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Analysis of the Effect of Throttle Variations and Valve Load Variations on the Performance of Gasoline and Diesel Fuel Motors

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ABSTRACT

Technological developments in the modern era have experienced quite a significant increase, one of which is the combustion motorbike. Several things that are of concern to continue to be developed in combustion engines are the fuel system, ignition system and valve mechanism. The aim of this research is to analyze the effect of variations in throttle and valve load on petrol and diesel engines to determine the performance of these engines. The method used in this research is an experimental method by providing throttle variations and valve load variations on petrol and diesel motorbikes. The results of this research are that on petrol motorbikes the throttle changes with a fixed load at Pi, Pm, Ni, Ne, Nm, Qe, ηe, and ηi. There is a correlation between rotation and throttle, where the higher the rotation and the larger the throttle, the higher the value of the throttle. Pi, Pm, Ni, Ne, Nm, Qe, ηe, and ηi. In diesel motors Pi, Pm, Ni, Ne, Nm, Gs, Gg, Qb, Qeg, Qe, Qpp, ηe, and ηi There is a correlation between rotation and throttle, where the higher the rotation and the larger the throttle, the higher the value of Pi. , Pm, Ni, Ne, Nm, Gs, Gg, Qb, Qeg, Qe, Qpp, ηe, and ηi.

Keywords: Combustion engine, throttle, valve, performance

1. Introduction

Introduction The development of combustion engine technology in the modern era continues to progress quite significantly. Research on combustion engines continues to be carried out to achieve technological developments that are required to continue to be developed. The development of combustion engine technology has largely concentrated on the fuel system, ignition system and valve mechanism system [1][2]. The development of this technology certainly cannot be separated from its objectives, namely increasing maximum work efficiency and effectiveness on combustion engines, saving fuel and improving exhaust emissions. To achieve this goal, technological improvements are needed [3][4]. In the fuel system and valve mechanism, piston combustion motors use several cylinders in which there is a piston that moves in translation. Combustion occurs in the cylinder involving fuel and air. The combustion gas that occurs will move the piston which is connected to the crankshaft. The translational motion of the piston will cause rotational motion on the crankshaft and vice versa. Combustion motorbikes in terms of their ignition systems are petrol motorbikes (Otto) and diesel motorbikes [4][3].

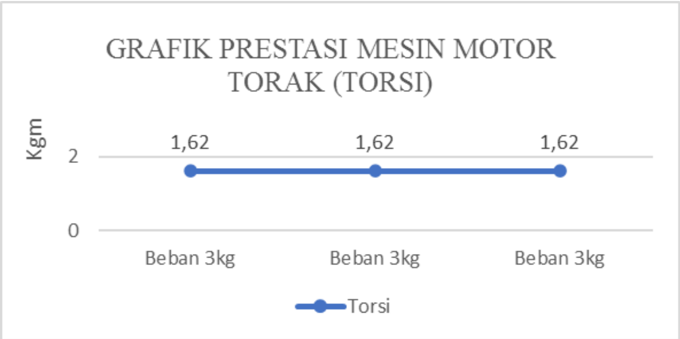
Combustion (gasoline) motors are ignited using a surge of electric sparks between the two spark plug electrodes. Meanwhile, in diesel engines, the ignition process itself occurs because the fuel that is sprayed into the cylinder is under high pressure [5][6].

2. Methodology of Research

This research uses an experimental method by providing throttle variations and valve load variations on petrol and diesel motorbikes. On diesel engines, the throttle is changed with a fixed valve load during each random data collection 3 times: 15°, 20°, 25° with a load of 2 kg. Change the valve load with a fixed throttle in each random data collection 3 times: 1kg, 2kg and 3 kg, with a 20o throttle. On petrol motorbikes, the throttle is changed with a fixed load during each random data collection 3 times: 15°, 20°, 25° random data collection 3 times: 15°, 20°, 25°. Changing the load with a fixed throttle in each random data collection 3 times: 2kg, 3kg and 4 kg, random data collection 3 times: 2kg, 3kg and 4 kg with a 70° throttle.

3. Result and Discussion

The torque in the 3 tests is the same, namely 1.62 kgm. The highest effective power in test 3 was 9.54 PS, and the lowest in test 1 was 5.18 PS. The highest Specific Fuel Consumption Effective (SFCe) was in test 3, namely 0.27 kg/PS.second and the lowest was in test 2, namely 0.21 kg/PS.second. The highest indicated power in test 3 was 47.66 PS, and the lowest was in test 1, namely 25.88 PS. The highest mechanical power was in test 3, namely 38.12 PS, and the lowest was in test 1, namely 20.7 PS. The highest Specific Fuel Consumption Indicated (SFCi) was in tests 1 and 3, namely 0.05 kg/PS.sec and the lowest was in test 2, namely 0.04 kg/PS.sec. The values obtained from the graph are influenced by several factors which cause the values to increase or decrease. For power, both effective power, indication power and mechanical power for this experiment are greatly influenced by the value of the engine rotation that occurs and causes the power value to change. Meanwhile, for the SFCe and SFCi values, the value really depends on the size of the FC value [7][8][9][10].



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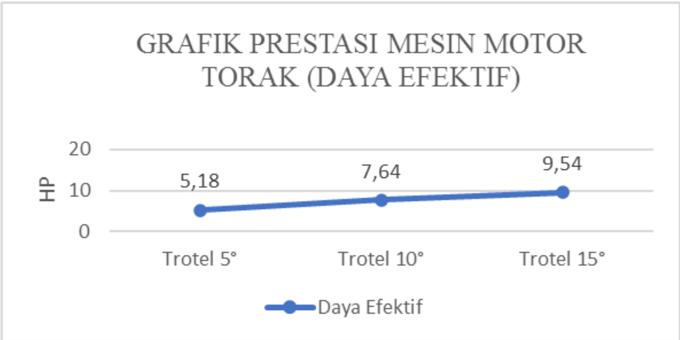

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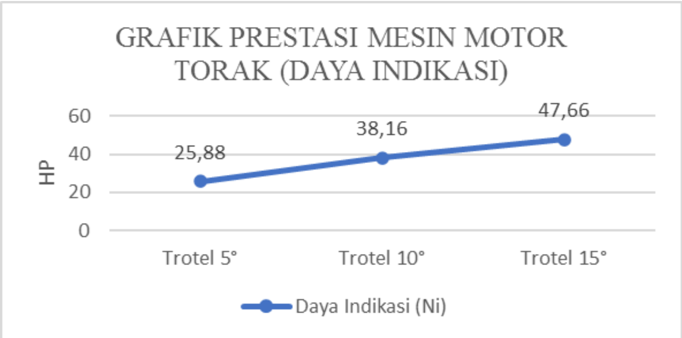

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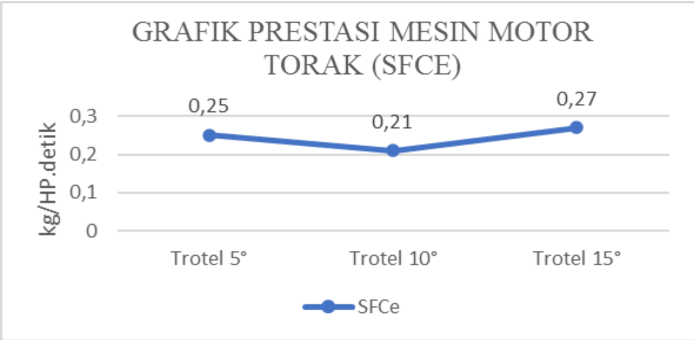

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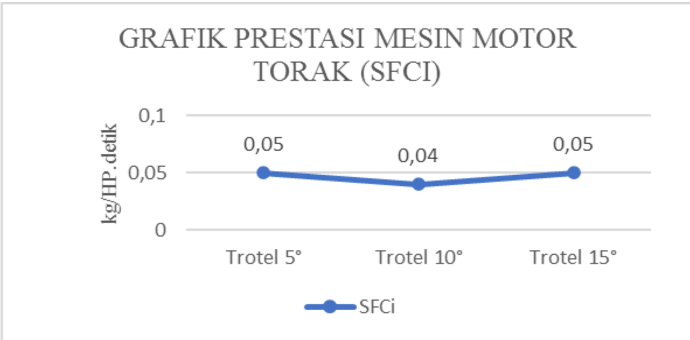
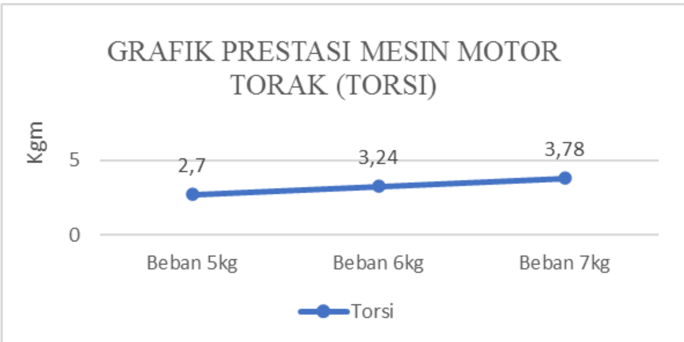
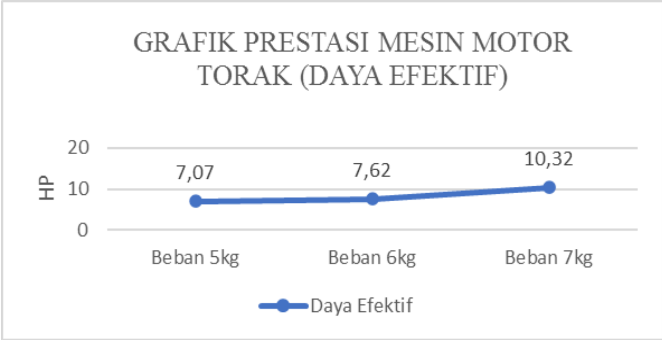


(f)

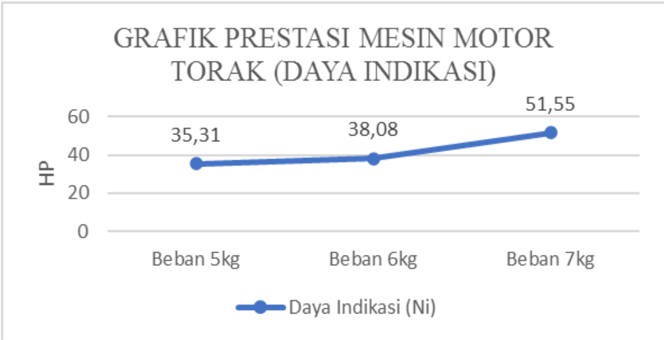
Figure 1. Fixed Load Changing Throttle Reciprocating Motor Engine, (a) Torque piston engine motor graph, (b) Effective power piston engine motor graph, (c) Reciprocating engine motor graph power indication, (d) Mechanical power reciprocating engine motor graph, (e) SFCE piston engine motor graph, (f) SFCI reciprocating engine motor graphics.



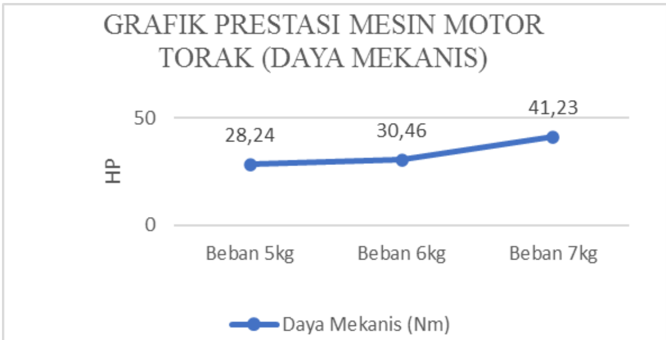
(a)


GRAFIK PRESTASI MESIN MOTOR TORAK (DAYA EFEKTIF)
HP
20
10
0
7,07
7,62
10,32
Beban 5kg
Beban 6kg
Beban 7kg
Daya Efektif

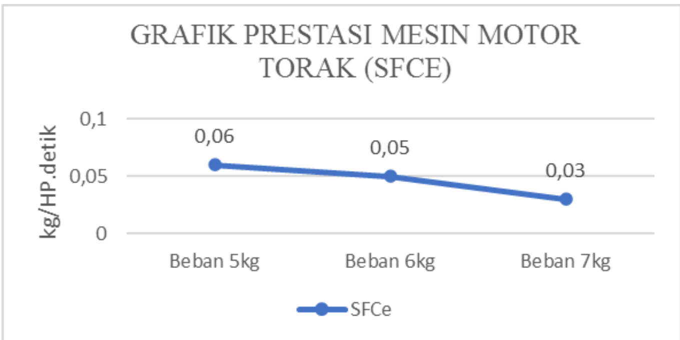
(b)


GRAFIK PRESTASI MESIN MOTOR TORAK (DAYA INDIKASI)
HP
60
40
20
0
35,31
38,08
51,55
Beban 5kg
Beban 6kg
Beban 7kg
Daya Indikasi (Ni)

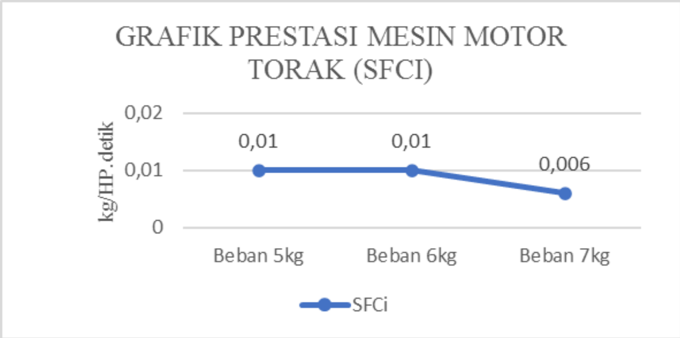
(c)


GRAFIK PRESTASI MESIN MOTOR TORAK (DAYA MEKANIS)
HP
50
0
28,24
30,46
41,23
Beban 5kg
Beban 6kg
Beban 7kg
Daya Mekanis (Nm)

(d)


GRAFIK PRESTASI MESIN MOTOR TORAK (SFCE)
kg/HP.detik
0,1
0,05
0
0,06
0,05
0,03
Beban 5kg
Beban 6kg
Beban 7kg
SFCe

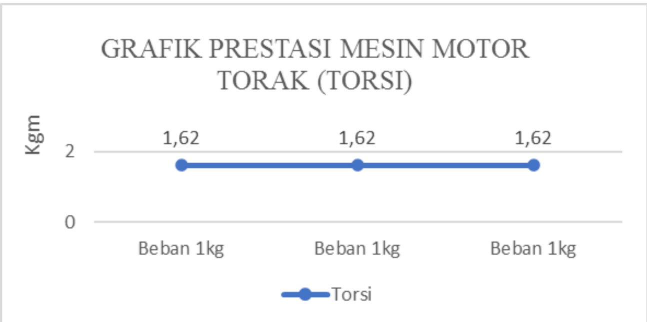
(e)



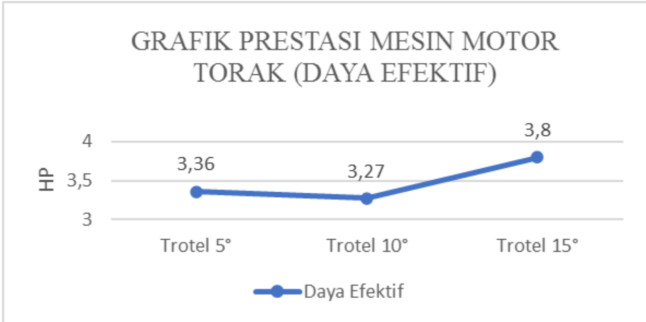
(f)

Figure 2. Fixed Load Throttle Reciprocating Motor Engine, (a) Torque piston engine motor graph, (b) Effective power piston engine motor graph, (c) Reciprocating engine motor graph power indication, (d) Mechanical power reciprocating engine motor graph, € SFCE piston engine motor graph, f. SFCI reciprocating engine motor graphics.

The highest torque in test 3 was 3.78 kgm, and the lowest in test 1 was 2.7 kgm. The highest effective power in test 3 was 10.32 PS, and the lowest in test 1 was 7.07PS. The highest Specific Fuel Consumption Effective (SFCe) was in test 1, namely 0.06 kg/PS.second and the lowest was in test 3, namely 0.03 kg/PS.second. The highest indicated power in test 3 was 51.55 PS, and the lowest in test 1 was 35.31 PS. The highest mechanical power was in test 3, namely, 41.23 PS, and the lowest was in test 1, namely 28.24 PS. The highest Specific Fuel Consumption Indicated (SFCi) in tests 1 and 2 is 0.01 kg/PS.sec and the lowest in test 3 is 0.006 kg/PS.sec. The values obtained from the graph are influenced by several factors which cause the values to increase or decrease. For power, both effective power, indication power and mechanical power for this experiment are greatly influenced by the value of the engine rotation that occurs and causes the power value to change. Meanwhile, for the SFCe and SFCi values, the value really depends on the size of the FC value [7][8].



(a)



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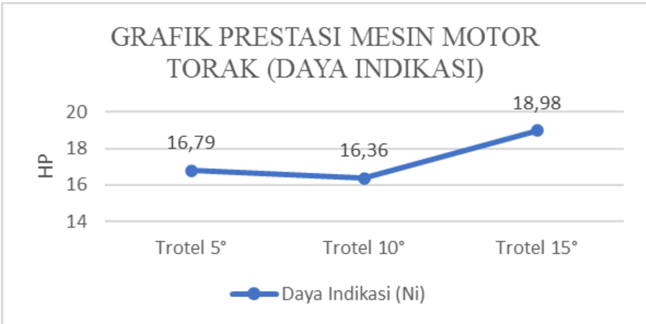

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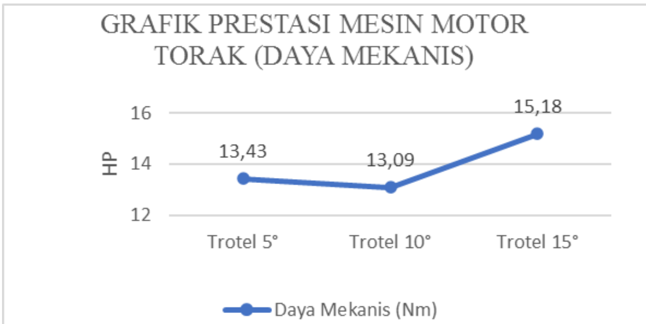

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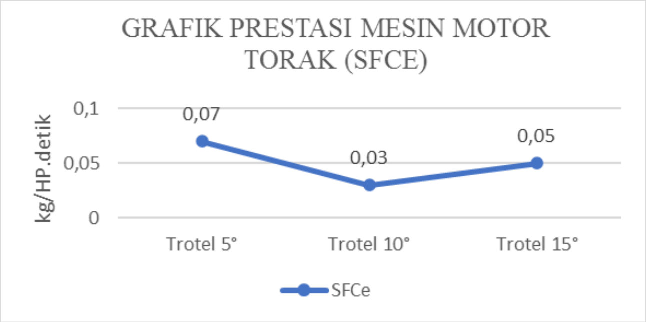

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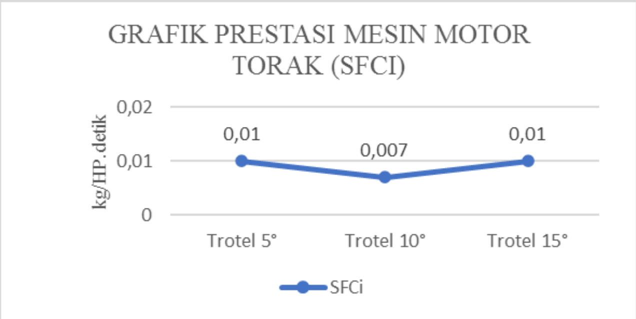

(f)

Figure 3. Fixed Throttle Reciprocating Motor Engine Changing Load, (a) Torque piston engine motor graph, (b) Effective power piston engine motor graph, (c) Reciprocating engine motor graph power indication, (d) Mechanical power reciprocating engine motor graph, (e) SFCE piston engine motor graph, (f) SFCI reciprocating engine motor graphics.

The torque in the 3 tests is the same, namely 1.62 kgm. The highest effective power in test 3 was 3.8 PS, and the lowest in test 2 was 3.27 PS. The highest Specific Fuel Consumption Effective (SFCe) was in test 1, namely 0.07 kg/PS.second and the lowest was in test 2, namely 0.03 kg/PS.second. The highest indicated power in test 3 was 18.98 PS, and the lowest was in test 2, namely 16.36 PS. The highest mechanical power was in test 3, namely 15.18 PS, and the lowest was in test 2, namely 13.09 PS. The highest Specific Fuel Consumption Indicated (SFCi) in tests 1 and 3 is 0.01 kg/PS.sec and the lowest in test 2 is 0.007 kg/PS.sec. The values obtained from the graph are influenced by several factors which cause the values to increase or decrease. For power, both effective power, indication power and mechanical power for this experiment are greatly influenced by the value of the engine rotation that occurs and the load received by the engine and causes the power value to change. Meanwhile, for the SFCe and SFCi values, the value really depends on the size of the FC value [7][8][9][10].

4. Conclusion

Testing diesel motor variations in throttle changes with a fixed load above, it can be concluded that at Pi, Pm, Ni, Ne, Nm, Qe, ηe, and ηi there is a correlation between rotation and throttle, where the higher the rotation and the larger the throttle, the higher the value. on Pi, Pm, Ni, Ne, Nm, Qe, ηe, and ηi. In SFCe, SFCi, ηm, ηv, and ηe, there is a correlation between rotation and throttle, where the greater the rotation and throttle, the higher the SFCe, SFCi, ηm, ηv, and ηe values. Testing the diesel motor with fixed throttle variations with changing load above can be concluded that in Pm and Nm there is no correlation between the changing load rotation and the fixed throttle, so there is no influence. Testing gasoline motorbikes with changing throttle variations with a fixed load above, it can be concluded that at Pi, Pm, Ni, Ne, Nm, Gs, Gg, Qb, Qeg, Qe, Qpp, ηe, and ηi there is a correlation between rotation and throttle, where the more The higher the rotation and the bigger the throttle, the values of Pi, Pm, Ni, Ne, Nm, Gs, Gg, Qb, Qeg, Qe, Qpp, ηe, and ηi will increase. In SFCe, SFCi, ηm, ηv, and ηe, there is a correlation between rotation and throttle, where the greater the rotation and throttle, the smaller the values of SFCe, SFCi, ηm, ηv, and ηe. At T, Pe, Ne, Qw, Qe, ηm, ηe, ηv, and ηe there is a correlation between rotation and throttle, where when the throttle is fixed and the rotation changes decrease, the values of T, Pe, Ne, Qw, Qe, ηm, ηe , ηv, and ηe are increasing. In Pi, Pm, Ni, Nm, SFCe, SFCi, Gs, Gg, Qb, and Qeg there is a correlation between rotation and throttle, where when the rotation changes to decrease and the throttle remains constant, the values of Pi, Pm, Ni, Nm, SFCe, SFCi , Gs, Gg, Qb, and Qeg decrease.

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