

LAMPIRAN

Tabel Data identitas sampel oli bekas

No	Jenis Motor	Tahun Motor	Jenis Oli	Odometer Sebelumnya	Odometer Sekarang	Plat Nomor	Nama Pemilik/Pemakai	Alamat Pemilik / Pemakai	Keterangan
1	Vario PGMFI	2015	MPX2	0	921	AA 4444 XX	Muna	Magelang	Oli Bekas 1
2	Vario PGMFI	2014	MPX2	8360	8360	R 2864 X	Sutarman	Sigaluh, Banjarnegara	Oli Bekas 2
3	Vario PGMFI	2015	MPX2	4403	6410	AB 3089 XX	Eko Wahyu	Jadan no. 48 RT/RW 002, Bantul, Kasihan	Oli Bekas 3
4	Vario PGMFI	2012	MPX2	18479	21226	R 4502 XX	Waslam	Wiramastra, Banjarnegara	Oli Bekas 4
5	Vario PGMFI	2014	MPX2	4800	8464	G 3835XXX	Isna	Pekalongan	Oli Bekas 5

Tabel hasil pengujian konduktivitas termal sampel oli bekas 1 dan 2

Jenis Fluida	T1 (°C)	T2 (°C)	Tegangan Heater (Volt)	Arus Heater (A)	Daya, Qe, (Watt)	(T1-T2) (C)	Qi (Watt)	Qc (Watt)	Tebal spesimen (m)	Luas permukaan (m ²)	Temperatur rata-rata spesimen (°C)	K Eksperimen
Oli Bekas 1	27.7	27.3	38	0.067	2.546	0.4	0.08	2.466	0.00034	0.0133	27.5	0.1576015
	44.7	33.2	185	0.333	61.605	11.5	1.16	60.445	0.00034	0.0133	38.95	0.13436613
	30.6	29.8	49	0.091	4.459	0.8	0.12	4.339	0.00034	0.0133	30.2	0.13865226
	39.8	32.1	148	0.28	41.44	7.7	1.1	40.34	0.00034	0.0133	35.95	0.13392833
	50.6	35	211	0.356	75.116	15.6	2.2	72.916	0.00034	0.0133	42.8	0.11948834
Oli Bekas 2	31	30.3	46	0.083	3.818	0.7	0.11	3.708	0.00034	0.0133	30.65	0.13541568
	47.5	35.2	186	0.335	62.31	12.3	1.6	60.71	0.00034	0.0133	41.35	0.12617764
	28.3	27.6	48	0.088	4.224	0.7	0.11	4.114	0.00034	0.0133	27.95	0.15024275
	38.9	31.2	148	0.279	41.292	7.7	1.1	40.192	0.00034	0.0133	35.05	0.13343697
	49.7	34.4	209	0.352	73.568	15.3	2.1	71.468	0.00034	0.0133	42.05	0.11941186

Tabel hasil pengujian konduktivitas termal sampel oli bekas 3, 4, dan 5

Oli Bekas 3	29.9	29	44	0.079	3.476	0.9	0.14	3.336	0.00034	0.0133	29.45	0.09475689
	46	33.3	183	0.332	60.756	12.7	1.83	58.926	0.00034	0.0133	39.65	0.11861252
	30.4	29.6	48	0.087	4.176	0.8	0.12	4.056	0.00034	0.0133	30	0.12960902
	39.1	31.9	143	0.271	38.753	7.2	1	37.753	0.00034	0.0133	35.5	0.13404365
	50.9	34.9	213	0.359	76.467	16	2.3	74.167	0.00034	0.0133	42.9	0.11849991
Oli Bekas 4	31.1	30.9	29	0.05	1.45	0.2	0.04	1.41	0.00034	0.0133	31	0.18022556
	47.8	35.4	185	0.333	61.605	12.4	1.8	59.805	0.00034	0.0133	41.6	0.12329432
	30.8	30.1	41	0.074	3.034	0.7	0.11	2.924	0.00034	0.0133	30.45	0.1067841
	40.9	33.3	146	0.274	40.004	7.6	1.05	38.954	0.00034	0.0133	37.1	0.13102849
	51.1	36.2	204	0.345	70.38	14.9	2.05	68.33	0.00034	0.0133	43.65	0.11723369
Oli Bekas 5	33.4	33	43	0.07	3.01	0.4	0.08	2.93	0.00034	0.0133	33.2	0.18725564
	49.1	36.4	184	0.333	61.272	12.7	1.83	59.442	0.00034	0.0133	42.75	0.11965118
	29.7	28.4	59	0.113	6.667	1.3	0.26	6.407	0.00034	0.0133	29.05	0.12599075
	40	31.2	157	0.297	46.629	8.8	1.2	45.429	0.00034	0.0133	35.6	0.13197078
	50.9	34.2	219	0.37	81.03	16.7	2.4	78.63	0.00034	0.0133	42.55	0.12036468

Tabel hasil pengujian konduktivitas termal sampel oli baru

Oli Baru	28.4	27.6	48	0.087	4.176	0.8	0.15	4.026	0.00034	0.0133	28	0.12865038
	29.2	28.2	51	0.096	4.896	1	0.2	4.696	0.00034	0.0133	28.7	0.12004812
	30.8	28.1	84	0.17	14.28	2.7	0.4	13.88	0.00034	0.0133	29.45	0.13141743
	30.9	30.4	39	0.069	2.691	0.5	0.1	2.591	0.00034	0.0133	30.65	0.13247218
	32.2	31.1	56	0.106	5.936	1.1	0.22	5.716	0.00034	0.0133	31.65	0.13283937
	35.4	29.3	130	0.252	32.76	6.1	0.9	31.86	0.00034	0.0133	32.35	0.13351904
	35.7	31.9	100	0.196	19.6	3.8	0.5	19.1	0.00034	0.0133	33.8	0.12849228
	39.6	31	157	0.296	46.472	8.6	1.3	45.172	0.00034	0.0133	35.3	0.13427592
	39	33	128	0.247	31.616	6	0.85	30.766	0.00034	0.0133	36	0.13108321
	41.5	31.1	171	0.319	54.549	10.4	1.5	53.049	0.00034	0.0133	36.3	0.13039806
	43	33.3	162	0.303	49.086	9.7	1.4	47.686	0.00034	0.0133	38.15	0.12567429
	44.3	32.2	188	0.337	63.356	12.1	1.75	61.606	0.00034	0.0133	38.25	0.13015622
	44.9	32.4	189	0.338	63.882	12.5	1.8	62.082	0.00034	0.0133	38.65	0.12696469
	45.7	32.8	195	0.345	67.275	12.9	1.9	65.375	0.00034	0.0133	39.25	0.12955354
	46.9	32.6	201	0.352	70.752	14.3	2.1	68.652	0.00034	0.0133	39.75	0.12272822
	46.5	33.7	192	0.341	65.472	12.8	1.85	63.622	0.00034	0.0133	40.1	0.12706461
	46.8	34.4	191	0.339	64.749	12.4	1.8	62.949	0.00034	0.0133	40.6	0.12977601
	47.2	34.2	191	0.343	65.513	13	1.9	63.613	0.00034	0.0133	40.7	0.12509208
	47.8	34.3	188	0.34	63.92	13.5	2	61.92	0.00034	0.0133	41.05	0.11725313
49	33.3	212	0.358	75.896	15.7	2.3	73.596	0.00034	0.0133	41.15	0.11983449	
50.5	34.9	211	0.356	75.116	15.6	2.3	72.816	0.00034	0.0133	42.7	0.11932447	

Tabel Hasil Pengujian Viskositas Sampel Oli Bekas 1

No,	Fluida	Rotor	Speed (rpm)	Percent (%)	Tempera-tur	Viskositas (mPas)	Ket,
1	Oli Bekas 1 Temp, Kamar	1	3	2,2	29,9	54	23,856
		1	6	4,8	30,2	48	
		1	12	9,3	30,3	46,5	
		1	30	23,7	30,5	47,4	
		1	60	47,6	30,5	47,6	
2	Oli Bekas 1 Temp, +- 43	1	3	1,7	44	34	
		1	60	22,2	44	26,7	
		1	12	5,2	44,11	26	
		1	6	2,5	44,2	25	
		1	30	13,2	44,2	26	
3	Oli Bekas 1 Temp, +- 53	1	3	1,1	53,5	22	
		1	30	9,5	53,5	19	
		1	6	2,1	53,8	21	
		1	12	3,8	53,8	19	
		1	60	18	53,8	18	
4	Oli Bekas 1 Temp, +- 65	1	30	7,2	63,4	14,4	
		1	12	2,9	63,5	14,5	
		1	6	1,5	63,9	15	
		1	3	0,7	64	14	
		1	60	13,9	64	13,9	
5	Oli Bekas 1 Temp, +- 75	1	3	0	73,1	0	
		1	6	1,3	73,4	13	
		1	30	5,2	74,2	10,4	
		1	12	21	74,3	10,5	
		1	60	10,5	74,5	10,5	

Tabel Hasil Pengujian Viskositas Sampel Oli Bekas 2

No,	Fluida	Rotor	Speed (rpm)	Percent (%)	Tempera-tur	Viskositas (mPa.s)	Ket,
1	Oli Bekas 2 Temp, Kamar	1	3	2,9	30,4	58	26,884
		1	6	5,9	30,4	59	
		1	12	10,7	30,4	53,5	
		1	30	27,4	30,5	54,8	
		1	60	54,8	30,5	54,8	
2	Oli Bekas 2 Temp, +- 43	1	6	3,2	42,5	32	
		1	3	1,6	43,9	32	
		1	12	5,9	43,9	29,5	
		1	30	15	43,9	30,2	
		1	60	29,6	44	29,6	
3	Oli Bekas 2 Temp, +- 53	1	3	1,1	52,8	22	
		1	6	2,1	53,2	21	
		1	12	4	54	20	
		1	30	9,9	54	19,6	
		1	60	20,9	54	20,9	
4	Oli Bekas 2 Temp, +- 65	1	12	3,1	62,5	15,5	
		1	6	1,8	63	18	
		1	60	16,1	63,1	16,1	
		1	3	0,6	63,4	12	
		1	30	7,3	63,5	14,6	
5	Oli Bekas 2 Temp, +- 75	1	30	5,4	74,2	10,8	
		1	3	0,7	74,3	14	
		1	6	1,3	74,3	13	
		1	12	2,1	74,3	10	
		1	60	11,2	75	11,2	

Tabel Hasil Pengujian Viskositas Sampel Oli Bekas 3

No,	Fluida	Rotor	Speed (rpm)	Percent (%)	Tempera-tur	Viskositas (mPas)	Ket,
1	Oli Bekas 3 Temp, Kamar	1	3	2,9	29,4	58	26,0375
		1	6	5,2	29,4	52	
		1	12	10,4	29,6	52	
		1	30	26,9	29,8	52	
		1	60	52,3	29,9	52,3	
2	Oli Bekas 3 Temp, +- 43	1	3	2	42,5	40	
		1	6	3,1	42,5	31	
		1	12	6	43,1	30	
		1	30	13,8	43,5	27,6	
		1	60	27,6	43,9	27,6	
3	Oli Bekas 3 Temp, +- 53	1	3	1,2	52	24	
		1	6	2,3	52,2	23	
		1	12	4,1	52,3	20,5	
		1	30	10,2	53	20,6	
		1	60	20	53,2	20	
4	Oli Bekas 3 Temp, +- 65	1	3	0,7	62,7	14	
		1	12	2,9	62,7	14,5	
		1	6	1,7	62,8	17	
		1	30	7,1	63	14,2	
		1	60	14,3	63,2	14,3	
5	Oli Bekas 3 Temp, +- 75	1	3	0	73,4	0	
		1	6	1,3	73,9	1,3	
		1	12	2,1	73,9	2,1	
		1	30	5,4	73,9	5,4	
		1	60	11,5	74,1	11,5	

Tabel Hasil Pengujian Viskositas Sampel Oli Bekas 4

No,	Fluida	Rotor	Speed (rpm)	Percent (%)	Tempera-tur	Viskositas (mPas)	Ket,
1	Oli Bekas 4 Temp, Kamar	1	3	2,4	30	48	22,42
		1	6	4,6	30,2	46	
		1	12	9,2	30,3	46	
		1	30	23,4	30,4	46,8	
		1	60	47	30,5	47	
2	Oli Bekas 4 Temp, +- 43	1	60	27,2	42	27,2	
		1	12	5,3	43,9	26,6	
		1	30	13	43,9	26,2	
		1	6	2,6	44	26	
		1	3	1,3	44,3	26	
3	Oli Bekas 4 Temp, +- 53	1	6	1	53,1	10	
		1	3	0,7	53,3	14	
		1	30	9,5	53,3	19	
		1	60	18,5	53,5	18,5	
		1	12	3	53,8	19	
4	Oli Bekas 4 Temp, +- 65		3	0,8	63,5	16	
		1	6	1,5	63,6	15	
		1	30	6,2	63,6	13,4	
		1	12	2,6	63,9	13	
		1	60	14,1	64	14,1	
5	Oli Bekas 4 Temp, +- 73	1	3	0	73,8	0	
		1	6	1,3	74	13	
		1	12	1,9	75	9,5	
		1	30	4,9	75	9,8	
		1	60	10,4	75	10,4	

Tabel Hasil Pengujian Viskositas Sampel Oli Bekas 5

No,	Fluida	Rotor	Speed (rpm)	Percent (%)	Tempera-tur	Viskositas (mPas)	Ket,
1	Oli Bekas 5 Temp, Kamar	1	3	3,4	28,2	68	28,224
		1	6	6,4	28,2	64	
		1	12	2,2	28,2	61	
		1	30	30,4	28,2	60,8	
		1	60	61,5	28,2	61,5	
2	Oli Bekas 5 Temp, +- 43	1	60	32,6	43	32,6	
		1	30	15,9	43,3	31,8	
		1	12	6,3	43,5	31,5	
		1	6	3,2	43,9	32	
		1	3	1,9	44,3	38	
3	Oli Bekas 5 Temp, +- 53	1	12	4,9	52	24,5	
		1	6	2,2	52,1	22	
		1	30	11,5	52,1	23	
		1	3	1,8	52,6	36	
		1	60	21,5	52,9	21,5	
4	Oli Bekas 1 Temp, +- 65	1	3	0,8	63	16	
		1	6	1,6	64	16	
		1	30	7,4	64,2	14,8	
		1	12	2,9	64,3	14,5	
		1	60	15,3	64,3	15,3	
5	Oli Bekas 5 Temp, +- 75	1	3	0	74,2	0	
		1	6	1,3	74,5	1,3	
		1	60	11,8	74,6	11,8	
		1	30	5,5	74,7	5,5	
		1	12	2,2	74,9	2,2	

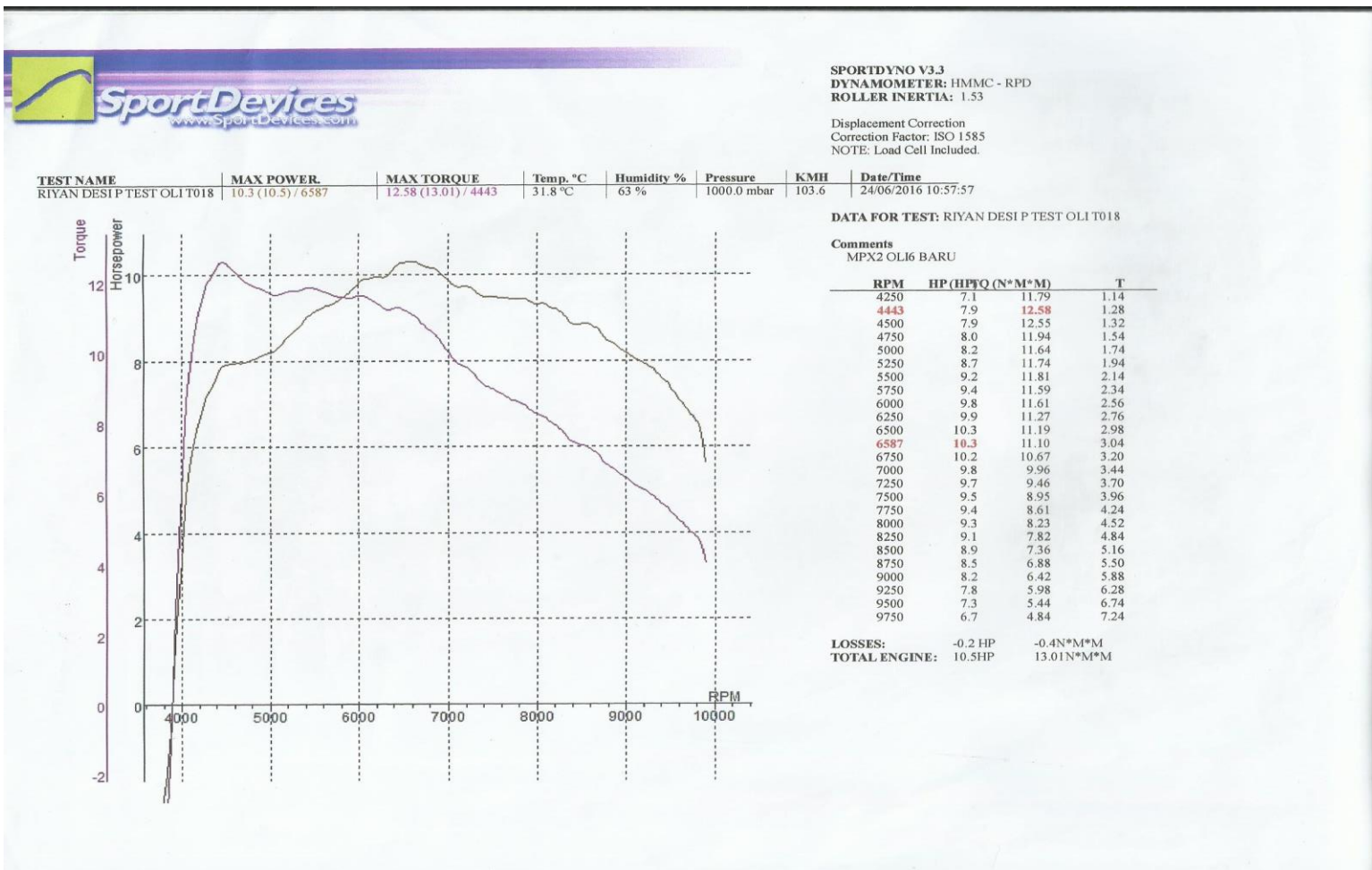
Tabel Hasil Pengujian Viskositas Sampel Oli Baru

No,	Fluida	Rotor	Speed (rpm)	Perセント (%)	Tempera-tur	Viskositas (mPas)	Ket,
1	Oli Baru Temp, Kamar	1,5	1	2,9	28,4	116	51,34828
		3	1	5,5	28,4	110	
		6	1	11	28,4	110	
		12	1	21,7	28,4	108,5	
		30	1	54,3	28,4	108,8	
		60	1	100	28,4	100	
2	Oli Baru Temp, +- 43	12	1	10,2	43,1	51	
		3	1	3,2	43,4	64	
		6	1	5,8	43,4	58	
		30	1	26,3	43,4	52,6	
		1,5	1	1,8	43,5	72	
		60	1	51,5	43,7	51,5	
3	Oli Baru Temp, +- 53	60	1	35,7	53	35,7	
		30	1	17,3	53,1	34,6	
		12	1	6,9	53,8	34,5	
		1,5	1	1,1	53,9	44	
		3	1	2,1	53,9	42	
		6	1	3,4	53,9	34	
4	Oli Baru Temp, +- 65	1,5	1	0,7	59,4	28	
		3	1	1,7	61,1	34	
		6	1	2,4	61,5	24	
		60	1	25,7	62,2	25,7	
		12	1	5,2	62,4	26	
		30	1	12,6	62,4	25,2	
5	Oli Baru Temp, +- 75	6	1	2,1	68,2	21	
		3	1	1,1	68,6	22	
		12	1	3,9	71,5	19,5	
		60	1	18,7	71,8	18,7	
		30	1	8,9	72	17,8	

Tabel hasil data pengujian konsumsi bahan bakar

Sampel Oli	Odometer Awal	Odometer Akhir	Jarak (KM)	Waktu (jam)	Volume BBM (Liter)
Oli Baru	35130,6	35135,6	5	0,155	0,084
	36120	36125,1	5,1	0,1545	0,078
Oli Bekas 1	35145,6	35150,6	5	0,156	0,091
	36104,7	36109,8	5,1	0,155	0,087
Oli Bekas 2	35155,6	35160,6	5	0,161	0,085
	36114,9	36120	5,1	0,1545	0,089
Oli Bekas 3	35140,6	35145,6	5	0,157	0,084
	36099,6	36104,7	5,1	0,1675	0,095
Oli Bekas 4	35150,6	35155,6	5	0,152	0,087
	36109,8	36114,9	5,1	0,152	0,093
Oli Bekas 5	35135,6	35140,6	5	0,1555	0,088
	36094,5	36099,6	5,1	0,1683	0,008

Pengujian Kinerja Sepeda Motor Terhadap Daya dan Torsi





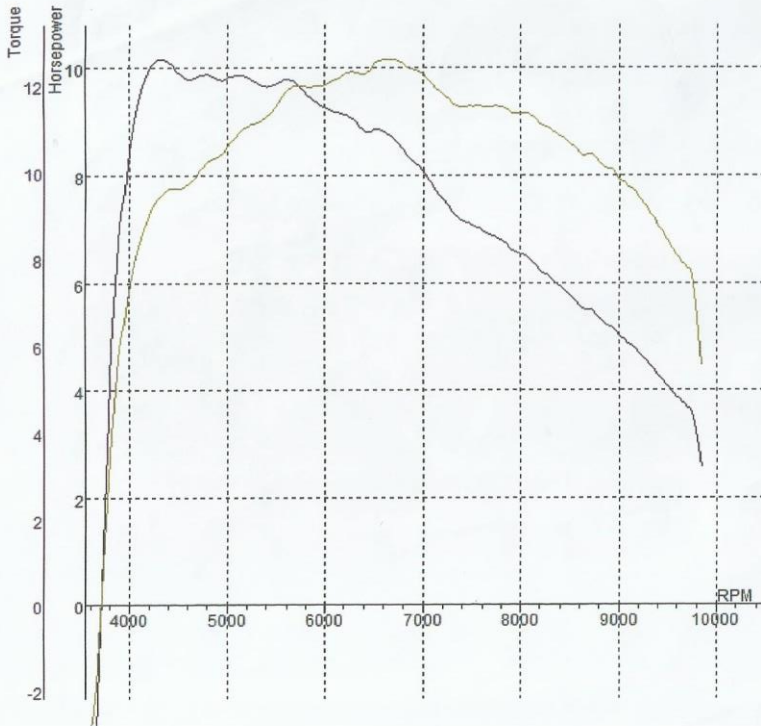
SPORTDYNO V3.3
DYNAMOMETER: HMMC - RPD
ROLLER INERTIA: 1.53

Displacement Correction
 Correction Factor: ISO 1585
 NOTE: Load Cell Included.

TEST NAME	MAX POWER	MAX TORQUE	Temp. °C	Humidity %	Pressure	KMH	Date/Time
RIYAN DESI P TEST OLI T003	10.2 (10.5) / 6882	12.59 (13.18) / 4340	31.8 °C	63 %	1000.0 mbar	103.0	24/06/2016 10:21:18

DATA FOR TEST: RIYAN DESI P TEST OLI T003

Comments
 MPX2 OLI1



RPM	HP (HP/Q)	(N*M*M)	T
4000	6.1	10.85	1.04
4250	7.5	12.53	1.22
4340	7.7	12.59	1.28
4500	7.8	12.24	1.42
4750	8.2	12.23	1.60
5000	8.5	12.15	1.80
5250	9.0	12.11	2.00
5500	9.3	12.04	2.20
5750	9.7	11.92	2.40
6000	9.7	11.46	2.62
6250	9.9	11.26	2.82
6500	10.1	10.98	3.04
6682	10.2	10.78	3.20
6750	10.1	10.58	3.28
7000	9.9	9.95	3.52
7250	9.4	9.18	3.78
7500	9.3	8.76	4.04
7750	9.3	8.46	4.34
8000	9.1	8.08	4.62
8250	8.9	7.63	4.94
8500	8.6	7.12	5.28
8750	8.3	6.74	5.62
9000	7.9	6.20	6.02
9250	7.5	5.70	6.44
9500	6.8	5.03	6.94
9750	6.1	4.43	7.52

LOSSES: -0.3 HP -0.6N*M*M
 TOTAL ENGINE: 10.5HP 13.18N*M*M



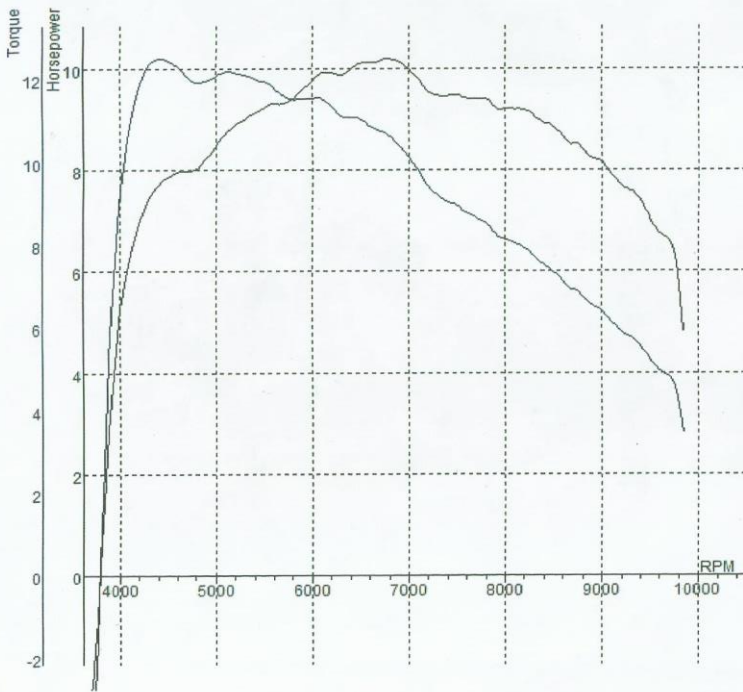
SPORTDYNO V3.3
DYNAMOMETER: HMMC - RPD
ROLLER INERTIA: 1.53

Displacement Correction
 Correction Factor: ISO 1585
 NOTE: Load Cell Included.

TEST NAME	MAX POWER.	MAX TORQUE	Temp. °C	Humidity %	Pressure	KMH	Date/Time
RIYAN DESI P TEST OLI T006	10.2(10.3) / 6771	12.50(12.76) / 4424	31.8 °C	63 %	1000.0 mbar	103.2	24/06/2016 10:28:43

DATA FOR TEST: RIYAN DESI P TEST OLI T006

Comments
 MPX2 OLI2



RPM	HP (HP)	T (N*M)	T (LBS*FT)
4250	7.3	12.25	1.22
4424	7.8	12.50	1.34
4500	7.9	12.44	1.40
4750	8.0	11.96	1.60
5000	8.5	12.09	1.80
5250	9.0	12.10	2.00
5500	9.3	11.93	2.20
5750	9.3	11.54	2.40
6000	9.8	11.54	2.62
6250	9.9	11.21	2.82
6500	10.1	11.02	3.04
6750	10.2	10.67	3.28
6771	10.2	10.67	3.28
7000	10.0	10.10	3.50
7250	9.5	9.26	3.76
7500	9.5	8.93	4.04
7750	9.4	8.58	4.32
8000	9.2	8.14	4.60
8250	9.1	7.81	4.92
8500	8.8	7.34	5.24
8750	8.5	6.84	5.60
9000	8.1	6.39	5.98
9250	7.6	5.81	6.38
9500	7.1	5.24	6.86
9750	6.4	4.65	7.42

LOSSES: -0.1 HP -0.3N*M*M
 TOTAL ENGINE: 10.3HP 12.76N*M*M



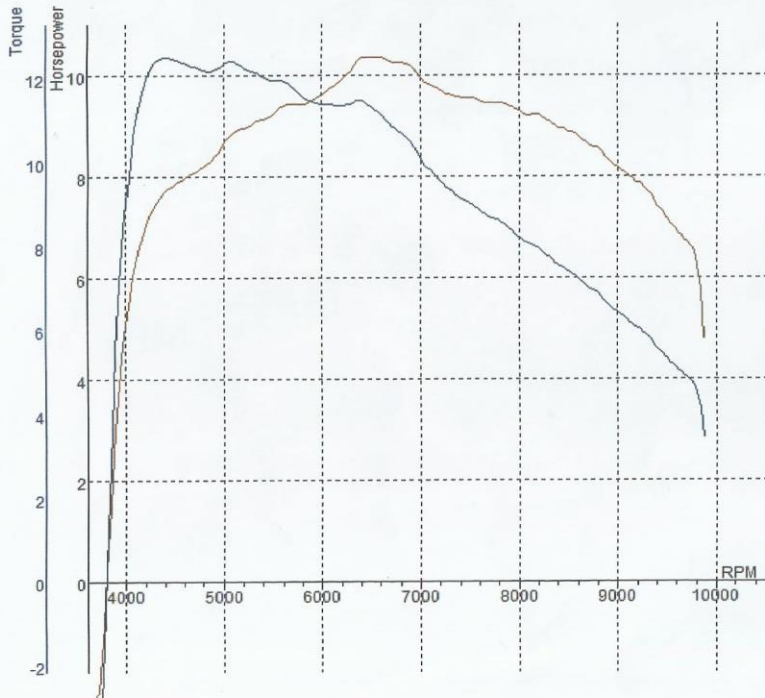
SPORTDYNO V3.3
DYNAMOMETER: HMMC - RPD
ROLLER INERTIA: 1.53

Displacement Correction
 Correction Factor: ISO 1585
 NOTE: Load Cell Included.

TEST NAME	MAX POWER	MAX TORQUE	Temp. °C	Humidity %	Pressure	KMH	Date/Time
RIYAN DESI P TEST OLI T009	10.4 (10.5) / 6444	12.50 (12.75) / 4392	31.8 °C	63 %	1000.0 mbar	103.5	24/06/2016 10:34:51

DATA FOR TEST: RIYAN DESI P TEST OLI T009

Comments
 MPX2 OLB



RPM	HP (HPTQ (N*M*M))	T
4250	7.3	12.27
4392	7.7	12.50
4500	7.9	12.43
4750	8.1	12.22
5000	8.7	12.35
5250	9.0	12.17
5500	9.3	11.94
5750	9.4	11.58
6000	9.6	11.37
6250	10.0	11.37
6444	10.4	11.40
6500	10.3	11.26
6750	10.3	10.75
7000	9.9	10.03
7250	9.6	9.40
7500	9.5	9.00
7750	9.4	8.62
8000	9.3	8.18
8250	9.1	7.83
8500	8.9	7.38
8750	8.6	6.93
9000	8.2	6.40
9250	7.8	5.97
9500	7.1	5.30
9750	6.6	4.76

LOSSES: -0.1 HP -0.2N*M*M
TOTAL ENGINE: 10.5HP 12.75N*M*M



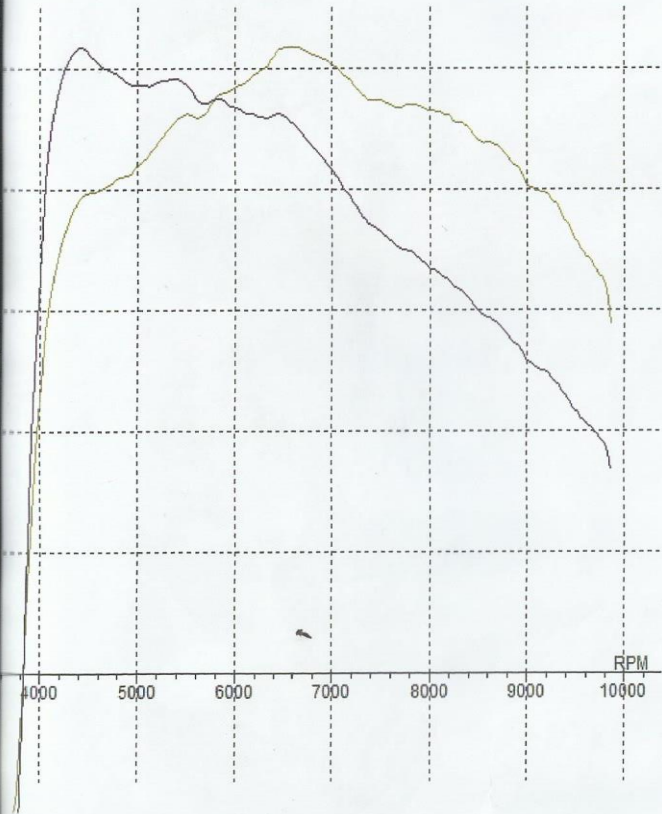
SPORTDYNO V3.3
 DYNAMOMETER: HMMC - RPD
 ROLLER INERTIA: 1.53

Displacement Correction
 Correction Factor: ISO 1585
 NOTE: Load Cell Included.

OLI T011	MAX POWER 10.4 (10.5) / 6504	MAX TORQUE 12.70 (13.03) / 4398	Temp. °C 31.8 °C	Humidity % 63 %	Pressure 1000.0 mbar	KMH 103.2	Date/Time 24/06/2016 10:43:14
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DATA FOR TEST: RYAN DESI P TEST OLI T011

Comments
 MPX2 OLI4



RPM	HP (HP)	T (N*M)	T (LBS*FT)
4250	7.4	12.34	1.20
4398	7.8	12.70	1.30
4500	7.9	12.51	1.40
4750	8.1	12.19	1.58
5000	8.4	11.93	1.78
5250	8.9	12.01	1.98
5500	9.2	11.93	2.18
5750	9.4	11.60	2.38
6000	9.7	11.46	2.60
6250	9.9	11.29	2.80
6500	10.4	11.29	3.02
6504	10.4	11.29	3.02
6750	10.2	10.76	3.24
7000	10.1	10.17	3.48
7250	9.6	9.40	3.74
7500	9.5	8.93	4.00
7750	9.4	8.57	4.28
8000	9.3	8.21	4.58
8250	9.1	7.81	4.88
8500	8.8	7.33	5.20
8750	8.6	6.94	5.56
9000	8.1	6.32	5.92
9250	7.8	5.98	6.34
9500	7.1	5.27	6.80
9750	6.6	4.76	7.30

LOSSES: -0.2 HP -0.3N*M*M
 TOTAL ENGINE: 10.5HP 13.03N*M*M



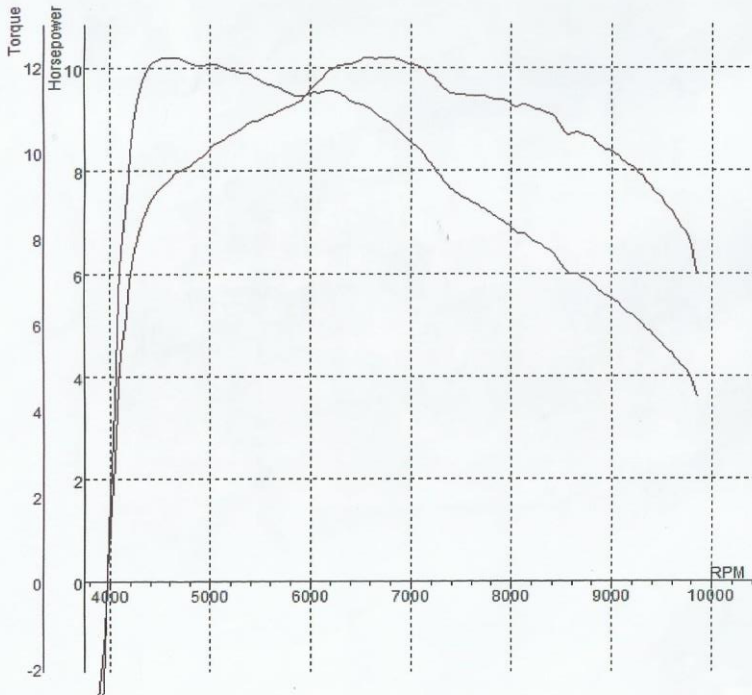
SPORTDYNO V3.3
DYNAMOMETER: HMMC - RPD
ROLLER INERTIA: 1.53

Displacement Correction
 Correction Factor: ISO 1585
 NOTE: Load Cell Included.

TEST NAME	MAX POWER.	MAX TORQUE	Temp. °C	Humidity %	Pressure	KMH	Date/Time
RIYAN DESI P TEST OLI T015	10.2 (10.4) / 6777	12.17 (12.54) / 4625	31.8 °C	63 %	1000.0 mbar	103.2	24/06/2016 10:49:54

DATA FOR TEST: RIYAN DESI P TEST OLI T015

Comments
 MPX2 OLIS



RPM	HP (HP/Q (N*M*M))	T
4250	6.7	11.17
4500	7.7	12.15
4625	7.9	12.17
4750	8.1	12.06
5000	8.4	12.01
5250	8.7	11.84
5500	9.0	11.59
5750	9.2	11.38
6000	9.6	11.35
6250	10.0	11.38
6500	10.2	11.08
6750	10.2	10.71
6777	10.2	10.67
7000	10.1	10.18
7250	9.7	9.50
7500	9.5	8.94
7750	9.4	8.61
8000	9.3	8.18
8250	9.2	7.85
8500	8.8	7.30
8750	8.7	6.99
9000	8.4	6.55
9250	8.0	6.08
9500	7.4	5.49
9750	6.7	4.88

LOSSES: -0.2 HP -0.4N*M*M
TOTAL ENGINE: 10.4HP 12.54N*M*M

Tabel Properties A-13

B-2
APPENDIX I

TABLE A-13

Properties of liquids

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	Dynamic Viscosity μ , kg/m·s	Kinematic Viscosity ν , m ² /s	Prandtl Number Pr	Volume Expansion Coeff. β , 1/K
<i>Methane (CH₄)</i>								
-160	420.2	3492	0.1863	1.270×10^{-7}	1.133×10^{-4}	2.699×10^{-7}	2.126	0.00352
-150	405.0	3580	0.1703	1.174×10^{-7}	9.169×10^{-5}	2.264×10^{-7}	1.927	0.00391
-140	388.8	3700	0.1550	1.077×10^{-7}	7.551×10^{-5}	1.942×10^{-7}	1.803	0.00444
-130	371.1	3875	0.1402	9.749×10^{-8}	6.288×10^{-5}	1.694×10^{-7}	1.738	0.00520
-120	351.4	4146	0.1258	8.634×10^{-8}	5.257×10^{-5}	1.496×10^{-7}	1.732	0.00637
-110	328.8	4611	0.1115	7.356×10^{-8}	4.377×10^{-5}	1.331×10^{-7}	1.810	0.00841
-100	301.0	5578	0.0967	5.761×10^{-8}	3.577×10^{-5}	1.188×10^{-7}	2.063	0.01282
-90	261.7	8902	0.0797	3.423×10^{-8}	2.761×10^{-5}	1.055×10^{-7}	3.082	0.02922
<i>Methanol (CH₃(OH))</i>								
20	788.4	2515	0.1987	1.002×10^{-7}	5.857×10^{-4}	7.429×10^{-7}	7.414	0.00118
30	779.1	2577	0.1980	9.862×10^{-8}	5.088×10^{-4}	6.531×10^{-7}	6.622	0.00120
40	769.6	2644	0.1972	9.690×10^{-8}	4.460×10^{-4}	5.795×10^{-7}	5.980	0.00123
50	760.1	2718	0.1965	9.509×10^{-8}	3.942×10^{-4}	5.185×10^{-7}	5.453	0.00127
60	750.4	2798	0.1957	9.320×10^{-8}	3.510×10^{-4}	4.677×10^{-7}	5.018	0.00132
70	740.4	2885	0.1950	9.128×10^{-8}	3.146×10^{-4}	4.250×10^{-7}	4.655	0.00137
<i>Isobutane (R600a)</i>								
-100	683.8	1881	0.1383	1.075×10^{-7}	9.305×10^{-4}	1.360×10^{-6}	12.65	0.00142
-75	659.3	1970	0.1357	1.044×10^{-7}	5.624×10^{-4}	8.531×10^{-7}	8.167	0.00150
-50	634.3	2069	0.1283	9.773×10^{-8}	3.769×10^{-4}	5.942×10^{-7}	6.079	0.00161
-25	608.2	2180	0.1181	8.906×10^{-8}	2.688×10^{-4}	4.420×10^{-7}	4.863	0.00177
0	580.6	2306	0.1068	7.974×10^{-8}	1.993×10^{-4}	3.432×10^{-7}	4.304	0.00199
25	550.7	2455	0.0956	7.069×10^{-8}	1.510×10^{-4}	2.743×10^{-7}	3.880	0.00232
50	517.3	2640	0.0851	6.233×10^{-8}	1.155×10^{-4}	2.233×10^{-7}	3.582	0.00286
75	478.5	2896	0.0757	5.460×10^{-8}	8.785×10^{-5}	1.836×10^{-7}	3.363	0.00385
100	429.6	3361	0.0669	4.634×10^{-8}	6.483×10^{-5}	1.509×10^{-7}	3.256	0.00628
<i>Glycerin</i>								
0	1276	2262	0.2820	9.773×10^{-8}	10.49	8.219×10^{-3}	84,101	
5	1273	2288	0.2835	9.732×10^{-8}	6.730	5.287×10^{-3}	54,327	
10	1270	2320	0.2846	9.662×10^{-8}	4.241	3.339×10^{-3}	34,561	
15	1267	2354	0.2856	9.576×10^{-8}	2.496	1.970×10^{-3}	20,570	
20	1264	2386	0.2860	9.484×10^{-8}	1.519	1.201×10^{-3}	12,671	
25	1261	2416	0.2860	9.388×10^{-8}	0.9934	7.878×10^{-4}	8,392	
30	1258	2447	0.2860	9.291×10^{-8}	0.6582	5.232×10^{-4}	5,631	
35	1255	2478	0.2860	9.195×10^{-8}	0.4347	3.464×10^{-4}	3,767	
40	1252	2513	0.2863	9.101×10^{-8}	0.3073	2.455×10^{-4}	2,697	
<i>Engine Oil (unused)</i>								
0	899.0	1797	0.1469	9.097×10^{-8}	3.814	4.242×10^{-3}	46,636	0.00070
20	888.1	1881	0.1450	8.680×10^{-8}	0.8374	9.429×10^{-4}	10,863	0.00070
40	876.0	1964	0.1444	8.391×10^{-8}	0.2177	2.485×10^{-4}	2,962	0.00070
60	863.9	2048	0.1404	7.934×10^{-8}	0.07999	8.565×10^{-5}	1,080	0.00070
80	852.0	2132	0.1380	7.599×10^{-8}	0.03232	3.794×10^{-5}	499.3	0.00070
100	840.0	2220	0.1367	7.330×10^{-8}	0.01718	2.046×10^{-5}	279.1	0.00070
120	828.9	2308	0.1347	7.042×10^{-8}	0.01029	1.241×10^{-5}	176.3	0.00070
140	816.8	2395	0.1330	6.798×10^{-8}	0.006558	8.029×10^{-6}	118.1	0.00070
150	810.3	2441	0.1327	6.708×10^{-8}	0.005344	6.595×10^{-6}	98.31	0.00070

Source: Data generated from the EES software developed by S. A. Klein and F. L. Alvarado. Originally based on various sources.

Grafik Kalibrasi

Grafik 1 Kalibrasi Q_i 