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EXPERIMENTAL STUDY OF OCTANE NUMBER FUEL PLASTIC WASTE POLYPROPYLENE PURIFICATION RESULT WITH ABSORPTION DISTILLATION

Aditya Wahyu Pratama[1] **And Ahmad Robiul Awal Udin** [2]

[1]Research Leader ,Engineering Department, Politeknik Negeri Jember, Mastrip Street, Mail Box 164 Jember, Indonesia
E-mail : Aditya_wa@polije.ac.id
[2]Research Assistant, Engineering Department, Politeknik Negeri Jember, Mastrip Street, Mail Box 164 Jember, Indonesia

E-mail : ahmadrobiulawal@gmail.com

Abstract . In Indonesia, plastic waste has become an important problem at this time, because it causes environmental pollution problems. With this, further action is needed regarding the treatment of waste utilization, one of which is by converting waste into liquid fuel. Some types of rubbish that we often encounter are plastic bottles such as plastic cups, plastic bottle caps, children's toys and margarines and others, which is one of the types of PP (polypropylene) waste. The development of current plastic waste treatment technology is to convert plastic waste into fuel oil by utilizing plastic waste to be processed as plastic fuels such as premium fuel, diesel and kerosene. Polypropylene type plastic is the type of plastic that is most widely used in daily life because it has good mechanical properties with low density, heat and moisture resistance, and has good dimensional stability. Some of the technology used to convert plastic waste, among others, by using the method of high temperature (Thermal Cracking), namely heating polymer or plastic material without oxygen, this process is usually carried out at temperature. This process includes the pyrolysis process ,. The results of the thermal cracking process will produce fuel oil by condensation with the cooling process, when the pipe releases steam that occurs in a heated pressure vessel, thus producing steam that is condensed using water until it changes shape to become liquid. One of the results of the pyrolysis process is Polypropylene Plastic is a fuel that is equivalent to fossil fuels. In this study, researchers analyzed the octane number of Polypropylene liquid fuel that was heated and the Distillation process with a temperature variation of 800C, 1000C, and 1200C produced Polypropylene fuel equivalent to a standard fuel with an octane number of 93.8. So that this fuel can be used on vehicles motorized.

1.INTRODUCTION

In Indonesia, plastic waste has become an important problem at this time, because it causes environmental problems such as health and soil pollution. So many people who do not

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use plastic waste to be treated again, but rather destroyed by burning that causes air pollution so that it can endanger the surrounding community who breathe the surrounding air every day. Some types of rubbish that we often encounter are plastic bottles such as plastic cups, plastic bottle caps, children's toys and margarines and others, which is one of the types of PP (polypropylene) waste.

Polypropylene type plastic is the type of plastic that is most widely used in daily life because it has good mechanical properties with low density, heat and humidity resistance, and has good dimensional stability .

Polypropylene PP plastic cracking process is one way to handle plastic waste. Cracking process there are three kinds, namely cracking process using hydrogen (hydro cracking), cracking process using high temperature (thermal cracking) and cracking process using catalyst (catalytic cracking) .

Based on the description above, several problems can be formulated as follows:

1. What is the octane number value of pyrolysis polypropylene plastic fuels with variations of a mixture of standard fuels and Polypropylene Plastic Fuels?
2. How does the ratio of the octane number of polypropylene plastic fuel pyrolysis results and the value of the octane number with the standard fuel mixture variation Polypropylene Plastic Fuel?

2.Material and Methods

2.1. Research Methods

The method used in this study is to use an experimental method. The experimental method is a research method used to test the effect of a treatment performed on the object under study by comparing it with no treatment. This experimental method can also mean comparing the testing of several variations of treatment with testing without variation as a comparison.

Figure 1. Mixing Fuel

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2.2. Polypropylene Liquid Fuel from PDFG(Polypropylene Distilation Fuel Generator) apparatus

Bahan bakar yang digunakan untuk diuji angka oktannya adalah yang dihasilkan dari Hasil Pemurnian alat *PDFG(Polypropylene Distilation Fuel Generator)*, dan bahan bakar standar yaitu premium, pertalite, dan pertamax.

Figure 2 : Pyrolysis Reactor

Plastic is burned at a high temperature and pressure on the reactor. Combustion gas will be flowed through a high pressure pipe to condenser 1. In condenser 1 combustible gas will be cooled. In condenser 1 this has actually been obtained pyrolysis plastic fuel but with a still low quality. Because it is visually similar to diesel fuel and for easy identification, this fuel is called solar polypropilene.

Gas that has not been condensed in condenser 1 will flow through the connecting pipe to undergo a further cooling process. The result of plastic fuel after passing through this connecting pipe is fuel similar to kerosene / kerosene so called kerosene polypropilene.

After passing through the connecting pipe there is a residual combustion gas which is still left which is then put into condenser 2 for further cooling. The results of this advanced condensation process will produce a liquid fuel that is similar to premium so it is called premium polypropilene. So that in this test the premium polypropilene fuel from pyrolysis is taken to be tested in several analyzes, namely as a standard fuel mixture of 10%, 20% and 40%. Then also in the analysis of standard pyrolysis plastic fuel testing and also testing in the purification results at temperatures of 800C and 1000C. In testing the fuel to know the value or the Octane number.

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Figure 3. BBPP premium from *pyrolisis*

figure.4. Purification Distillation Fuel

This tool is used for purification of fuels resulting from pyrolysis called polypropilene plastic fuels such as kerosene, diesel fuel and premium. The fuel tested is premium polypropylene from pyrolysis which will be purified with this tool at a purification temperature of 80 ^{0}C and 100 ^{0}C for analysis before testing its octane value.

2.3.Octane Value Testing

The octane number test is carried out using an octane meter, that is with a mixture of fuel that has been prepared '

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figure.5 octane meter.

This tool is used to test the octane number value or the large octane number value to be tested, the type of material being tested is the vehicle fuel type (premium, pertalite and pertamax). Then the name of this tool is Octane Meter. In this study with testing stage at ITS Surabaya.

Figure 6.Purification Testing with Temperature 80^0C

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3.Research Flowchart

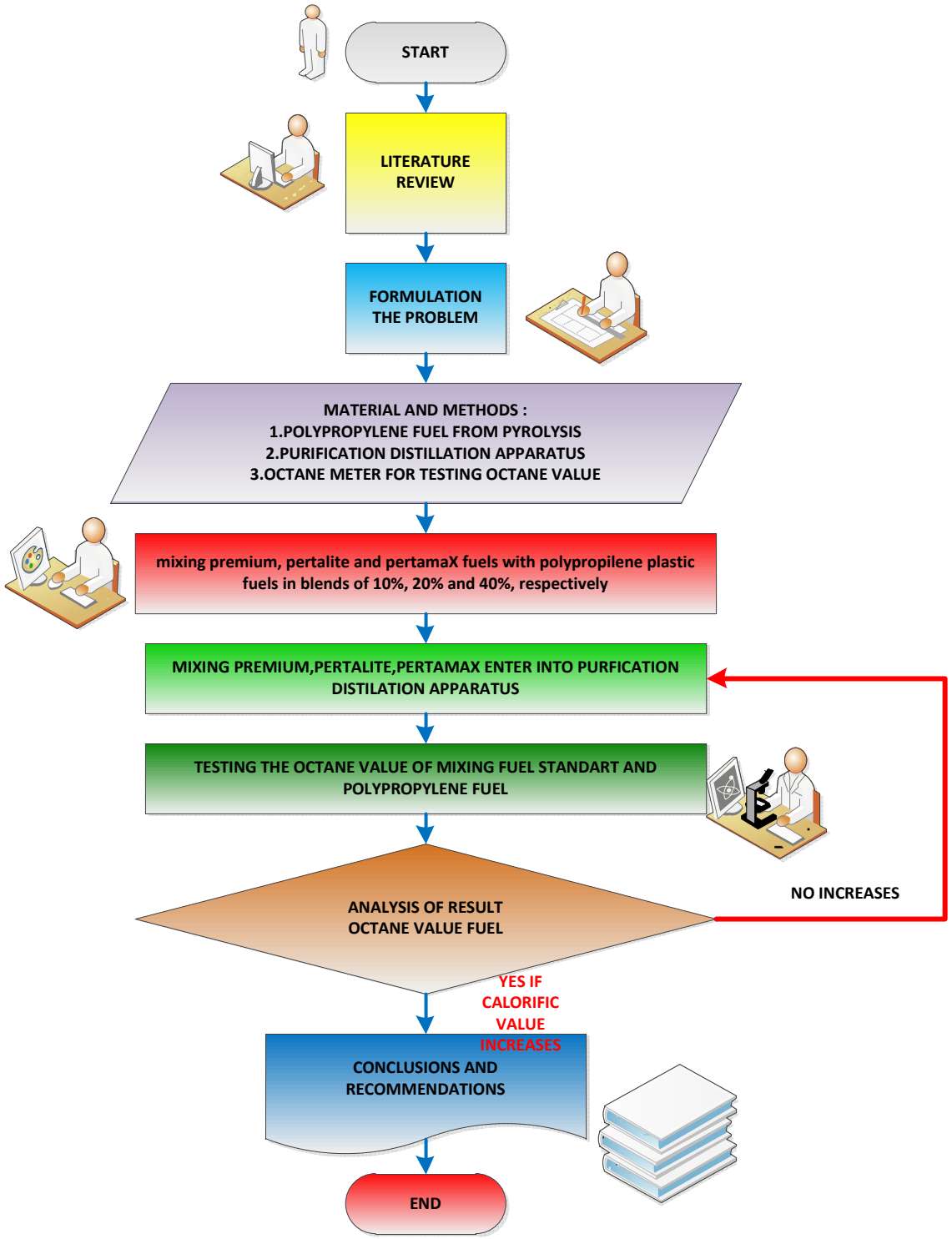

figure.7. *Flowchart*

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4.Parameter measured

4.1.Dependent variables and observed variables

4.1.1.Dependent Variables

1. Volume of Polypropylene liquid fuel
2. Fuel heating temperature
3. Standar fuel like Premium, pertalite, Pertamax

4.1.2.Observed variables

1. Octane number Value mixing fuel between Polypropylene fuel from purification and standar fuel (premium, pertalite, pertamax)

5.Result and Discussion

5.1.Result and discussion of octane value testing

octane value testing using an octane analyzer. This test aims to determine the value of the octane number in varicose mixture of standard fuels (premium, pertalite and pertamax) and polypropilene plastic fuels resulting from pyrolysis. The results of testing the octane value can be seen in Table 5.1 below:

Tabel 5.1 Octane Value Testing Result.

No	FUEL	MIXED	OCTANE VALUE/RON
1	PREMIUM 90%	10% Polypropylene Fuel From pirolisis	90,9
2	PREMIUM 80%	20% Polypropylene Fuel from pirolisis	90,9
3	PREMIUM 60%	40% Polypropylene Fuel from pirolisis	92,3
4	PERTALITE 90%	10% Polypropylene Fuel from pirolisis	91,8
5	PERTALITE 80%	20% Polypropylene Fuel from pirolisis	92,2
6	PERTALITE 60%	40% Polypropylene Fuel from pirolisis	92,5
7	PERTAMAX 90%	10% Polypropylene Fuel from pirolisis	92,9
8	PERTAMAX 80%	20% Polypropylene Fuel from pirolisis	93,3
9	PERTAMAX 60%	40% Polypropylene Fuel from pirolisis	93,8
10	Polypropylene Fuel from pirolisis	-	95,2
11	Polypropylene fuel from purification with temperature 80^0 C	-	96,5
12	Polypropylene Fuel from purification with tempertaure 100^0 C	-	96,7

It can be seen from the table 5.1 above that a mixture of standard fuels and polypropylene plastic fuels resulting from pyrolysis which have variations of plastic fuel sizes ranging from 10%, 20% and 40% then mixed with standard fuels ranging in size from 90%, 80% and 60%

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of each standard fuel such as premium, pertalite and Pertamax. And also the BBPP standard premium fuel results from pyrolysis with purification variations at 80oC and 100oC
In table 5.1, testing the variation of a mixture of standard fuels and polypropilene plastic fuels resulting from pyrolysis and by purification has obtained test data on the octane number values with the octane analyzer test tool made with the following graph:

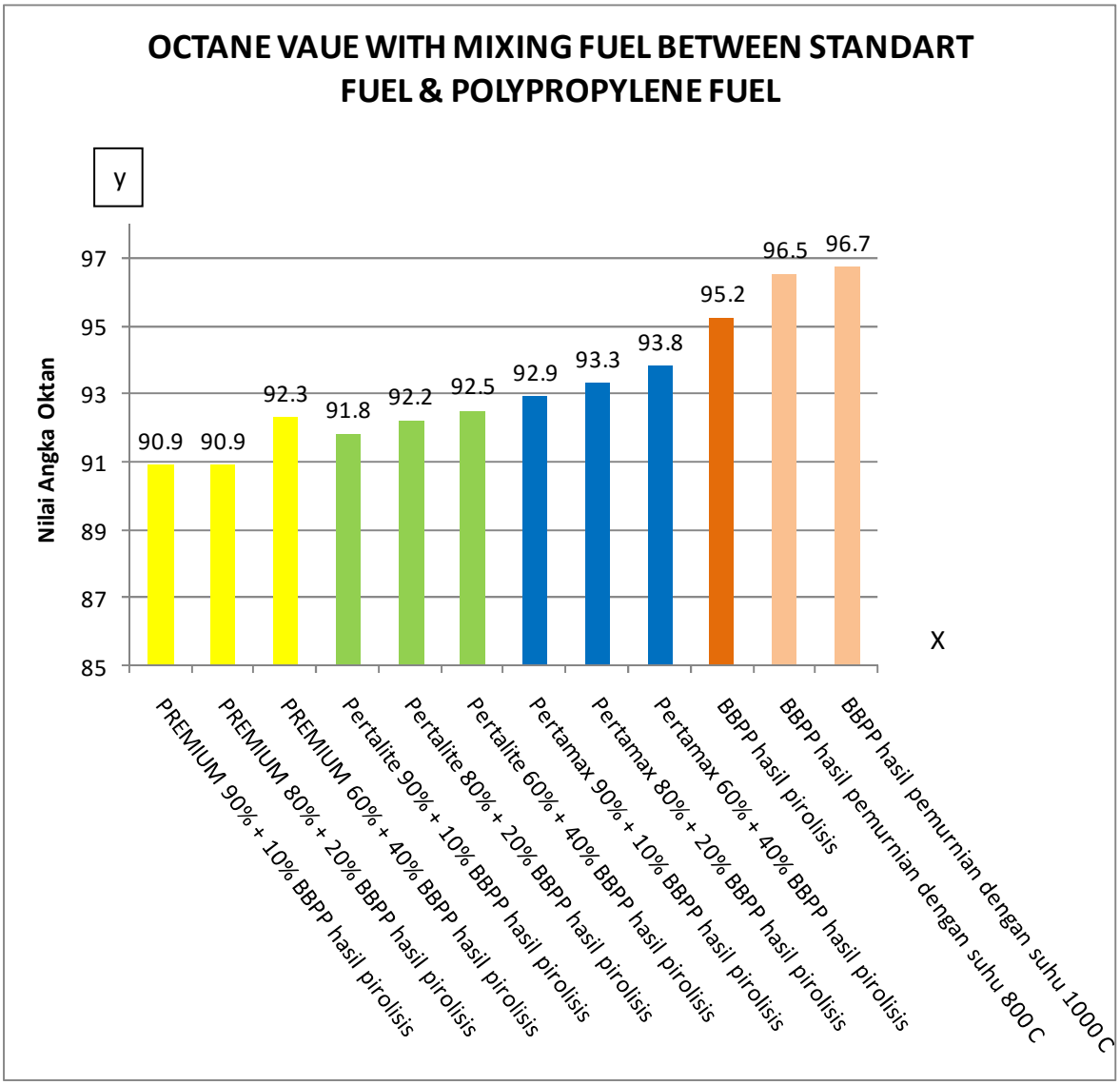

Figure .8. Octane Value.

6.conclusion

1. In the largest octane number from the comparison of the variation of the fuel mixture with the plastic fuel standard pyrolysis polyprolpilene, it can be seen that the largest comparison value is the fuel in the table 5.1 above no.10, at the BBPP pyrolysis premium with a dose of 100% from a 250mm measuring cup produces a large octane number = 95.2.

2. Then the comparison of fuel the sequence table no.3-9 is producing a large octane value between 91.8 - 93.8 it is still below the results of the largest

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95.2 octane value at the standard premium of BBPP pyrolysis results from 10 variations of fuel which can be called a large value of the octane number.

3. the comparison of fuel the sequence table no.1 and 2 is to produce a large octane number value of 90.9. This fuel is the lowest octane number comparison value of 10 variations of fuel has been carried out by testing in this research.

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