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The effect of magnetic rotor variations on motorcycle 4-step injection modification on engine performance as a potential application of bioethanol

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Abstract

Various innovations in technology continue to be developed to improve engine performance and optimize the combustion process in the combustion chamber. Perfect combustion can improve the performance of the engine, while also maximizing the ignition system by modifying the pulser magnetic pickup to increase the spark from the spark plug in the combustion chamber, so that the air and fuel mixture burns more efficiently and the combustion is more complete. This research aims to explore the effect of variations in the magnetic rotor on a 4-stroke injection motorbike on engine performance, especially in the application of bioethanol fuel. The rotors used in this research include standard rotors that have been issued by the manufacturer of the vehicle, and the use of rotors that are modified by increasing the length of the mold by 2 mm, and the rotor is shortened by 2 mm. The experimental method used in this research, and the results show that a fuel mixture with 30% Pertamax and 70% ethanol produces a torque of 8.15 N.m and can produce a power of 5.9 kW, which is produced by treating the rotor. In this research, torque and power increased better than using standard rotors.

Keywords

Combustion engine, Bioethanol, Variations in fuel mixture

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Introduction

Various efforts continue to be made to develop technology to improve engine performance by optimizing combustion in the combustion chamber. Perfect combustion will improve engine performance, one of which is by optimizing the ignition system to increase the spark on the spark plug, so that the air and fuel mixture can burn optimally. The ignition system components that have been developed include spark plugs, spark plug cables, spark plug caps, coils, CDI (Capacitive Discharge Ignition), and

modifications to the magnetic protrusion (pickup pulser). All of these components play an important role in maximizing combustion in the combustion chamber, so that the air and fuel mixture burns perfectly.

Method

The type of research used is the experimental method. "Experimental research is unique in two important aspects: first, it is the only type of research that directly seeks to influence specific variables, and second, when applied appropriately, it is the best method for testing hypotheses regarding cause-and-effect relationships" [2]. Thus, it can be explained that the experimental method is a very typical method because it directly tries to influence certain variables through the application of independent and dependent variables, and is very effective in testing hypotheses about cause-and-effect relationships. Figure 2 shows the research stages.

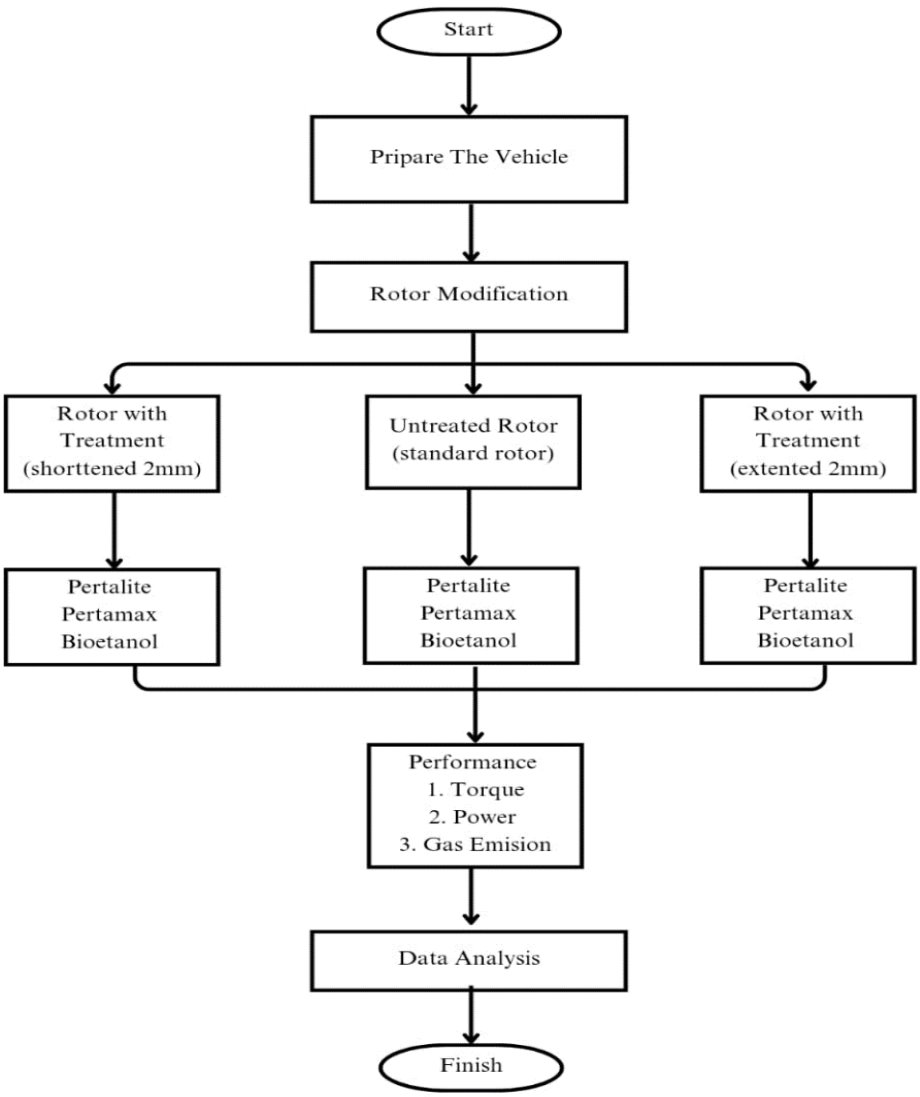

Figure 2. Research Stage

Results and Discussion

Result data

Based on the torque and power graph, you can see the difference in the ratio of torque and power produced using a standard rotor (without treatment) and a treated rotor (extended 2 mm). In the torque test using pertalite fuel, on the standard rotor the torque produced was 8.2 N.m, while on the treated rotor there was an increase of 8.22 N.m. Meanwhile, in the power test with pertalite fuel, on the standard rotor the power produced was 5.31 kW, while on the treated rotor the power produced increased by 5.78 kW. On Pertamax fuel, the torque produced by the standard rotor is 7.24 N.m, on the treated rotor the torque produced is 8.19 N.m.

Meanwhile, the power produced on the standard rotor was 4.36 kW, on the treated rotor there was an increase of 5.72 kW. On pertalite fuel with a mixture of 20% ethanol, the torque produced on the standard rotor was 7.21 N.m, while on the treated rotor it increased by 8.22 N.m. Then in the power test, the standard rotor produced 4.61 kW of power, while the treated rotor produced 5.77 kW. On pertalite fuel with a mixture of 30% ethanol, the standard rotor produces a torque of 7.20 N.m, on the treated rotor the resulting torque increases by 8.27 N.m. Meanwhile, the power generated on each rotor is 4.59 kW on the standard rotor and 5.81 kW on the treated rotor. Then on pertalite fuel with a mixture of 40% ethanol, the standard rotor produces a torque of 7.22 N.m, the treated rotor produces a torque of 8.24 N.m. Meanwhile, the power produced on the standard rotor is 4.51 kW, on the treated rotor it is 5.84 kW. Pertamax fuel with a mixture of 50% ethanol, on the standard rotor the torque produced is 7.3 N.m and on the treated rotor it is 8.24 N.m. Meanwhile, the power produced is 4.51 kW on the standard rotor, on the treated rotor it is 5.84 kW. Pertamax fuel with a mixture of 60% ethanol, on the standard rotor the torque produced is 7.08 N.m, the torque produced by the treated rotor is 8.22 N.m.

While the power produced is 4.55 kW on the standard rotor, on the treated rotor it is 5.88 kW. Then, Pertamax fuel with a mixture of 70% ethanol for torque on each rotor is 6.86 N.m and 8.15 N.m. Meanwhile, the power is 4.54 kW on the standard rotor and the treated rotor is 5.9 kW. The effect of ignition time on increasing engine performance is because when the ignition time is advanced, the combustion process in the combustion chamber takes longer, so that the mixture between fuel and air is homogeneous and the combustion pressure becomes higher. By increasing the pressure that occurs in the combustion chamber, the resulting engine performance becomes greater at lower and higher rpm. This shows that proper ignition has an effect on increasing engine performance. The increase in engine performance is also caused by an increase in the octane number of fuel mixed with ethanol. By increasing the octane number, the combustion temperature and pressure in the combustion chamber will be higher so that the combustion energy produced will be greater and cause the combustion process to be more perfect. The best mixture of fuel and ethanol in this study with a percentage of

Pertamax fuel of 30% and ethanol of 70%, produces a torque of 8.15 N.m and a power of 5.9 kW using a treated rotor. In a mixture of 80% fuel and ethanol, the engine experiences excessive heat due to economical fuel consumption. In this condition, oil circulation in the tidal is not optimal, which causes friction in the engine to cause excessive heat and when conducting research, researchers did not control the condition of the oil. In this condition the engine experiences unstable operation because the AFR (air flow ratio) no longer matches what is required by the motorbike engine and maximum torque and power are not obtained.

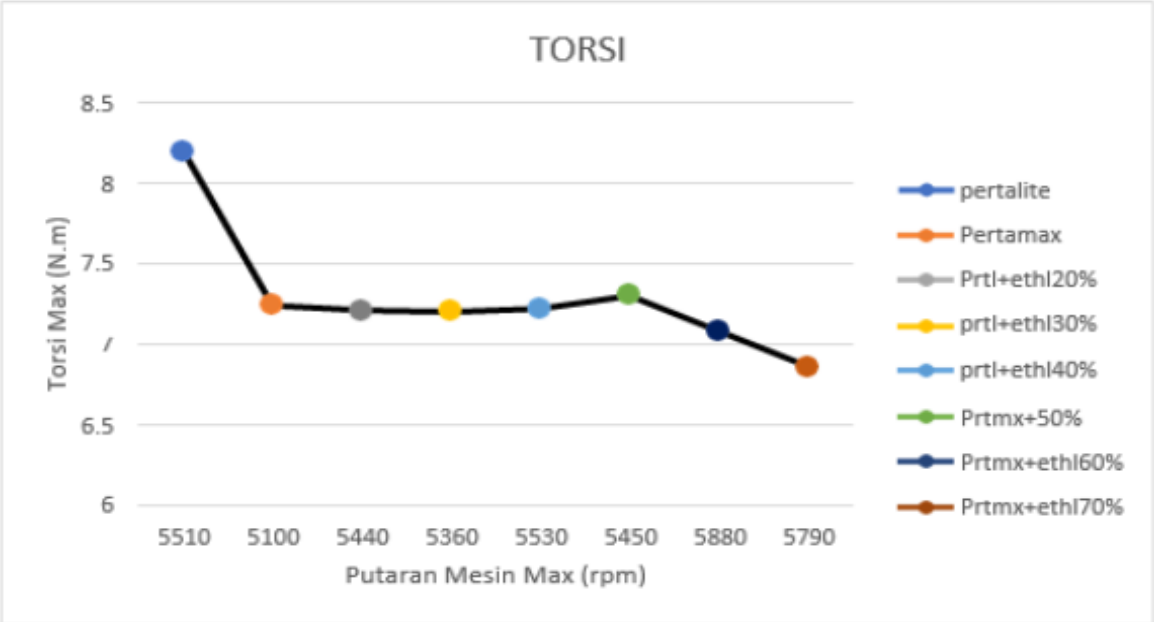

Figure 1. Graph of standard rotor torque test results

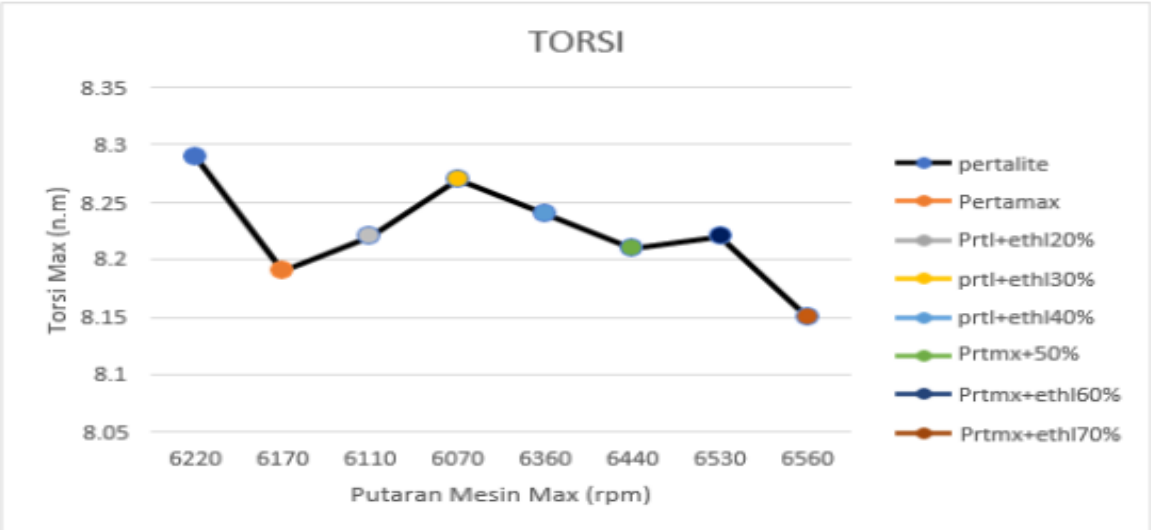

Figure 2. Graph of rotor torque test results with treatment (extended 2 mm)

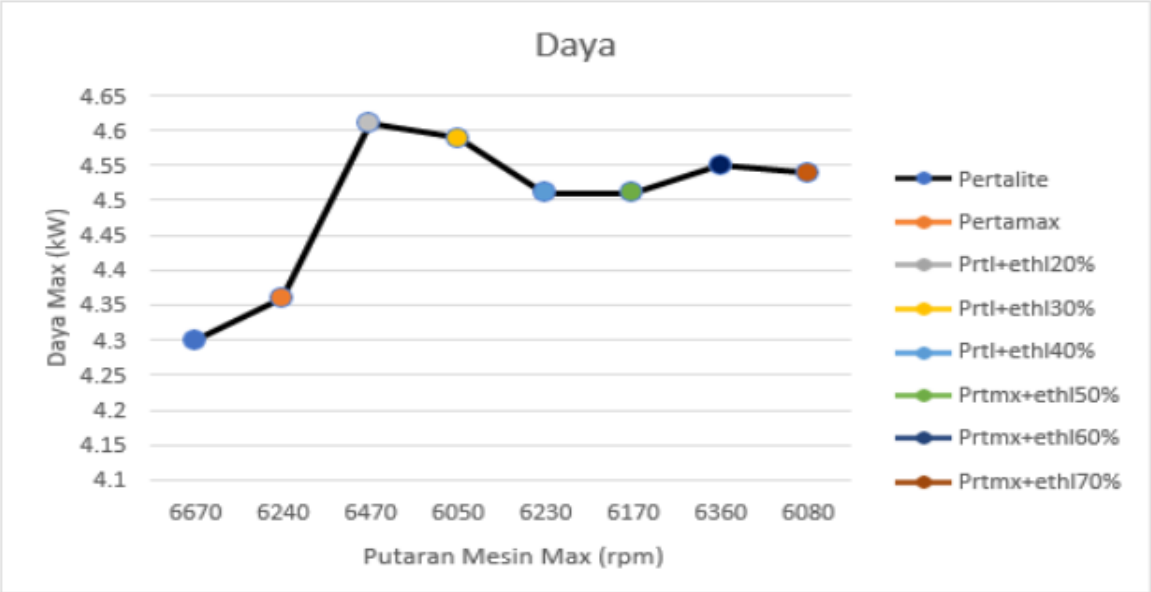

Figure 3. Graph of standard rotor power test results

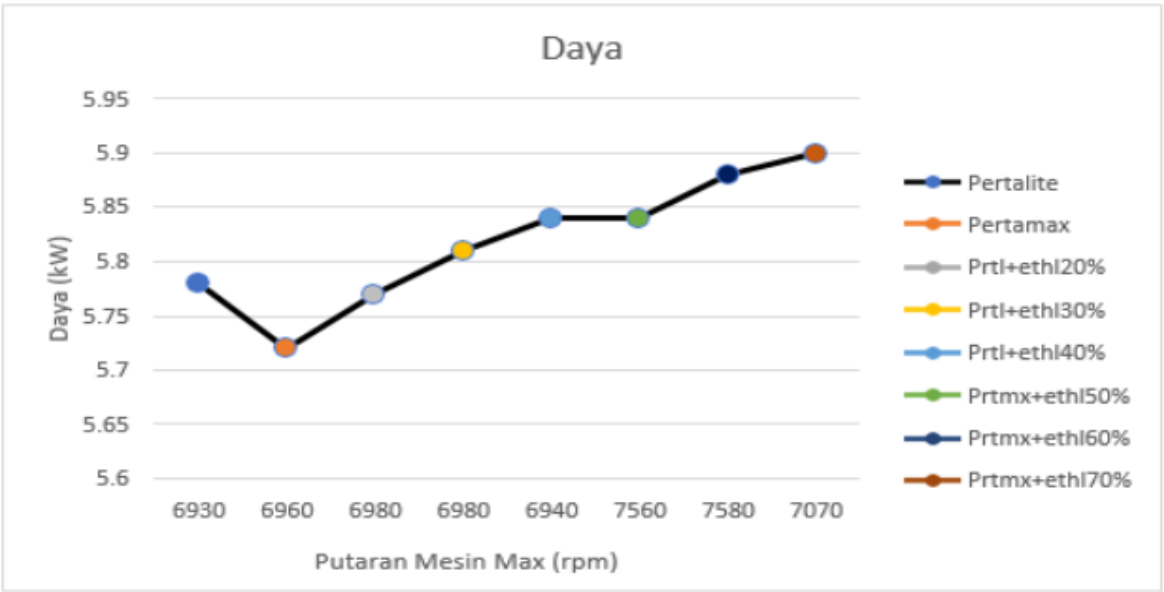

Figure 4. Graph of rotor power test results with treatment (extended 2 mm)

Conclusion

Based on the results of this research, namely the Effect of Magnetic Rotor Variations on Motorcycle 4 Steps for Injection Modification on Engine Performance as Potential The application of Bioethanol can be concluded with the following research results:

a. In this research, 3 types of rotors should be used, namely standard rotors, rotors with treatment (lengthened 2 mm) and rotor with treatment (shortened 2 mm), However, in carrying out the research, a treated (shortened) rotor was used 2 mm) 4 stroke motor cannot be started, then the rotor must be treated (shortened by 2 mm) research cannot be carried out.

b. The torque and power produced using a treated rotor (lengthened by 2 mm) has increased compared to the results obtained by a standard rotor, whether using pertalite, Pertamax, Pertalite ethanol and Pertamax ethanol fuel.

c. CO, CO2 and HC content in exhaust emissions on 4 stroke motorbikes on standard rotors and rotors treated with Pertamax fuel with a mixture of ethanol. The best emissions were obtained, namely in the variation of the 40% Pertamax mixture with 60% ethanol mixture, namely in the standard rotor CO was 0.07%, CO2 was 5.6% and HC was 100 ppm in the standard rotor, while in the rotor with CO2 treatment it was 0, 85%, CO2 4.8% and HC of 92 ppm. And in the mixture of 30% Pertamax with 70% ethanol mixture, namely in the standard rotor CO is 0.11%, CO2 is 6.2% and HC is 88 ppm, while in the rotor treated with CO it is 0.47%, CO2 is 4.7% and HC of 81 ppm.

d. On Pertamax fuel with a mixture of 60% ethanol, torque uses rotor with treatment there was an increase of 13.86%, namely 1.14 N.m, and after carrying out the t test the torque increased significantly.

e. On Pertamax fuel with a mixture of 60% ethanol, power uses rotor with treatment there was an increase of 22.61%, namely 1.33 Kw, and after carrying out the t test the power increased significantly.

f. On Pertamax fuel with a mixture of 70% ethanol, power uses rotor with treatment there was an increase of 23.05%, namely 1.36 Kw, and after carrying out the t test the power increased significantly.

g. The best mixture of fuel with ethanol that can be applied is mixture Pertamax 30% with ethanol of 70%.

h. In a mixture of 20% Pertamax with 80% ethanol at idle it starts to become difficult turned on tends to prevent the vehicle from starting.

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