

## The Comparison of Octane 90 Mixed Fuel with Bio additivestowards The Performance of The Otto Engine

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### ABSTRACT

Innovations regarding alternative fuels began to be put forward, either searching for new fuels to replace fossil fuels or adding certain ingredients to fuel oil. One of the ways is to use bio additives where this material is mixed into the fuel to the combustion process perfectly of the engine combustion chamber. Cajeput oil is one type of bio additives. The study uses cajeput oil because it is easily available on the market and is relatively inexpensive. The aim is to determine how much mixing cajeput oil with 90 octane fuel and to compare what the maximum torque is produced when it is mixed. The method in the study uses the full open throttle method with engine speed between 1500 to 6500rpm. Data analysis uses two way anova experimental design. The dependent variable is engine speed where the engine speed range starts from 1500 to 6500rpm and the independent variable is octane 90 and bio additives mixture of 3%, 6% and 9%. The test results show better performance when fuel is mixed with bio additives cajeput oil. The result of mixing bio additives 3% with fuel increased 1.92% torque to the standard, where the initial torque was 11.41 Nm and after mixing the bio additives was 11.64 Nm.

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### I. INTRODUCTION

Gasoline is a liquid fuel with the chemical formula gasoline is C<sub>8</sub>H<sub>18</sub> and C<sub>7</sub>H<sub>16</sub> with volatility at low temperature (1), while bio additives is an ingredient added to fuel. The purpose of adding bio additives to perfectly the combustion engine combustion process. The ideal additive must be able to reduce the level of exhaust emissions, be detergent (clean) the engine from carbon deposits, renewable, and can reduce (save) fuel consumption (2). The purpose of the study was to determine how much mixing cajeput oil with 90 octane fuel and to compare what the maximum torque produced when it is mixed. Some researches by Rudhi A.U and I.M. Arsana (2020: 25-29) concluded that there is an influence of a mixture of pertalite with cajeput oil 7% can increase power 2.25% and torque of 2.01% (3). Asep.K (2009: 14) concluded that there was a fuel consumption of 253.14 mL / hour when a mixture of cajeput oil 3% with diesel fuel (4). Iwan.P, Ena.M, Priyagung.H (2017: 3) concluded that the addition of bio additives cajeput oil with pertalite fuel can increase the highest power of 7.01 HP (5).

### II. MATERIAL AND METHODS

The study uses laboratory experimental methods by comparing the performance when the engine uses cajeput oil mixture of 3%, 6% and 9% with 90 octane fuel. Performance testing uses the full valve opening method to obtain data. Then the test data were analyzed using two way anova.

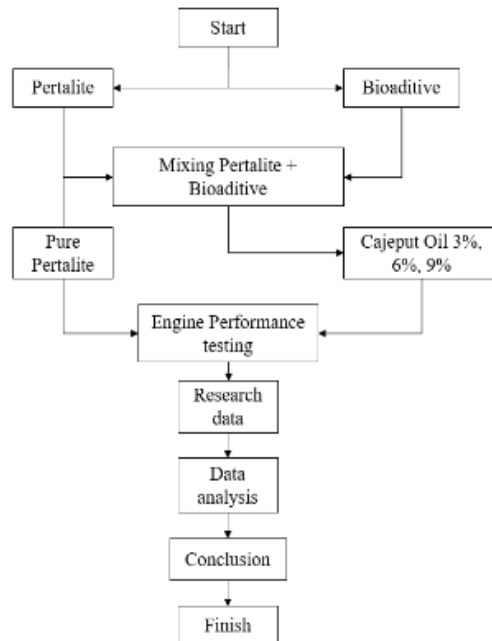


Figure 1: The flow of the methodology

The study uses octane fuel 90 and cajeput oil bio additives with a percentage of 3%, 6%, 9%. Data were obtained at 1500, 2000, 2500, 3000, 3500, 4000, 4500, 5000, 5500, 6000 engine speeds. The study used a dynamometer chassis, 250 ml measuring cup, 10 ml measuring cup, and tachometer. The testing procedure starts with mixing the fuel with cajeput oil to the level prepared, then closes the gas tank tap so that the fuel intake does not come from the tank but from the fuel that was mixed earlier. It measures the performance of the engine generated from the dynamometer. The following steps flow are explained in the figure below.

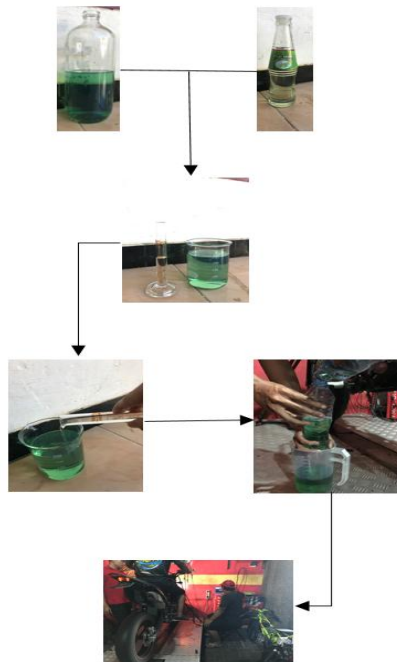


Figure 2. Research procedures

### III. RESULTS

The performance results are entered into a table and drawn on a graph. The graph explains the causes of the increase and decrease in performance. This is to determine the influence and determination of problem solving.

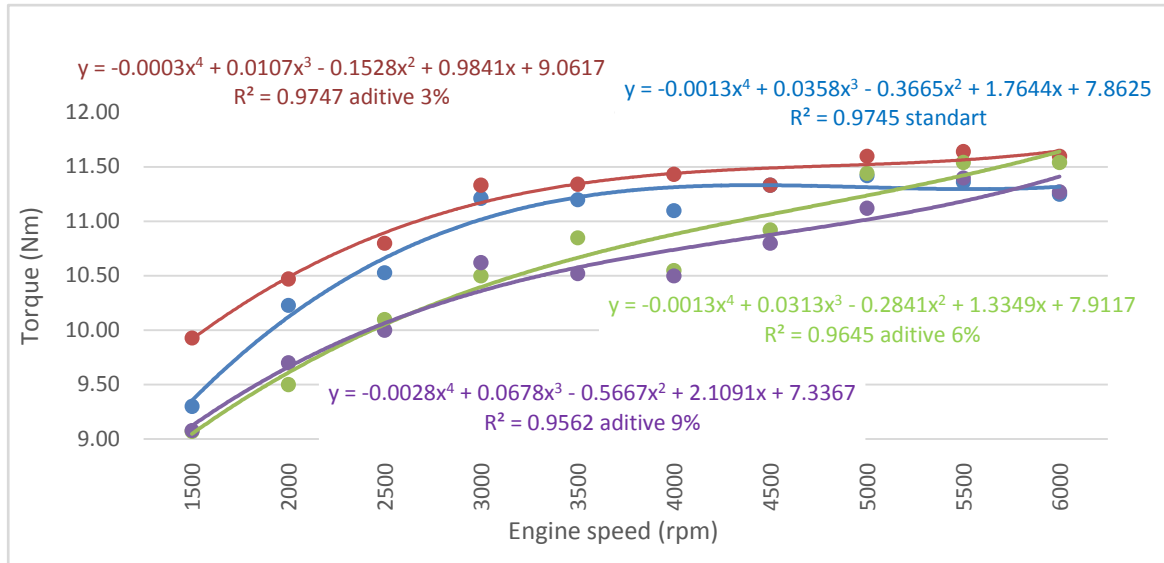


Figure3: The correlation between engine speed and torque

### IV. DISCUSSION AND CONCLUSION

Based on the test chart above shows that there is an effect of the addition of cajeput oil on pertalite fuel. In standard conditions, the torque of 9.53 Nm at 1500 rpm rotation, then increased by 7.34% at 2000 rpm which is 10.23 Nm. Then it increased again by 2.93% at 2500 rpm by 10.53 Nm. Then it increase to 6.64% at 3000 rpm which is 11.21 Nm. The torque slightly decreased by 0.08% at 3500 rpm which is 11.20 Nm. It decrease again at 4000 rpm by 3.3% which is 10.83 Nm. Torque has increased by 4.61% at 4500 rpm which is 11.33 Nm. The peak torque is reached at 5000 turns at 11.42 Nm and at subsequent rounds it tends to decrease. After changing the fuel by mixing pertalite with 3% cajeput oil. Direct torque increased by 4.19% compared to standard conditions at 2000 rpm which is 10.47 Nm. It rise again by 2.34% from standard conditions at 3000 rpm which is 11.33 Nm. Torque increased again by 1.25 at 3500 rpm by 11.34 Nm. It goes up by 5.54% at 4000 rpm which is 11.43 Nm. It is level of at 4500 rpm which is 11.33 Nm and peak torque occurs at 5500 rotation of 11.64 Nm with an increase of 1.92% compared to the peak torque in the standard position. After that pertalite with a mixture of 6% cajeput oil, the highest torque is achieved at 5500 rpm with an increase of 1.05% which is 11.54 Nm. And the peak torque decreased in the pertalite mixture with 9% cajeput oil with a decrease of 0.17% which is 11.4 Nm. After that, from the three variations of the mixture, the percentage increase in torque is the most significant among the three mixtures. The highest increase among the three mixes, namely in the mixture of pertalite with 3% cajeput oil that is equal to 1.92% compared to the standard, while the torque on the pertalite with a mixture of 9% cajeput oil has decreased 0.17% compared to the standard. The conclusion is Based on the graph above, it can be concluded that the best mixture between octane 90 and cajeput oil bio additives is 3% with an increase of 1.92% with a peak torque of 11.64 Nm. And the addition of bio additives to 90 octane fuel, it can improve engine performance.

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