



CONFERENCE PROGRAMS AND ABSTRACT

**The 3rd FIRST 2019 INTERNATIONAL CONFERENCE
FORUM IN RESEARCH, SCIENCE, AND TECHNOLOGY
OCTOBER 09-10, 2019
*Palembang, Province of South Sumatera
Indonesia***

Organized by :



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PREFACE

The 3rd FIRST 2019 (Forum in Research, Science, and Technology) International Conference was initiated and organized by State Polytechnic of Sriwijaya in collaboration with Management and Science, University (MSU), Malaysia and National Chin-Yi University of Technology, Taiwan. The theme of the conference was “Integration of Advanced Technology to Enhance Social Welfare”. The 3rd FIRST 2019 International Conference facilitated the participants from all over the world to meet face to face to open chances in establishing connection and collaboration among them. It was not only for the researchers in academics, but also in industries and governments. This conference became an effective media to link the researchers from many parts of the world conference, for exchanging, sharing, following up and discussing the results of the latest research, industry’s needs, and government regulatory policies. The 3rd FIRST 2019 International Conference became worthwhile platform for researchers to present their finding in the areas on multidisciplinary of Engineering and Science (Track 1), Computer Science and ICT (Track 2), and Social Science (Track 3). It has also provided an opportunity for the professionals and researchers to learn and share about the latest development and research in those 3 tracks.

The 3rd FIRST 2019 International Conference attracted so many authors not only from Indonesia but also from other countries, such as Japan, Taiwan, and Malaysia. There were 180 papers were accepted in the 3rd FIRST 2019 International Conference, including 89 papers for Track 1 (Engineering and Science), 46 papers for Track 2 (Computer Science and ICT), and 45 papers for Track 3 (Social Science). In The 3rd FIRST 2019 International Conference, there were 4 keynote speakers and 2 invited speakers. As the keynote speakers, there were Prof. Yasushi Kiyoki, Ph. D from KEIO University, Japan, Prof. Nurul Taufiqu Rochman, M. Eng, Ph. D, From LIPI, Indonesia, Prof. Tjiptohadi Sawarjuwono, M. Ec., Ph. D., Ak, from Universitas Airlangga, Indonesia, and Prof. Win-Jet Luo, from National Chin-Yi University of Technology, Taiwan. As the invited speakers, there were Dr. R. Wisnu Nurcahyo, DVM from Universitas Gadjah Mada, Indonesia, and Assoc. Prof. Dr. Intan Zaurah binti Mat Darus from Universiti Teknologi, Malaysia. The 3rd FIRST 2019 International Conference committee would like to say thank you very much for all the participants and their respected institutions that have supported for the success of the 3rd FIRST 2019 International Conference, and also for all of the guess and sponsors of the 3rd FIRST 2019 International Conference.

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Study of Plastic Waste Power Plants Capacity Unit 1 KWh Using Plastic Bags Based on Effectiveness Produced in Optimum Load

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Abstract. This research conducted to convert plastic bags into liquid fuels to be used as alternative fuels in generators to produce electricity. The purpose was to get the influence of the electrical load (200;400; 600;800; and 1000 watt) and ratio liquid fuel product with gasoline (0:5;1:4;2:3;3:2;4:1;and 5:0) towards performance liquid fuel the result of conversion Polypropylene (PP) and Low-Density Polyethylene (LDPE) plastic waste on the unit prototype plastic waste power plant with design capacity 1 KWH in terms of Specific Fuel Consumption (SFC) value, Torque and effective power generator. Effective power and torque analyzed using tachometer, voltmeter, ampere meter, and stopwatch while SFC calculation of liquid fuel consumption. Analysis of this data using descriptive statistical analysis that is describing collected data after being given treatment during the research, by presenting data in the form of tables, figures, and calculations. The results of the research show that the ratio liquid fuel:gasoline 2:3 with 800 Watt Electrical load produced of engine power, torque, and SFC optimal with results 1.280 Hp, 173.611 Nm, and 0.461 Kg/Hp.hr., with type of Polypropylene plastic, while type of Low Density Polyethylene plastic have the result 1.259 Hp, 170.753 Nm, and 0.536 Kg/Hp.hr., so that by mixing it can save conventional fuel specially gasoline.

Keyword: liquid fuel, Specific Fuel Consumption (SFC), Torque, Power, Plastic Waste

1.Introduction

The need for electricity in Indonesia is still insufficient. According to the General Electricity Supply Plan of the State Electricity Company (PLN) in 2010-2019, the electricity demand is estimated to reach 55,000 MW and of the total power, only 32,000 MW (57 percent) will be built by PLN. These conditions indicate the supply of electricity supplied by the government through PLN is still not sufficient for the needs of the community [1]. Scarcity and rising fuel prices have become a global problem, especially in our country Indonesia. This problem is expected to continue for the next few years. So looking at this matter, researchers are trying to convert something that has the potential to produce fuel oil such as from waste plastic.

The increasing amount of plastic waste produced causes the need for treatment of the plastic waste. Then another method is needed to cope. The amount of plastic waste is one of them by processing plastic waste into alternative fuels by the pyrolysis method [2]. Liquid fuel is a combination of hydrocarbon compounds obtained from nature or artificially. Liquid fuels are generally derived from



petroleum. In the future, the possibility of liquid fuels derived from oil shale, coal and biomass will increase. Petroleum is a natural mixture of liquid hydrocarbons with little sulfur, nitrogen, oxygen, very little metal, and minerals [3]. Liquid fuel is a fuel whose structure is not tight when compared to solid molecules whose fuel can move freely. Gasoline, Premium, diesel oil, kerosene are examples of liquid fuels. Liquid fuels commonly used in industry, transportation or households are a fraction of petroleum [4].

From the results of alternative fuels resulting from the conversion of plastic waste, the researchers sought to see the performance of 1300 watt generator sets fueled by a mixture of gasoline and oil resulting from the conversion of polypropylene (PP) or Low Density Polyethylene (LDPE) plastic waste types.

2. Methodology

We can get fuel oil from the plastic waste pyrolysis process in the reactor. Then the liquid fuel will be used as fuel in the Generator to see the performance of the liquid fuel research results. The parameters observed in the performance of liquid fuel are the electrical load given during the generator is turned on, the length of time the ignition of the generator, the electric current generated during the generator is turned on, the genset shaft rotation in RPM units, the fuel consumption per hour from the generator, and the amount of fuel used to start the generator set. The results of observations and measurements during the process are tabulated in the form of tables and graphs to be evaluated to see various scientific phenomena that occur in accordance with the objectives of the study. The diagram of the testing process of the performance of liquid fuels on the Generator setting can be seen in Figure 1 below.

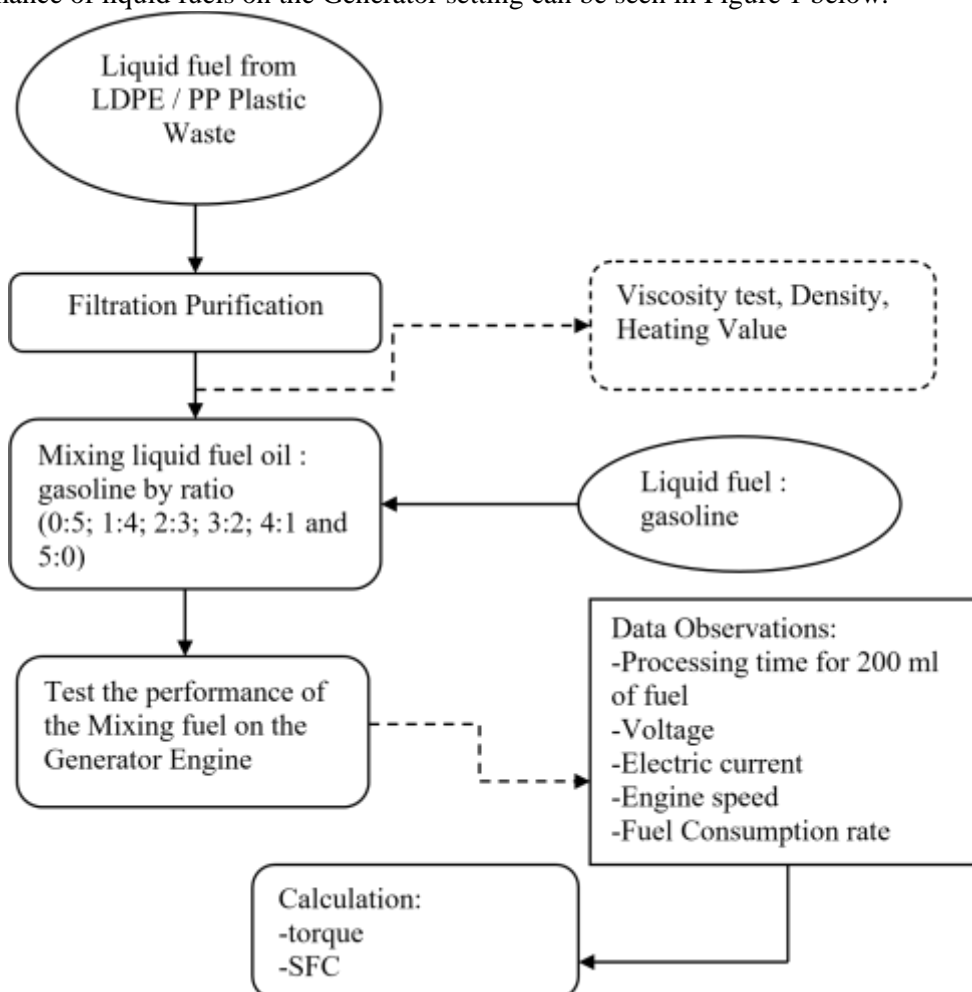


Figure 1. Liquid fuel performance testing process the results of research on the Generator

3. Results and Discussions

From the observation data obtained the results of observations while experimenting and analyzing the 1300 Watt generator set in the laboratory, which will then be used as material for calculations, so the results are as shown in Tables 1 and 2 below:

Table 1. Calculation of Polypropylene (PP)

No.	Fuel : Gasoline	Electricity Load (Watt)	Fuel Consump (Kg/hr)	Calculation		
				Power (Hp)	Torque (Nm)	SFC (Kg/Hp. Hr)
1		200	.444	0.344	45.918	1.291
2		400	0.461	0.670	89.847	0.688
3 (0 :		600	0.495	0.963	129.313	0.514
4 5)		800	0.551	1.316	177.897	0.419
5		1000	0.625	.544	209.702	
6		200		0.341	45.567	
7		400	1 0.577	0.664	89.059	
8 (1 :		600	0.858	0.951	128.151	0.709
9 4)		800		1.298	175.871	0.537
10		1000		1.539	211.148	.445
11		200		0.335	44.929	1.
12		400		0.651	87.434	0.748
13 (2 :		600	0.956	0.936	126.270	0.555
14 3)		800		1.280	173.611	0.461
15		1000		1.524	209.541	0.
16		200		0.300	40.348	1.
17		400		0.612	83.169	1.037
18 (3 :		600	1.612	0.876	119.205	0.903
19 2)		800		1.136	155.540	0.775
20		1000		1.449	200.424	1.
21		200		0.297	40.090	1.
22		400	0.969	0.600	81.815	1.120
23 (4 :		600	1.740	0.861	117.339	1.002
24 1)		800		1.105	152.079	0.877
25		1000		1.433	198.983	1.
26		200		0.615	0.28738.737	2.
27		400	0.680	0.591	80.765	1.152
28		(5 : 0)		600	0.951	0.843
29		800	1.190 1.080	148.834	1.102	30 1000 2.055 1.392 194.264
30		1000				1.477

Table 2. The Results of the Calculation of type of LDPE

No.	Fuel : Gasoline	Electricity Load (Watt)	Calculation		
			Power (KW)	Torque (Nm)	SFC (Litre/Hp. Hr)
1		200	0.256	0.77	1.729
2		400	0.500	1.50	0.921
3 (0 :		600	0.718	2.16	.689
4 5)		800	.982	2.96	0.561
5		1000	1.152	3.50	0.542

6	200	0.245	0.73	1.893
7	400	0.483	1.45	.028
8 (1 : 4)	600	0.700	2.11	0.748
9	800	0.960	.90	.640
10	1000	1.152	3.50	0.841
11	200	0.240	0.72	2.049
12	400	0.481	1.44	1.065
13 (2 : 3)	600	0.689	2.07	0.787
14	800	0.939	2.85	0.718
15	1000	1.128	3.44	0.878
16	200	0.216	0.65	3.060
17	400	0.450	1.36	1.504
18 (3 : 2)	600	0.617	1.87	1.278
19	800	0.853	2.60	1.039
20	1000	.064	3.26	1.629
21	200	0.212	0.64	3.230
22	400	0.440	1.33	1.630
23 (4 : 1)	600	0.609	1.85	1.321
24	800	0.848	2.59	1.140
25	1000	1.032	3.16	1.984
26	200	0.203	0.62	3.605
27	400	0.428	1.30	1.725
28 (5 : 0)	600	0.601	1.83	1.426
29	800	0.837	2.56	1.263
30	1000	1.046	3.21	2.071

This study uses the Prototype of Plastic Waste Power Generation Equipment 1 KW as a place to convert LDPE / PP plastic raw material into liquid fuel which will be used as an alternative fuel in the generator set to produce electricity. This research is conducted to see the effect of the electrical load given during the generator is turned on, the Liquid / Gasoline Fuel Ratio by observing the ignition time of the generator, the electric current generated during the generator is turned on, the generator shaft rotation in RPM units, the fuel consumption per hour of the generator, and the amount of fuel that is generated used to turn on the generator [5].

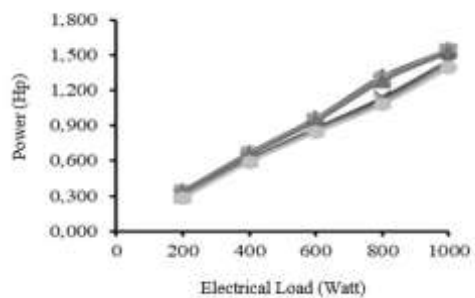


Figure 2. Electrical load vs Power for PP

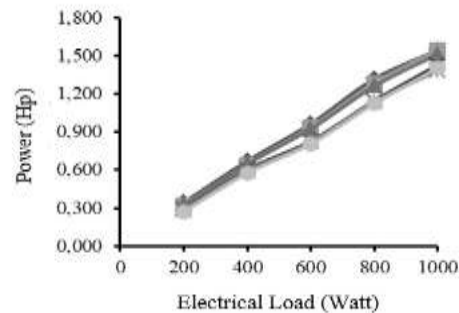


Figure 3. Electrical load vs Power for PP

In Figures 2 above it can be seen that the optimal effective power occurs when the engine uses liquid fuel:Gasoline 2:3 mixing while the lowest power when the engine uses liquid fuel: Gasoline ratio 5:0. The increase in power is due to differences in the value of the vapor pressure and the type of liquid fuel:Gasoline ratio used. Using the liquid fuel: Gasoline ratio 2:3 is the maximum mixing because the power produced is close to the power when using the liquid fuel: Gasoline ratio of 0:5 so that by mixing it can reduce the use of conventional fuels by mixing liquid fuels from plastic waste conversion, but does not reduce the optimal power generated when using pure gasoline. The engine power generated is influenced by the voltage and electric current generated, where the higher the voltage and electric current produced, the higher the power generated by the engine [6]

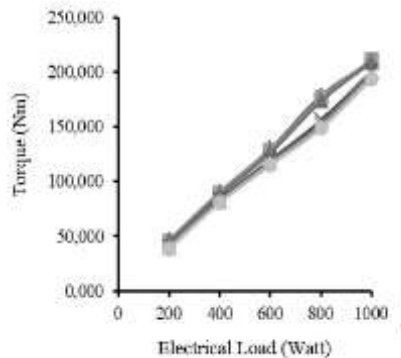


Figure 4. Electrical load vs Torque for PP

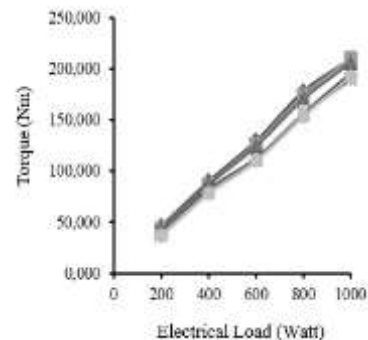


Figure 5. Electrical load vs Torque for LDPE

In Figures 3 above it can be seen that the torque is directly proportional to the power generated the optimal torque when the engine is using a type of fuel with a mixture of liquid fuel:Gasoline 2:3 compared to other ratios. The increase in torque value is due to the comparison of the vapor pressure value of the type of fuel used. The use of fuel with a liquid fuel mixture:Gasoline 2:3 will produce an optimal torque value because the torque value is still stable and approaches the torque value when using pure gasoline. So that by using this mixture can produce engine work to produce optimal work by saving conventional gasoline fuel by mixing liquid fuel with plastic waste conversion results with a mixing ratio of 2 to 3[7].

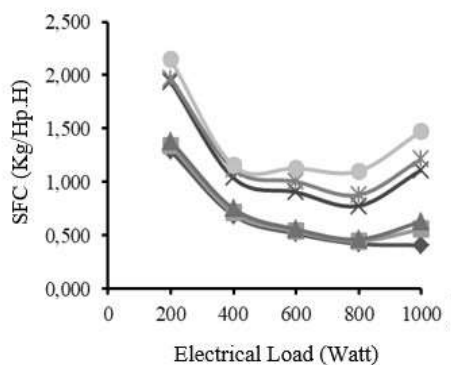


Figure 6. Electrical load vs SFC for PP

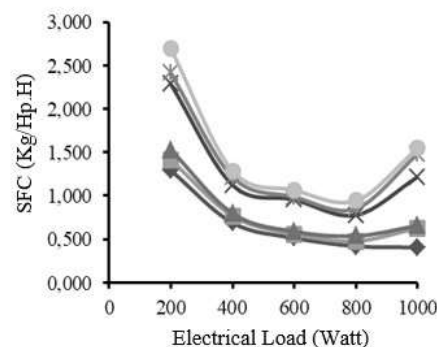


Figure 7. Electrical load vs SFC for LDPE

Specific Fuel Consumption is the amount of fuel per time used during the combustion process to produce the power of one Hp. Figure 4 showed that the fuel consumption of both the liquid fuel and gasoline will be lower along with the addition of the load. Gasoline has a lower SFC value than liquid fuel oil which results in the use of fuel (Fig. 6 & 7). Gasoline is more efficient than the Liquid fuel. Comparison of SFC values when using liquid fuels resulting from the conversion of waste plastic-type Polypropylene (PP) is more efficient than the type of plastic Low Density Polyethylene (LDPE) this is because the content of PP plastic hydrocarbon compounds is better than LDPE and also based on research results of PP plastic heat value greater than LDPE [8].

4. Conclusion

Liquid fuel:Gasoline ratio (2:3) is the maximum mixing of both PP and LDPE plastic types because it produces power close to when using the Fuel:gasoline ratio (0:5) so that mixing can produce optimal power and reduce use conventional fuels especially gasoline. Fuel with liquid fuel mixture: Gasoline (2:3) is the maximum mixing because the torque value produced is still stable and approaches the torque value when using pure gasoline. Mixing can produce engine work to produce optimal work by saving

conventional gasoline fuel. Liquid fuel:Gasoline (2:3) ratio is the maximum mixing because the average fuel consumption is still close to using pure gasoline, and does not experience a high increase in SFC values. So that using this ratio can save conventional fuel gasoline and the Liquid Fuel but produces 1 HP of optimal power with a time of 1 hour. Also, the value of SFC when using PP type plastic is smaller than the LDPE type so it is more economical to use PP plastic-type.

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