

DAFTAR PUSTAKA

- [1] A. Li, Z. Zheng, and T. Peng, "Effect of water injection on the knock, combustion, and emissions of a direct injection gasoline engine," *Fuel*, 2020, doi: 10.1016/j.fuel.2020.117376.
- [2] Administration U.S. Energy Information, *August 2020, Monthly Energy Review*. 2020.
- [3] A. Fitriyatus Sa'adah, A. Fauzi, and B. Juanda, "Peramalan Penyediaan dan Konsumsi Bahan Bakar Minyak Indonesia dengan Model Sistem Dinamik Prediction of Fuel Supply and Consumption in Indonesia with System Dynamics Model," *J. Ekon. dan Pembang. Indones.*, 2017, doi: 10.21002/jepi.v17i2.661.
- [4] H. Zabed, J. N. Sahu, A. Suely, A. N. Boyce, and G. Faruq, "Bioethanol production from renewable sources: Current perspectives and technological progress," *Renewable and Sustainable Energy Reviews*. 2017, doi: 10.1016/j.rser.2016.12.076.
- [5] M. Koç, Y. Sekmen, T. Topgül, and H. S. Yücesu, "The effects of ethanol-unleaded gasoline blends on engine performance and exhaust emissions in a spark-ignition engine," *Renew. Energy*, 2009, doi: 10.1016/j.renene.2009.01.018.
- [6] A. Elfakhany, "Investigations on the effects of ethanol–methanol–gasoline blends in a spark-ignition engine: Performance and emissions analysis," *Eng. Sci. Technol. an Int. J.*, 2015, doi: 10.1016/j.jestch.2015.05.003.
- [7] S. R. Jhang, Y. C. Lin, K. S. Chen, S. L. Lin, and S. Batterman, "Evaluation of fuel consumption, pollutant emissions and well-to-wheel GHGs assessment from a vehicle operation fueled with bioethanol, gasoline and hydrogen," *Energy*, 2020, doi: 10.1016/j.energy.2020.118436.
- [8] N. Sharma, C. Patel, N. Tiwari, and A. K. Agarwal, "Experimental investigations of noise and vibration characteristics of gasoline-methanol blend fuelled gasoline direct injection engine and their relationship with combustion characteristics," *Appl. Therm. Eng.*, 2019, doi: 10.1016/j.applthermaleng.2019.113754.
- [9] F. Putri and G. Suharto, "PENGARUH PEMBERIAN RANITIDIN TERHADAP GAMBARAN HISTOPATOLOGI PANKREAS TIKUS WISTAR PADA PEMBERIAN METANOL DOSIS BERTINGKAT," *DIPONEGORO Med. J. (JURNAL Kedokt. DIPONEGORO)*, 2017.
- [10] B. S. Nuthan Prasad, J. K. Pandey, and G. N. Kumar, "Impact of changing compression ratio on engine characteristics of an SI engine fueled with equi-volume blend of methanol and gasoline," *Energy*, 2020, doi: 10.1016/j.energy.2019.116605.

- [11] Erdiwansyah, M. S. M. Sani, R. Mamat, J. M. Zikri, N. F. D. Razak, and Munawir, "Experimental investigation of vibrations and noise characterization for spark ignition engine," 2019, doi: 10.1088/1742-6596/1262/1/012014.
- [12] V. Soloiu *et al.*, "Combustion performance, noise, and vibrations of an IDI engine fueled with carinata biofuel," 2016, doi: 10.1115/IMECE201667051.
- [13] J. kumar, "Performance Study of Ethanol Blended Gasoline Fuel in Spark Ignition Engine," *IOSR J. Mech. Civ. Eng.*, 2013, doi: 10.9790/1684-0737178.
- [14] I. Wiratmaja, "Analisa Unjuk Kerja Motor Bensin Akibat Pemakaian Biogasoline," *J. Energi Dan Manufaktur*, 2010.
- [15] A. F. I. Kamil, "Analisis Penggunaan Venturi Mixer 12 Lubang Menyilang Terhadap Perubahan Performa dan Emisi Pada Sepeda Motor 4 Langkah/125 CC Dengan Penambahan LPG," Depok, 2008.
- [16] M. Ilham, "Pengaruh Bahan Bakar Peralite Dan Premium Terhadap Performa Mesin Motor Yamaha Jupiter Z – Cw Tahun 2010," *Mech. Eng. Mach.*, 2016.
- [17] E. RETNOKTAPIAN, *ANALISA KINERJA MOTOR BENSIN MODEL TVI DENGAN VARIASI KOMPRESI DAN MENGGUNAKAN BAHAN BAKAR PREMIUM, PERTALITE DAN PERTAMAX*. FAKULTAS TEKNIK UNIVERSITAS HASANUDDIN, 2019.
- [18] S. Mulyono, G. Gunawan, and B. Maryanti, "Pengaruh Penggunaan dan Perhitungan Efisiensi Bahan Bakar Premium dan Pertamina Terhadap Unjuk Kerja Motor Bakar Bensin," *JTT (Jurnal Teknol. Terpadu)*, 2014, doi: 10.32487/jtt.v2i1.38.
- [19] PT. Pertamina, "Bahan Bakar Minyak," Jakarta, 2014.
- [20] D. P. UTOMO, "ANALISIS MATEMATIS DAN EKONOMIS PENGGUNAAN METANOL DAN ETANOL PADA KOMPOR 'HD,'" *J. Tek. Ind.*, 2012, doi: 10.22219/jtiumm.vol11.no1.50-55.
- [21] I. Hafizullah, "Kajian Eksperimental Pengaruh Penggunaan Bahan Bakar Premium, Peralite, dan Pertamina Terhadap Unjuk Kerja Motor 2 Langkah 135 cc," Pontianak: Fakultas Teknik Program Studi Teknik Mesin Universitas Muhammadiyah Pontianak, 2016.
- [22] X. Zhen and Y. Wang, "An overview of methanol as an internal combustion engine fuel," *Renewable and Sustainable Energy Reviews*. 2015, doi: 10.1016/j.rser.2015.07.083.
- [23] MUHAMMAD MARDUANSYAH, "PENENTUAN KONVERSI CO YANG MENJADI METANOL PADA METANOL REAKTOR DI PT. KALTIM METANOL INDUSTRI BONTANG," Medan, 2013.

- [24] M. R. N. NATSIR, *PRODUKSI BIO OIL DARI LIMBAH KULIT BIJI METE DENGAN METODE MICROWAVE PIROLISIS*. Gowa: DEPARTEMEN MESIN FAKULTAS TEKNIK UNIVERSITAS HASANUDDIN, 2020.
- [25] ISO 10816., “Analisis Analisa High Vibration Pada Pompa Amine C1 G-1C,” 1995.
- [26] A. D. Haholongan, *Uji Eksperimental Perbandingan Unjuk Kerja Motor Bakar Berbahan Bakar Premium Dengan Campuran Premium Bioetanol (Gasohol BE-35 dan BE-40)*. Medan: Departemen Teknik Mesin Fakultas Teknik Universitas Sumatera Utara., 2009.
- [27] M. A. SYAIFULLAH, “ANALISIS PENGARUH VARIASI VOLUME OKSIGEN TERHADAP NILAI KALORI BAHAN BAKAR GASOLINE MENGGUNAKAN ALAT KALORIMETER BOM,” 2019.
- [28] G. D. Haryadi, “Pengujian Campuran Bahan Bakar Premium – Methanol Pada Mesin Sepeda Motor 4 Langkah Pengaruh Terhadap Emisi Gas Buang,” *Rotasi*, vol. 8, no. 2, pp. 19-29–29, 2006, doi: 10.14710/rotasi.8.2.19-29.
- [29] MENTERI NEGARA LINGKUNGAN HIDUP, “PERATURAN MENTERI NEGARA LINGKUNGAN HIDUP TENTANG AMBANG BATAS EMISI GAS BUANG KENDARAAN BERMOTOR LAMA. LAMA,” 2006.
- [30] B. B. Mandal and A. K. Srivastava, “Risk from vibration in Indian mines,” *Indian Journal of Occupational and Environmental Medicine*. 2006.
- [31] R. Marisdayana, Suhartono, and Nurjazuli, “The Relationship Between Noise Exposure and Work Period with Hearing Disorder on Workers of ‘Industry X,’” *J. Kesehatan. Lingkungan. Indones.* <http://ejournal.undip.ac.id/index.php/jkli>, 2016.
- [32] S. Djalante, “Analisis Tingkat Kebisingan di Jalan Raya yang Menggunakan Alat pemberi Isyarat Lalu Lintas (APIL) (Studi kasus: Simpang Ade Swalayan),” *J. SMARTek*, 2010.
- [33] (LH). Peraturan Menteri Negara Lingkungan Hidup Nomor 07 Tahun 2009, “Ambang Batas Kebisingan Kendaraan Bermotor Tipe Baru,” 2009.
- [34] S. Iliev, “A comparison of ethanol and methanol blending with gasoline using a 1-D engine model,” *Procedia Eng.*, vol. 100, no. January, pp. 1013–1022, 2015, doi: 10.1016/j.proeng.2015.01.461.
- [35] A. S. Bambang Sulistyono, Jayan Sentanuhady, “Pemanfaatan Etanol Sebagai Octane Improver Bahan Bakar Bensin Pada Sistem Bahan Bakar Injeksi Sepeda Motor 4 Langkah 1 Silinder,” *Thermofluid Semin. Nas. 2009*, vol. 3, pp. 3–7, 2009.
- [36] A. K. Agarwal, H. Karare, and A. Dhar, “Combustion, performance,

emissions and particulate characterization of a methanol-gasoline blend (gasohol) fuelled medium duty spark ignition transportation engine,” *Fuel Process. Technol.*, vol. 121, no. X, pp. 16–24, 2014, doi: 10.1016/j.fuproc.2013.12.014.

- [37] C. Gong, F. Liu, J. Sun, and K. Wang, “Effect of compression ratio on performance and emissions of a stratified-charge DISI (direct injection spark ignition) methanol engine,” *Energy*, vol. 96, no. X, pp. 166–175, 2016, doi: 10.1016/j.energy.2015.12.062.
- [38] M. M. S. Ashkan Moosavian Seyed, Gholamhassan Najafi , Barat Ghobadian, “Piston scuffing fault and its identification in an IC engine by vibration analysis,” *Appl.Acoust*, vol. 102, pp. 40–48, 2016.
- [39] D. Alexandru, D. Ilie, and T. Dragos, “Evaluation of performance and emissions characteristics of methanol blend (gasohol) in a naturally aspirated spark ignition engine,” 2017, doi: 10.1088/1757-899X/252/1/012086.

LAMPIRAN

Tabel 6. Data pengujian performa premium

	Beban 1
--	---------

	putaran (rpm)	Torsi (Nm)	BP (kw)	FC (kg/h)	SFC (kg/kwh)	Ma (kg/h)	AFR	η_{th} (%)	Mth (kg/kwh)	η_{vol} (%)
rasio 6	1204	1,73	0,22	0,61	2,79	7,65	12,59	2,68	27,93	27,40
	1413	1,76	0,26	0,70	2,67	9,32	13,40	2,80	32,78	28,42
	1622	1,74	0,30	0,78	2,65	10,04	12,84	2,83	37,63	26,68
	1807	1,75	0,33	0,83	2,49	10,73	13,00	3,00	41,92	25,60
rasio 8	1209	1,72	0,22	0,61	2,79	7,87	12,94	2,68	28,05	28,07
	1408	1,76	0,26	0,65	2,51	8,86	13,59	2,98	32,67	27,11
	1613	1,74	0,29	0,74	2,51	9,73	13,17	2,98	37,42	25,99
	1818	1,68	0,32	0,91	2,85	12,45	13,64	2,62	42,18	29,51
rasio 10	1200	1,76	0,22	0,56	2,55	7,43	13,16	2,93	27,84	26,69
	1418	1,76	0,26	0,65	2,49	8,87	13,61	3,00	32,90	26,96
	1616	1,78	0,30	0,74	2,45	9,73	13,18	3,05	37,49	25,96
	1811	1,77	0,34	0,83	2,46	10,92	13,23	3,04	42,02	25,98
Beban 5										
	putaran (rpm)	Torsi (Nm)	BP (kw)	FC (kg/h)	SFC (kg/kwh)	Ma (kg/h)	AFR	η_{th} (%)	Mth (kg/kwh)	η_{vol} (%)
rasio 6	1227	9,2	1,18	0,78	0,66	9,93	12,69	11,31	28,47	34,86
	1398	9,18	1,34	0,83	0,61	10,70	12,97	12,18	32,44	33,00
	1603	9,21	1,55	1,04	0,67	13,35	12,81	11,09	37,19	35,91
	1793	9,22	1,73	1,17	0,68	14,81	12,63	11,04	41,60	35,60
rasio 8	1197	9,21	1,15	0,61	0,53	8,23	13,54	14,20	27,77	29,65
	1402	9,2	1,35	0,78	0,58	9,89	12,65	12,92	32,53	30,41
	1596	9,02	1,51	0,83	0,55	10,32	12,51	13,66	37,03	27,87
	1806	9,21	1,74	1,04	0,60	11,38	10,91	12,50	41,90	27,15
rasio 10	1200	9,19	1,15	0,61	0,53	7,80	12,82	14,21	27,84	28,01
	1408	9,28	1,37	0,78	0,57	10,32	13,20	13,09	32,67	31,60
	1617	9,07	1,54	0,83	0,54	11,17	13,53	13,92	37,52	29,76
	1818	9,03	1,72	0,83	0,48	11,45	13,87	15,58	42,18	27,15

Tabel 7. Data pengujian performa premium A20

Beban 1										
	putaran (rpm)	Torsi (Nm)	BP (kw)	FC (kg/h)	SFC (kg/kwh)	Ma (kg/h)	AFR	η_{th} (%)	Mth (kg/kwh)	η_{vol} (%)
rasio 6	1217	1,76	0,22	0,62	2,76	8,15	13,16	3,26	28,24	28,86
	1393	1,76	0,26	0,71	2,76	9,21	13,01	3,27	32,32	28,49
	1611	1,75	0,30	0,84	2,85	9,75	11,60	3,16	37,38	26,08
	1793	1,76	0,33	0,93	2,81	12,29	13,23	3,20	41,60	29,54

rasio 8	1198	1,75	0,22	0,62	2,82	8,41	13,59	3,19	27,79	30,26
	1432	1,96	0,29	0,71	2,41	9,83	13,90	3,74	33,22	29,60
	1622	1,94	0,33	0,88	2,69	10,39	11,75	3,36	37,63	27,62
	1808	1,76	0,33	0,88	2,66	12,07	13,65	3,39	41,95	28,78
rasio 10	1212	1,84	0,23	0,62	2,65	8,00	12,92	3,40	28,12	28,45
	1399	1,76	0,26	0,66	2,57	8,62	12,99	3,50	32,46	26,54
	1591	1,75	0,29	0,75	2,58	9,16	12,19	3,49	36,91	24,82
	1828	1,77	0,34	0,75	2,22	9,75	12,97	4,06	42,41	22,98
Beban 5										
	putaran (rpm)	Torsi (Nm)	BP (kw)	FC (kg/h)	SFC (kg/kwh)	Ma (kg/h)	AFR	η_{th} (%)	Mth (kg/kwh)	η_{vol} (%)
rasio 6	1203	9,2	1,16	0,84	0,73	11,11	13,23	12,42	27,91	39,82
	1391	9,2	1,34	0,97	0,73	12,60	12,95	12,40	32,27	39,05
	1617	9,23	1,56	1,11	0,71	13,59	12,30	12,73	37,52	36,23
	1789	9,2	1,72	1,11	0,64	13,74	12,43	14,04	41,51	33,10
rasio 8	1209	9,23	1,17	0,75	0,64	9,92	13,20	14,00	28,05	35,36
	1400	9,03	1,32	0,84	0,63	10,28	12,23	14,19	32,48	31,63
	1614	9,22	1,56	0,80	0,51	10,22	12,84	17,63	37,45	27,30
	1805	9,21	1,74	1,06	0,61	12,90	12,15	14,77	41,88	30,79
rasio 10	1182	8,97	1,11	0,71	0,64	8,74	12,35	14,13	27,42	31,86
	1418	9,19	1,36	0,80	0,58	9,69	12,18	15,44	32,90	29,46
	1619	9,41	1,59	0,97	0,61	12,63	12,98	14,77	37,56	33,63
	1808	9,11	1,72	0,97	0,56	13,82	14,21	15,97	41,95	32,96

Tabel 8. Data pengujian performa pertalite

Beban 1										
	putaran (rpm)	Torsi (Nm)	BP (kw)	FC (kg/h)	SFC (kg/kwh)	Ma (kg/h)	AFR	η_{th} (%)	Mth (kg/kwh)	η_{vol} (%)
rasio 6	1203	1,76	0,22	0,62	2,79	7,60	12,29	2,72	27,91	27,23
	1400	1,84	0,27	0,71	2,62	9,09	12,87	2,89	32,48	27,99
	1604	1,73	0,29	0,71	2,43	9,25	13,09	3,12	37,21	24,85
	1802	1,75	0,33	0,79	2,41	10,28	12,93	3,15	41,81	24,58
rasio 8	1217	1,94	0,25	0,66	2,68	8,85	13,35	2,83	28,24	31,33
	1404	1,76	0,26	0,62	2,39	9,79	15,83	3,17	32,57	30,04

	1628	1,76	0,30	0,75	2,50	11,58	15,43	3,03	37,77	30,67
	1819	1,73	0,33	0,84	2,55	12,01	14,31	2,98	42,20	28,46
rasio 10	1216	1,73	0,22	0,62	2,81	9,32	15,08	2,70	28,21	33,04
	1394	1,77	0,26	0,71	2,74	11,63	16,45	2,77	32,34	35,94
	1609	1,74	0,29	0,75	2,56	11,97	15,95	2,96	37,33	32,08
	1807	1,73	0,33	0,84	2,56	12,32	14,68	2,96	41,92	29,38
Beban 5										
	putaran (rpm)	Torsi (Nm)	BP (kw)	FC (kg/h)	SFC (kg/kwh)	Ma (kg/h)	AFR	η_{th} (%)	Mth (kg/kwh)	η_{vol} (%)
rasio 6	1221	9,17	1,17	0,71	0,60	10,31	14,59	12,58	28,33	36,40
	1402	9,22	1,35	0,75	0,55	10,82	14,41	13,67	32,53	33,27
	1620	9,17	1,55	0,79	0,51	11,35	14,28	14,84	37,59	30,21
	1821	9,21	1,76	0,84	0,48	11,78	14,04	15,87	42,25	27,89
rasio 8	1224	9,21	1,18	0,66	0,56	9,19	13,87	13,51	28,40	32,36
	1414	9,24	1,37	0,71	0,52	11,26	15,94	14,68	32,81	34,32
	1616	9,19	1,55	0,79	0,51	11,81	14,86	14,83	37,49	31,50
	1807	9,4	1,78	0,97	0,55	13,46	13,85	13,88	41,92	32,10
rasio 10	1204	9,24	1,16	0,66	0,57	10,18	15,36	13,33	27,93	36,43
	1395	9,21	1,34	0,75	0,56	11,58	15,43	13,59	32,37	35,79
	1617	9,2	1,56	0,84	0,54	12,54	14,95	14,08	37,52	33,43
	1823	9,22	1,76	0,97	0,55	14,50	14,92	13,73	42,30	34,27

Tabel 9. Data pengujian performa pertalite A20

	Beban 1									
	putaran (rpm)	Torsi (Nm)	BP (kw)	FC (kg/h)	SFC (kg/kwh)	Ma (kg/h)	AFR	η_{th} (%)	Mth (kg/kwh)	η_{vol} (%)
rasio 6	1203	1,76	0,22	0,58	2,63	8,12	13,93	3,42	27,91	29,08
	1422	1,72	0,26	0,67	2,63	9,71	14,44	3,43	32,99	29,43
	1589	1,72	0,29	0,72	2,51	11,07	15,43	3,59	36,87	30,02
	1804	1,73	0,33	0,90	2,74	12,63	14,09	3,28	41,85	30,17
rasio 8	1209	1,75	0,22	0,63	2,83	8,57	13,66	3,17	28,05	30,56
	1407	1,75	0,26	0,67	2,61	11,14	16,57	3,45	32,64	34,12
	1606	1,75	0,29	0,81	2,74	12,61	15,64	3,28	37,26	33,85
	1814	1,75	0,33	0,90	2,70	12,78	14,25	3,33	42,09	30,36
rasio 10	1221	1,76	0,22	0,67	2,99	8,74	13,00	3,01	28,33	30,86
	1393	1,75	0,26	0,76	2,99	11,52	15,12	3,01	32,32	35,65
	1621	1,76	0,30	0,81	2,70	12,15	15,06	3,33	37,61	32,30

	1210	1,74	0,22	0,72	3,25	12,16	16,96	2,76	28,07	43,32
	Beban 5									
	putaran (rpm)	Torsi (Nm)	BP (kw)	FC (kg/h)	SFC (kg/kwh)	Ma (kg/h)	AFR	η_{th} (%)	Mth (kg/kwh)	η_{vol} (%)
rasio 6	1219	9,2	1,17	0,67	0,57	9,36	13,92	15,71	28,28	33,08
	1401	9,1	1,33	0,76	0,57	11,27	14,80	15,75	32,50	34,69
	1607	9,4	1,58	0,85	0,54	11,92	14,00	16,70	37,28	31,97
	1808	9,19	1,74	0,85	0,49	12,88	15,12	18,37	41,95	30,70
rasio 8	1206	9,24	1,17	0,67	0,58	9,21	13,70	15,61	27,98	32,91
	1394	9,04	1,32	0,76	0,58	10,81	14,18	15,57	32,34	33,41
	1617	9,2	1,56	0,81	0,52	12,58	15,59	17,36	37,52	33,53
	1800	9,22	1,74	0,99	0,57	14,07	14,27	15,85	41,76	33,70
rasio 10	1218	9,08	1,16	0,63	0,54	9,22	14,70	16,59	28,26	32,64
	1421	9,2	1,37	0,76	0,56	10,43	13,69	16,15	32,97	31,65
	1594	9,01	1,50	0,81	0,54	11,67	14,46	16,76	36,98	31,54
	1817	9,24	1,76	0,99	0,56	13,18	13,37	16,03	42,16	31,27

Tabel 10. Data pengujian performa pertamax

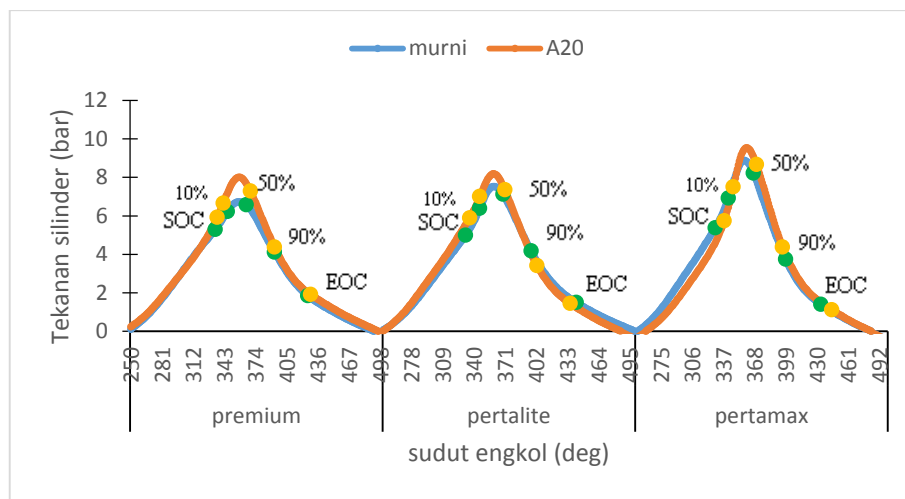
	Beban 1									
	putaran (rpm)	Torsi (Nm)	BP (kw)	FC (kg/h)	SFC (kg/kwh)	Ma (kg/h)	AFR	η_{th} (%)	Mth (kg/kwh)	η_{vol} (%)
rasio 6	1203	1,76	0,22	0,62	2,82	9,35	14,98	2,62	27,91	33,50
	1418	1,75	0,26	0,71	2,75	10,40	14,58	2,69	32,90	31,61
	1599	1,74	0,29	0,76	2,60	11,39	15,03	2,84	37,10	30,71
	1809	1,74	0,33	0,94	2,84	14,65	15,65	2,60	41,97	34,92
rasio 8	1220	1,74	0,22	0,62	2,81	8,58	13,75	2,63	28,31	30,33
	1426	1,75	0,26	0,67	2,56	9,72	14,54	2,88	33,08	29,38
	1593	1,76	0,29	0,71	2,43	10,45	14,66	3,04	36,96	28,28
	1803	1,75	0,33	0,80	2,43	11,90	14,83	3,04	41,83	28,44
rasio 10	1218	1,77	0,23	0,67	2,96	9,51	14,22	2,49	28,26	33,64
	1416	1,71	0,25	0,71	2,81	10,42	14,61	2,62	32,85	31,73
	1599	1,76	0,29	0,85	2,88	11,86	14,01	2,57	37,10	31,98
	1795	1,76	0,33	0,94	2,83	13,27	14,18	2,61	41,65	31,87
	Beban 5									
	putaran (rpm)	Torsi (Nm)	BP (kw)	FC (kg/h)	SFC (kg/kwh)	Ma (kg/h)	AFR	η_{th} (%)	Mth (kg/kwh)	η_{vol} (%)
rasio 6	1205	9,09	1,15	0,67	0,58	10,27	15,36	12,65	27,96	36,73
	1377	9,03	1,30	0,76	0,58	11,54	15,23	12,67	31,95	36,12

	1598	9,21	1,54	0,94	0,61	12,47	13,32	12,14	37,08	33,64
	1805	9,19	1,74	1,07	0,62	14,10	13,18	11,98	41,88	33,68
rasio 8	1217	9,02	1,15	0,62	0,54	9,03	14,47	13,59	28,24	31,97
	1420	9,04	1,34	0,71	0,53	10,47	14,68	13,90	32,95	31,79
	1611	9,01	1,52	0,76	0,50	10,96	14,46	14,80	37,38	29,33
	1805	9,22	1,74	0,89	0,51	12,62	14,15	14,42	41,88	30,13
rasio 10	1210	9,3	1,18	0,67	0,57	9,42	14,09	13,00	28,07	33,57
	1418	9,2	1,37	0,67	0,49	10,87	16,25	15,07	32,90	33,04
	1617	9,22	1,56	0,80	0,51	11,92	14,86	14,35	37,52	31,78
	1808	9	1,70	0,85	0,50	12,62	14,90	14,84	41,95	30,09

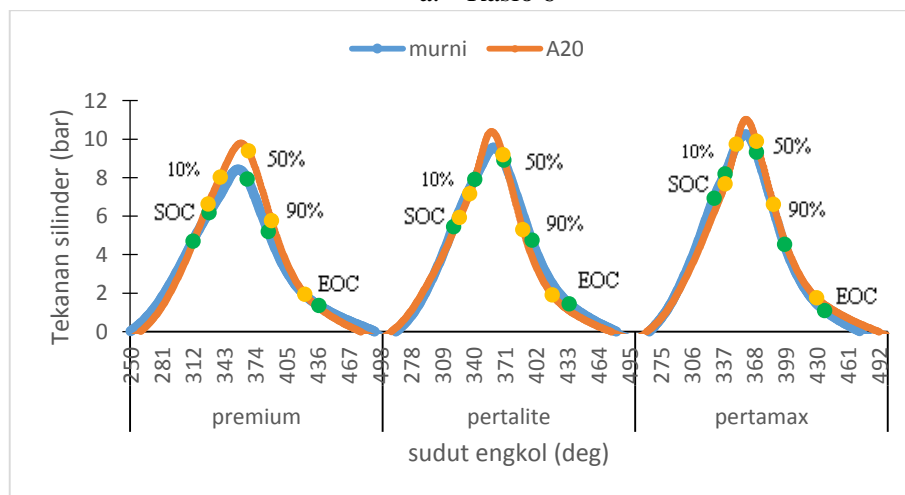
Tabel 11. Data pengujian performa pertamax A20

Beban 1										
	putaran (rpm)	Torsi (Nm)	BP (kw)	FC (kg/h)	SFC (kg/kwh)	Ma (kg/h)	AFR	η_{th} (%)	Mth (kg/kwh)	η_{vol} (%)
rasio 6	1216	1,95	0,25	0,68	2,73	9,34	13,79	3,24	28,21	33,12
	1408	1,72	0,25	0,68	2,67	10,15	14,98	3,31	32,67	31,07
	1596	1,76	0,29	0,77	2,61	12,04	15,68	3,38	37,03	32,52
	1809	1,75	0,33	0,90	2,73	13,78	15,25	3,24	41,97	32,83
rasio 8	1202	1,73	0,22	0,68	3,11	9,10	13,42	2,84	27,89	32,62
	1420	1,71	0,25	0,77	3,02	10,75	14,00	2,93	32,95	32,64
	1610	1,75	0,29	0,81	2,76	12,01	14,77	3,21	37,35	32,16
	1810	1,76	0,33	0,95	2,85	13,06	13,76	3,11	41,99	31,10
rasio 10	1212	1,75	0,22	0,68	3,05	9,13	13,47	2,90	28,12	32,46
	1395	1,75	0,26	0,72	2,83	9,99	13,83	3,13	32,37	30,88
	1607	1,75	0,29	0,81	2,76	10,48	12,89	3,20	37,28	28,12
	1817	1,75	0,33	0,95	2,85	11,46	12,07	3,10	42,16	27,17
Beban 5										
	putaran (rpm)	Torsi (Nm)	BP (kw)	FC (kg/h)	SFC (kg/kwh)	Ma (kg/h)	AFR	η_{th} (%)	Mth (kg/kwh)	η_{vol} (%)
rasio 6	1227	9,18	1,18	0,72	0,61	10,64	14,72	14,42	28,47	37,37
	1426	9,19	1,37	0,81	0,59	12,35	15,18	14,91	33,08	37,32
	1610	9,24	1,56	0,99	0,64	12,96	13,04	13,85	37,35	34,69
	1810	9,22	1,75	1,08	0,62	13,59	12,54	14,24	41,99	32,37
rasio 8	1226	9,19	1,18	0,72	0,61	9,68	13,39	14,42	28,44	34,02
	1399	9	1,32	0,81	0,62	11,13	13,69	14,33	32,46	34,30
	1620	9,18	1,56	0,90	0,58	11,77	13,02	15,23	37,59	31,30

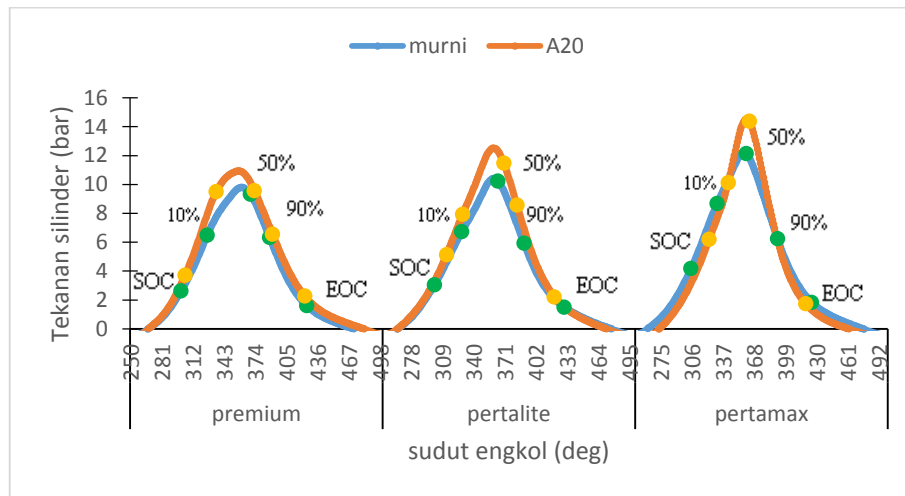
	1811	9,4	1,78	1,08	0,61	14,44	13,32	14,53	42,02	34,37
rasio 10	1206	9,19	1,16	0,68	0,58	9,29	13,71	15,13	27,98	33,21
	1416	9,13	1,35	0,72	0,53	9,97	13,79	16,55	32,85	30,34
	1598	9,22	1,54	0,77	0,50	10,32	13,43	17,75	37,08	27,83
	1812	9,2	1,74	0,90	0,52	11,43	12,65	17,07	42,04	27,19



a. Rasio 6

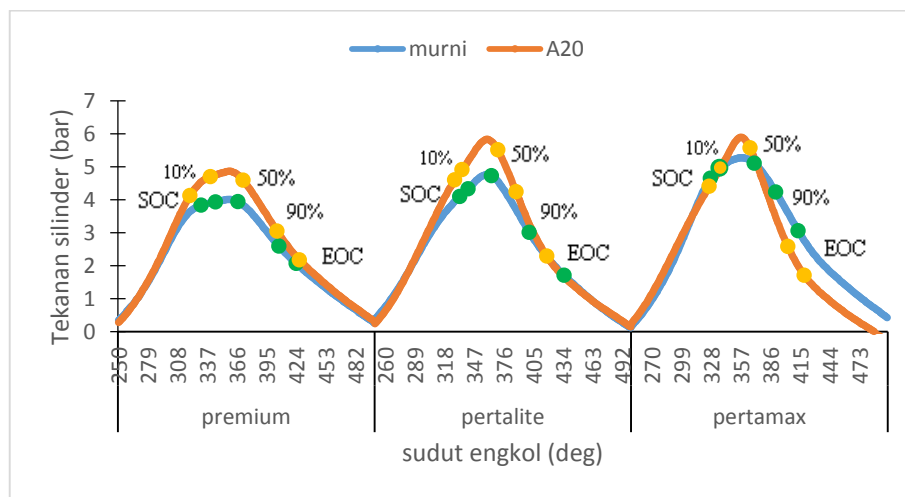


b. Rasio 8

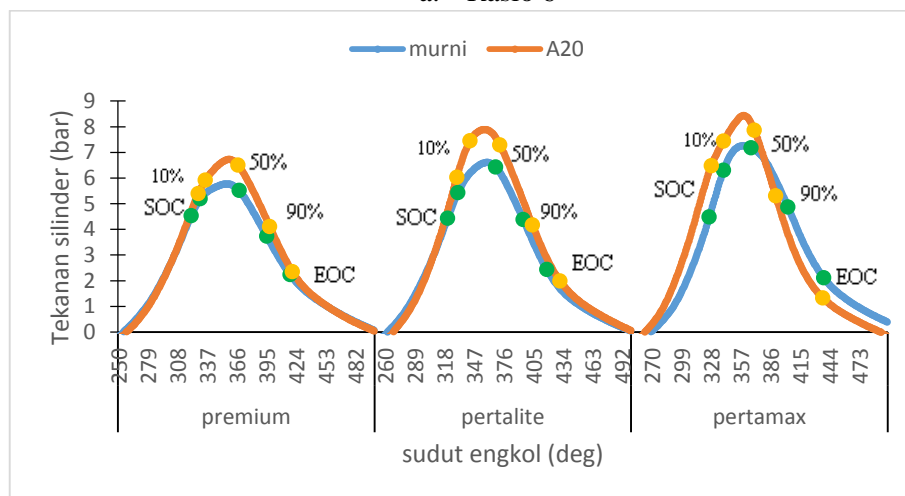


c. Rasio 10

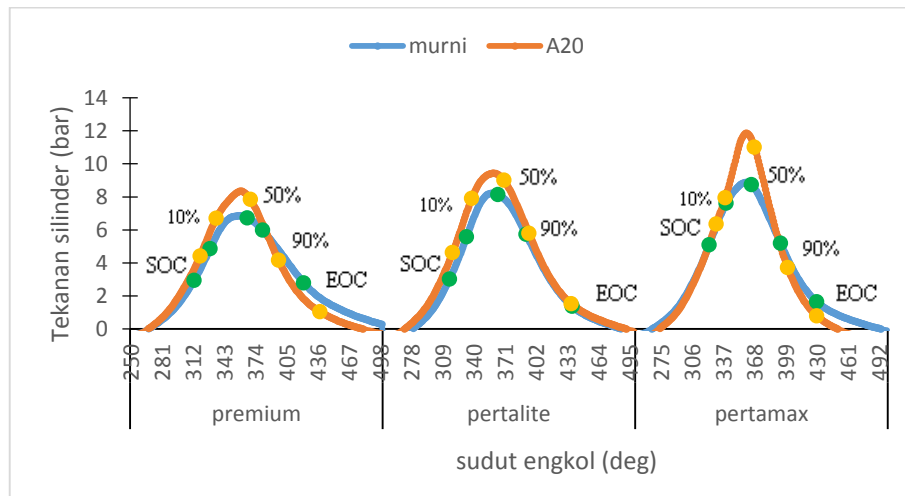
Gambar 33. Perbandingan tekanan silinder terhadap sudut engkol pada putaran 1200 rpm beban 5 kg



a. Rasio 6

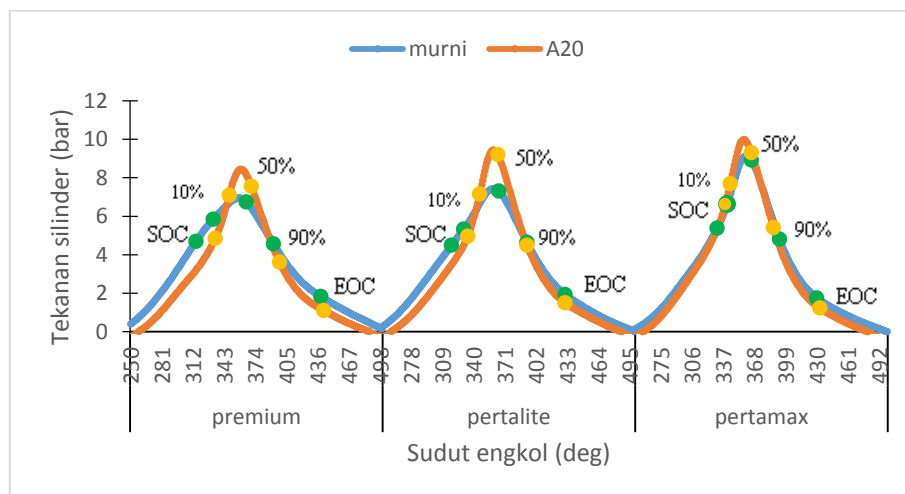


b. Rasio 8

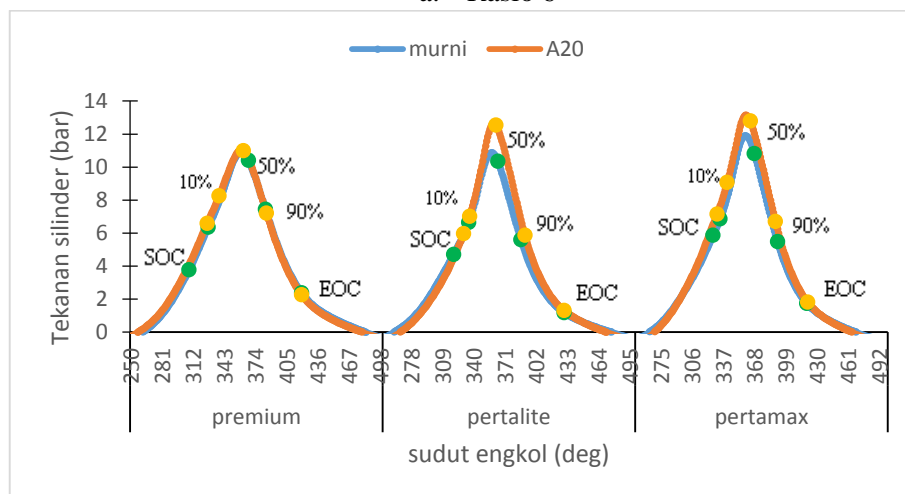


c. Rasio 10

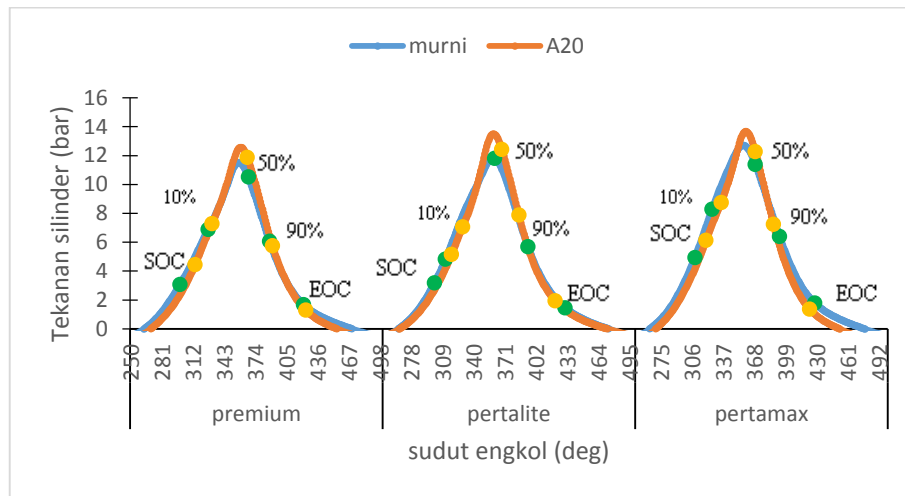
Gambar 34. Perbandingan tekanan silinder terhadap sudut engkol pada putaran 1400 rpm beban 1 kg



a. Rasio 6

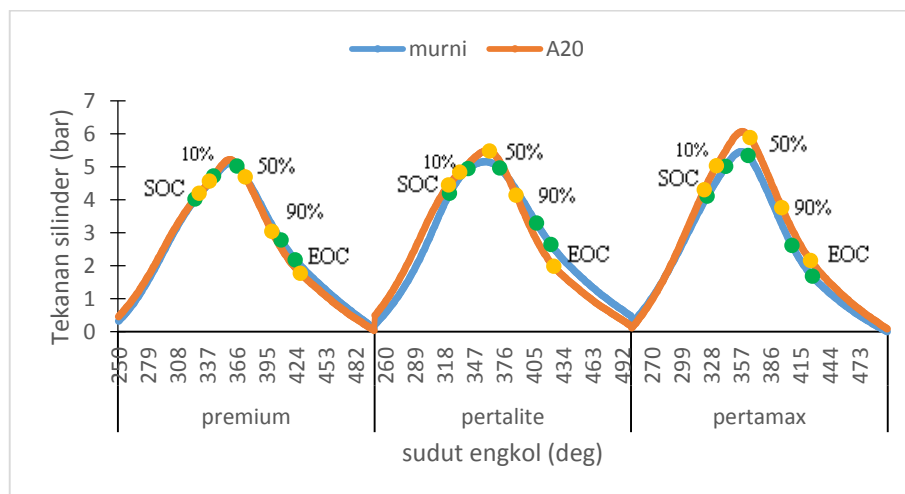


b. Rasio 8

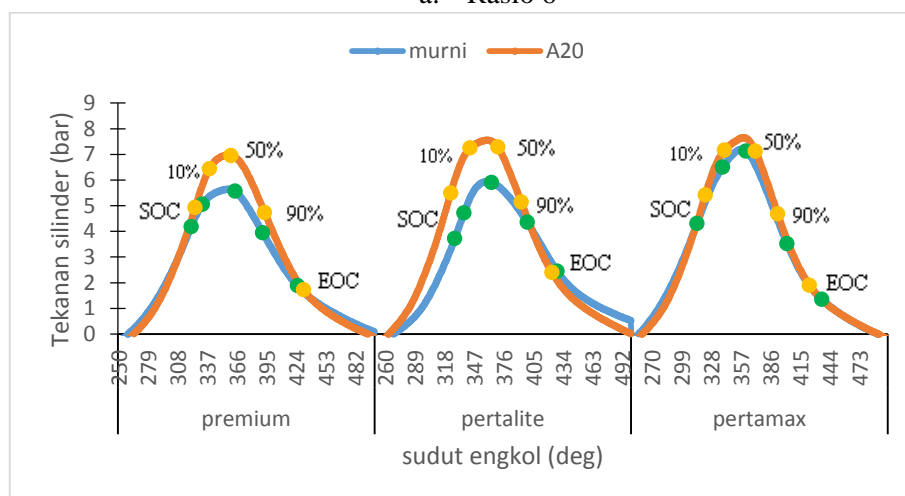


c. Rasio 10

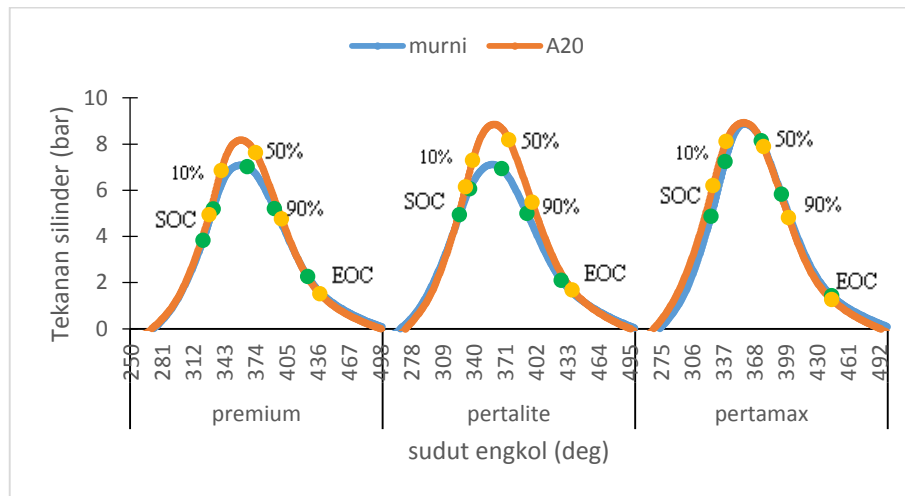
Gambar 35. Perbandingan tekanan silinder terhadap sudut engkol pada putaran 1400 rpm beban 5 kg



a. Rasio 6

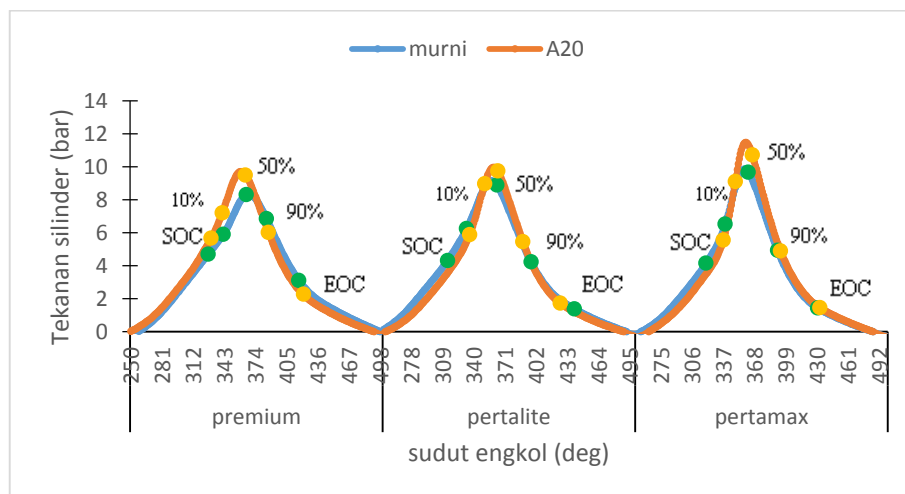


b. Rasio 8

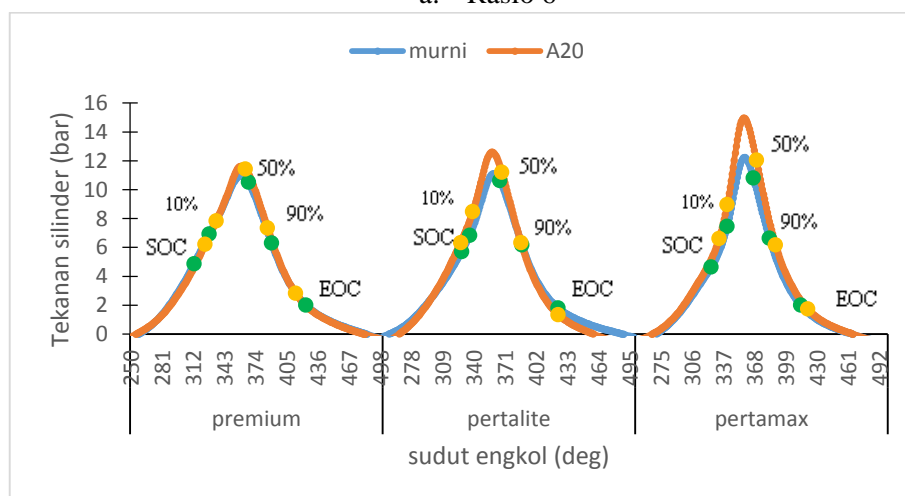


c. Rasio 10

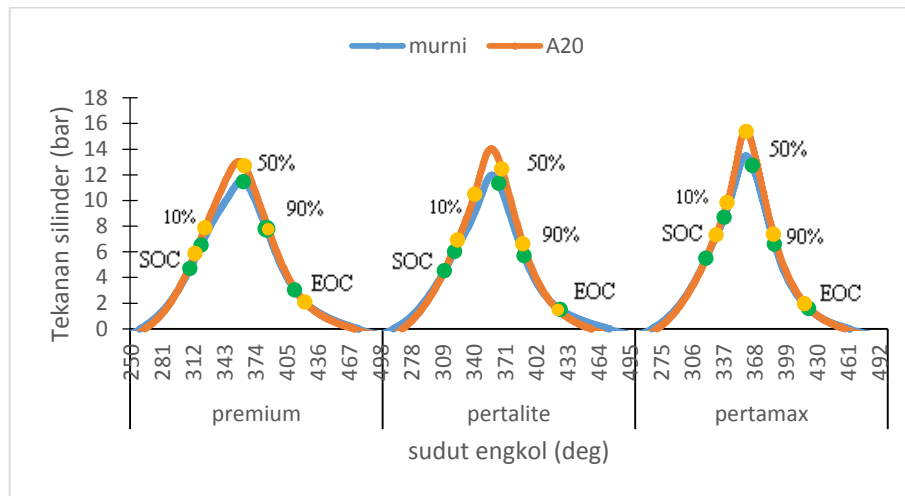
Gambar 36. Perbandingan tekanan silinder terhadap sudut engkol pada putaran 1600 rpm beban 1 kg



a. Rasio 6

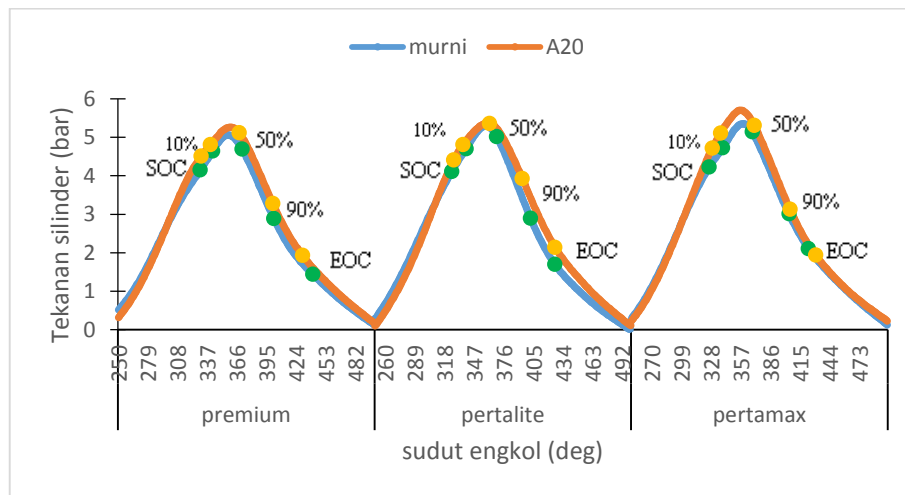


b. Rasio 8

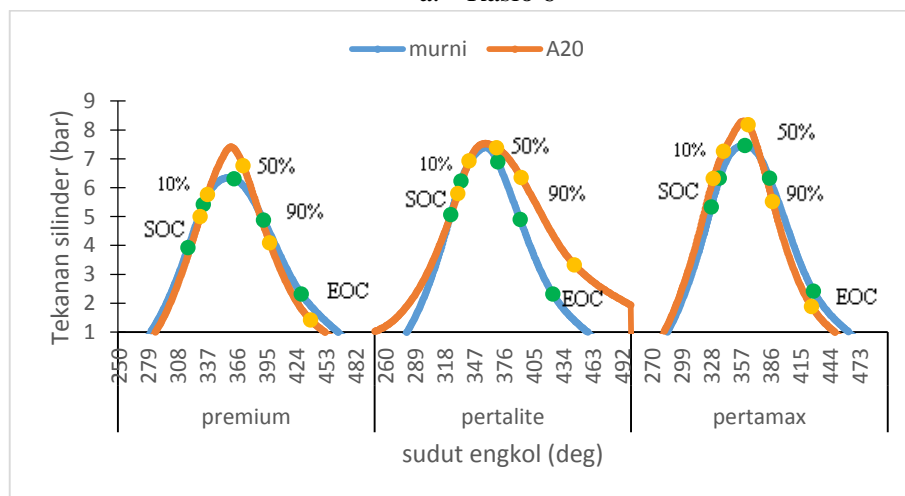


c. Rasio 10

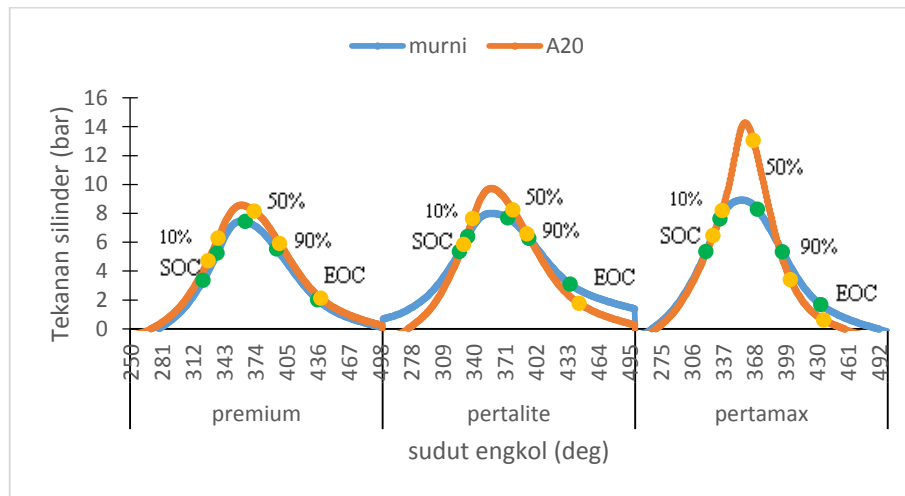
Gambar 37. Perbandingan tekanan silinder terhadap sudut engkol pada putaran 1600 rpm beban 5 kg



a. Rasio 6

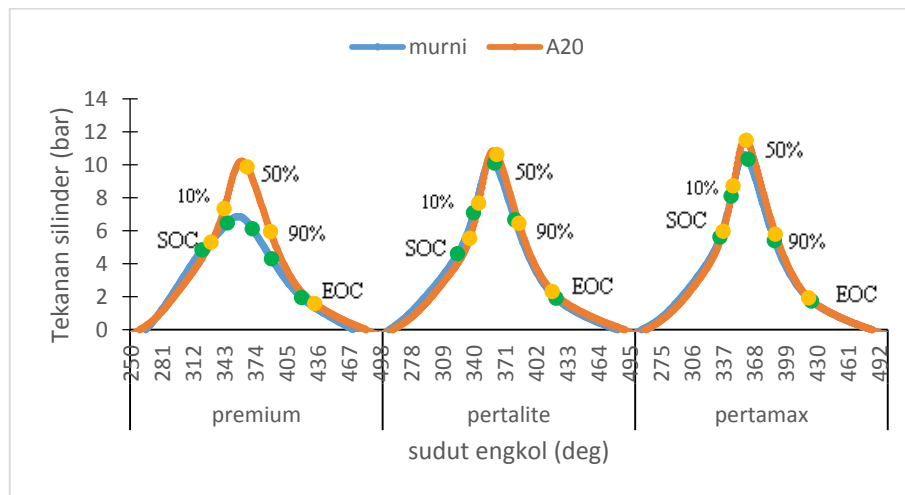


b. Rasio 8

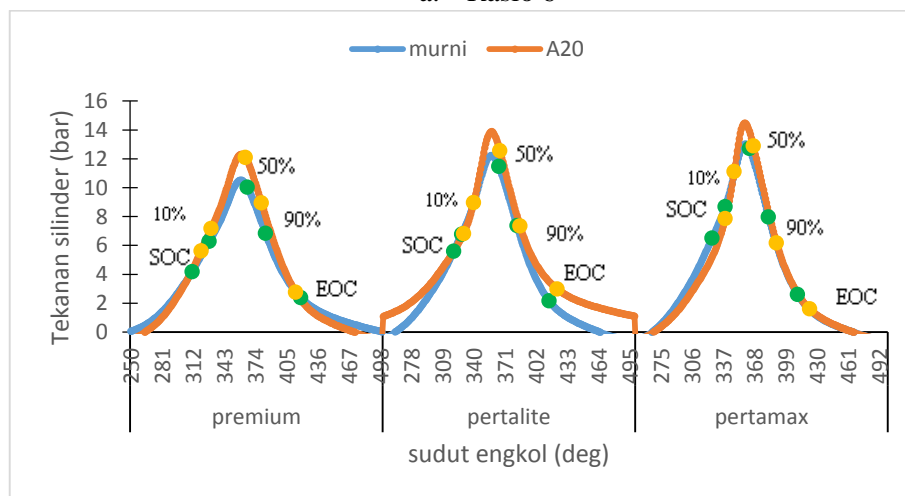


c. Rasio 10

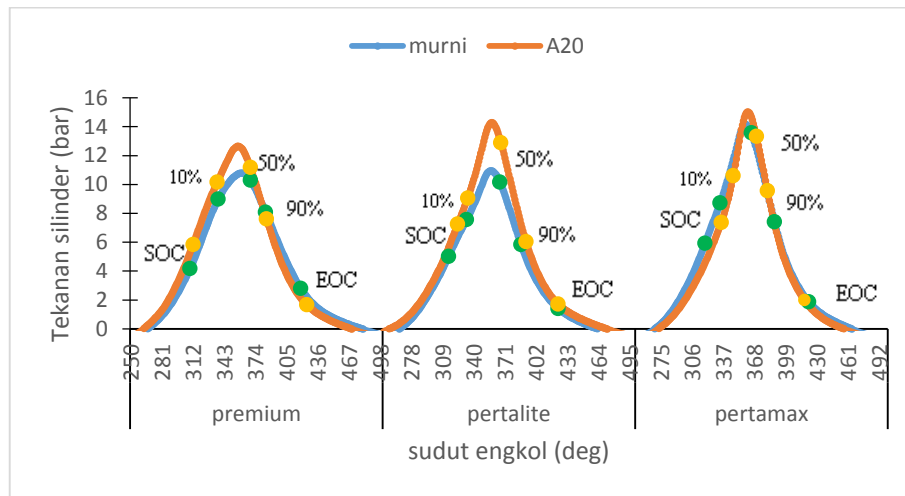
Gambar 38. Perbandingan tekanan silinder terhadap sudut engkol pada putaran 1800 rpm beban 1 kg



a. Rasio 6

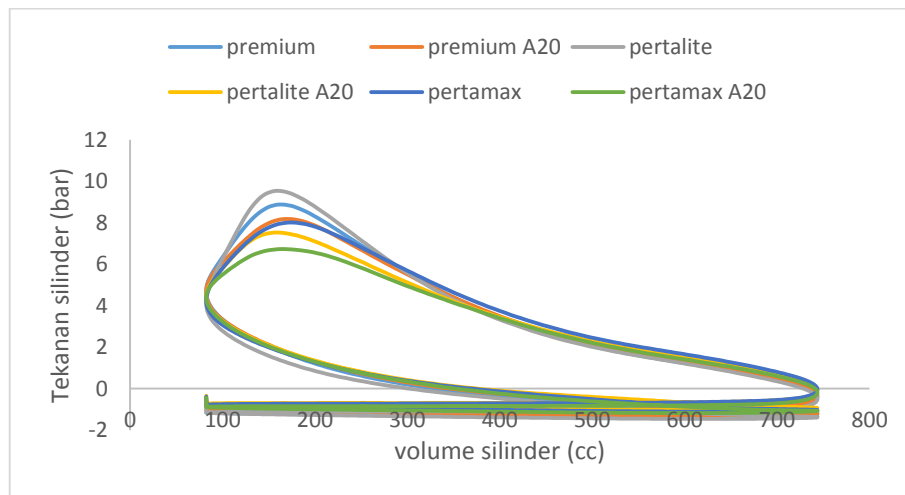


b. Rasio 8

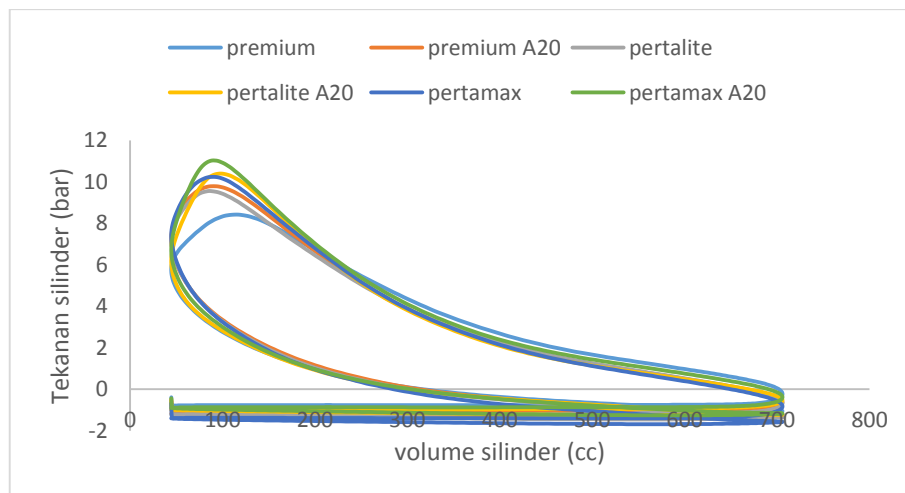


c. Rasio 10

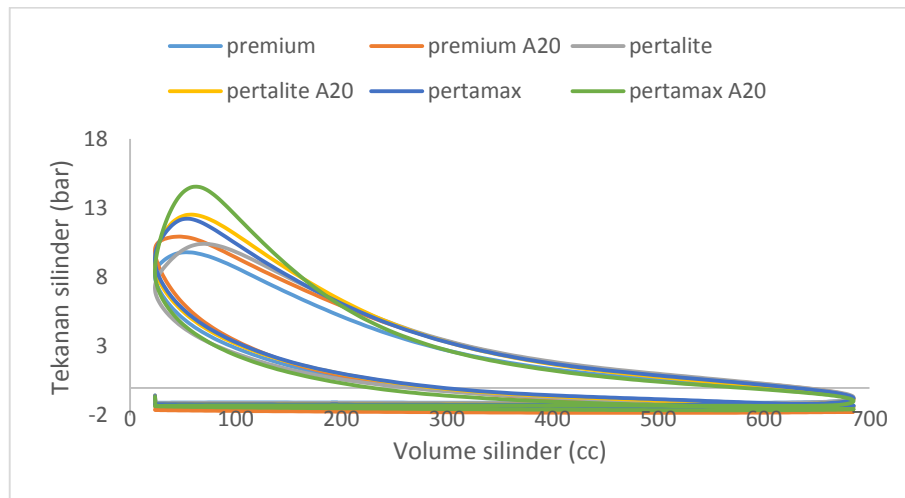
Gambar 39. Perbandingan tekanan silinder terhadap sudut engkol pada putaran 1800 rpm beban 5 kg



a. Rasio 6

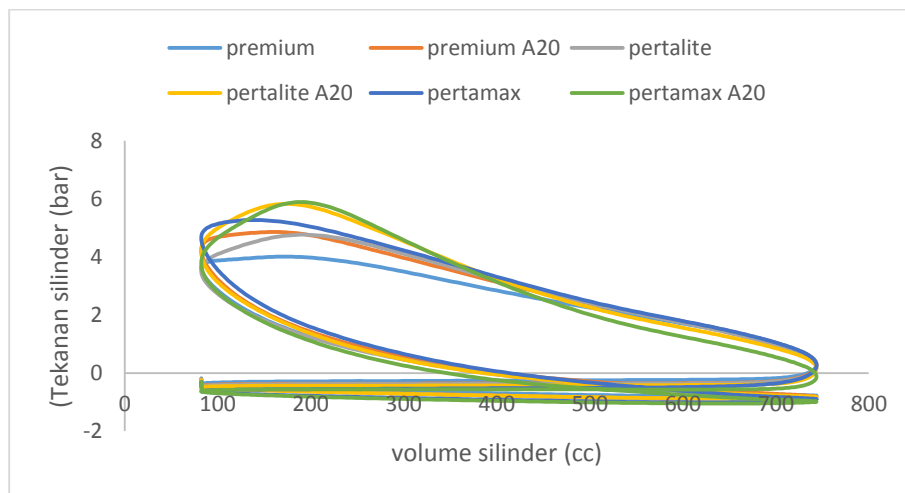


b. Rasio 8

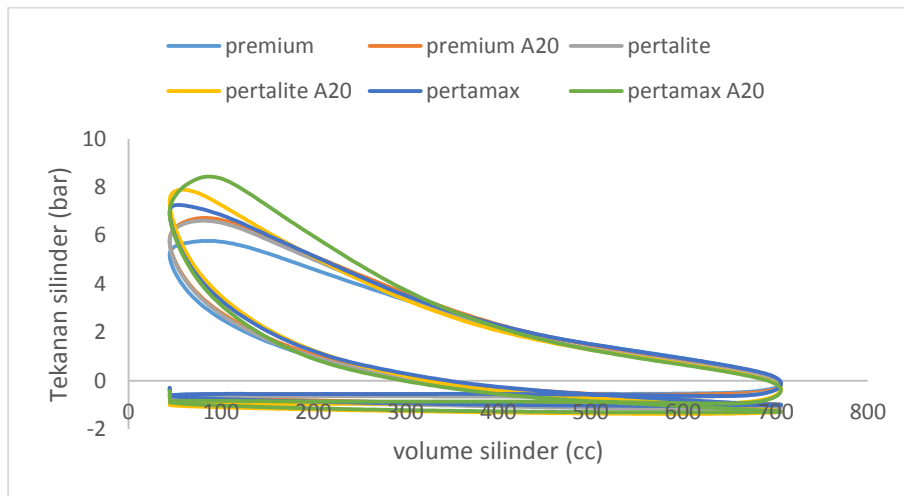


c. Rasio 10

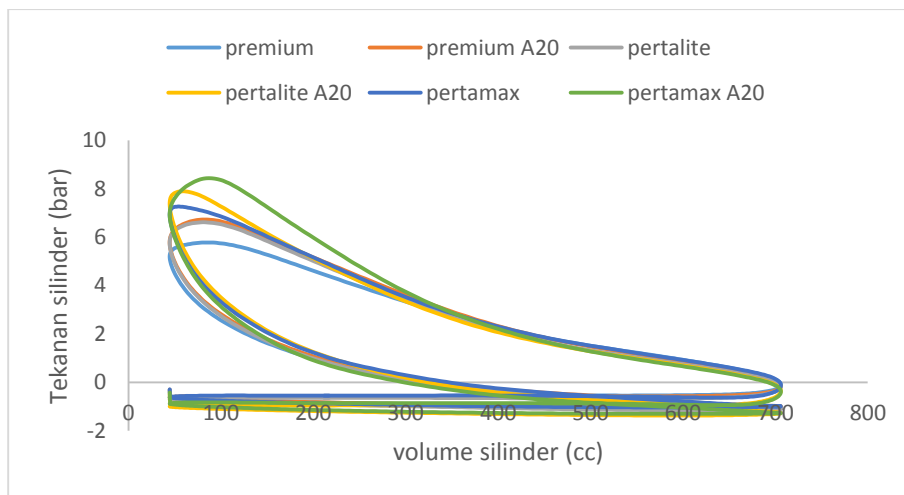
Gambar 40. Perbandingan tekanan silinder terhadap volume silinder pada putaran 1200 rpm beban 5 kg



a. Rasio 6

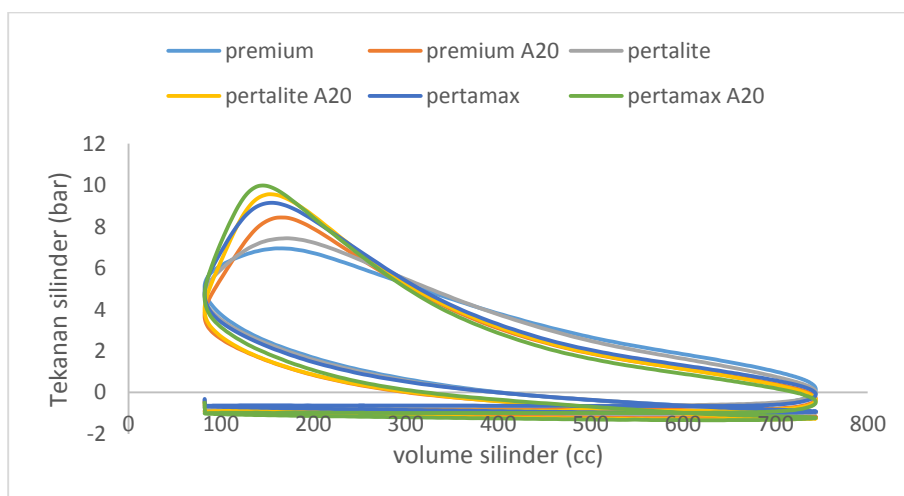


b. Rasio 8

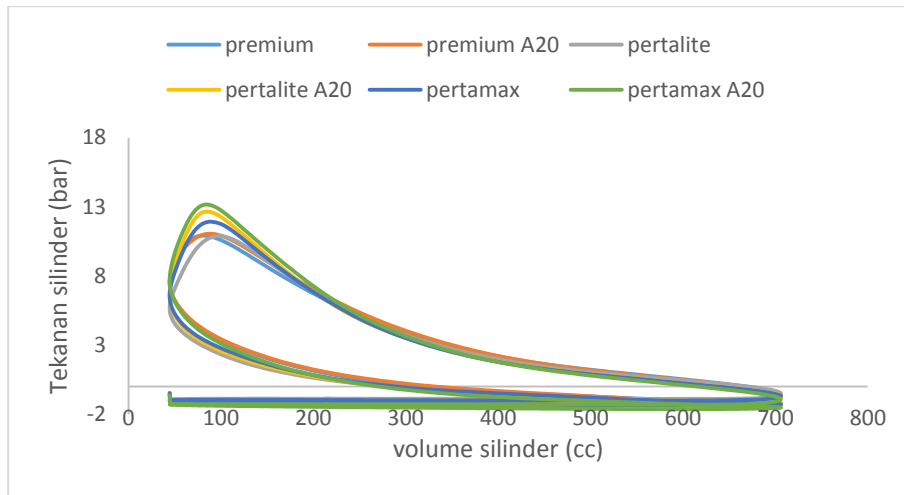


c. Rasio 10

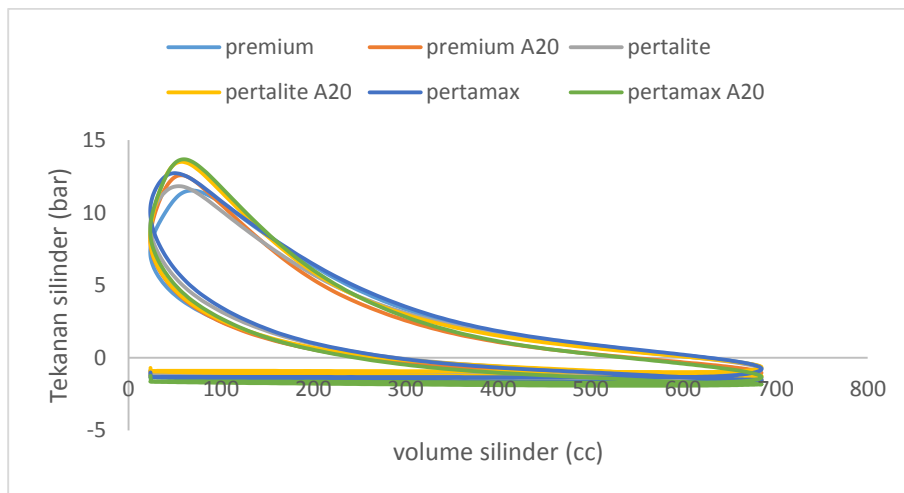
Gambar 41. Perbandingan tekanan silinder terhadap volume silinder pada putaran 1400 rpm beban 1 kg



a. Rasio 6

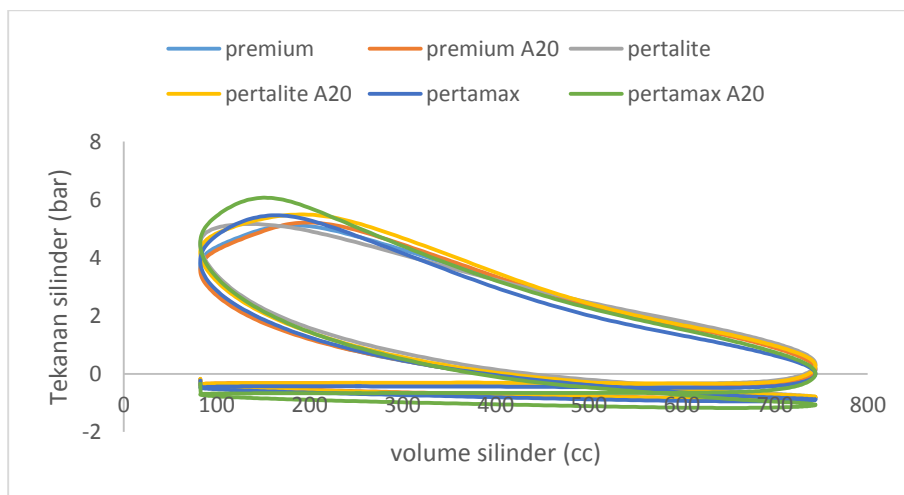


b. Rasio 8

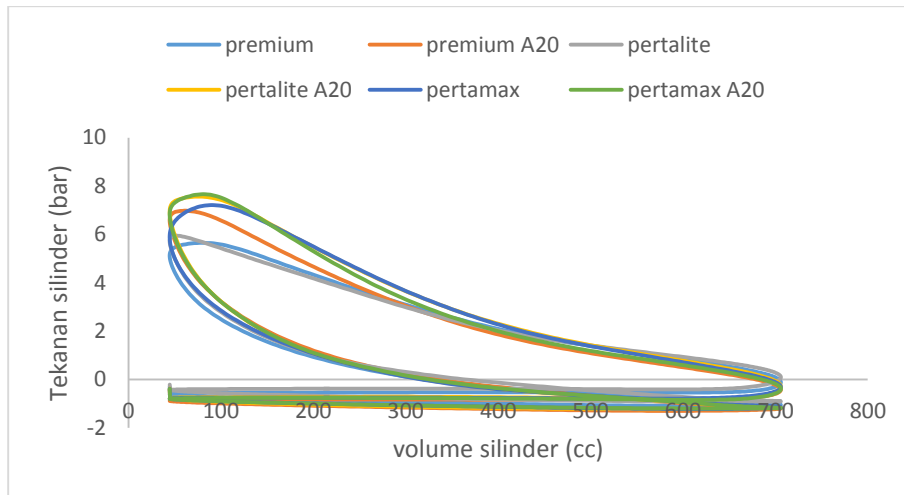


c. Rasio 10

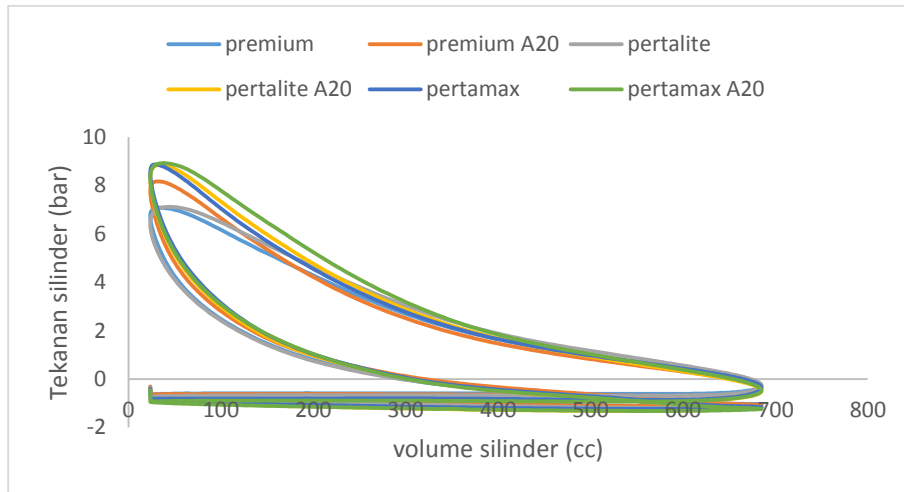
Gambar 42. Perbandingan tekanan silinder terhadap volume silinder pada putaran 1400 rpm beban 5 kg



a. Rasio 6

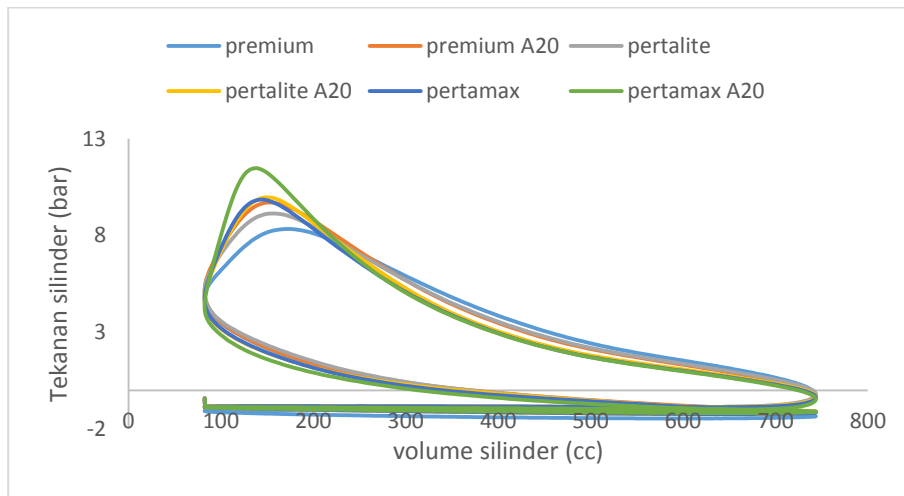


b. Rasio 8

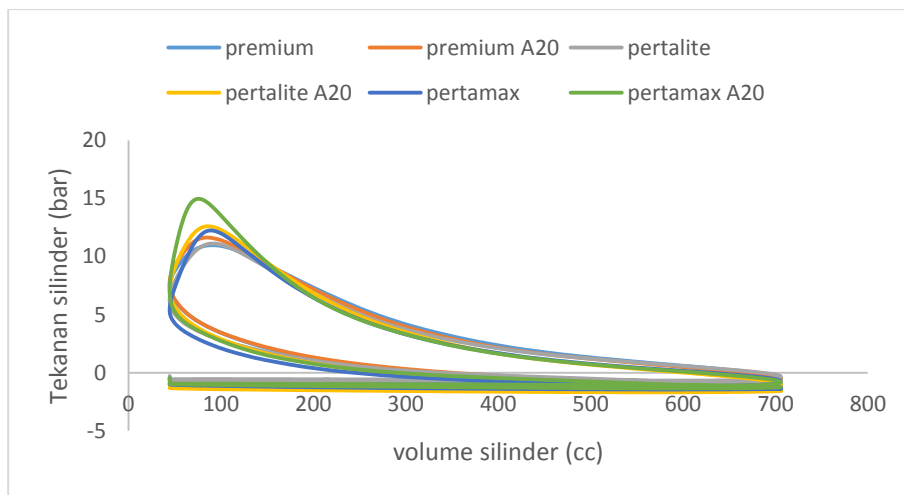


c. Rasio 10

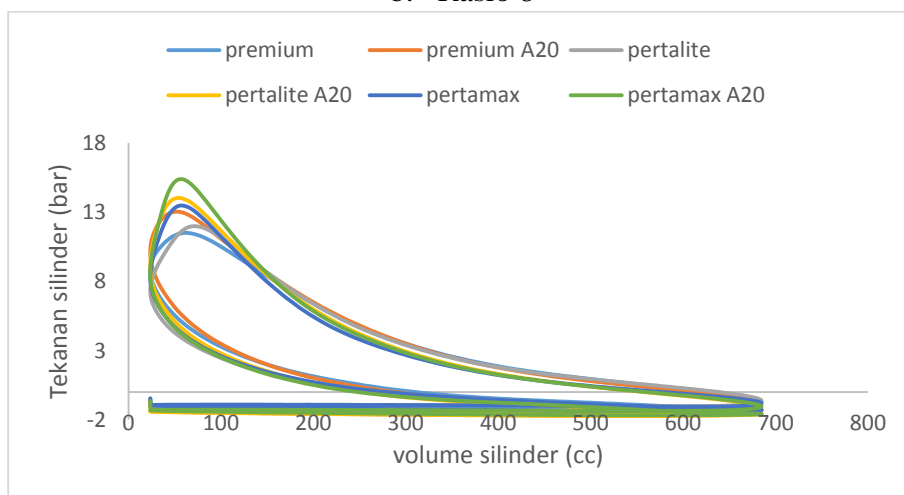
Gambar 43. Perbandingan tekanan silinder terhadap volume silinder pada putaran 1600 rpm beban 1 kg



a. Rasio 6

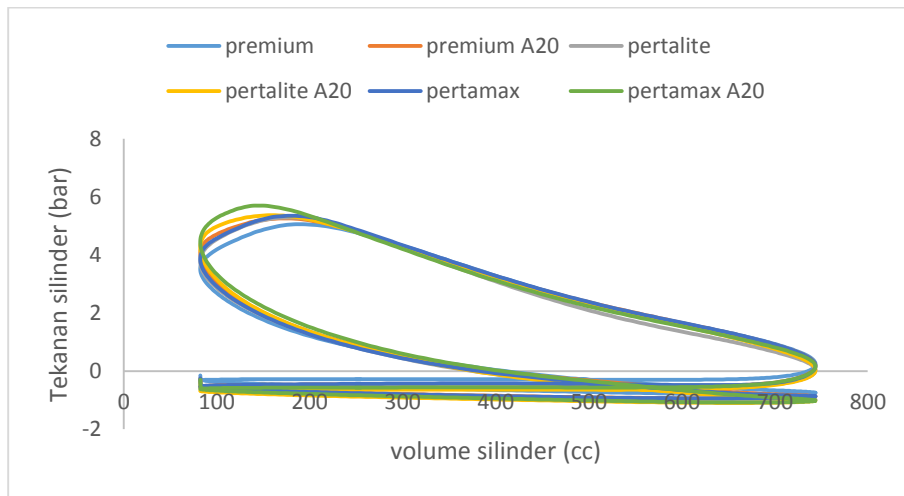


b. Rasio 8

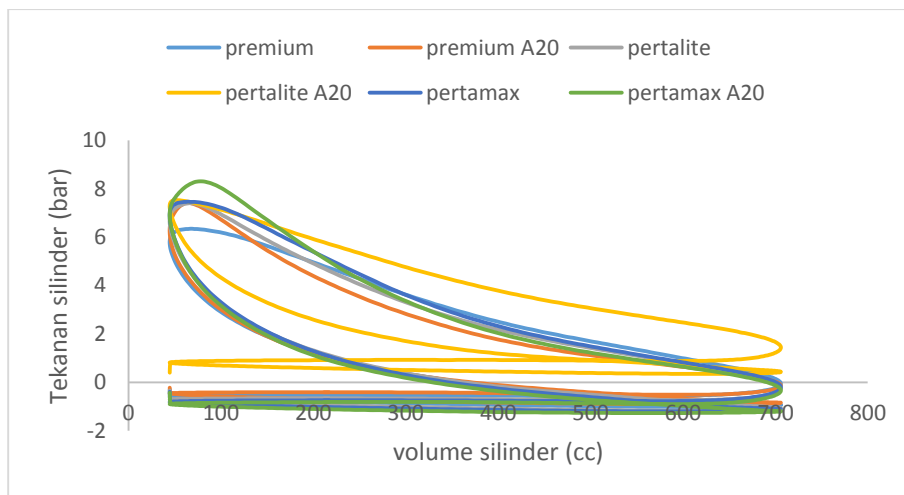


c. Rasio 10

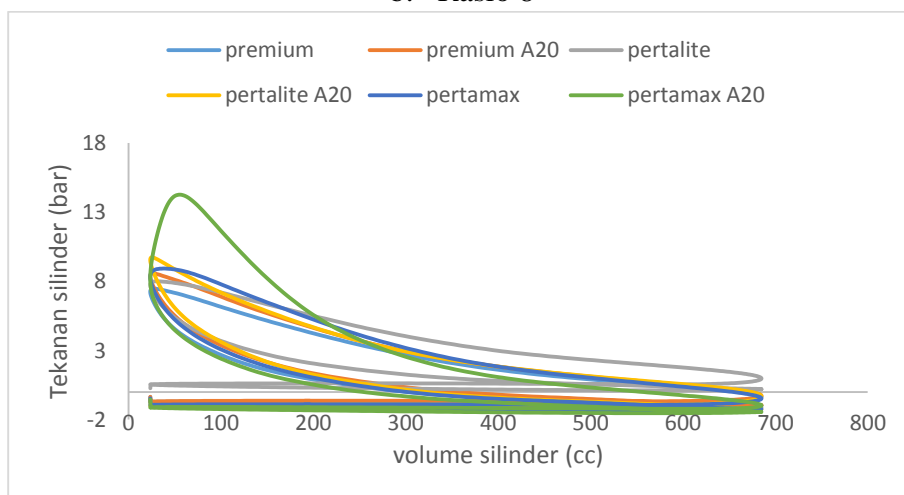
Gambar 44. Perbandingan tekanan silinder terhadap volume silinder pada putaran 1600 rpm beban 5 kg



a. Rasio 6

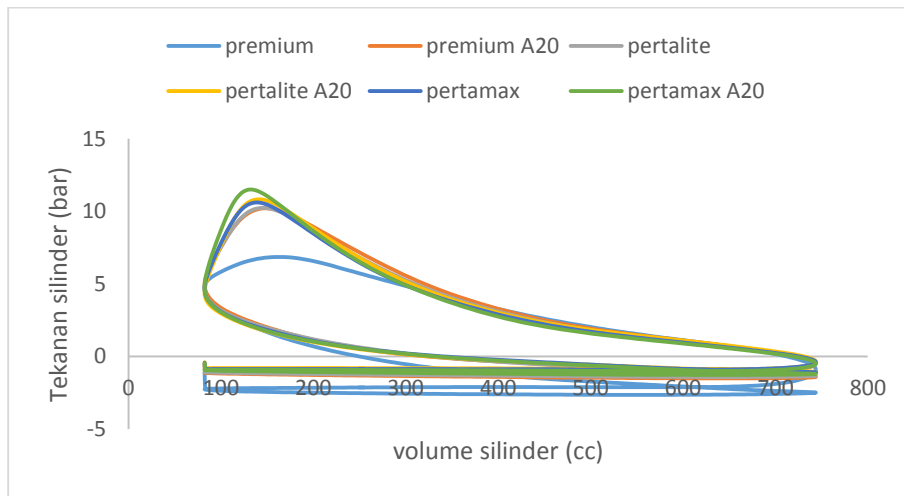


b. Rasio 8

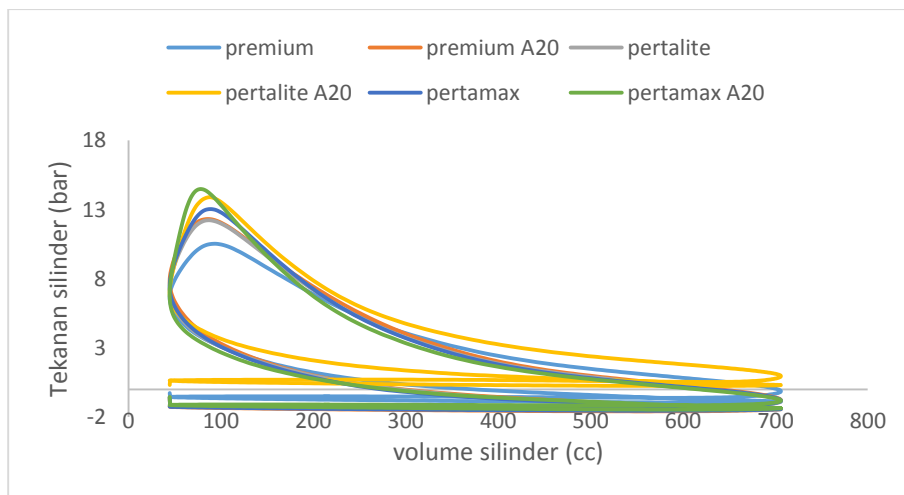


c. Rasio 10

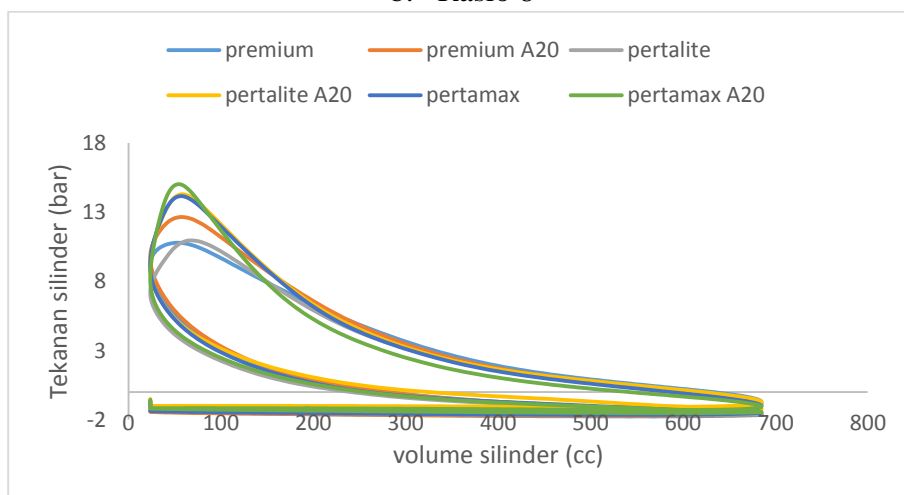
Gambar 45. Perbandingan tekanan silinder terhadap volume silinder pada putaran 1800 rpm beban 1 kg



a. Rasio 6

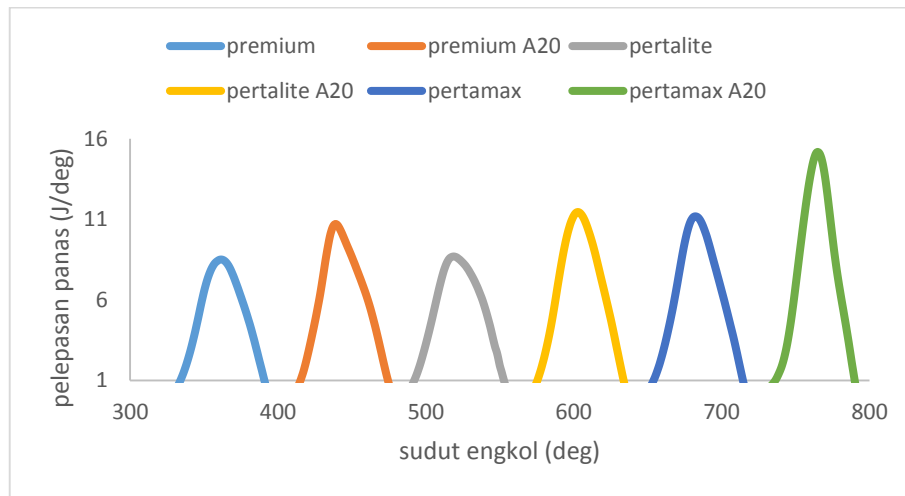


b. Rasio 8

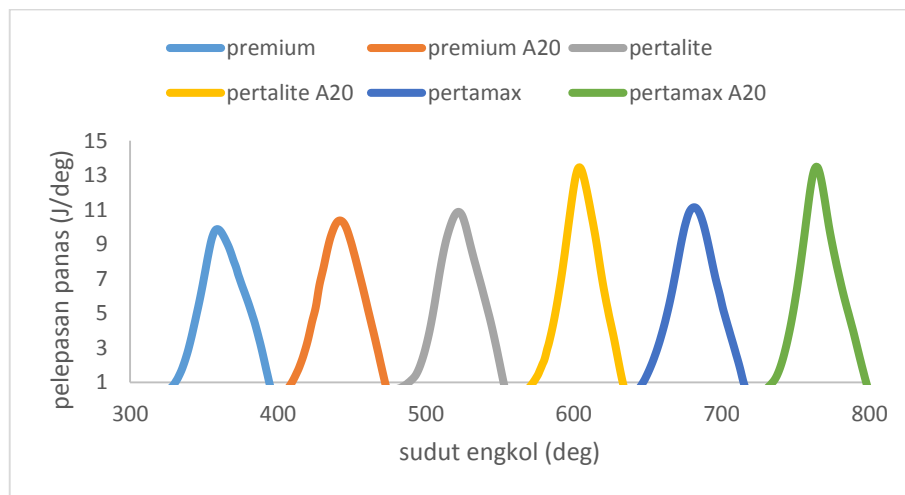


c. Rasio 10

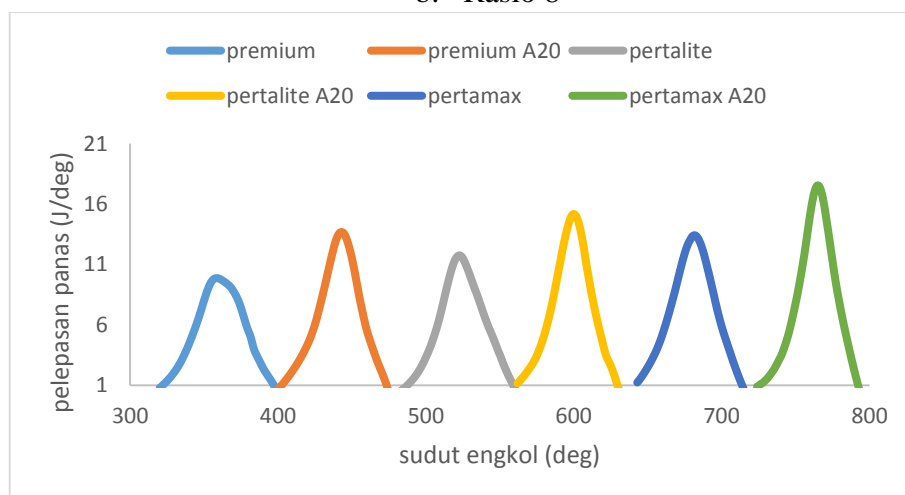
Gambar 46. Perbandingan tekanan silinder terhadap volume silinder pada putaran 1800 rpm beban 5 kg



a. Rasio 6

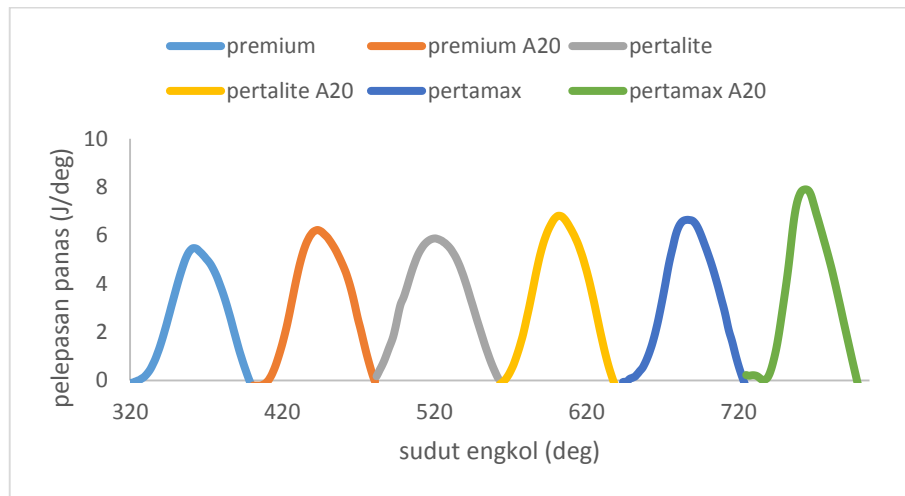


b. Rasio 8

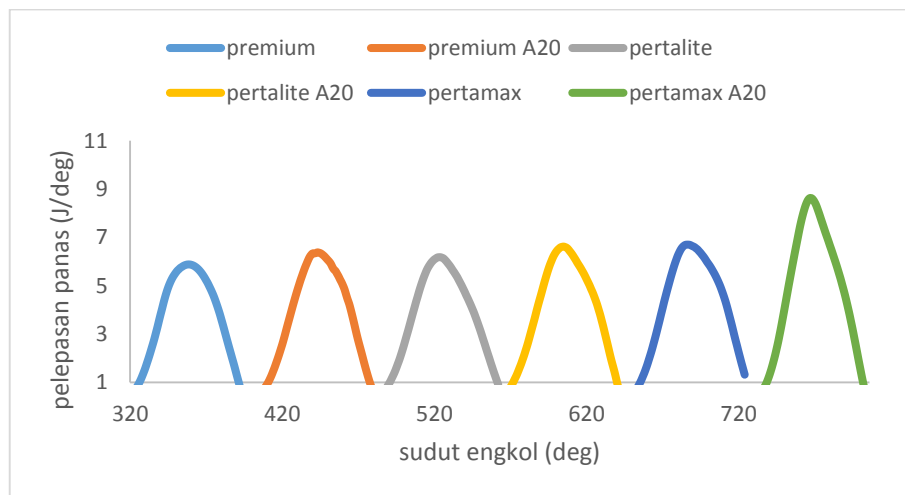


c. Rasio 10

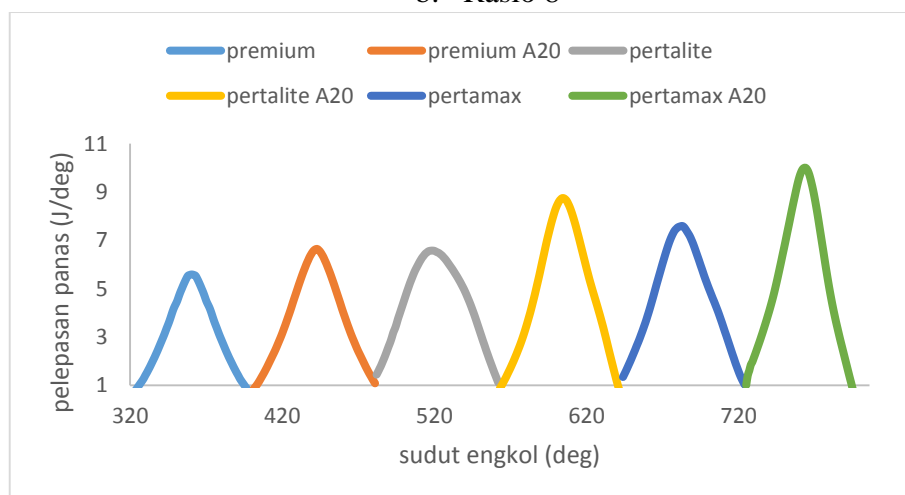
Gambar 47. Perbandingan pelepasan panas terhadap sudut engkol pada putaran 1200 rpm beban 5 kg



a. Rasio 6

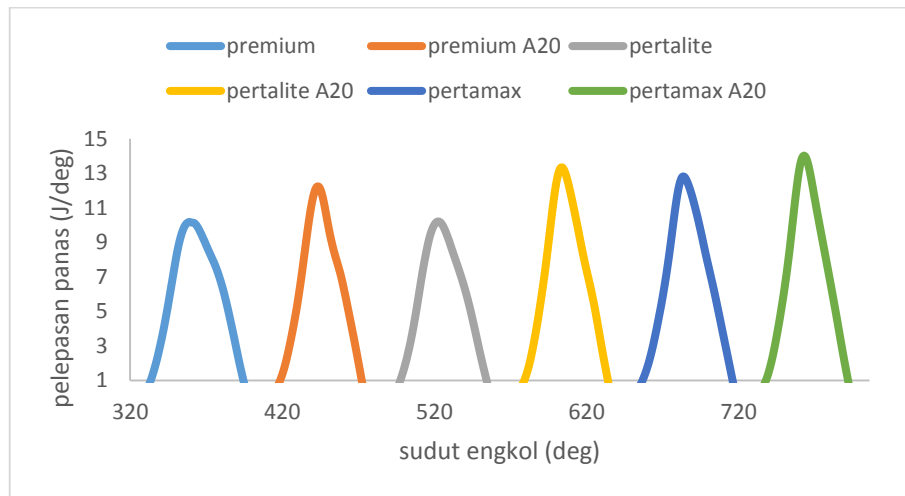


b. Rasio 8

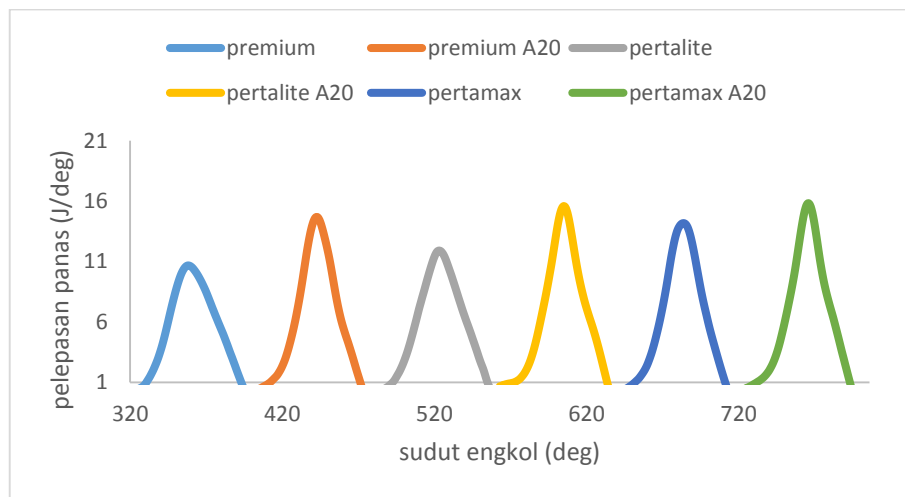


c. Rasio 10

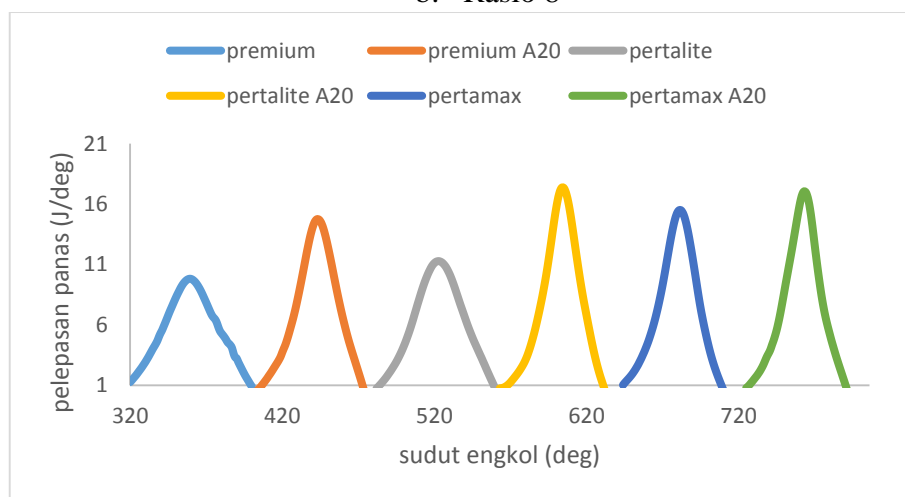
Gambar 48. Perbandingan pelepasan panas terhadap sudut engkol pada putaran 1400 rpm beban 1 kg



a. Rasio 6

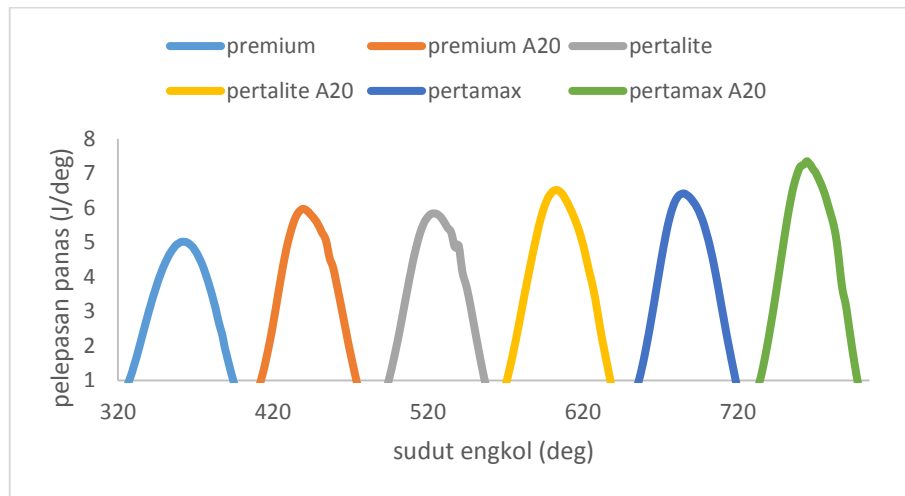


b. Rasio 8

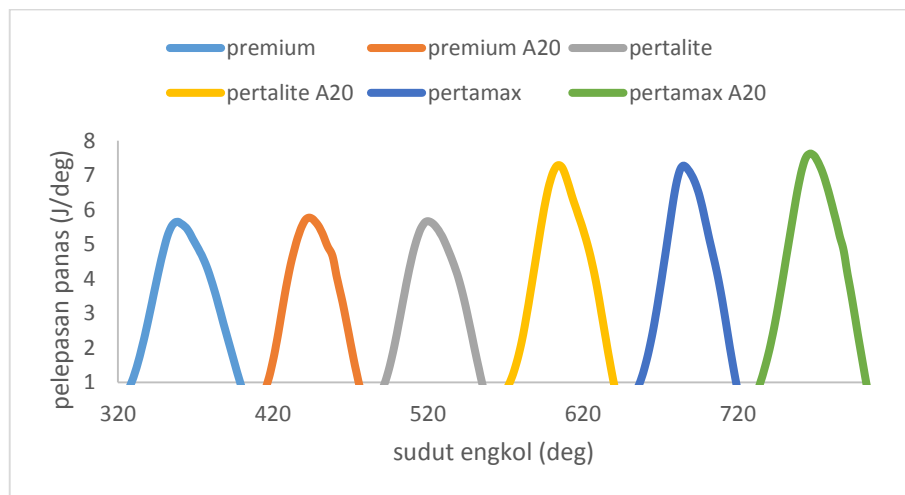


c. Rasio 10

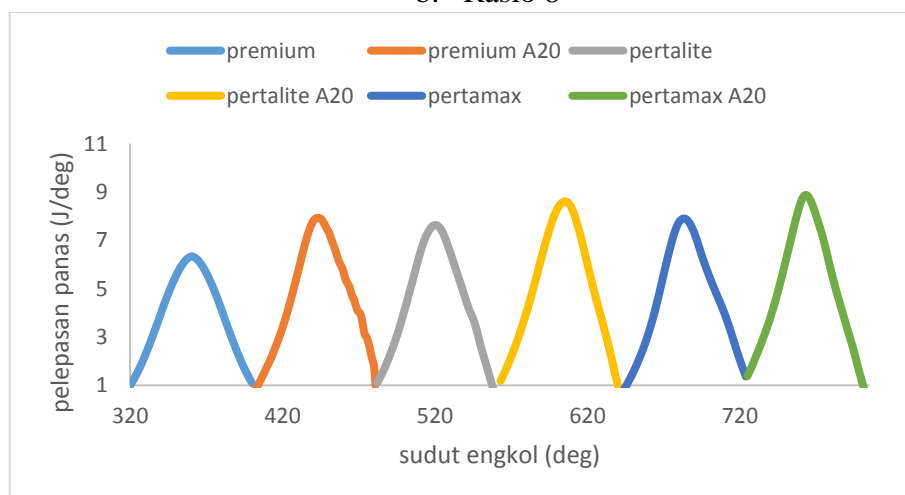
Gambar 49. Perbandingan pelepasan panas terhadap sudut engkol pada putaran 1400 rpm beban 5 kg



a. Rasio 6

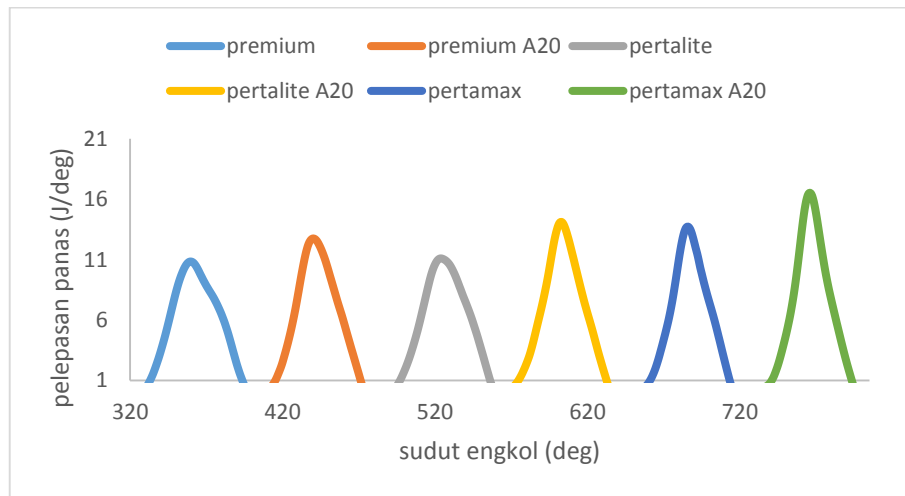


b. Rasio 8

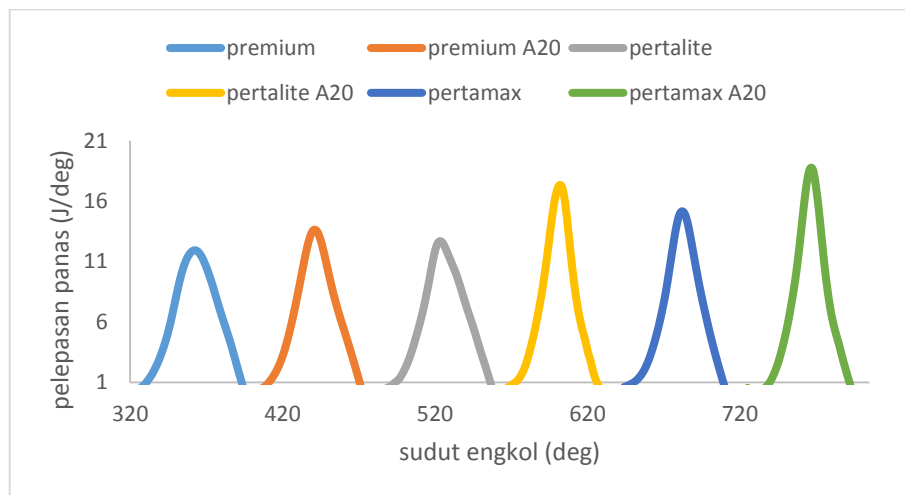


c. Rasio 10

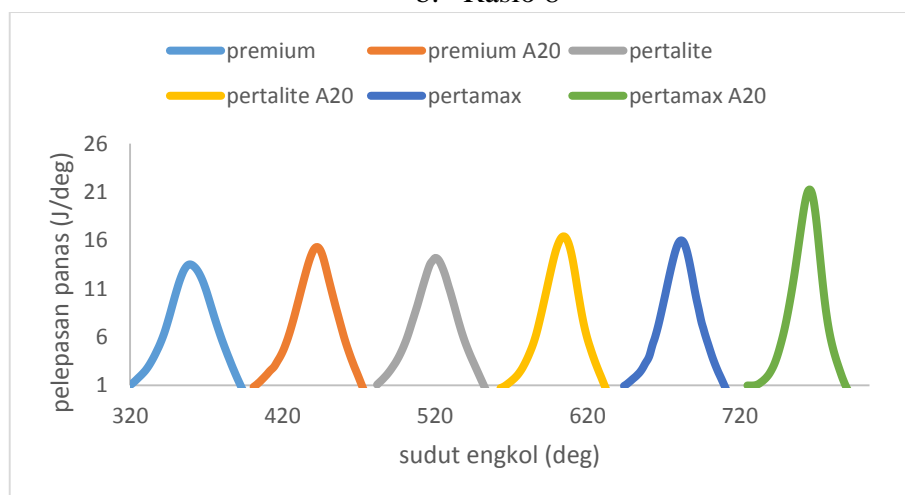
Gambar 50. Perbandingan pelepasan panas terhadap sudut engkol pada putaran 1600 rpm beban 1 kg



a. Rasio 6

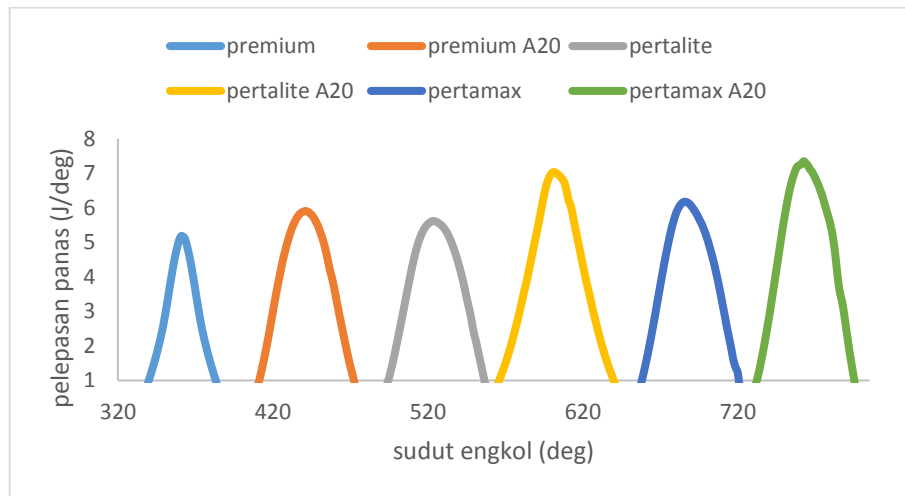


b. Rasio 8

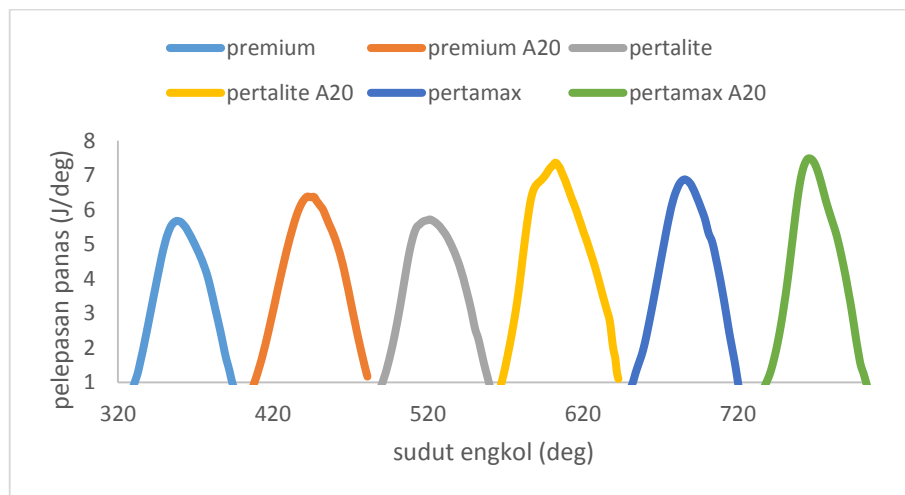


c. Rasio 10

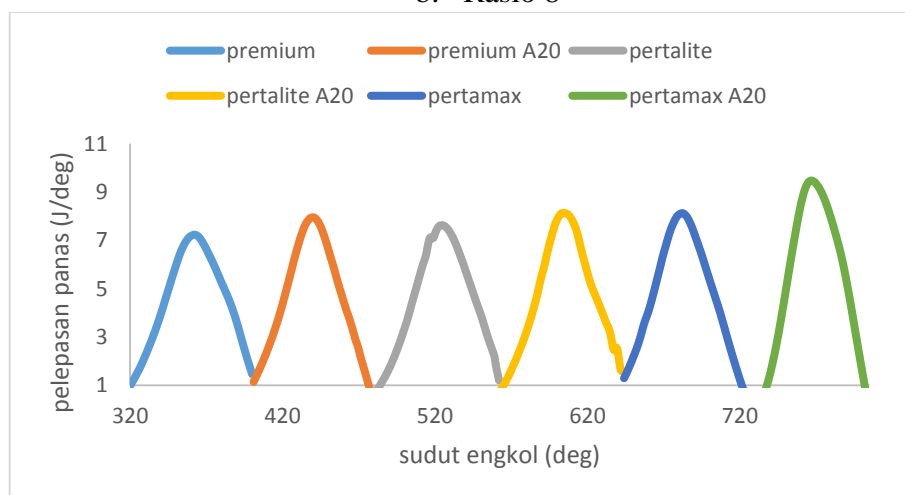
Gambar 51. Perbandingan pelepasan panas terhadap sudut engkol pada putaran 1600 rpm beban 5 kg



a. Rasio 6

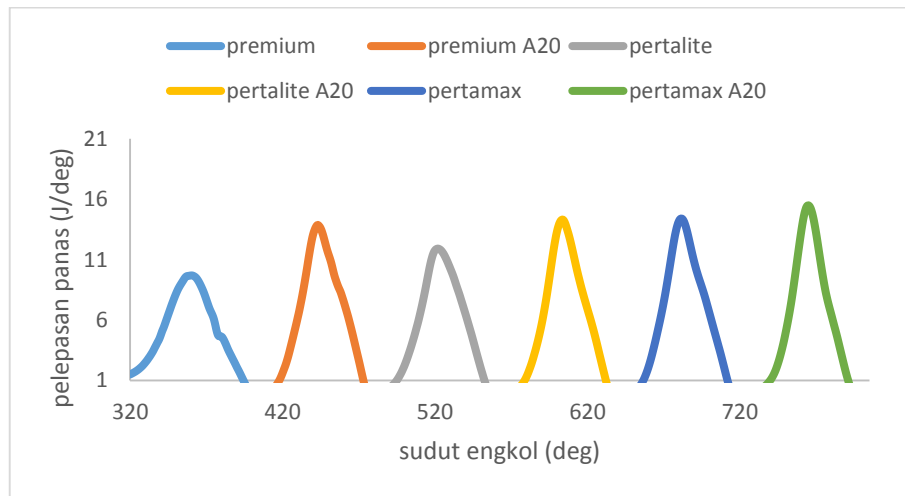


b. Rasio 8

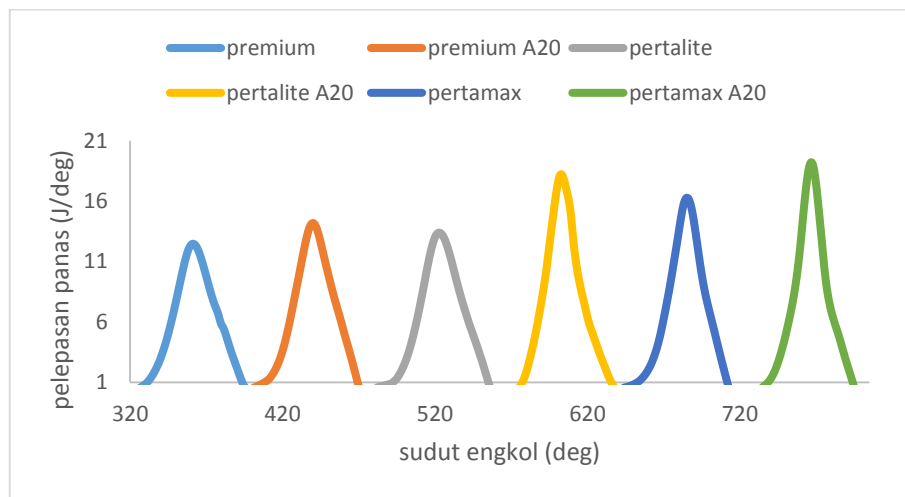


c. Rasio 10

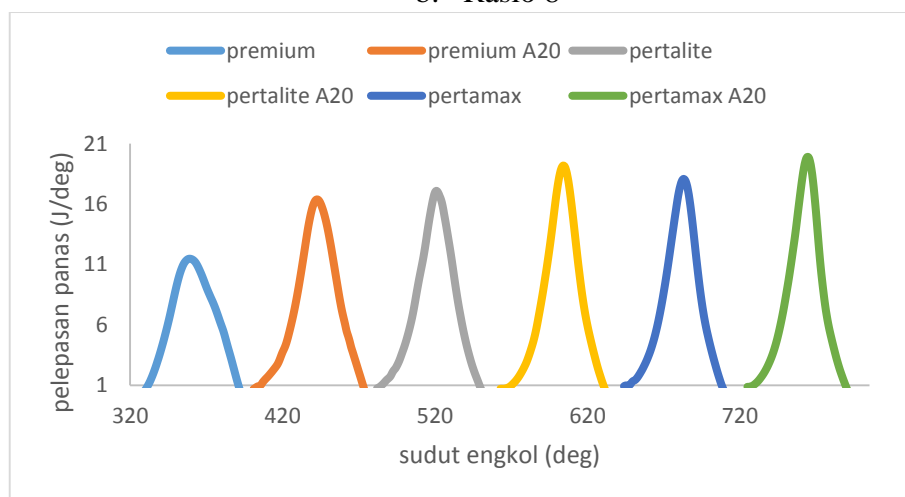
Gambar 52. Perbandingan pelepasan panas terhadap sudut engkol pada putaran 1800 rpm beban 1 kg



a. Rasio 6



b. Rasio 8



c. Rasio 10

Gambar 53. Perbandingan pelepasan panas terhadap sudut engkol pada putaran 1800 rpm beban 5 kg