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Lampiran 1. Tabel *Properties of miscellaneous material*853
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TABLE A-8

Properties of miscellaneous materials

(Values are at 300 K unless indicated otherwise)

Material	Density, ρ kg/m ³	Thermal Conductivity, k W/m · K	Specific Heat, c_p J/kg · K	Material	Density, ρ kg/m ³	Thermal Conductivity, k W/m · K	Specific Heat, c_p J/kg · K
Asphalt	2115	0.062	920	Ice			
Bakelite	1300	1.4	1465	273 K	920	1.88	2040
Brick, refractory				253 K	922	2.03	1945
Chrome brick				173 K	928	3.49	1460
473 K	3010	2.3	835	Leather, sole	998	0.159	—
823 K	—	2.5	—	Linoleum	535	0.081	—
1173 K	—	2.0	—		1180	0.186	—
Fire clay, burnt				Mica	2900	0.523	—
1600 K				Paper	930	0.180	1340
773 K	2050	1.0	960	Plastics			
1073 K	—	1.1	—	Plexiglass	1190	0.19	1465
1373 K	—	1.1	—	Teflon			
Fire clay, burnt				300 K	2200	0.35	1050
1725 K				400 K	—	0.45	—
773 K	2325	1.3	960	Lexan	1200	0.19	1260
1073 K	—	1.4	—	Nylon	1145	0.29	—
1373 K	—	1.4	—	Polypropylene	910	0.12	1925
Fire clay brick				Polyester	1395	0.15	1170
478 K	2645	1.0	960	PVC, vinyl	1470	0.1	840
922 K	—	1.5	—	Porcelain	2300	1.5	—
1478 K	—	1.8	—	Rubber, natural	1150	0.28	—
Magnesite				Rubber, vulcanized			
478 K	—	3.8	1130	Soft	1100	0.13	2010
922 K	—	2.8	—	Hard	1190	0.16	—
1478 K	—	1.9	—	Sand	1515	0.2–1.0	800
Chicken meat, white (74.4% water content)				Snow, fresh	100	0.60	—
198 K	—	1.60	—	Snow, 273 K	500	2.2	—
233 K	—	1.49	—	Soil, dry	1500	1.0	1900
253 K	—	1.35	—	Soil, wet	1900	2.0	2200
273 K	—	0.48	—	Sugar	1600	0.58	—
293 K	—	0.49	—	Tissue, human			
Clay, dry	1550	0.930	—	Skin	—	0.37	—
Clay, wet	1495	1.675	—	Fat layer	—	0.2	—
Coal, anthracite	1350	0.26	1260	Muscle	—	0.41	—
Concrete (stone mix)	2300	1.4	880	Vaseline	—	0.17	—
Cork	86	0.048	2030	Wood, cross-grain			
Cotton	80	0.06	1300	Balsa	140	0.055	—
Fat	—	0.17	—	Fir	415	0.11	2720
Glass				Oak	545	0.17	2385
Window	2800	0.7	750	White pine	435	0.11	—
Pyrex	2225	1–1.4	835	Yellow pine	640	0.15	2805
Crown	2500	1.05	—	Wood, radial			
Lead	3400	0.85	—	Oak	545	0.19	2385
				Fir	420	0.14	2720
				Wool, ship	145	0.05	—

Source: Compiled from various sources.

Lampiran 2. Tabel *Properties of insulating material*

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TABLE A-6

Properties of insulating materials
(at a mean temperature of 24°C)

Material	Thickness, L mm	Density, ρ kg/m ³	Thermal Conductivity, k W/m · K	Specific Heat, c_p kJ/kg · K	R -value (for listed thickness, L/k), K · m ² /W
Blanket and Batt					
Mineral fiber (fibrous form processed from rock, slag, or glass)	50 to 70 mm	4.8–32	—	0.71–0.96	1.23
	75 to 90 mm	4.8–32	—	0.71–0.96	1.94
	135 to 165 mm	4.8–32	—	0.71–0.96	3.32
Board and Slab					
Cellular glass		136	0.055	1.0	—
Glass fiber (organic bonded)		64–144	0.036	0.96	—
Expanded polystyrene (molded beads)		16	0.040	1.2	—
Expanded polyurethane (R -11 expanded)		24	0.023	1.6	—
Expanded perlite (organic bonded)		16	0.052	1.26	—
Expanded rubber (rigid)		72	0.032	1.68	—
Mineral fiber with resin binder		240	0.042	0.71	—
Cork		120	0.039	1.80	—
Sprayed or Formed in Place					
Polyurethane foam		24–40	0.023–0.026	—	—
Glass fiber		56–72	0.038–0.039	—	—
Urethane, two-part mixture (rigid foam)		70	0.026	1.045	—
Mineral wool granules with asbestos/inorganic binders (sprayed)		190	0.046	—	—
Loose Fill					
Mineral fiber (rock, slag, or glass)	~75 to 125 mm	9.6–32	—	0.71	1.94
	~165 to 222 mm	9.6–32	—	0.71	3.35
	~191 to 254 mm	—	—	0.71	3.87
	~185 mm	—	—	0.71	5.28
Silica aerogel		122	0.025	—	—
Vermiculite (expanded)		122	0.068	—	—
Perlite, expanded		32–66	0.039–0.045	1.09	—
Sawdust or shavings		128–240	0.065	1.38	—
Cellulosic insulation (milled paper or wood pulp)		37–51	0.039–0.046	—	—
Roof Insulation					
Cellular glass	—	144	0.058	1.0	—
Preformed, for use above deck	13 mm	—	—	1.0	0.24
	25 mm	—	—	2.1	0.49
	50 mm	—	—	3.9	0.93
Reflective Insulation					
Silica powder (evacuated)		160	0.0017	—	—
Aluminum foil separating fluffy glass mats; 10–12 layers (evacuated); for cryogenic applications (150 K)		40	0.00016	—	—
Aluminum foil and glass paper laminate; 75–150 layers (evacuated); for cryogenic applications (150 K)		120	0.000017	—	—

Lampiran 3. Tabel *Properties of air at 1 atm pressure.*860
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TABLE A-15

Properties of air at 1 atm pressure

Temp. $T, ^\circ\text{C}$	Density $\rho, \text{kg/m}^3$	Specific Heat $c_p, \text{J/kg} \cdot \text{K}$	Thermal Conductivity $k, \text{W/m} \cdot \text{K}$	Thermal Diffusivity $\alpha, \text{m}^2/\text{s}^2$	Dynamic Viscosity $\mu, \text{kg/m} \cdot \text{s}$	Kinematic Viscosity $\nu, \text{m}^2/\text{s}$	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^{-5}	5.837×10^{-6}	0.7263
-50	1.582	999	0.01979	1.252×10^{-5}	1.474×10^{-5}	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/Plenum, NY, 1970, ISBN 0-306067020-8.

Lampiran 4. Tabel *Properties of saturated water*

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TABLE A-9

Properties of saturated water

Temp. $T, ^\circ\text{C}$	Saturation Pressure $P_{\text{sat}}, \text{kPa}$	Density $\rho, \text{kg/m}^3$		Enthalpy of Vaporization $h_{\text{fg}}, \text{kJ/kg}$	Specific Heat $c_p, \text{J/kg} \cdot \text{K}$		Thermal Conductivity $k, \text{W/m} \cdot \text{K}$		Dynamic Viscosity $\mu, \text{kg/m} \cdot \text{s}$		Prandtl Number Pr		Volume Expansion Coefficient $\beta, 1/\text{K}$
		Liquid	Vapor		Liquid	Vapor	Liquid	Vapor	Liquid	Vapor	Liquid	Vapor	
0.01	0.6113	999.8	0.0048	2501	4217	1854	0.561	0.0171	1.792×10^{-3}	0.922×10^{-5}	13.5	1.00	-0.068×10^{-3}
5	0.8721	999.9	0.0068	2490	4205	1857	0.571	0.0173	1.519×10^{-3}	0.934×10^{-5}	11.2	1.00	0.015×10^{-3}
10	1.2276	999.7	0.0094	2478	4194	1862	0.580	0.0176	1.307×10^{-3}	0.946×10^{-5}	9.45	1.00	0.733×10^{-3}
15	1.7051	999.1	0.0128	2466	4185	1863	0.589	0.0179	1.138×10^{-3}	0.959×10^{-5}	8.09	1.00	0.138×10^{-3}
20	2.339	998.0	0.0173	2454	4182	1867	0.598	0.0182	1.002×10^{-3}	0.973×10^{-5}	7.01	1.00	0.195×10^{-3}
25	3.169	997.0	0.0231	2442	4180	1870	0.607	0.0186	0.891×10^{-3}	0.987×10^{-5}	6.14	1.00	0.247×10^{-3}
30	4.246	996.0	0.0304	2431	4178	1875	0.615	0.0189	0.798×10^{-3}	1.001×10^{-5}	5.42	1.00	0.294×10^{-3}
35	5.628	994.0	0.0397	2419	4178	1880	0.623	0.0192	0.720×10^{-3}	1.016×10^{-5}	4.83	1.00	0.337×10^{-3}
40	7.384	992.1	0.0512	2407	4179	1885	0.631	0.0196	0.653×10^{-3}	1.031×10^{-5}	4.32	1.00	0.377×10^{-3}
45	9.593	990.1	0.0655	2395	4180	1892	0.637	0.0200	0.596×10^{-3}	1.046×10^{-5}	3.91	1.00	0.415×10^{-3}
50	12.35	988.1	0.0831	2383	4181	1900	0.644	0.0204	0.547×10^{-3}	1.062×10^{-5}	3.55	1.00	0.451×10^{-3}
55	15.76	985.2	0.1045	2371	4183	1908	0.649	0.0208	0.504×10^{-3}	1.077×10^{-5}	3.25	1.00	0.484×10^{-3}
60	19.94	983.3	0.1304	2359	4185	1916	0.654	0.0212	0.467×10^{-3}	1.093×10^{-5}	2.99	1.00	0.517×10^{-3}
65	25.03	980.4	0.1614	2346	4187	1926	0.659	0.0216	0.433×10^{-3}	1.110×10^{-5}	2.75	1.00	0.548×10^{-3}
70	31.19	977.5	0.1983	2334	4190	1936	0.663	0.0221	0.404×10^{-3}	1.126×10^{-5}	2.55	1.00	0.578×10^{-3}
75	38.58	974.7	0.2421	2321	4193	1948	0.667	0.0225	0.378×10^{-3}	1.142×10^{-5}	2.38	1.00	0.607×10^{-3}
80	47.39	971.8	0.2935	2309	4197	1962	0.670	0.0230	0.355×10^{-3}	1.159×10^{-5}	2.22	1.00	0.653×10^{-3}
85	57.83	968.1	0.3536	2296	4201	1977	0.673	0.0235	0.333×10^{-3}	1.176×10^{-5}	2.08	1.00	0.670×10^{-3}
90	70.14	965.3	0.4235	2283	4206	1993	0.675	0.0240	0.315×10^{-3}	1.193×10^{-5}	1.96	1.00	0.702×10^{-3}
95	84.55	961.5	0.5045	2270	4212	2010	0.677	0.0246	0.297×10^{-3}	1.210×10^{-5}	1.85	1.00	0.716×10^{-3}
100	101.33	957.9	0.5978	2257	4217	2029	0.679	0.0251	0.282×10^{-3}	1.227×10^{-5}	1.75	1.00	0.750×10^{-3}
110	143.27	950.6	0.8263	2230	4229	2071	0.682	0.0262	0.255×10^{-3}	1.261×10^{-5}	1.58	1.00	0.798×10^{-3}
120	198.53	943.4	1.121	2203	4244	2120	0.683	0.0275	0.232×10^{-3}	1.296×10^{-5}	1.44	1.00	0.858×10^{-3}
130	270.1	934.6	1.496	2174	4263	2177	0.684	0.0288	0.213×10^{-3}	1.330×10^{-5}	1.33	1.01	0.913×10^{-3}
140	361.3	921.7	1.965	2145	4286	2244	0.683	0.0301	0.197×10^{-3}	1.365×10^{-5}	1.24	1.02	0.970×10^{-3}
150	475.8	916.6	2.546	2114	4311	2314	0.682	0.0316	0.183×10^{-3}	1.399×10^{-5}	1.16	1.02	1.025×10^{-3}
160	617.8	907.4	3.256	2083	4340	2420	0.680	0.0331	0.170×10^{-3}	1.434×10^{-5}	1.09	1.05	1.145×10^{-3}
170	791.7	897.7	4.119	2050	4370	2490	0.677	0.0347	0.160×10^{-3}	1.468×10^{-5}	1.03	1.05	1.178×10^{-3}
180	1,002.1	887.3	5.153	2015	4410	2590	0.673	0.0364	0.150×10^{-3}	1.502×10^{-5}	0.983	1.07	1.210×10^{-3}
190	1,254.4	876.4	6.388	1979	4460	2710	0.669	0.0382	0.142×10^{-3}	1.537×10^{-5}	0.947	1.09	1.280×10^{-3}
200	1,553.8	864.3	7.852	1941	4500	2840	0.663	0.0401	0.134×10^{-3}	1.571×10^{-5}	0.910	1.11	1.350×10^{-3}
220	2,318	840.3	11.60	1859	4610	3110	0.650	0.0442	0.122×10^{-3}	1.641×10^{-5}	0.865	1.15	1.520×10^{-3}
240	3,344	813.7	16.73	1767	4760	3520	0.632	0.0487	0.111×10^{-3}	1.712×10^{-5}	0.836	1.24	1.720×10^{-3}
260	4,688	783.7	23.69	1663	4970	4070	0.609	0.0540	0.102×10^{-3}	1.788×10^{-5}	0.832	1.35	2.000×10^{-3}
280	6,412	750.8	33.15	1544	5280	4835	0.581	0.0605	0.094×10^{-3}	1.870×10^{-5}	0.854	1.49	2.380×10^{-3}
300	8,581	713.8	46.15	1405	5750	5980	0.548	0.0695	0.086×10^{-3}	1.965×10^{-5}	0.902	1.69	2.950×10^{-3}
320	11,274	667.1	64.57	1239	6540	7900	0.509	0.0836	0.078×10^{-3}	2.084×10^{-5}	1.00	1.97	
340	14,586	610.5	92.62	1028	8240	11,870	0.469	0.110	0.070×10^{-3}	2.255×10^{-5}	1.23	2.43	
360	18,651	528.3	144.0	720	14,690	25,800	0.427	0.178	0.060×10^{-3}	2.571×10^{-5}	2.06	3.73	
374.14	22,090	317.0	317.0	0	—	—	—	—	0.043×10^{-3}	4.313×10^{-5}			

Note 1: Kinematic viscosity ν and thermal diffusivity α can be calculated from their definitions, $\nu = \mu/\rho$ and $\alpha = k/\rho c_p = \nu/\text{Pr}$. The temperatures 0.01°C, 100°C, and 374.14°C are the triple-, boiling-, and critical-point temperatures of water, respectively. The properties listed above (except the vapor density) can be used at any pressure with negligible error except at temperatures near the critical-point value.

Note 2: The unit kJ/kg · °C for specific heat is equivalent to kJ/kg · K, and the unit W/m · °C for thermal conductivity is equivalent to W/m · K.

Source: Viscosity and thermal conductivity data are from J. V. Sengers and J. T. R. Watson, *Journal of Physical and Chemical Reference Data* 15 (1986), pp. 1291–1322. Other data are obtained from various sources or calculated.

Lampiran 5. Tabel pengambilan data Pelat kolektor standar.

Plat Kolektor Standar								
t	IN (T _{fi})C	OUT (T _{fo})C	Plat datar (T _{P1})C	Kaca Dalam (T _{c- dalam})C	Kaca Luar (T _{c- Luar})C	Tanki (T.Tangki)C	Ling (T _a)C	Ilum (I) Kw
0	27.00	27.00	26.40	26.70	26.70	26.94	27.13	0.946576
5	27.42	33.06	44.22	48.83	54.49	26.99	27.12	0.964493
10	28.02	34.94	47.29	60.66	69.07	27.46	27.20	0.976801
15	28.43	35.79	48.69	66.01	75.02	28.12	27.37	0.982411
20	28.87	36.48	49.88	68.85	77.79	28.86	27.47	0.989289
25	29.32	37.10	50.71	70.46	79.26	29.63	27.61	0.992185
30	29.79	37.67	51.44	71.53	80.52	30.40	27.72	0.999424
35	30.30	38.20	52.09	72.34	81.11	31.17	27.86	1.001234
40	30.84	38.87	52.88	73.18	82.27	31.90	28.11	1.006483
45	31.27	39.37	53.39	73.57	82.31	32.62	28.15	1.007388
50	31.70	39.81	53.82	73.76	82.43	33.32	28.04	1.006302
55	32.15	40.25	54.28	74.01	82.51	33.96	28.02	1.00594
60	32.62	40.75	54.73	74.27	82.88	34.57	28.18	1.006302
65	33.06	41.18	55.15	74.51	83.35	35.18	28.25	1.005759
70	33.46	41.58	55.57	74.79	83.42	35.74	28.31	1.003768
75	33.86	41.93	55.86	74.77	83.29	36.26	28.37	0.998339
80	34.22	42.26	56.19	74.70	82.81	36.77	28.21	0.995262
85	34.56	42.60	56.47	74.79	83.01	37.23	28.24	0.996891
90	34.89	42.93	56.77	74.89	83.01	37.66	28.16	0.996529
95	35.22	43.20	57.07	75.00	82.95	38.08	28.13	0.996891
100	35.54	43.51	57.28	75.19	83.39	38.47	28.19	0.996891
105	35.83	43.78	57.57	75.31	83.60	38.83	28.19	0.997796
110	36.12	44.03	57.79	75.39	83.65	39.19	28.20	0.997796
115	36.38	44.29	58.04	75.54	83.51	39.52	28.24	0.996167
120	36.64	44.51	58.23	75.56	83.60	39.85	28.20	0.99309
125	36.88	44.76	58.43	75.62	83.49	40.15	28.26	0.993633
130	37.10	44.97	58.61	75.71	83.83	40.43	28.31	0.993814
135	37.32	45.17	58.79	75.77	83.85	40.69	28.30	0.992728
140	37.52	45.34	59.00	75.84	83.81	40.95	28.27	0.993452
145	37.71	45.49	59.21	75.92	83.63	41.18	28.25	0.994719
150	37.91	45.71	59.48	76.00	84.11	41.43	28.32	0.995081
155	38.10	45.88	59.66	75.97	84.01	41.64	28.33	0.995624
160	38.25	46.09	59.79	76.15	84.11	41.86	28.37	0.996529
165	38.41	46.20	59.77	76.25	84.13	42.05	28.39	0.995624
170	38.58	46.34	59.88	76.33	84.50	42.24	28.39	0.996529
175	38.69	46.47	59.97	76.35	84.33	42.43	28.36	0.996348
180	38.86	46.62	60.11	76.41	84.23	42.58	28.36	0.997253

185	38.65	40.43	43.26	57.16	59.91	42.61	28.34	0
190	38.18	38.68	39.75	45.15	45.46	42.02	28.37	0
195	37.77	37.93	38.37	39.63	39.10	41.37	28.30	0
200	37.52	37.45	37.42	36.58	35.82	40.75	28.25	0
205	37.18	37.01	36.71	34.88	33.99	40.15	28.25	0
210	36.71	36.49	36.02	33.81	32.83	39.59	28.19	0
215	36.16	35.89	35.39	33.02	32.07	39.03	28.16	0
220	35.78	35.46	34.84	32.45	31.44	38.49	28.18	0
225	35.38	35.03	34.38	31.97	31.01	37.98	28.19	0
230	35.00	34.65	33.93	31.55	30.59	37.51	28.13	0
235	34.64	34.28	33.52	31.24	30.28	37.06	28.06	0
240	34.32	33.95	33.15	30.91	30.06	36.60	28.08	0

Lampiran 6. Tabel pengambilan data Pelat kolektor dengan ketebalan PCM 4 mm.

Plat Kolektor PCM 4 mm									
t	IN (T_{fi})C	OUT (T_{fo})C	Plat datar (T_{P1})C	Material PCM	Kaca Dalam (T_{c- dalam})C	Kaca Luar (T_{c- Luar})C	Tanki (T.Tangki)C	Ling (T_a)C	Illum (I) Kw
0	26.97	26.97	26.27	26.40	26.80	26.57	27.12	26.95	0.9882
5	27.26	31.48	48.45	31.42	54.07	32.99	27.11	27.06	1.0072
10	27.72	33.96	52.49	34.65	67.63	43.14	27.43	27.16	1.0159
15	28.08	35.15	54.47	36.31	73.85	49.69	27.99	27.26	1.0208
20	28.42	36.00	55.65	37.39	76.98	53.77	28.66	27.26	1.0251
25	28.82	36.61	56.46	38.29	78.71	56.25	29.37	27.41	1.0311
30	29.19	37.18	57.04	38.98	79.74	58.06	30.10	27.33	1.0304
35	29.64	37.68	57.55	39.57	80.37	59.14	30.87	27.44	1.0298
40	30.04	38.13	58.04	40.06	80.80	59.89	31.54	27.49	1.0295
45	30.39	38.53	58.41	40.49	81.25	60.48	32.19	27.40	1.0277
50	30.76	38.87	58.73	40.89	81.25	60.67	32.80	27.37	1.0266
55	31.12	39.27	59.06	41.34	81.06	60.59	33.37	27.29	1.0262
60	31.48	39.67	59.41	41.78	81.07	60.64	33.91	27.30	1.0251
65	31.83	40.04	59.69	42.05	81.48	60.97	34.44	27.34	1.0253
70	32.12	40.37	60.01	42.31	81.78	61.41	34.91	27.42	1.0226
75	32.38	40.64	60.27	42.65	82.15	61.69	35.35	27.43	1.0233
80	32.70	40.99	60.55	42.96	82.25	61.81	35.75	27.45	1.0230
85	32.95	41.20	60.75	43.23	82.15	61.75	36.12	27.37	1.0230
90	33.23	41.47	60.94	43.46	82.20	61.83	36.48	27.49	1.0240
95	33.43	41.70	61.17	43.73	82.56	62.06	36.83	27.53	1.0222
100	33.64	41.92	61.29	43.97	82.61	62.14	37.12	27.54	1.0197
105	33.85	42.16	61.54	44.19	82.80	62.37	37.39	27.65	1.0193
110	33.96	42.30	61.67	44.43	82.94	62.51	37.67	27.49	1.0193
115	34.24	42.51	61.73	44.57	82.59	62.39	37.91	27.61	1.0195
120	34.34	42.66	61.91	44.75	82.83	62.53	38.17	27.56	1.0190
125	34.48	42.79	61.99	44.92	83.12	62.72	38.38	27.59	1.0188
130	34.68	43.02	62.10	45.07	83.04	62.63	38.59	27.64	1.0177
135	34.79	43.12	62.04	45.31	83.27	62.75	38.79	27.59	1.0182
140	34.95	43.27	62.12	45.63	83.25	62.69	38.98	27.69	1.0152
145	35.02	43.31	62.18	45.61	82.95	62.45	39.15	27.56	1.0119
150	35.12	43.36	62.17	45.78	82.83	62.33	39.30	27.50	1.0090
155	35.33	43.49	62.24	45.85	82.91	62.44	39.44	27.60	1.0123
160	35.35	43.57	62.32	46.02	82.77	62.38	39.58	27.55	1.0134
165	35.41	43.68	62.44	46.20	82.72	62.35	39.70	27.58	1.0108
170	35.55	43.79	62.43	46.33	83.06	62.54	39.82	27.72	1.0112
175	35.57	43.86	62.49	46.37	83.16	62.63	39.93	27.58	1.0114

180	35.68	43.95	62.56	46.39	83.15	62.66	40.03	27.65	1.0135
185	35.45	40.00	51.53	43.18	69.89	60.19	40.07	27.58	0
190	35.07	37.33	40.34	39.79	50.11	50.97	39.63	27.67	0
195	34.62	36.18	38.00	38.28	41.63	43.92	38.99	27.51	0
200	34.27	35.38	36.56	37.09	37.28	39.48	38.34	27.49	0
205	33.87	34.69	35.48	36.11	34.70	36.53	37.69	27.47	0
210	33.50	34.11	34.57	35.22	33.13	34.47	37.09	27.47	0
215	33.09	33.54	33.80	34.37	32.01	33.05	36.51	27.34	0
220	32.68	33.01	33.07	33.72	31.21	31.98	35.94	27.32	0
225	32.36	32.57	32.51	33.04	30.65	31.19	35.39	27.35	0
230	32.04	32.19	32.01	32.55	30.17	30.59	34.89	27.34	0
235	31.67	31.79	31.58	32.09	29.79	30.11	34.39	27.19	0
240	31.35	31.43	31.13	31.63	29.41	29.68	33.93	27.21	0

Lampiran 7. Tabel pengambilan data Pelat kolektor dengan ketebalan PCM 8 mm.

Plat Kolektor PCM 8 mm									
t	IN (T_{fi})C	OUT (T_{fo})C	Plat datar (T_{P1})C	Material PCM	Kaca Dalam (T_{c- dalam})C	Kaca Luar (T_{c- Luar})C	Tanki (T.Tangki)C	Ling (T_a)C	Illum (I) Kw
0	26.97	26.97	26.57	26.47	27.27	27.13	27.00	26.87	0.9873
5	27.30	31.93	47.22	30.67	53.17	48.46	27.02	26.91	1.0068
10	27.71	33.97	50.97	34.68	67.08	59.82	27.35	26.82	1.0159
15	28.06	34.96	52.77	36.87	72.99	65.13	27.91	26.97	1.0150
20	28.45	35.70	53.80	38.19	76.04	68.17	28.54	27.14	1.0137
25	28.74	36.27	54.59	39.19	77.60	69.97	29.20	27.06	1.0273
30	29.09	36.66	55.19	39.95	78.67	70.95	29.89	27.03	1.0273
35	29.57	37.16	55.66	40.61	79.19	71.55	30.57	27.21	1.0275
40	29.92	37.52	56.15	41.22	79.58	72.04	31.20	27.14	1.0258
45	30.23	37.86	56.61	41.75	80.03	72.31	31.79	27.09	1.0248
50	30.63	38.27	57.07	42.26	80.30	72.60	32.37	27.22	1.0260
55	30.99	38.75	57.61	42.73	80.87	73.04	32.90	27.47	1.0255
60	31.30	39.18	58.14	43.15	81.55	73.67	33.42	27.65	1.0226
65	31.59	39.47	58.36	43.56	81.81	73.92	33.90	27.61	1.0228
70	31.98	39.83	58.75	43.97	82.05	74.02	34.37	27.61	1.0242
75	32.16	40.02	59.04	44.33	82.06	73.91	34.79	27.47	1.0219
80	32.44	40.28	59.25	44.71	81.87	73.95	35.20	27.38	1.0213
85	32.67	40.51	59.44	44.96	81.84	73.95	35.57	27.44	1.0220
90	32.91	40.82	59.75	45.31	82.25	74.35	35.91	27.53	1.0222
95	33.18	41.11	59.98	45.58	82.69	74.36	36.24	27.69	1.0168
100	33.45	41.43	60.03	45.82	82.81	74.53	36.57	27.71	1.0070
105	33.65	41.66	60.25	46.11	83.19	74.79	36.86	27.81	1.0084
110	33.81	41.88	60.49	46.25	83.39	74.89	37.15	27.76	1.0040
115	33.95	42.08	60.68	46.43	83.53	74.87	37.43	27.69	1.0073
120	34.11	42.23	60.81	46.65	83.11	74.84	37.65	27.57	1.0055
125	34.35	42.40	60.97	46.78	82.93	74.73	37.89	27.65	1.0061
130	34.44	42.52	61.10	46.96	82.91	74.82	38.11	27.61	1.0082
135	34.57	42.70	61.33	47.07	83.08	75.05	38.30	27.57	1.0099
140	34.56	42.82	62.19	47.17	83.57	75.17	38.48	27.63	1.0166
145	34.81	42.95	61.76	47.36	83.75	75.30	38.68	27.85	1.0144
150	34.92	43.18	61.81	47.53	83.71	75.25	38.86	27.73	1.0163
155	35.11	43.33	61.91	47.67	84.11	75.63	39.03	27.89	1.0180
160	35.23	43.39	62.05	47.83	84.19	75.50	39.21	27.88	1.0250
165	35.28	43.47	62.16	47.98	83.94	75.47	39.35	27.76	1.0169
170	35.37	43.51	62.29	48.03	83.85	75.35	39.49	27.53	1.0174
175	35.44	43.58	62.32	48.13	83.73	75.34	39.62	27.50	1.0205

180	35.57	43.62	62.27	48.26	83.82	75.23	39.72	27.62	1.0262
185	35.35	39.57	46.37	47.24	67.07	60.61	39.76	27.42	0
190	34.87	37.15	39.64	43.26	48.09	45.65	39.33	27.47	0
195	34.54	36.21	37.87	40.73	40.59	39.41	38.73	27.45	0
200	34.23	35.53	36.73	39.42	36.67	36.14	38.13	27.47	0
205	33.93	34.98	35.87	38.19	34.43	34.13	37.58	27.47	0
210	33.44	34.39	35.14	37.05	33.08	32.65	37.04	27.10	0
215	33.11	33.87	34.39	36.05	32.11	31.72	36.48	27.24	0
220	32.74	33.41	33.81	35.19	31.41	31.02	35.97	27.26	0
225	32.46	32.99	33.21	34.45	30.98	30.55	35.48	27.46	0
230	32.20	32.62	32.75	33.79	30.62	30.16	35.01	27.57	0
235	31.85	32.22	32.23	33.21	30.25	29.81	34.58	27.50	0
240	31.60	31.86	31.81	32.71	29.97	29.53	34.15	27.46	0

Lampiran 8. Tabel pengambilan data Pelat kolektor dengan ketebalan PCM 12 mm.

Plat Kolektor PCM 12 mm									
t	IN (T _{fi})C	OUT (T _{fo})C	Plat datar (T _{P1})C	Material PCM	Kaca Dalam (T _{c- dalam})C	Kaca Luar (T _{c- Luar})C	Tanki (T.Tangki)C	Ling (T _a)C	Ilum (I) Kw
0	26.86	26.86	26.67	26.93	27.20	27.17	27.00	26.89	0.9873
5	27.10	30.81	45.93	30.84	51.88	45.62	27.00	27.02	1.0068
10	27.52	32.81	49.40	34.33	65.25	56.65	27.29	27.10	1.0159
15	27.79	33.93	51.32	36.51	71.52	62.71	27.77	27.25	1.0210
20	28.14	34.78	52.63	38.04	74.41	65.70	28.31	27.38	1.0237
25	28.58	35.52	53.63	39.22	76.13	67.77	28.92	27.54	1.0273
30	28.94	36.11	54.46	40.21	77.35	69.25	29.57	27.62	1.0273
35	29.31	36.64	55.07	40.97	78.06	70.11	30.25	27.66	1.0275
40	29.70	37.29	55.63	41.65	78.39	71.50	30.90	27.63	1.0258
45	30.04	37.72	56.17	42.33	78.65	72.83	31.49	27.61	1.0248
50	30.41	38.12	56.59	42.87	79.07	73.53	32.09	27.69	1.0260
55	30.78	38.46	56.99	43.40	79.25	73.51	32.65	27.69	1.0255
60	31.12	38.87	57.38	43.93	79.47	73.76	33.18	27.69	1.0226
65	31.41	39.25	57.71	44.44	79.69	74.01	33.69	27.69	1.0228
70	31.76	39.45	58.10	44.90	79.79	73.95	34.17	27.62	1.0242
75	32.04	39.84	58.44	45.41	79.93	74.56	34.59	27.62	1.0219
80	32.29	40.14	58.79	45.87	80.34	74.76	35.00	27.77	1.0213
85	32.54	40.47	59.12	46.33	80.55	74.94	35.38	27.66	1.0220
90	32.78	40.73	59.41	46.77	80.81	75.03	35.75	27.70	1.0222
95	33.01	41.02	59.62	47.11	80.67	74.82	36.10	27.66	1.0208
100	33.21	41.27	59.89	47.47	80.92	75.07	36.42	27.63	1.0190
105	33.38	41.43	60.16	47.81	80.71	75.09	36.73	27.50	1.0184
110	33.60	41.63	60.37	48.13	80.79	75.15	37.01	27.63	1.0220
115	33.79	41.89	60.65	48.42	80.94	75.11	37.30	27.60	1.0233
120	33.93	42.09	61.03	48.77	81.19	75.36	37.50	27.69	1.0255
125	34.10	42.24	61.19	49.06	81.29	75.48	37.73	27.65	1.0201
130	34.29	42.41	61.35	49.30	81.27	75.41	37.96	27.68	1.0182
135	34.41	42.51	61.53	49.56	81.24	75.35	38.17	27.66	1.0179
140	34.55	42.58	61.69	49.75	81.28	75.37	38.37	27.55	1.0166
145	34.70	42.73	61.84	49.96	81.23	75.47	38.55	27.36	1.0144
150	34.77	42.87	61.92	50.07	81.09	75.46	38.71	27.30	1.0163
155	34.84	43.03	61.95	50.16	81.18	75.35	38.89	27.42	1.0180
160	35.07	43.16	62.05	50.25	81.28	75.57	39.03	27.51	1.0250
165	35.09	43.27	62.19	50.41	81.25	75.71	39.17	27.30	1.0169
170	35.13	43.28	62.26	50.52	81.17	75.51	39.30	27.20	1.0174
175	35.15	43.36	62.35	50.64	81.20	75.51	39.42	27.16	1.0205

180	35.34	43.53	62.43	50.69	81.41	75.64	39.51	27.36	1.0236
185	35.13	40.03	49.29	48.54	66.26	61.75	39.59	27.27	0
190	34.74	37.98	41.99	44.59	48.54	47.81	39.27	27.23	0
195	34.48	37.00	39.95	42.67	41.15	41.73	38.73	27.18	0
200	34.10	36.19	38.50	41.35	37.45	38.19	38.18	27.15	0
205	33.80	35.58	37.53	40.31	35.31	35.77	37.64	27.20	0
210	33.42	35.00	36.64	39.41	33.89	34.13	37.14	27.17	0
215	33.10	34.49	35.91	38.61	32.89	32.95	36.61	27.09	0
220	32.74	34.03	35.20	37.83	32.14	32.12	36.10	26.94	0
225	32.44	33.56	34.55	37.02	31.55	31.45	35.64	26.95	0
230	32.14	33.13	33.93	36.25	30.97	30.88	35.17	26.71	0
235	31.80	32.68	33.38	35.52	30.47	30.41	34.72	26.74	0
240	31.52	32.28	32.87	34.79	30.12	29.98	34.29	26.79	0

Lampiran 9. Tabel hasil perhitungan Pelat kolektor standar.

Plat Kolektor Standar								
t	Ut (W/m ² .K)	Ub (W/m ² .K)	U _l (W/m ² .K)	Q _{loss} (W/m ² .K)	S (W/m ²)	V (m ³ /s)	Qu (Watt)	η (%)
0	4.126743	1.95	6.076743	-0.79124	799.667	2.79E-06	0	0.00
5	4.985208	1.95	6.935208	2.07695	814.8041	2.77E-06	65.08587	60.14
10	5.385996	1.95	7.335996	6.017809	825.2013	2.79E-06	80.26723	73.24
15	5.546375	1.95	7.496375	7.906333	829.9412	2.79E-06	85.37029	77.45
20	5.630556	1.95	7.580556	10.58613	835.7514	2.79E-06	88.31044	79.56
25	5.679857	1.95	7.629857	13.01447	838.1978	2.79E-06	90.18623	81.01
30	5.715275	1.95	7.665275	15.81961	844.3138	2.8E-06	91.62003	81.70
35	5.741989	1.95	7.691989	18.72919	845.8428	2.79E-06	91.58608	81.53
40	5.774758	1.95	7.724758	21.07209	850.2769	2.8E-06	93.28553	82.61
45	5.787608	1.95	7.737608	24.12965	851.0414	2.79E-06	93.90028	83.08
50	5.792765	1.95	7.742765	28.30444	850.124	2.79E-06	94.07461	83.32
55	5.800933	1.95	7.750933	31.99278	849.8182	2.79E-06	93.96359	83.25
60	5.814061	1.95	7.764061	34.49851	850.124	2.78E-06	93.91512	83.18
65	5.824993	1.95	7.774993	37.43234	849.6653	2.78E-06	93.62207	82.96
70	5.835493	1.95	7.785493	40.09326	847.9834	2.79E-06	93.82704	83.31
75	5.837054	1.95	7.787054	42.73754	843.3964	2.79E-06	93.30348	83.30
80	5.832442	1.95	7.782442	46.74025	840.7971	2.79E-06	92.97178	83.26
85	5.837479	1.95	7.787479	49.20409	842.1732	2.79E-06	92.88563	83.04
90	5.839958	1.95	7.789958	52.41486	841.8674	2.78E-06	92.73195	82.94
95	5.843292	1.95	7.793292	55.25322	842.1732	2.79E-06	92.23983	82.47
100	5.851701	1.95	7.801701	57.36993	842.1732	2.79E-06	92.14975	82.39
105	5.85719	1.95	7.80719	59.5959	842.9377	2.78E-06	91.77274	81.97
110	5.860492	1.95	7.810492	61.85848	842.9377	2.79E-06	91.49428	81.73
115	5.86556	1.95	7.81556	63.60319	841.5616	2.79E-06	91.39387	81.77
120	5.866534	1.95	7.816534	65.97745	838.9623	2.78E-06	90.80809	81.50
125	5.869739	1.95	7.819739	67.42997	839.421	2.78E-06	90.80162	81.45
130	5.875017	1.95	7.825017	68.80004	839.5739	2.78E-06	90.73639	81.37
135	5.877279	1.95	7.827279	70.60349	838.6565	2.78E-06	90.36283	81.13
140	5.87941	1.95	7.82941	72.43223	839.2681	2.78E-06	90.21216	80.93
145	5.881179	1.95	7.831179	74.13108	840.3384	2.79E-06	89.82795	80.49
150	5.887925	1.95	7.837925	75.13896	840.6442	2.78E-06	89.74778	80.38
155	5.88795	1.95	7.83795	76.54248	841.1029	2.78E-06	89.58431	80.19
160	5.894028	1.95	7.844028	77.52105	841.8674	2.78E-06	90.18433	80.66
165	5.896653	1.95	7.846653	78.61979	841.1029	2.78E-06	89.79078	80.38
170	5.900865	1.95	7.850865	79.96536	841.8674	2.79E-06	89.58978	80.13
175	5.900546	1.95	7.850546	81.06097	841.7145	2.78E-06	89.79603	80.33
180	5.902048	1.95	7.852048	82.48228	842.479	2.78E-06	89.3303	79.84

Lampiran 10. Tabel hasil perhitungan Pelat kolektor dengan ketebalan PCM 4 mm.

Plat Kolektor PCM 4 mm								
t	Ut (W/m ² .K)	Ub (W/m ² .K)	U1 (W/m ² .K)	Qloss (W/m ² .K)	S (W/m ²)	V (m ³ /s)	Qu (Watt)	η (%)
0	4.161686	1.920724	6.08241	0.098998	834.834	2.79E-06	0	0.00
5	5.073217	1.920724	6.993941	1.411538	850.8885	2.79E-06	48.9518	43.32
10	5.479616	1.920724	7.40034	4.167509	858.2277	2.79E-06	72.24925	63.39
15	5.655257	1.920724	7.575981	6.165349	862.356	2.79E-06	82.16966	71.74
20	5.745534	1.920724	7.666258	8.85912	866.0256	2.79E-06	87.84217	76.37
25	5.799991	1.920724	7.720715	10.90752	871.0713	2.79E-06	90.29892	78.05
30	5.831306	1.920724	7.752031	14.43412	870.4597	2.79E-06	92.5602	80.06
35	5.854533	1.920724	7.775257	17.059	870.001	2.79E-06	93.3435	80.78
40	5.870739	1.920724	7.791463	19.83374	869.6952	2.78E-06	93.71677	81.14
45	5.883363	1.920724	7.804088	23.39702	868.1662	2.79E-06	94.4813	81.94
50	5.885724	1.920724	7.806449	26.52973	867.2488	2.8E-06	94.26228	81.84
55	5.881973	1.920724	7.802697	29.8443	866.943	2.79E-06	94.47661	82.05
60	5.884749	1.920724	7.805473	32.64985	866.0256	2.79E-06	95.01686	82.61
65	5.897489	1.920724	7.818213	35.09543	866.1785	2.78E-06	94.93031	82.52
70	5.90933	1.920724	7.830054	36.83082	863.885	2.78E-06	95.35793	83.11
75	5.920318	1.920724	7.841042	38.79682	864.4966	2.8E-06	96.05892	83.66
80	5.92517	1.920724	7.845894	41.17051	864.1908	2.8E-06	96.19077	83.81
85	5.922392	1.920724	7.843117	43.73457	864.1908	2.79E-06	95.54936	83.25
90	5.927552	1.920724	7.848276	44.98963	865.1082	2.79E-06	95.40014	83.03
95	5.938329	1.920724	7.859053	46.43288	863.5792	2.8E-06	95.8506	83.57
100	5.940741	1.920724	7.861466	47.98258	861.4386	2.8E-06	96.08534	83.98
105	5.94965	1.920724	7.870375	48.83117	861.1328	2.79E-06	96.09421	84.02
110	5.950998	1.920724	7.871722	50.9407	861.1328	2.8E-06	96.76333	84.61
115	5.945569	1.920724	7.866293	52.16029	861.2857	2.8E-06	96.00178	83.93
120	5.951653	1.920724	7.872378	53.35381	860.827	2.78E-06	96.05602	84.02
125	5.959843	1.920724	7.880567	54.25586	860.6741	2.8E-06	96.44837	84.38
130	5.959335	1.920724	7.880059	55.50927	859.7567	2.79E-06	96.51137	84.52
135	5.963283	1.920724	7.884007	56.79462	860.2154	2.8E-06	96.49727	84.46
140	5.965073	1.920724	7.885797	57.29524	857.6161	2.79E-06	96.35027	84.59
145	5.955523	1.920724	7.876247	58.71291	854.8639	2.79E-06	96.0245	84.58
150	5.951053	1.920724	7.871777	60.01205	852.4175	2.8E-06	95.85885	84.67
155	5.955897	1.920724	7.876622	60.84382	855.1697	2.8E-06	94.82388	83.49
160	5.952091	1.920724	7.872815	61.42948	856.0871	2.8E-06	95.41871	83.92
165	5.95225	1.920724	7.872974	61.61012	853.9465	2.79E-06	95.88657	84.55
170	5.962999	1.920724	7.883723	61.77123	854.2523	2.78E-06	95.08081	83.80
175	5.963211	1.920724	7.883935	63.00476	854.4052	2.79E-06	95.92787	84.54
180	5.964868	1.920724	7.885592	63.3517	856.2264	2.78E-06	95.43971	83.93

Lampiran 11. Tabel hasil perhitungan Pelat kolektor dengan ketebalan PCM 8 mm.

Plat Kolektor PCM 8 mm								
t	Ut (W/m ² .K)	Ub (W/m ² .K)	UI (W/m ² .K)	Qloss (W/m ² .K)	S (W/m ²)	V (m ³ /s)	Qu (Watt)	η (%)
0	4.192401	1.892438	6.084838	0.594223	834.0695	2.77E-06	0	0.00
5	5.09652	1.892438	6.988957	2.707311	850.5827	2.79E-06	53.62634	47.47
10	5.515785	1.892438	7.408223	6.607594	858.2277	2.79E-06	72.553	63.65
15	5.68147	1.892438	7.573907	8.283961	857.4401	2.78E-06	79.91533	70.18
20	5.769404	1.892438	7.661842	10.05118	856.3544	2.79E-06	83.99564	73.85
25	5.813796	1.892438	7.706234	12.91898	867.8604	2.78E-06	87.14697	75.61
30	5.843981	1.892438	7.736418	15.91607	867.8604	2.78E-06	87.64551	76.04
35	5.864032	1.892438	7.75647	18.35597	868.0133	2.78E-06	87.66028	76.04
40	5.87635	1.892438	7.768787	21.59682	866.6372	2.78E-06	87.86747	76.34
45	5.889183	1.892438	7.781621	24.41889	865.7198	2.79E-06	88.56661	77.03
50	5.901753	1.892438	7.794191	26.56418	866.7901	2.78E-06	88.35272	76.75
55	5.92405	1.892438	7.816487	27.53073	866.3314	2.79E-06	90.07304	78.28
60	5.94841	1.892438	7.840847	28.61195	863.885	2.79E-06	91.28872	79.57
65	5.955727	1.892438	7.848165	31.24448	864.0379	2.78E-06	91.0957	79.38
70	5.963986	1.892438	7.856423	34.34628	865.2611	2.79E-06	90.8761	79.08
75	5.963135	1.892438	7.855573	36.823	863.2734	2.8E-06	91.29288	79.63
80	5.958647	1.892438	7.851084	39.76656	862.8147	2.79E-06	90.90506	79.33
85	5.960711	1.892438	7.853148	41.02963	863.4263	2.78E-06	90.66235	79.06
90	5.974942	1.892438	7.86738	42.30765	863.5792	2.79E-06	91.5859	79.85
95	5.989164	1.892438	7.881601	43.2821	858.9768	2.79E-06	91.87359	80.53
100	5.993196	1.892438	7.885634	45.22945	850.6894	2.8E-06	92.59238	81.95
105	6.006152	1.892438	7.898589	46.0751	851.9203	2.8E-06	93.14326	82.32
110	6.011582	1.892438	7.904019	47.80491	848.1834	2.8E-06	93.74397	83.22
115	6.014242	1.892438	7.906679	49.49396	850.9798	2.8E-06	94.36229	83.49
120	6.003743	1.892438	7.896181	51.61306	849.4354	2.79E-06	94.09552	83.41
125	6.001974	1.892438	7.894411	52.86069	849.9172	2.79E-06	93.13098	82.50
130	6.001866	1.892438	7.894304	53.93927	851.7674	2.8E-06	93.73246	82.86
135	6.007372	1.892438	7.899809	55.28838	853.1512	2.79E-06	94.08449	83.03
140	6.025612	1.892438	7.91805	54.82322	858.8393	2.78E-06	95.45997	83.69
145	6.031248	1.892438	7.923686	55.22334	856.9561	2.79E-06	94.335	82.88
150	6.028452	1.892438	7.920889	56.87982	858.5896	2.79E-06	95.63164	83.86
155	6.042565	1.892438	7.935002	57.31696	859.9657	2.79E-06	94.95924	83.14
160	6.044266	1.892438	7.936703	58.36267	865.9035	2.78E-06	94.16121	81.88
165	6.037306	1.892438	7.929743	59.57633	859.0483	2.79E-06	94.61018	82.92
170	6.03098	1.892438	7.923417	62.15962	859.4652	2.79E-06	94.17968	82.51
175	6.028163	1.892438	7.920601	62.83367	862.1217	2.79E-06	94.27014	82.33
180	6.03161	1.892438	7.924048	62.98999	866.9243	2.8E-06	93.59575	81.29

Lampiran 12. Tabel hasil perhitungan Pelat kolektor dengan ketebalan PCM 12 mm.

Plat Kolektor PCM 12 mm								
t	Ut (W/m ² .K)	Ub (W/m ² .K)	UI (W/m ² .K)	Qloss (W/m ² .K)	S (W/m ²)	V (m ³ /s)	Qu (Watt)	η (%)
0	4.173173	1.864972	6.038145	-0.19655	834.0695	2.79E-06	0	0.00
5	5.053681	1.864972	6.918653	0.517998	850.5827	2.79E-06	43.12554	38.18
10	5.459484	1.864972	7.324455	3.075699	858.2277	2.79E-06	61.38937	53.86
15	5.63665	1.864972	7.501621	4.07803	862.5089	2.79E-06	71.3046	62.25
20	5.721325	1.864972	7.586297	5.803319	864.8024	2.78E-06	76.89608	66.95
25	5.7758	1.864972	7.640772	7.98401	867.8604	2.78E-06	80.32436	69.69
30	5.815036	1.864972	7.680008	10.12501	867.8604	2.78E-06	83.02813	72.03
35	5.838347	1.864972	7.703319	12.73856	868.0133	2.78E-06	84.7403	73.51
40	5.85434	1.864972	7.719312	15.98139	866.6372	2.78E-06	87.83828	76.31
45	5.86867	1.864972	7.733642	18.78026	865.7198	2.8E-06	89.22412	77.60
50	5.884797	1.864972	7.749768	21.08986	866.7901	2.78E-06	89.03207	77.34
55	5.891225	1.864972	7.756197	24.01088	866.3314	2.8E-06	89.32851	77.64
60	5.899481	1.864972	7.764453	26.66503	863.885	2.78E-06	89.60842	78.10
65	5.907768	1.864972	7.77274	28.92006	864.0379	2.78E-06	90.49277	78.86
70	5.910873	1.864972	7.775845	32.17155	865.2611	2.79E-06	89.22112	77.64
75	5.918505	1.864972	7.783477	34.40743	863.2734	2.79E-06	90.3389	78.79
80	5.933472	1.864972	7.798444	35.23516	862.8147	2.79E-06	91.00142	79.41
85	5.939031	1.864972	7.804002	38.05467	863.4263	2.78E-06	91.66919	79.94
90	5.947625	1.864972	7.812597	39.69877	863.5792	2.78E-06	91.71078	79.96
95	5.944306	1.864972	7.809278	41.81726	862.356	2.78E-06	92.20664	80.51
100	5.951911	1.864972	7.816883	43.66462	860.827	2.78E-06	92.87936	81.24
105	5.946493	1.864972	7.811465	45.97373	860.3683	2.79E-06	93.12766	81.50
110	5.952489	1.864972	7.817461	46.72154	863.3898	2.79E-06	93.04377	81.14
115	5.956827	1.864972	7.821799	48.40247	864.4966	2.79E-06	93.88204	81.77
120	5.967647	1.864972	7.832619	48.82638	866.3314	2.79E-06	94.53913	82.17
125	5.970423	1.864972	7.835395	50.57809	861.7444	2.79E-06	94.11435	82.23
130	5.971507	1.864972	7.836479	51.75851	860.2154	2.78E-06	93.76241	82.07
135	5.971138	1.864972	7.836109	52.92945	859.9096	2.79E-06	93.57514	81.93
140	5.970946	1.864972	7.835918	54.91775	858.8393	2.78E-06	92.60138	81.18
145	5.967546	1.864972	7.832518	57.49456	856.9561	2.79E-06	92.76468	81.51
150	5.963887	1.864972	7.828859	58.41063	858.5896	2.78E-06	93.45699	81.96
155	5.967698	1.864972	7.83267	58.15859	859.9657	2.77E-06	94.05615	82.35
160	5.973314	1.864972	7.838286	59.29745	865.9035	2.78E-06	93.21587	81.06
165	5.970193	1.864972	7.835165	61.00819	859.0483	2.78E-06	94.39085	82.73
170	5.966025	1.864972	7.830997	62.09736	859.4652	2.78E-06	93.97416	82.33
175	5.966305	1.864972	7.831276	62.55844	862.1217	2.79E-06	94.96388	82.94
180	5.97591	1.864972	7.840882	62.60964	864.7569	2.78E-06	94.51913	82.30

Lampiran 13. Dokumentasi

