

The Effect of Electromagnetic-Based Fuel Saver to the Changes of Peralite-Bioethanol Fuel Molecules

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Keywords: Fuel Saver, Electromagnet, Fuel Molecules.

Abstract: The effort that can we do to reduce the consumption of fossil fuels by vehicles is using biofuels as a mixture of fossil fuels which are alternative fuels used for motorcycle, so that the usage and dependence on fossil fuels can be reduced. By maximize the combustion process in the engine, the usage of fuel will be more efficient. The electromagnetic-based fuel saver usage has been proven to reduce the fuel consumption, but the explanation for this phenomenon cannot be explained in detail. In this research, the difference between fuel molecules that using electromagnetic-based fuel saver and not using it can be shown. The researcher using six sample in this research; 100% Peralite Fuel, 100% Peralite fuel magnetized, 90% Peralite-10% Bioethanol Fuel, 20% Peralite-10% Bioethanol Fuel Magnetized, 100% Bioethanol Fuel, and 100% Bioethanol Fuel Magnetized. The electromagnetic-based fuel saver that using for this research uses 5000 coils. This research using Particle Size Analyzer to analyse the molecule size of the fuel. As a result of this research shown that the fuel molecules size of magnetized fuel by the electromagnetic-based fuel saver is reduce into smaller molecules.

1 INTRODUCTION

The usage of fossil fuels by motorcycles is increasing every time which will cause fossil fuels to run out faster. The usage of fuel saver is an option to reduce the consumption of fossil fuels. In addition, using biofuels mixed with fossil fuels can also reduce excessive consumption of fossil fuels.

The usage of fuel saver based on magnetic field can increase the combustion efficiency in engine (Faris, et al., 2012). The magnetic field changes the structure of the fuel which increases the air-fuel mixture to make the combustion of the fuel more efficient (Chavan & Jhavar, 2016). Magnets will help disperse the hydrocarbon clusters into smaller particles and make combustion efficiency increased (Niaki, 2020). Proper combustion of fuel through the magnetic field of the internal combustion engine obtains maximum energy per litre of fuel (Kapase, 2018). Research on fuel magnetization using permanent magnets in 4-stroke motor engines states that fuel magnetization can increase oxygen levels in fuel by 2 - 4% (Costa, et al., 2020).

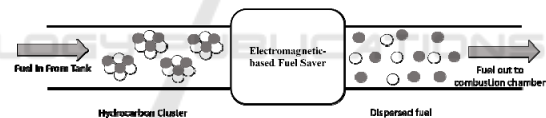


Figure 1: Schematic figure of de-cluster process of fuel molecules due to magnetic exposure.

The mixture of fossil fuel and biofuel can increase the speed of combustion rate (Mane & Sawant, 2015). From the results of research on the magnetization of a mixture of bioethanol and gasoline, it was found that the temperature of the combustion chamber in a mixture of bioethanol and gasoline increased. This proves that the fuel is more easily mixed with oxygen and combustion occurs more efficient (Ulfiana, et al., 2021). Mariaca and Castano blending gasoline and bioethanol on a gasoline engine the results showed that the E40 mixture was the most efficient, due to a 2.50% (Mariaca & Castaño, 2018). The addition of alcohol to gasoline can increase the octane number of the fuel (Al-Mashhadani & Fernando, 2017).

Magnetization of biodiesel biofuels has also been carried out. Based on this research, the stronger the magnetic field used for the biodiesel magnetization

process, so the biodiesel viscosity will be lower. The spray angle of the biodiesel blended fuel at the nozzle increases by 3.5% to 12% and the particle diameter of the jet decreases by 0.2916 – 0.9753 nm (Nufus, 2017). The study about using magnetized fuel by the electromagnet was conducted by Subramanian et al. They concluded that the strength of magnetic field that produced by electromagnet is higher than permanent magnet which tent to increase the ionization of the fuel (Subramanian, et al., 2019).

Based on Chawere research, the hydrogen atom has two structures, the name is para hydrogen which has opposite electron spins and ortho hydrogen which has unidirectional electron spins. The fuel in the form of ortho hydrogen is more reactive to oxygen, so that the combustion becomes more effectively, but this research has not been proven in practice in the field (Chaware, 2015).

The study using an injection system has been conducted by Costa and Sodre, Hydrous Ethanol (6.80% water) and Ethanol Blending (E22). The results showed that using Hydrous Ethanol was better than E22 fuel. Using a mixture of gasoline and ethanol fuel is more efficient than using hydrous ethanol (Costa & Sodr , 2011). From the study of Feng et al. that conducted on a single cylinder high speed spark ignition (SI) motorcycle engine under both full load and partial load at 6500 and 8500 rpm with pure gasoline, 30% and 35% volume butanol-gasoline blends show that butanol-gasoline blend provides more efficient combustion. With the increasing of butanol blend ratio, more complete combustion process will achieve with the optimum operating parameters. With engine load increases, the rates of heat release become faster and ascend in peak value for both pure gasoline and butanol-gasoline blends. Overall, the engine power, torque, brake specific energy consumption, HC, CO and O2 emissions are better than those of pure gasoline (Feng, et al., 2015).

2 MATERIALS AND METHOD

The materials used in this study is bioethanol from cassava with a content of 98%, Pertamina fuel with an octane number of 90 (Pertalite), and mixture of both. There are 6 variants that using in this research, 100% Pertalite (P100), 100% Pertalite magnetized (MP100), 90% Pertalite-10% Bioethanol (P90), 90% Pertalite-10% Bioethanol magnetized (MP90), 100% Bioethanol (P0), and 100% Bioethanol magnetized (MP0). The electromagnetic-based fuel saver is made from galvanum tube with inner diameter of

127 mm, tube thick of 2 mm, and length of 70 mm wounded with 0.15 mm diameter of copper wire. The tube was wounded with 5,000 wire coils, and 12 volts DC voltage were used to generate the electromagnet. The Particle Size Analyzer using Battersize BeNano 90 Zeta.

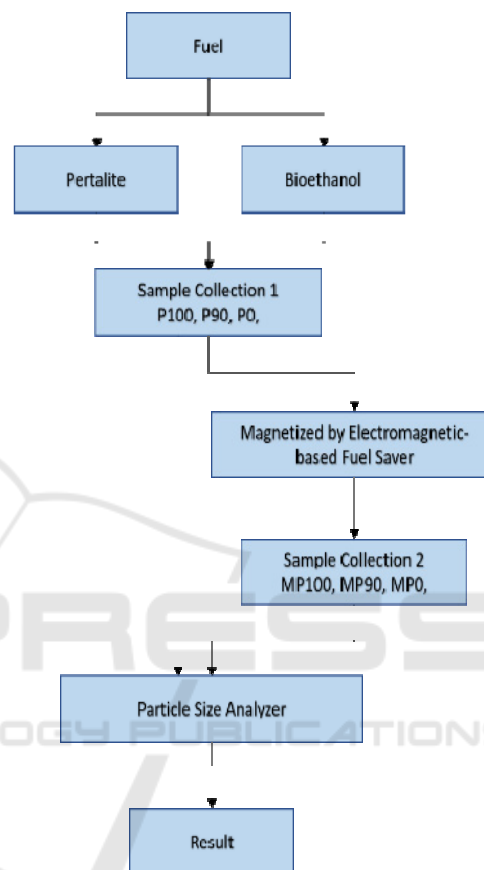


Figure 2: Schematic Diagram of Experiment.

The pertalite, bioethanol, and the mixture from both of them were collected for sampling. P100, P90, and P0. then some of the samples were treated with magnetization by the electromagnetic-based fuel saver and some were not magnetized. Then the sample is mixed with the dispersant and then put it into the PSA device for analysis. The result that comes out is the particle size of the samples.

3 RESULTS AND DISCUSSION

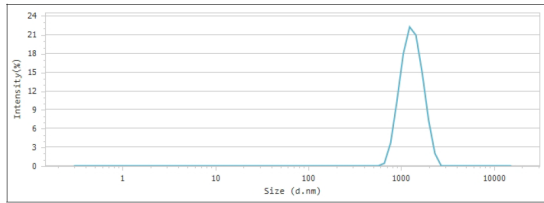


Figure 3: PSA result of sample P100.

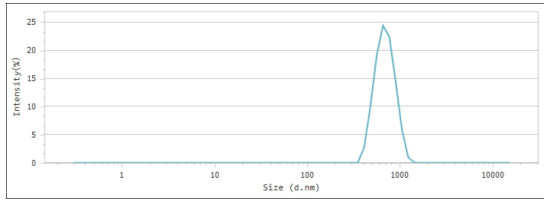


Figure 4: PSA result of sample MP100.

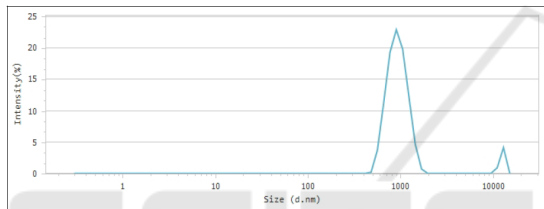


Figure 5: PSA result of sample P90.

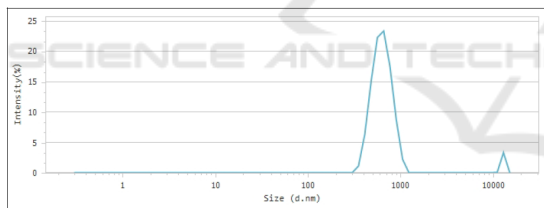


Figure 6: PSA result of sample MP90.

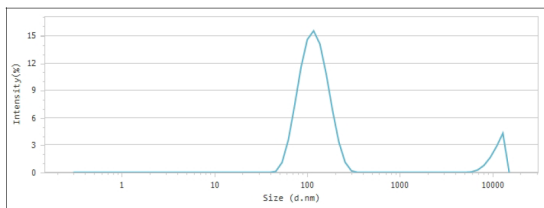


Figure 7: PSA result of sample P0.

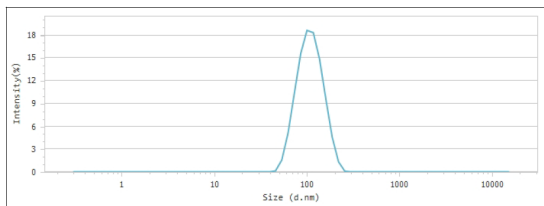


Figure 8: PSA result of sample MP0.

The results of the PSA shows that the sample which is magnetized by the electromagnetic-based fuel saver (MP100, MP90, MP0) has a smaller particle size if compared to the sample that is not magnetized (P100, P90, P0). The particle size of sample MP100 in fig. 4 is smaller than sample P100 in fig. 3, it reduces around 37% than before magnetized. The particle size of sample MP90 in fig. 6 is smaller than sample P90 in fig. 5, it reduces around 32% than before magnetized. The particle size of sample MP0 in fig. 8 is smaller than sample P0 in fig. 7, it reduces around 9% than before magnetized. The phenomenon occurs due to the electromagnetic-based fuel saver is able to break down the fuel molecules which initially become de-clusters. The electromagnetic-based fuel saver is very effective on pure peralite so it is be able to break down the hydrocarbon molecules of peralite into the de-cluster up to 37%. This is in line with previous research on magnetized fuel. Based on this research, the viscosity value of the magnetized fuel is lower than the unmagnetized fuel (Abdelnabi, 2015).

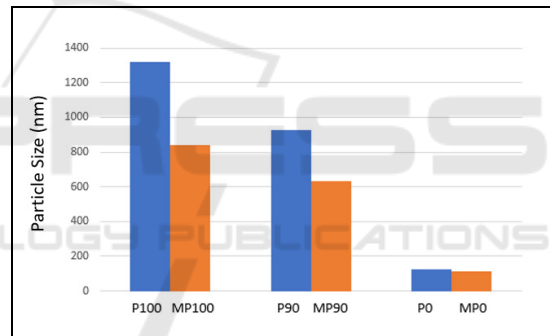


Figure 9: The comparison particle size between magnetized and unmagnetized fuel.

The mixture of 90% peralite and 10% bioethanol (Sample P90) in fig. 5 has smaller particle size than the 100% peralite (Sample P100) in fig. 3. The sample P90 is 70% smaller than sample P100. In research conducted by Susilo and Agustriyana, using mixture of 10% bioethanol and 90% gasoline resulted in an increase in the power of the motor engine, which means that the fuel mixture makes a more perfect combustion if compared to the use of pure gasoline (Susilo & Agustriyana, 2021).

Fig. 9 shows that the de-cluster process on the fuel molecules occurs due to the effect of the electromagnetic-based fuel saver. The most significant de-cluster process occurred in the magnetized sample P0 (pure Peralite), the fuel particle size was reduced up to 37%. Majority of research works prove that the use of magnetized fuel

can improve performance of an engine like power and specific fuel consumption improved to a significant level (Oommen, 2019).

4 CONCLUSIONS

In this research, the electromagnetic-based fuel saver has been successfully broken down the fuel molecules become de-clusters. The particle size of the fuel obtained by this research :

- a. Peralite particle size reduced around 37%
- b. Mixture of 90% peralite and 10% bioethanol particle size reduced around 32%.
- c. Bioethanol particle size reduced around 9%.

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