13	30.57	29.59	29.33
75	341	27.01	77.2	35.47	33.29	32.49	31.37	30.18
100	455	27.57	105.4	40.25	36.69	35.45	33.64	32.03
125	568	27.33	138.3	45.84	40.45	38.63	36.76	34.10
150	682	27.19	170.8	51.91	44.57	42.34	39.15	36.01
175	795	27.39	218.1	59.91	49.99	47.08	43.73	39.51
200	**909**	**27.54**	**260.9**	**70.15**	**56.97**	**53.37**	**48.56**	**40.05**

Tabel 13 Data Temperatur Rata-Rata pada Jarak 4mm dan Kemiringan 0°

V	Daya *Heater* (W)	$T_{ambient}$	T_{heater}	T_{before}	T_{after}	$T_{evaporator}$	$T_{condenser}$	T_{wall}
25	114	27.15	38.5	29.77	29.40	29.03	28.58	28.41
50	227	27.39	55.5	32.18	31.26	30.71	29.86	29.36
75	341	27.15	77.2	34.91	33.18	32.23	31.16	30.11
100	455	27.13	105.4	39.56	36.47	35.34	33.30	31.53
125	568	27.30	138.3	45.60	40.70	38.94	36.90	33.66
150	682	27.38	170.8	52.72	45.81	43.46	40.20	36.59
175	795	27.17	218.1	59.84	50.66	47.79	43.75	39.52
200	909	27.54	260.9	68.55	56.42	52.86	47.52	44.34

Tabel 14 Data Temperatur Rata-Rata pada Jarak 5mm dan Kemiringan 0°

V	Daya *Heater* (W)	$T_{ambient}$	T_{heater}	T_{before}	T_{after}	$T_{evaporator}$	$T_{condenser}$	T_{wall}
25	114	27.12	38.5	29.77	29.41	29.03	28.53	28.43
50	227	27.02	55.5	31.57	30.72	30.15	29.22	28.94
75	341	27.29	77.2	35.15	33.37	32.54	31.34	30.10
100	455	27.05	105.4	39.02	36.14	34.91	33.00	31.22
125	568	27.06	138.3	44.67	40.18	38.46	35.71	33.12
150	682	27.37	170.8	51.03	44.62	42.35	38.78	35.49
175	795	27.30	218.1	58.68	49.84	47.05	42.54	38.64
200	909	27.23	260.9	67.82	56.18	52.76	47.22	43.25

Tabel 15 Data Temperatur Rata-Rata pada Jarak 6mm dan Kemiringan 0°

V	Daya *Heater* (W)	$T_{ambient}$	T_{heater}	T_{before}	T_{after}	$T_{evaporator}$	$T_{condenser}$	T_{wall}
25	114	27.18	38.5	29.80	29.46	29.14	28.81	28.49
50	227	27.02	55.5	31.73	30.87	30.38	29.69	29.01
75	341	27.03	77.2	34.87	33.12	32.36	31.29	29.97
100	455	27.06	105.4	39.33	36.42	35.33	33.54	31.36
125	568	27.22	138.3	44.34	40.05	38.56	36.16	33.11
150	682	27.25	170.8	50.46	44.36	42.12	39.08	35.35
175	795	27.06	218.1	58.68	49.97	47.00	43.12	38.73
200	909	27.37	260.9	67.42	56.22	52.55	47.59	43.40

Tabel 16 Data Temperatur Rata-Rata pada Jarak 3mm dan Kemiringan 15°

V	Daya *Heater* (W)	$T_{ambient}$	T_{heater}	T_{before}	T_{after}	$T_{evaporator}$	$T_{condenser}$	T_{wall}
25	114	27.01	38.5	29.78	29.43	29.20	28.92	28.41
50	227	27.14	55.5	32.19	31.20	30.88	30.10	29.15
75	341	27.07	77.2	35.18	33.40	32.89	31.75	29.93
100	455	27.08	105.4	39.29	36.48	35.78	33.96	31.29
125	568	27.49	138.3	44.89	41.03	39.83	37.37	33.66
150	682	27.35	170.8	50.83	45.41	43.93	40.70	37.68
175	795	27.18	218.1	59.79	52.18	48.90	44.32	38.70
200	909	27.47	260.9	67.10	57.50	55.05	49.66	44.56

Tabel 17 Data Temperatur Rata-Rata pada Jarak 4mm dan Kemiringan 15°

V	Daya *Heater* (W)	$T_{ambient}$	T_{heater}	T_{before}	T_{after}	$T_{evaporator}$	$T_{condenser}$	T_{wall}
25	114	27.24	38.5	30.05	29.66	29.44	29.01	28.66
50	227	27.25	55.5	32.25	31.26	30.89	30.02	29.31
75	341	25.76	77.2	36.46	34.48	33.91	32.47	30.89
100	455	27.23	105.4	40.06	36.96	36.12	33.92	31.75
125	568	27.02	138.3	43.99	40.19	38.88	36.35	32.68
150	682	27.18	170.8	49.77	44.58	42.94	39.64	34.99
175	795	27.47	218.1	57.74	50.41	48.19	43.49	38.62
200	909	27.21	260.9	66.40	56.68	53.98	47.77	42.87

Tabel 18 Data Temperatur Rata-Rata pada Jarak 5mm dan Kemiringan 15°

V	Daya *Heater* (W)	$T_{ambient}$	T_{heater}	T_{before}	T_{after}	$T_{evaporator}$	$T_{condenser}$	T_{wall}
25	114	27.50	38.5	30.24	29.87	29.62	29.14	28.76
50	227	27.55	55.5	32.58	31.59	31.22	30.33	29.41
75	341	27.11	77.2	35.40	33.50	32.91	31.41	29.96
100	455	27.23	105.4	39.33	36.32	35.47	33.43	31.19
125	568	26.96	138.3	44.72	40.89	39.11	36.33	32.90
150	682	27.40	170.8	51.89	46.41	43.94	39.99	35.80
175	795	27.54	218.1	59.46	52.10	48.87	43.67	40.10
200	909	27.10	260.9	67.49	58.22	54.24	47.77	45.08

Tabel 19 Data Temperatur Rata-Rata pada Jarak 6mm dan Kemiringan 15°

V	Daya *Heater* (W)	$T_{ambient}$	T_{heater}	T_{before}	T_{after}	$T_{evaporator}$	$T_{condenser}$	T_{wall}
25	114	27.32	38.5	30.03	29.67	29.41	28.99	28.52
50	227	27.22	55.5	32.03	31.08	30.64	30.15	29.08
75	341	27.07	77.2	35.11	33.23	32.54	31.59	29.72
100	455	27.29	105.4	39.45	36.42	35.42	33.83	31.15
125	568	27.11	138.3	44.45	40.67	39.14	36.63	32.86
150	682	27.54	170.8	52.14	46.60	44.37	40.70	35.90
175	795	27.47	218.1	59.37	51.68	48.52	43.24	38.74
200	909	47.40	260.9	68.40	58.51	54.30	47.45	43.02

Tabel 20 Data Temperatur Rata-Rata pada Jarak 3mm dan Kemiringan 30°

V	Daya *Heater* (W)	$T_{ambient}$	T_{heater}	T_{before}	T_{after}	$T_{evaporator}$	$T_{condenser}$	T_{wall}
25	114	27.53	38.5	30.08	29.78	29.49	29.04	28.53
50	227	27.14	55.5	31.86	31.14	30.72	30.00	28.96
75	341	27.31	77.2	35.14	33.69	32.99	31.89	29.99
100	455	27.51	105.4	39.28	36.89	35.87	34.26	31.43
125	568	27.26	138.3	44.38	40.68	39.24	36.76	32.98
150	682	27.46	170.8	50.31	45.13	43.12	39.84	35.38
175	795	27.18	218.1	57.59	50.67	48.20	43.82	38.90
200	909	27.39	260.9	67.05	57.47	54.64	48.57	44.24

Tabel 21 Data Temperatur Rata-Rata pada Jarak 4mm dan Kemiringan 30°

V	Daya *Heater* (W)	$T_{ambient}$	T_{heater}	T_{before}	T_{after}	$T_{evaporator}$	$T_{condenser}$	T_{wall}
25	114	26.93	38.5	29.49	29.24	28.99	28.73	28.08
50	227	27.16	55.5	31.72	31.03	30.69	30.05	28.89
75	341	27.36	77.2	35.19	33.73	33.23	32.00	30.00
100	455	27.40	105.4	39.36	36.94	36.14	34.26	31.36
125	568	27.05	138.3	44.00	40.39	39.30	36.75	32.70
150	682	27.15	170.8	50.51	45.24	43.77	40.70	35.26
175	795	27.08	218.1	57.37	50.33	48.57	44.11	38.42
200	909	27.25	260.9	67.19	57.59	55.54	49.59	43.82

Tabel 22 Data Temperatur Rata-Rata pada Jarak 5mm dan Kemiringan 30°

V	Daya *Heater* (W)	$T_{ambient}$	T_{heater}	T_{before}	T_{after}	$T_{evaporator}$	$T_{condenser}$	T_{wall}
25	114	27.22	38.5	29.77	29.54	29.38	29.04	28.42
50	227	27.00	55.5	31.70	30.98	30.65	29.95	28.88
75	341	27.23	77.2	35.46	33.88	33.37	32.15	30.14
100	455	26.92	105.4	38.78	36.36	35.59	33.82	31.07
125	568	27.33	138.3	44.17	40.36	39.32	36.98	32.76
150	682	27.67	170.8	50.69	45.50	44.19	41.00	35.93
175	795	27.30	218.1	56.72	49.88	48.39	44.35	38.71
200	909	27.39	260.9	66.04	56.60	54.91	48.94	44.17

Tabel 23 Data Temperatur Rata-Rata pada Jarak 6mm dan Kemiringan 30°

V	Daya *Heater* (W)	$T_{ambient}$	T_{heater}	T_{before}	T_{after}	$T_{evaporator}$	$T_{condenser}$	T_{wall}
25	114	27.08	38.5	29.54	29.32	29.08	28.81	28.28
50	227	27.11	55.5	31.94	31.19	30.83	30.12	28.97
75	341	27.25	77.2	35.00	33.55	32.97	31.81	29.91
100	455	27.02	105.4	39.16	36.72	35.83	34.04	31.15
125	568	26.95	138.3	44.08	40.25	38.92	36.45	32.79
150	682	27.05	170.8	50.54	45.37	43.62	40.28	35.28
175	795	27.30	218.1	58.08	51.14	49.08	44.61	38.96
200	909	27.08	260.9	66.66	57.20	55.00	49.11	43.51

Lampiran 2 Referensi Perhitungan

TABLE A–15

Properties of air at 1 atm pressure

Temp. T, °C	Density ρ, kg/m^3	Specific Heat c_p, J/kg · K	Thermal Conductivity k, W/m · K	Thermal Diffusivity α, m^2/s^2	Dynamic Viscosity μ, kg/m · s	Kinematic Viscosity ν, m^2/s	Prandtl Number Pr
−150	2.866	983	0.01171	4.158×10^{-6}	8.636×10^{-6}	3.013×10^{-6}	0.7246
−100	2.038	966	0.01582	8.036×10^{-6}	1.189×10^{-6}	5.837×10^{-6}	0.7263
−50	1.582	999	0.01979	1.252×10^{-5}	1.474×10^{-6}	9.319×10^{-6}	0.7440
−40	1.514	1002	0.02057	1.356×10^{-5}	1.527×10^{-5}	1.008×10^{-5}	0.7436
−30	1.451	1004	0.02134	1.465×10^{-5}	1.579×10^{-5}	1.087×10^{-5}	0.7425
−20	1.394	1005	0.02211	1.578×10^{-5}	1.630×10^{-5}	1.169×10^{-5}	0.7408
−10	1.341	1006	0.02288	1.696×10^{-5}	1.680×10^{-5}	1.252×10^{-5}	0.7387
0	1.292	1006	0.02364	1.818×10^{-5}	1.729×10^{-5}	1.338×10^{-5}	0.7362
5	1.269	1006	0.02401	1.880×10^{-5}	1.754×10^{-5}	1.382×10^{-5}	0.7350
10	1.246	1006	0.02439	1.944×10^{-5}	1.778×10^{-5}	1.426×10^{-5}	0.7336
15	1.225	1007	0.02476	2.009×10^{-5}	1.802×10^{-5}	1.470×10^{-5}	0.7323
20	1.204	1007	0.02514	2.074×10^{-5}	1.825×10^{-5}	1.516×10^{-5}	0.7309
25	1.184	1007	0.02551	2.141×10^{-5}	1.849×10^{-5}	1.562×10^{-5}	0.7296
30	1.164	1007	0.02588	2.208×10^{-5}	1.872×10^{-5}	1.608×10^{-5}	0.7282
35	1.145	1007	0.02625	2.277×10^{-5}	1.895×10^{-5}	1.655×10^{-5}	0.7268
40	1.127	1007	0.02662	2.346×10^{-5}	1.918×10^{-5}	1.702×10^{-5}	0.7255
45	1.109	1007	0.02699	2.416×10^{-5}	1.941×10^{-5}	1.750×10^{-5}	0.7241
50	1.092	1007	0.02735	2.487×10^{-5}	1.963×10^{-5}	1.798×10^{-5}	0.7228
60	1.059	1007	0.02808	2.632×10^{-5}	2.008×10^{-5}	1.896×10^{-5}	0.7202
70	1.028	1007	0.02881	2.780×10^{-5}	2.052×10^{-5}	1.995×10^{-5}	0.7177
80	0.9994	1008	0.02953	2.931×10^{-5}	2.096×10^{-5}	2.097×10^{-5}	0.7154
90	0.9718	1008	0.03024	3.086×10^{-5}	2.139×10^{-5}	2.201×10^{-5}	0.7132
100	0.9458	1009	0.03095	3.243×10^{-5}	2.181×10^{-5}	2.306×10^{-5}	0.7111
120	0.8977	1011	0.03235	3.565×10^{-5}	2.264×10^{-5}	2.522×10^{-5}	0.7073
140	0.8542	1013	0.03374	3.898×10^{-5}	2.345×10^{-5}	2.745×10^{-5}	0.7041
160	0.8148	1016	0.03511	4.241×10^{-5}	2.420×10^{-5}	2.975×10^{-5}	0.7014
180	0.7788	1019	0.03646	4.593×10^{-5}	2.504×10^{-5}	3.212×10^{-5}	0.6992
200	0.7459	1023	0.03779	4.954×10^{-5}	2.577×10^{-5}	3.455×10^{-5}	0.6974
250	0.6746	1033	0.04104	5.890×10^{-5}	2.760×10^{-5}	4.091×10^{-5}	0.6946
300	0.6158	1044	0.04418	6.871×10^{-5}	2.934×10^{-5}	4.765×10^{-5}	0.6935
350	0.5664	1056	0.04721	7.892×10^{-5}	3.101×10^{-5}	5.475×10^{-5}	0.6937
400	0.5243	1069	0.05015	8.951×10^{-5}	3.261×10^{-5}	6.219×10^{-5}	0.6948
450	0.4880	1081	0.05298	1.004×10^{-4}	3.415×10^{-5}	6.997×10^{-5}	0.6965
500	0.4565	1093	0.05572	1.117×10^{-4}	3.563×10^{-5}	7.806×10^{-5}	0.6986
600	0.4042	1115	0.06093	1.352×10^{-4}	3.846×10^{-5}	9.515×10^{-5}	0.7037
700	0.3627	1135	0.06581	1.598×10^{-4}	4.111×10^{-5}	1.133×10^{-4}	0.7092
800	0.3289	1153	0.07037	1.855×10^{-4}	4.362×10^{-5}	1.326×10^{-4}	0.7149
900	0.3008	1169	0.07465	2.122×10^{-4}	4.600×10^{-5}	1.529×10^{-4}	0.7206
1000	0.2772	1184	0.07868	2.398×10^{-4}	4.826×10^{-5}	1.741×10^{-4}	0.7260
1500	0.1990	1234	0.09599	3.908×10^{-4}	5.817×10^{-5}	2.922×10^{-4}	0.7478
2000	0.1553	1264	0.11113	5.664×10^{-4}	6.630×10^{-5}	4.270×10^{-4}	0.7539

Note: For ideal gases, the properties c_p, k, μ, and Pr are independent of pressure. The properties ρ, ν, and α at a pressure P (in atm) other than 1 atm are determined by multiplying the values of ρ at the given temperature by P and by dividing ν and α by P.

Source: Data generated from the EES software developed by S. A. Klein and F. L. Alvarado. Original sources: Keenan, Chao, Keyes, Gas Tables, Wiley, 198; and Thermophysical Properties of Matter. Vol. 3: Thermal Conductivity. Y. S. Touloukian, P. E. Liley, S. C. Saxena, Vol. 11: Viscosity. Y. S. Touloukian, S. C. Saxena, and P. Hestermans, IFI/Plenun, NY, 1970, ISBN 0-306067020-8.

Gambar 29 Sifat Udara Pada Tekanan 1 atm (Cengel A-15)

Water

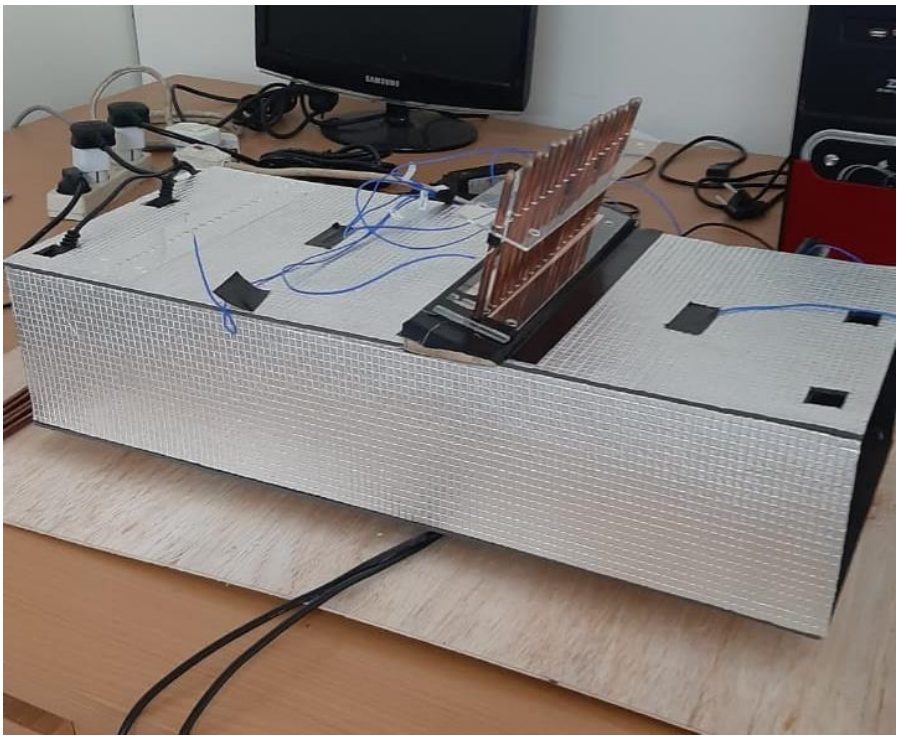
Temp °C	Latent heat kJ/kg	Liquid density kg/m^3	Vapour density kg/m^3	Liquid thermal conductivity W/m °C	Liquid viscos. cP	Vapour viscos. cP × 10^2	Vapour press. Bar	Vapour specific heat kJ/kg °C	Liquid surface tension N/m × 10^2
20	2448	998.2	0.02	0.603	1.00	0.96	0.02	1.81	7.28
40	2402	992.3	0.05	0.630	0.65	1.04	0.07	1.89	6.96
60	2359	983.0	0.13	0.649	0.47	1.12	0.20	1.91	6.62
80	2309	972.0	0.29	0.668	0.36	1.19	0.47	1.95	6.26
100	2258	958.0	0.60	0.680	0.28	1.27	1.01	2.01	5.89
120	2200	945.0	1.12	0.682	0.23	1.34	2.02	2.09	5.50
140	2139	928.0	1.99	0.683	0.20	1.41	3.90	2.21	5.06
160	2074	909.0	3.27	0.679	0.17	1.49	6.44	2.38	4.66
180	2003	888.0	5.16	0.669	0.15	1.57	10.04	2.62	4.29
200	1967	865.0	7.87	0.659	0.14	1.65	16.19	2.91	3.89

Gambar 30 Sifat Fluida Kerja *Heat Pipe*

Material and mesh size	Capillary height[1] (cm)	Pore radius (cm)	Permeability (m^2)	Porosity (%)
Glass fibre [29]	25.4	–	0.061×10^{-11}	–
Refrasil				
sleeving [29]	22.0	–	0.104×10^{-10}	–
Refrasil (bulk) [30]	–	–	0.18×10^{-10}	–
Refrasil (batt) [30]	–	–	1.00×10^{-10}	–
Monel beads [31]				
30–40	14.6	0.052[2]	4.15×10^{-10}	40
70–80	39.5	0.019[2]	0.78×10^{-10}	40
100–140	64.6	0.013[2]	0.33×10^{-10}	40
140–200	75.0	0.009	0.11×10^{-10}	40
Felt metal [32]				
FM1006	10.0	0.004	1.55×10^{-10}	–
FM1205	–	0.008	2.54×10^{-10}	–
Nickel powder [29]				
200 μ	24.6	0.038	0.027×10^{-10}	–
500 μ	>40.0	0.004	0.081×10^{-11}	–
Nickel fibre [29]				
0.01 mm dia.	>40.0	0.001	0.015×10^{-11}	68.9
Nickel felt [33]	–	0.017	6.0×10^{-10}	89
Nickel foam [33]				
Ampornik 220.5	–	0.023	3.8×10^{-9}	96
Copper foam [33]				
Amporcop 220.5	–	0.021	1.9×10^{-9}	91
Copper powder				
(sintered) [32]	156.8	0.0009	1.74×10^{-12}	52
Copper powder				
(sintered) [34]				
45 – 56 μ	–	0.0009	–	28.7
100 – 145 μ	–	0.0021	–	30.5
150 – 200 μ	–	0.0037	–	35
Nickel 50 [29]	4.8	–	–	62.5
50 [35]	–	0.0305	6.635×10^{-10}	–
Copper 60 [32]	3.0	–	8.4×10^{-10}	–
Nickel 60 [34]	–	0.009	–	–
100 [35]	–	0.0131	1.523×10^{-10}	–
100 [36]	–	–	2.48×10^{-10}	–
120 [32]	5.4	–	6.00×10^{-10}	–
120[3] [32]	7.9	0.019	3.50×10^{-10}	–
$2^5 \times 120$ [37]	–	–	1.35×10^{-10}	–
120 [38]	–	–	1.35×10^{-10}	–

Gambar 31 Data Ukuran *Wick* dan Permeabilitas *Heat Pipe*

Lampiran 3 Dokumentasi Penelitian



Gambar 32 Alat Penelitian