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LAMPIRAN

1. Contoh Perhitungan (B30 Tanpa Ozon Kompresi 18)

N	= 1451 rpm	T	= 16,62 Nm
t	= 187 detik	ho	= 51,21 mmWC
Kd	= 0,6	Do	= 20 mm
LHV_{bb}	= 36417 kJ/kg	Beban	= 9 kg
PV plot area	= 2340,35 cm	ρf	= 0,863

1. Daya indikasi (IP)

$$IP = \frac{\frac{PV\ plot\ area.N}{n.60}}{1000000} = \frac{\left(\frac{2340,35.1451}{2.60}\right).100}{1000000} = 2,83 \text{ kWatt}$$

2. Daya efektif (BP)

$$BP = \frac{T\ .\ N}{9549,3} = \frac{(16,62 \text{ Nm})\ (1451\ rpm)}{9549,3} = 2,53 \text{ kWatt}$$

3. Konsumsi Bahan Bakar (FC)

$$FC = \frac{VGU.10^{-3}\rho f.3600}{t} = \frac{(50cc)(10^{-3})(0,863)(3600)}{187\ detik} = 0,83\ {}^{kg}/_{h}$$

4. Konsumsi Bahan Bakar Spesifik (SFC)

$$SFC = \frac{FC}{BP} = \frac{0,83}{2,53} = 0,32\ \frac{kg}{kWh}$$

5. Laju Aliran Massa Aktual (M_a)

$$M_a = Kd\ .\frac{\pi}{4}\ .Do^2\ .10^{-6}\ .3600\ .4,4295\ .\sqrt{ho\ .\ \rho a}$$

$$= (0,6)\ .\left(\frac{3,14}{4}\right)(20)^2(10^{-6})(3600)(4,4295)\sqrt{(51,21)\left(1,17\ \frac{kg}{m^3}\right)}$$

$$= (23,25)\ \frac{kg}{h}$$

6. Volume silinder

$$Vs = \frac{\pi.d^2.s.z}{4.10^6}$$

$$= \frac{3,14\ .(87,5)^2.110.1}{4.10^6}$$

$$= 0,661\ m^3$$

7. Laju Aliran Massa Theoritis (Mth)

$$Mth = \frac{Vs.10^{-3}.N.60.\rho ud}{Ka}$$

$$= \frac{\left(0{,}661\ {}^{m^3}/_{s}\right)(10^{-3})(1451rpm)(60)\left(1{,}17^{kg}/_{m^3}\right)}{2}$$

$$= 33{,}70\ \frac{kg}{h}$$

8. Perbandingan Udara Bahan Bakar (AFR)

$$AFR_{act} = \frac{ma}{FC} = \frac{23{,}25\ {}^{kg}/_{h}}{0{,}83\ {}^{kg}/_{h}} = 28{,}012$$

9. Efisiensi Volumetrik (η_{vol})

$$\eta_{vol} = \frac{M_{act}}{M_{th}}\ 100\ \% = \frac{23{,}25\ {}^{kg}/_{h}}{33{,}70\ {}^{kg}/_{h}}\ .100\ \% = 69\ \%$$

10. Kalor Masuk (Q_{in})

$$Q_{in} = \frac{FC\ .\ LHV_{bb}}{3600} = \frac{\left(0{,}83\ {}^{kg}/_{h}\right)\left(36417^{kJ}/_{kg}\right)}{3600}$$

$$= 8{,}39\ \text{kWatt}$$

11. Efisiensi Thermis (η_{th})

$$\eta th = \frac{BP}{Qin}\ .100\% = \frac{(2{,}53)kWatt}{(8{,}39\ )kWatt}100\% = 30\%$$

2. Tabel Perhitungan

					Dengan ozon 0 ppm									
No	Rasio Kompresi	Beban (kg)	Putaran (rpm)	Torsi (Nm)	BP (Kw)	IP (kW)	FC (kg/h)	SFC (kg/kW.h)	Ma (kg/h)	Mth (kg/h)	AFR	Qin (kW)	ηvo (%)	ηth (%)
1	18	3,18	1470	5,78	0,889762	1,494644	0,52	0,5844262	24,81433	34,14270234	47,71987	5,260233	72,67828	16,91487
2	18	5,05	1461	9,17	1,402969	2,009696	0,57	0,4062813	24,18285	33,93366539	42,42605	5,766025	71,26507	24,33164
3	18	7,01	1458	12,73	1,943634	3,069541	0,72	0,3704402	28,00325	33,86398641	38,89341	7,2834	82,69332	26,6858
4	18	9,16	1451	16,62	2,525381	2,829876	0,83	0,3286633	23,25458	33,70140211	28,01756	8,396143	69,00181	30,07787
5	18	11,13	1419	20,2	3,001665	3,233159	1,09	0,3631317	21,82082	32,95815961	20,01911	11,02626	66,20765	27,22289

					Dengan Ozon 4 ppm									
No	Rasio Kompresi	Beban (kg)	Putaran (rpm)	Torsi (Nm)	BP (Kw)	IP (kW)	FC (kg/h)	SFC (kg/kW.h)	Ma (kg/h)	Mth (kg/h)	AFR	Qin (kW)	ηvo (%)	ηth (%)
1	18	3,09	1469	5,6	0,853256	2,829099	0,52	0,60943	29,10713	34,11947602	55,97526	5,260233	85,30944	16,22088
2	18	5,05	1455	9,16	1,395683	3,29093	0,62	0,4442268	28,48556	33,79430742	45,94445	6,271817	84,29099	22,25326
3	18	6,98	1456	12,67	1,931819	3,655287	0,67	0,3468234	27,98628	33,81753375	41,77057	6,777608	82,75672	28,50296
4	18	9,27	1448	16,82	2,550486	4,072308	0,78	0,305824	27,21923	33,63172313	34,89645	7,89035	80,9332	32,32412
5	18	10,93	1408	19,84	2,925316	4,536077	1,14	0,3897015	25,16297	32,70267	22,07278	11,53205	76,94469	25,36683

				Dengan Ozon 18 ppm										
No	Rasio Kompresi	Beban (kg)	Putaran (rpm)	Torsi (Nm)	BP (Kw)	IP (kW)	FC (kg/h)	SFC (kg/kW.h)	Ma (kg/h)	Mth (kg/h)	AFR	Qin (kW)	ηvo (%)	ηth (%)
1	18	3,09	1476	5,6	0,865571	2,712539	0,52	0,6007593	29,3204	34,28206031	56,38539	5,260233	85,52695	16,455
2	18	5,06	1460	9,18	1,403537	3,012529	0,62	0,441741	28,51335	33,91043906	45,98927	6,271817	84,08427	22,37848
3	18	7,02	1456	12,73	1,940967	3,37971	0,72	0,370949	27,8558	33,81753375	38,68861	7,2834	82,37087	26,64919
4	18	9,06	1447	16,44	2,491144	3,921209	0,83	0,3331803	27,17263	33,6084968	32,73811	8,396142	80,85049	29,6701
5	18	10,93	1404	19,83	2,915535	4,366535	1,09	0,3738593	25,33028	32,60976469	23,23879	11,02626	77,67697	26,44175

				Dengan Ozon 22 ppm										
No	Rasio Kompresi	Beban (kg)	Putaran (rpm)	Torsi (Nm)	BP (Kw)	IP (kW)	FC (kg/h)	SFC (kg/kW.h)	Ma (kg/h)	Mth (kg/h)	AFR	Qin (kW)	ηvo (%)	ηth (%)
1	18	3,18	1479	5,76	0,892111	3,322575	0,52	0,5828868	29,48203	34,3517393	56,69621	5,260233	85,82397	16,95954
2	18	5,05	1470	9,16	1,410072	3,639835	0,62	0,4396939	28,67584	34,14270234	46,25135	6,271817	83,98819	22,48267
3	18	7,12	1458	12,93	1,97417	3,770378	0,67	0,3393832	27,79318	33,86398641	41,48235	6,777608	82,07296	29,12782
4	18	9,17	1448	16,64	2,523192	4,129611	0,83	0,3289484	27,00501	33,63172313	32,53616	8,396142	80,29624	30,05181
5	18	11,03	1441	20,01	3,019531	4,55572	1,14	0,377542	24,91625	33,46913883	21,85636	11,53205	74,44546	26,18382

				Dengan O3 26 ppm										
No	Rasio Kompresi	Beban (kg)	Putaran (rpm)	Torsi (Nm)	BP (Kw)	IP (kW)	FC (kg/h)	SFC (kg/kW.h)	Ma (kg/h)	Mth (kg/h)	AFR	Qin (kW)	ηvo (%)	ηth (%)
1	18	3,18	1491	5,78	0,902472	3,167681	0,52	0,5761949	29,58572	34,63045523	56,89561	5,260233	85,43266	17,15651
2	18	5,05	1469	9,16	1,409113	3,521021	0,57	0,4045099	28,62977	34,11947602	50,22767	5,766025	83,91034	24,4382
3	18	7,03	1456	12,76	1,945542	3,815536	0,67	0,3443771	27,69803	33,81753375	41,34034	6,777608	81,90434	28,70543
4	18	9,05	1446	16,43	2,487908	4,538322	0,78	0,3135164	26,65075	33,58527047	34,16763	7,89035	79,3525	31,53102
5	18	10,93	1392	19,83	2,890616	5,004529	1,24	0,4289743	24,63495	32,33104875	19,86689	12,54363	76,19594	23,04449

3. Dokumentasi