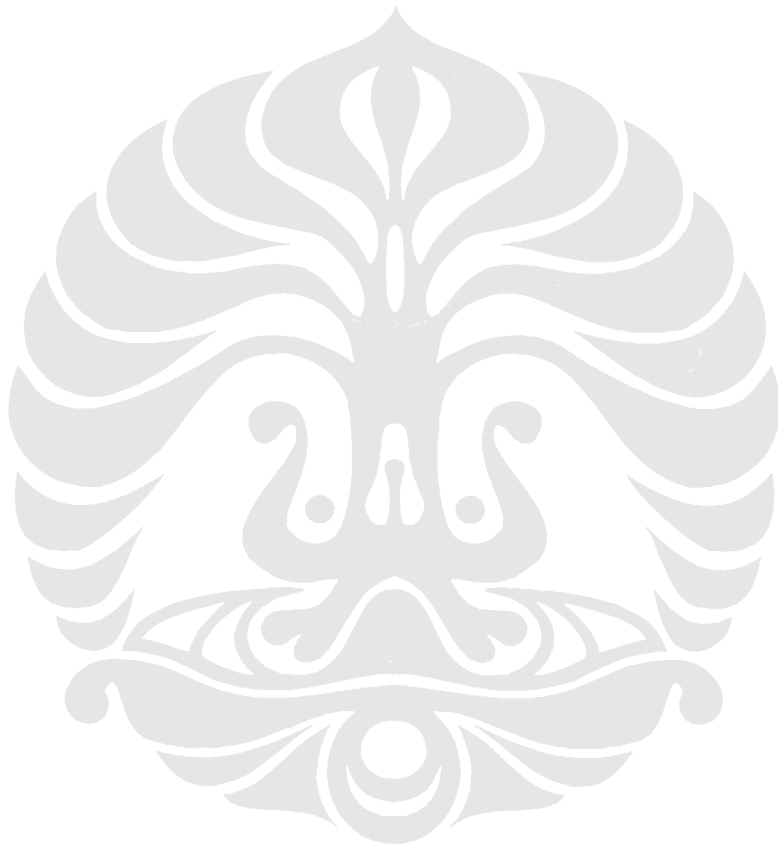


LAMPIRAN



Lampiran 1 Tabel pengujian unjuk kerja mesin



Laboratorium Termodinamika
 Departemen Teknik, Universitas Indonesia
 Kampus Baru UI, Depok 16424

Test on : 31 Mei 2008
 Tested Fuel : Solar 100%
 Engine No : 1

DATA SHEET AND TEST RESULT

ENGINE : Dong Feng Diesel Engine
 MODEL : R-175
 TYPE : 1 Cylinder - 4 Stroke - Horizontal

DIESEL ENGINE

Normal Output : 6,1 HP at 2200 rpm
 1. No. of cycle : 4 cycle
 2. Displacement (V) : 0,353 L
 3. Engine Cylinder Bore (Ø) : 7,5 cm
 4. Engine Piston Stroke (S) : 8,0 cm
 5. No. of Cylinder (C) : 1
 6. Compression Ratio : 21:1

GENERATOR

1. Model : ST-3-2
 2. Type : Synchronous Generator
 3. Output Power : 3 kW
 4. Pole No. : 2

FUEL

1. Fuel Consumption : 60 mL
 2. Percentage of CPO : 0 %

TEST CONDITIONS

1. Atmospheric Pressure (P_a) : 101.325 kPa

TEST NO.	Set or command		Measurement													Result					
	Electrical Lamp Load	Rotational Generator Shaft Speed	Fuel		Voltage Meter	Ampere Meter	Suction Air Temp	Cooling Water Temp			Fuel Temperature				Exhaust Gas Analyzer		Fuel Specification		Diesel Genset Performance		
	Watt	rpm	E	t	V	A	T ₂	T _{in}	T _{out}	T _{ts}	T ₀	T ₁	T ₂	Capacity	T _g	γ	LHV	W	SFC	η _h	
1	500	1500	52	6,44.19	220.3	1.4	32	28	64	28	NA	NA	NA	4.7	133	0.8340	43,124	463.15	0.8019	10.41	
2	500	1500	52	6,44.21	220.4	1.4	32	28	64	28	NA	NA	NA	3.8	135	0.8340	43,124	463.13	0.8019	10.41	
Average														4.25	134.0	0.8340	43,124	463.14	0.8019	10.41	
1	1000	1500	85	5,25.22	220.7	3.4	33	28	70	28	NA	NA	NA	7.3	160	0.8340	43,124	940.90	0.4906	17.02	
2	1000	1500	85	5,26.01	220.8	3.4	33	28	69	28	NA	NA	NA	5.0	169	0.8340	43,124	938.62	0.4906	17.02	
Average														6.15	164.5	0.8340	43,124	939.76	0.4906	17.02	
1	1500	1500	103	4,15.09	220.1	5.9	33	28	74	28	NA	NA	NA	9.2	202	0.8340	43,124	1,453.60	0.4049	20.62	
2	1500	1500	103	4,15.10	220.2	5.9	33	28	76	28	NA	NA	NA	9.2	204	0.8340	43,124	1,453.55	0.4049	20.62	
Average														9.20	203.0	0.8340	43,124	1,453.58	0.4049	20.62	
1	2000	1500	110	3,17.81	220.7	8.1	34	28	78	28	NA	NA	NA	29.0	271	0.8340	43,124	2,001.92	0.3791	22.02	
2	2000	1500	110	3,16.91	220.6	8.1	34	28	79	28	NA	NA	NA	25.0	266	0.8340	43,124	2,011.07	0.3791	22.02	
Average														27.00	268.5	0.8340	43,124	2,006.50	0.3791	22.02	



Laboratorium Termodinamika
Departemen Teknik, Universitas Indonesia
Kampus Baru UI, Depok 16424

Test on : 11 April 2008
Tested Fuel : CPO 10% & Solar 90%

DATA SHEET AND TEST RESULT

ENGINE : Dong Feng Diesel Engine
MODEL : R-175
TYPE : 1 Cylinder -4 Stroke - Horizontal

DIESEL ENGINE

Normal Output : 6,1 HP at 2200 rpm
1. No. of cycle : 4 cycle
2. Displacement (V) : 0,353 Lt
3. Engine Cylinder Bore (D) : 7,5 cm
4. Engine Piston Stroke (S) : 8,0 cm
5. No. of Cylinder (n) : 1
6. Compression Ratio : 21-23

GENERATOR

1. Model : ST-32
2. Type : Synchronous Generator
3. Output Power : 3kW
4. Pole No. : 2

FUEL

1. Fuel Consumption : 50 mL
2. Percentage of CPO : 10 %

TEST CONDITIONS

1. Atmospheric Pressure (P_a) : 101.325 kPa

TEST NO.	Set or command		Measurement											Result						
	Electric Lamp Load	Rotational Generator Shaft Speed	KWh Meter	Fuel Consumption Time	Voltage Meter	Ampere Meter	Suction Air Temp	Cooling Water Temp			Fuel Temperature			Exhaust Gas Analyzer		Fuel Specification		Diesel Genset Performance		
	-	N	E	t	V	A	T_a	T_{in}	T_{out}	T_f	T_0	T_1	T_2	Opacity	T_g	γ	LHV	P	SFC	η_b
	Watt	rpm	Wh	sec	Volt	Ampere	°C	°C	°C	°C	°C	°C	°C	k	°C	kg/dm ³	kJ/kg	Watt	kg/kWh	%
1	500	1500	51	6.32.75	220.7	1.8	28	25	71	28				2.0	113	0.8420	42,483	467.47	0.8255	10.27
2	500	1500	51	6.33.28	220.1	1.8	28	25	75	28				2.5	119	0.8420	42,483	466.84	0.8255	10.27
Average														2.25	116.0	0.8420	42,483	467.16	0.8255	10.27
1	1000	1500	82	5.09.60	220.9	3.9	31	25	72	28				3.4	139	0.8420	42,483	953.49	0.5134	16.51
2	1000	1500	82	5.09.30	220.8	3.9	31	25	72	28				3.5	140	0.8420	42,483	954.41	0.5134	16.51
Average														3.45	139.5	0.8420	42,483	953.95	0.5134	16.51
1	1500	1500	101	4.09.50	220.6	6.0	29	25	75	28				10.1	174	0.8420	42,483	1,456.73	0.4168	20.33
2	1500	1500	101	4.09.40	220.6	6.0	29	25	75	28				12.1	173	0.8420	42,483	1,457.90	0.4168	20.33
Average														11.10	173.5	0.8420	42,483	1,457.31	0.4168	20.33
1	2000	1500	107	3.13.15	220.5	7.9	30	25	82	28				35.0	228	0.8420	42,483	1,990.70	0.3935	21.54
2	2000	1500	107	3.11.04	220.8	7.9	30	25	85	28				37.0	233	0.8420	42,483	2,016.33	0.3935	21.54
Average														36.00	230.5	0.8420	42,483	2,003.51	0.3935	21.54



Laboratorium Termodinamika
Departemen Teknik, Universitas Indonesia
Kampus Baru UI, Depok 16424

Test on : 12 April 2008
Tested Fuel : CPO 20% & Solar 80%

DATA SHEET AND TEST RESULT

ENGINE : Dong Feng Diesel Engine
MODEL : R-175
TYPE : 1 Cylinder-4 Stroke - Horizontal

DIESEL ENGINE

Normal Output : 6,1 HP at 2200 rpm
1. No. of cycle : 4 cycle
2. Displacement (V) : 0,353 Lt
3. Engine Cylinder Bore (D) : 7,5 cm
4. Engine Piston Stroke (S) : 8,0 cm
5. No. of Cylinder (i) : 1
6. Compression Ratio : 21-23

GENERATOR

1. Model : ST-3-2
2. Type : Synchronous Generator
3. Output Power : 3 kW
4. Pole No. : 2

FUEL

1. Fuel Consumption : 80 mL
2. Percentage of CPO : 20 %

TEST CONDITIONS

1. Atmospheric Pressure (P) : 101.325 kPa

TEST NO.	Set or command		Measurement											Result						
	Backlight Lamp Load	Rotational Generator Shaft Speed	KWH Meter	Fuel Consuming Time	Voltage Meter	Ampere Meter	Suction Air Temp			Cooling Water Temp				Exhaust Gas Analyzer		Fuel Specification		Diesel Genset Performance		
							T_a	T_{in}	T_{out}	T_f	T_0	T_1	T_2	Opacity	T_g	γ	LHV	P	SFC	η_h
Watt	rpm	Wh	sec	Volt	Ampere	°C	°C	°C	°C	°C	°C	°C	k	°C	kg/dm ³	kJ/kg	Watt	kg/kWh	%	
1	500	1500	52	6.34.88	221.4	1.7	29	25	74	28				4.2	113	0.8560	41,841	474.07	0.8231	10.45
2	500	1500	52	6.39.84	220.7	1.7	29	25	75	28				5.4	114	0.8560	41,841	468.19	0.8231	10.45
Average														4.80	113.5	0.8560	41,841	471.13	0.8231	10.45
1	1000	1500	84	5.16.19	220.7	3.7	29	25	80	28				7.1	144	0.8560	41,841	956.39	0.5095	16.89
2	1000	1500	84	5.16.94	220.9	3.8	29	25	81	28				7.4	145	0.8560	41,841	954.12	0.5095	16.89
Average														7.25	144.5	0.8560	41,841	955.26	0.5095	16.89
1	1500	1500	101	4.11.25	220.2	5.9	29	25	81	28				14.7	178	0.8560	41,841	1,447.16	0.4238	20.30
2	1500	1500	101	4.10.58	220.1	5.9	29	25	81	28				15.1	178	0.8560	41,841	1,451.15	0.4238	20.30
Average														14.90	178.0	0.8560	41,841	1,449.16	0.4238	20.30
1	2000	1500	106	3.13.41	220.5	8.0	30	25	88	28				25.0	226	0.8560	41,841	1,973.01	0.4038	21.31
2	2000	1500	106	3.12.72	220.1	8.0	30	25	89	28				25.0	225	0.8560	41,841	1,980.07	0.4038	21.31
Average														25.00	225.5	0.8560	41,841	1,976.54	0.4038	21.31



DATA SHEET AND TEST RESULT

ENGINE : Dong Feng Diesel Engine
MODEL : R-175
TYPE : 1 Cylinder - 4 Stroke - Horizontal

DIESEL ENGINE

Normal Output : 6,1 HP at 2200 rpm
1. No. of cycle : 4 cycle
2. Displacement (V) : 0,333 Lt
3. Engine Cylinder Bore (D) : 7,5 cm
4. Engine Piston Stroke (S) : 8,0 cm
5. No. of Cylinder (n) : 1
6. Compression Ratio : 21-23

GENERATOR

1. Model : ST-3-2
2. Type : Synchronous Generator
3. Output Power : 3 kW
4. Pole No. : 2

FUEL

1. Fuel Consumption : 50 mL
2. Percentage of CPO : 25 %

TEST CONDITIONS

1. Atmospheric Pressure (P_a) : 101.325 kPa

TEST NO.	Set or command		Measurement											Exhaust Gas Analyzer		Result				
	Electricity Lamp Load	Rotational Generator Shaft Speed	kWh/Meter	Fuel Consuming Time	Voltage Meter	Ampere Meter	Stroke Inlet Temp	Cooling Water Temp			Fuel Temperature			Capacity	Tg	Fuel Specification		Diesel Genset Performance		
	-	N	E	t	V	A	T _a	T _{in}	T _{out}	T _f	T ₀	T ₁	T ₂	k	°C	γ	LHV	P	SFC	η _b
	Watt	rpm	Wh	sec	Volt	Ampere	°C	°C	°C	°C	°C	°C	°C			kg/m ³	kJ/kg	Watt	kgk/Wh	%
1	500	1500	52	6.40.98	221.5	1.4	29	25	73	28				5.3	129	0.8580	41,521	466.86	0.8250	10.51
2	500	1500	53	6.44.62	221.5	1.5	29	25	71	28				5.1	128	0.8580	41,521	471.55	0.8094	10.71
Average														5.20	128.5	0.8580	41,521	469.20	0.8172	10.61
1	1000	1500	84	5.25.44	220.5	3.7	29	25	72	28				10.0	158	0.8580	41,521	929.20	0.5107	16.98
2	1000	1500	84	5.26.53	220.5	3.6	29	25	72	28				8.2	156	0.8580	41,521	926.10	0.5107	16.98
Average														9.10	157.0	0.8580	41,521	927.65	0.5107	16.98
1	1500	1500	102	4.10.73	220.7	5.7	31	25	79	28				15.1	200	0.8580	41,521	1,464.52	0.4206	20.61
2	1500	1500	102	4.12.13	220.6	5.8	31	25	76	28				17.2	204	0.8580	41,521	1,456.39	0.4206	20.61
Average														16.15	202.0	0.8580	41,521	1,460.46	0.4206	20.61
1	2000	1500	107	3.11.72	220.7	7.9	30	25	80	28				32.7	250	0.8580	41,521	2,009.18	0.4009	21.63
2	2000	1500	107	3.18.55	220.6	7.9	30	25	79	28				31.6	249	0.8580	41,521	1,940.07	0.4009	21.63
Average														32.15	249.5	0.8580	41,521	1,974.62	0.4009	21.63



Laboratorium Termodinamika
Departemen Teknik, Universitas Indonesia
Kampus Baru UI, Depok 16424

Test on : 12 April 2008
Tested Fuel : CPO 30% & Solar 70%

DATA SHEET AND TEST RESULT

ENGINE : Dong Feng Diesel Engine
MODEL : R-175
TYPE : 1 Cylinder-4 Stroke - Horizontal

DIESEL ENGINE

Normal Output 6,1 HP at 2200 rpm
1. No. of cycle : 4 cycle
2. Displacement (V) : 0,353 Lt
3. Engine Cylinder Bore (D) : 7,5 cm
4. Engine Piston Stroke (S) : 8,0 cm
5. No. of Cylinder (n) : 1
6. Compression Ratio : 21-23

GENERATOR

1. Model : ST-3-2
2. Type : Synchronous Generator
3. Output Power : 3kW
4. Pole No. : 2

FUEL

1. Fuel Consumption : 50 mL
2. Percentage of CPO : 30 %

TEST CONDITIONS

1. Atmospheric Pressure (P_a) : 101.325 kPa

TEST NO.	Set or command		Measurement											Result							
	Electric Lamp Load Watt	Horizontal Generator Shaft Speed rpm	KWH Meter E Wh	Fuel Consuming Time t sec	Voltage Meter V	Ampere Meter A	Stator At Temp T _a °C	Cooling Water Temp			Fuel Temperature				Exhaust Gas Analyzer		Fuel Specification		Diesel Genset Performance		
								T _{in}	T _{out}	T _{ff}	T _o	T ₁	T ₂	Opacity	T _g	γ	LHV	P	SFC	η _b	
								°C	°C	°C	°C	°C	°C	k	°C	kg/dm ³	kJ/kg	Watt	kg/kWh	%	
1	500	1500	52	6.38.43	220.2	1.7	30	25	74	28					7.5	110	0.8610	41,200	469.84	0.8279	10.55
2	500	1500	52	6.35.53	220.9	1.7	30	25	75	28					6.9	110	0.8610	41,200	473.29	0.8279	10.55
Average															7.20	110.0	0.8610	41,200	471.57	0.8279	10.55
1	1000	1500	84	5.16.68	220.4	3.8	29	25	79	28					6.1	138	0.8610	41,200	954.91	0.5125	17.05
2	1000	1500	84	5.16.31	220.2	3.8	29	25	79	28					6.1	138	0.8610	41,200	956.02	0.5125	17.05
Average															6.10	138.0	0.8610	41,200	955.47	0.5125	17.05
1	1500	1500	101	4.09.10	220.5	5.9	28	25	84	28					10.1	161	0.8610	41,200	1,459.65	0.4262	20.50
2	1500	1500	101	4.08.59	220.5	5.9	28	25	86	28					9.9	166	0.8610	41,200	1,462.65	0.4262	20.50
Average															10.00	163.5	0.8610	41,200	1,461.15	0.4262	20.50
1	2000	1500	108	3.13.16	220.9	8.0	28	25	88	28					18.0	221	0.8610	41,200	2,012.84	0.3986	21.92
2	2000	1500	108	3.13.71	220.7	8.0	28	25	88	28					18.0	222	0.8610	41,200	2,007.12	0.3986	21.92
Average															18.00	221.5	0.8610	41,200	2,009.98	0.3986	21.92



Laboratorium Termodinamika
Departemen Teknik, Universitas Indonesia
Kampus Baru UI, Depok 16424

Test on : 12 April 2008
Tested Fuel : CPO 40% & Solar 60%

DATA SHEET AND TEST RESULT

ENGINE : Dong Feng Diesel Engine
MODEL : R-175
TYPE : 1 Cylinder-4 Stroke - Horizontal

DIESEL ENGINE

Normal Output 6,1 HP at 2200 rpm
1. No. of cycle : 4 cycle
2. Displacement (V) : 0,353 Lt
3. Engine Cylinder Bore (D) : 7,5 cm
4. Engine Piston Stroke (S) : 8,0 cm
5. No. of Cylinder (n) : 1
6. Compression Ratio : 21-23

GENERATOR

1. Model : ST-3-2
2. Type : Synchronous Generator
3. Output Power : 3 kW
4. Pole No. : 2

FUEL

1. Fuel Consumption : 50 mL
2. Percentage of CPO : 40 %

TEST CONDITIONS

1. Atmospheric Pressure (P_a) : 101.325 kPa

TEST NO.	Set or command		Measurement											Result							
	Electricity Lamp Load	Rotational Generator Shaft Speed	kWh Meatr	Fuel Consumption kg Time	Voltage Meatr	Ampe Meatr	Sector Air Temp	Cooling Water Temp			Fuel Temperature				Exhaust Gas Analyzer		Fuel Specification		Diesel Genset Performance		
								T _{in}	T _{out}	T _a	T ₀	T ₁	T ₂	Opacity	T _g	γ	LHV	P	SFC	η _g	
	Watt	rpm	Wh	sec	Volt	Ampere	°C	°C	°C	°C	°C	°C	°C	°C	kg/dm ³	kJ/kg	Watt	kg/kWh	%		
1	500	1500	52	6.31.53	220.9	1.8	26	25	72	28					9.6	108	0.8680	40,559	478.12	0.8346	10.63
2	500	1500	52	6.34.19	220.7	1.8	26	25	72	28					8.9	108	0.8680	40,559	474.90	0.8346	10.63
Average															9.25	108.0	0.8680	40,559	476.51	0.8346	10.63
1	1000	1500	83	5.14.65	220.1	3.9	27	25	74	28					7.3	133	0.8680	40,559	949.63	0.5229	16.97
2	1000	1500	83	5.16.03	220.3	3.9	27	25	74	28					7.1	133	0.8680	40,559	945.48	0.5229	16.97
Average															7.20	133.0	0.8680	40,559	947.55	0.5229	16.97
1	1500	1500	100	4.03.91	220.7	6.0	28	25	78	28					8.2	169	0.8680	40,559	1,475.95	0.4340	20.45
2	1500	1500	100	4.04.09	220.9	6.0	28	25	78	28					9.6	169	0.8680	40,559	1,474.87	0.4340	20.45
Average															8.90	169.0	0.8680	40,559	1,475.41	0.4340	20.45
1	2000	1500	107	3.09.78	221.5	8.0	30	25	86	28					38.0	228	0.8680	40,559	2,029.72	0.4056	21.88
2	2000	1500	106	3.11.19	221.2	8.0	30	25	86	28					35.0	228	0.8680	40,559	1,995.92	0.4094	21.68
Average															36.50	228.0	0.8680	40,559	2,012.82	0.4075	21.78



Laboratorium Termodinamika
Departemen Teknik, Universitas Indonesia
Kampus Baru UI, Depok 16424

Test on : 11 April 2008
Tested Fuel : CPO 50% & Solar 50%

DATA SHEET AND TEST RESULT

ENGINE : Dong Feng Diesel Engine
MODEL : R-175
TYPE : 1 Cylinder -4 Stroke - Horizontal

DIESEL ENGINE

Normal Output 6,1 HP at 2200 rpm
1. No. of cycle : 4 cycle
2. Displacement (V) : 0,353 Lt
3. Engine Cylinder Bore (D) : 7,5 cm
4. Engine Piston Stroke (S) : 8,0 cm
5. No. of Cylinder (n) : 1
6. Compression Ratio : 21-23

GENERATOR

1. Model : ST-32
2. Type : Synchronous Generator
3. Output Power : 3kW
4. Pole No. : 2

FUEL

1. Fuel Consumption : 50 mL
2. Percentage of CPO : 50 %

TEST CONDITIONS

1. Atmospheric Pressure (P_a) : 101,325 kPa

TEST NO.	Set or command		Measurement											Result								
	Electric Lamp Load	Rotational Generator Shaft Speed	KWh Meter	Fuel Consuming Time	Voltage Meter	Ampere Meter	Sector Air Temp	Cooling Water Temp			Fuel Temperature				Exhaust Gas Analyzer		Fuel Specification		Diesel Genset Performance			
								T _{in}	T _{out}	T _f	T ₀	T ₁	T ₂	Opacity	T _g	γ	LHV	P	SFC	η _n		
	Watt	rpm	Wh	sec	Volt	Ampere	°C	°C	°C	°C	°C	°C	°C	°C	k	°C	kg/dm ³	kJ/kg	Watt	kgkWh	%	
1	500	1500	51	6.23.90	220.9	1.5	32	25	77	28						5.1	117	0.8740	39,918	478.25	0.8569	10.53
2	500	1500	51	6.29.18	220.8	1.5	32	25	77	28						4.3	117	0.8740	39,918	471.76	0.8569	10.53
Average																4.70	117.0	0.8740	39,918	475.01	0.8569	10.53
1	1000	1500	83	5.13.09	221.5	3.6	32	25	79	28						7.0	143	0.8740	39,918	954.36	0.5265	17.13
2	1000	1500	82	5.14.38	220.4	3.6	32	25	79	28						7.0	143	0.8740	39,918	938.99	0.5329	16.92
Average																7.00	143.0	0.8740	39,918	946.67	0.5297	17.03
1	1500	1500	98	4.10.73	220.7	5.7	34	25	86	28						5.6	165	0.8740	39,918	1,407.09	0.4459	20.22
2	1500	1500	98	4.12.13	220.6	5.8	34	25	84	28						6.7	166	0.8740	39,918	1,399.28	0.4459	20.22
Average																6.15	165.5	0.8740	39,918	1,403.18	0.4459	20.22
1	2000	1500	105	3.10.50	215.7	7.8	33	25	88	28						20.8	218	0.8740	39,918	1,984.25	0.4162	21.67
2	2000	1500	105	3.06.07	221.5	7.8	33	25	87	28						28.5	216	0.8740	39,918	2,031.49	0.4162	21.67
Average																24.65	217.0	0.8740	39,918	2,007.87	0.4162	21.67



TEST NO.	Lain pada:		Output Power		Rotational Shaft Speed	Inlet and Outlet Temperature		Specific Fuel Consumption	Output	Thermal Efficiency	
	L	P	W	T		η_{th}	η_{net}				
	Watt	%	rpm	Liter	%	%					
HSD Main 2 Gen 2 100%	1	500	471	2200	179	0.618	7.9	8.21			
	2	1000	954	2200	209	0.698	11.9	14.01			
	3	1500	1447	2200	269	0.488	22.0	18.82			
	4	2000	2017	2200	322	0.418	49.6	20.22			
HSD Main 2 Gen 1 100%	1	500	465	2200	137	0.818	4.9	10.21			
	2	1000	944	2200	170	0.612	7.9	16.32			
	3	1500	1425	2200	218	0.423	11.2	18.72			
	4	2000	1968	2200	281	0.401	28.0	20.82			
HSD Main 1 Gen 1 100%	1	500	446	2200	131	0.819	3.8	10.19			
	2	1000	951	2200	165	0.482	4.1	18.88			
	3	1500	1446	2200	198	0.410	18.7	20.88			
	4	2000	1988	2200	267	0.388	38.0	21.48			
CPO 10%	1	500	467	2200	116	0.826	2.3	10.27			
	2	1000	954	2200	140	0.618	3.6	16.61			
	3	1500	1457	2200	174	0.417	11.1	20.38			
	4	2000	2004	2200	231	0.388	38.0	21.64			
CPO 20%	1	500	471	2200	114	0.823	4.8	10.46			
	2	1000	955	2200	145	0.610	7.3	18.89			
	3	1500	1449	2200	178	0.424	14.9	20.30			
	4	2000	1977	2200	226	0.404	26.0	21.31			
CPO 35%	1	500	469	2200	129	0.817	6.2	10.81			
	2	1000	928	2200	157	0.611	9.1	16.88			
	3	1500	1460	2200	202	0.421	16.2	20.81			
	4	2000	1975	2200	250	0.401	32.2	21.88			
CPO 38%	1	500	472	2200	110	0.828	7.2	10.66			
	2	1000	955	2200	138	0.618	8.1	17.06			
	3	1500	1461	2200	164	0.428	10.0	20.60			
	4	2000	2010	2200	222	0.399	18.0	21.92			
CPO 40%	1	500	477	2200	108	0.825	9.3	10.63			
	2	1000	948	2200	133	0.623	7.2	16.97			
	3	1500	1475	2200	169	0.434	8.9	20.46			
	4	2000	2013	2200	228	0.408	36.6	21.78			
CPO 50%	1	500	475	2200	117	0.867	4.7	10.63			
	2	1000	947	2200	143	0.630	7.0	17.03			
	3	1500	1403	2200	166	0.446	8.2	20.22			
	4	2000	2008	2200	217	0.418	24.7	21.87			

Cetane Number	Koncentrad	LHV	Load (watt)	Output Power(%)	Rotational Shaft Speed (rpm)	Exhaust Gas Temperature (C)	SFC (kg/MWh)	Opacity	Thermal Efficiency
52.833	0.00	43,124	500.00	446.19	2200.00	130.50	0.819	3.60	10.19
52.523	10.00	42,483	500.00	467.16	2200.00	116.00	0.825	2.25	10.27
52.853	20.00	41,841	500.00	471.13	2200.00	113.50	0.829	4.80	10.45
53.033	25.00	41,521	500.00	483.20	2200.00	128.50	0.817	5.20	10.61
53.203	30.00	41,200	500.00	471.57	2200.00	110.00	0.828	7.20	10.55
53.543	40.00	40,559	500.00	476.51	2200.00	108.00	0.835	9.25	10.63
53.883	50.00	39,918	500.00	475.01	2200.00	117.00	0.857	4.70	10.59
52.833	0.00	43,124	1000.00	950.87	2200.00	164.50	0.492	4.10	16.39
52.523	10.00	42,483	1000.00	953.95	2200.00	139.50	0.519	3.45	16.51
52.853	20.00	41,841	1000.00	955.26	2200.00	144.50	0.510	7.25	16.89
53.033	25.00	41,521	1000.00	927.65	2200.00	157.00	0.511	9.10	16.39
53.203	30.00	41,200	1000.00	955.47	2200.00	138.00	0.519	6.10	17.05
53.543	40.00	40,559	1000.00	947.55	2200.00	135.00	0.523	7.20	16.37
53.883	50.00	39,918	1000.00	946.67	2200.00	143.00	0.530	7.00	17.03
52.833	0.00	43,124	1500.00	1445.41	2200.00	197.50	0.410	13.70	20.39
52.523	10.00	42,483	1500.00	1457.31	2200.00	173.50	0.417	11.10	20.33
52.853	20.00	41,841	1500.00	1443.16	2200.00	178.00	0.424	14.50	20.30
53.033	25.00	41,521	1500.00	1460.46	2200.00	202.00	0.421	15.15	20.61
53.203	30.00	41,200	1500.00	1451.15	2200.00	163.50	0.435	10.00	20.90
53.543	40.00	40,559	1500.00	1475.41	2200.00	169.00	0.434	8.50	20.45
53.883	50.00	39,918	1500.00	1403.18	2200.00	165.50	0.445	6.15	20.22
52.833	0.00	43,124	2000.00	1988.03	2200.00	265.50	0.368	39.00	21.49
52.523	10.00	42,483	2000.00	2003.51	2200.00	230.50	0.358	35.00	21.54
52.853	20.00	41,841	2000.00	1976.54	2200.00	225.50	0.404	25.00	21.31
53.033	25.00	41,521	2000.00	1974.52	2200.00	249.50	0.401	32.15	21.63
53.203	30.00	41,200	2000.00	2009.98	2200.00	221.50	0.399	18.00	21.92
53.543	40.00	40,559	2000.00	2012.82	2200.00	238.00	0.408	35.50	21.78
53.883	50.00	39,918	2000.00	2007.87	2200.00	217.00	0.415	24.65	21.87

Lampiran 2 Tabel pengujian densitas dan viskositas tanpa pemanasan

CPO 40 %

TEMPERATUR (°C)	DENSITY (GR/ML)
28	0.868

TEMPERATUR (°C)	T1	T2	T3	T rata-rata	VISCOCITY
28	75.46	75.92	76.25	75.88	16.77

CPO 30 %

TEMPERATUR (°C)	DENSITY (GR/ML)
29	0.861

TEMPERATUR (°C)	T1	T2	T3	T rata-rata	VISCOCITY
28	52.26	52.08	52.1	52.15	11.52

CPO 20 %

TEMPERATUR (°C)	DENSITY (GR/ML)
28	0.856

TEMPERATUR (°C)	T1	T2	T3	T rata-rata	VISCOCITY
28	39.13	39.12	39.03	39.09	8.64

CPO 10 %

TEMPERATUR (°C)	DENSITY (GR/ML)
28	0.842

TEMPERATUR (°C)	T1	T2	T3	T rata-rata	VISCOCITY
28	25.72	25.91	25.97	25.87	5.72

Lampiran 3 Tabel pengujian densitas dan viskositas dengan Pemanasan

CPO 100%							
TEMPERATUR (°C)	DENSITY (GR/ML)	TEMPERATUR (°C)	T1	T2	T3	T rata-rata	VISCOCITY
28	0.904	28	387.82	388.57	385.22	387.20	85.57
60	0.88	60	101.12	100.79	100.25	100.72	22.26
70	0.874	70	79.82	79.96	80.2	79.99	17.68
80	0.868	80	61.83	61.99	62.77	62.20	13.75
90	0.862	90	49.73	48.6	53.56	50.63	11.19

CPO 75%							
TEMPERATUR (°C)	DENSITY (GR/ML)	TEMPERATUR (°C)	T1	T2	T3	T rata-rata	VISCOCITY
28.5	0.888	28	167.97	167	167.87	167.61	37.04
60	0.867	60	56.93	57.19	57.39	57.17	12.63
70	0.862	70	47.88	47.59	46.58	47.35	10.46
80	0.854	80	39.87	39.82	39	39.56	8.74
90	0.850	90	31.88	31.74	31.38	31.67	7.00

CPO 50%							
TEMPERATUR (°C)	DENSITY (GR/ML)	TEMPERATUR (°C)	T1	T2	T3	T rata-rata	VISCOCITY
29	0.874	29	101.37	103.02	99.97	101.45	22.42
60	0.854	60	38.07	37.63	37.39	37.70	8.33
70	0.847	70	29.55	29.86	30.3	29.90	6.61
80	0.84	80	25.77	25.49	25.79	25.68	5.68
90	0.832	90	20.38	20.7	20.46	20.51	4.53

CPO 25%							
TEMPERATUR (°C)	DENSITY (GR/ML)	TEMPERATUR (°C)	T1	T2	T3	T rata-rata	VISCOCITY
28	0.858	28	42.2	42.49	42.49	42.39	9.37
60	0.838	60	20.3	20.59	20.77	20.55	4.54
70	0.832	70	16.76	16.54	16.28	16.53	3.65
80	0.826	80	14.61	14.3	14.24	14.38	3.18
90	0.820	90	13.32	13.25	13.02	13.20	2.92

SOLAR 100 %							
TEMPERATUR (°C)	DENSITY (GR/ML)	TEMPERATUR (°C)	T1	T2	T3	T rata-rata	VISCOCITY
30	0.834	31	20.42	20.46	20.45	20.44	4.52
60	0.814	60	11.2	11.3	11.05	11.18	2.47
70	0.808	70	10.01	10	10.02	10.01	2.21
80	0.800	80	9.01	9.03	9.02	9.02	1.99
90	0.793	90	8.85	8.19	8.65	8.56	1.89

Lampiran 4 Tabel pengujian cetane number

Konsentrasi CPO (%)	Cetane Number
Solar	52.2
10	52.523
20	52.863
25	53.033
30	53.203
40	53.543
50	53.883
75	54.733
100	55.583

