JURNAL UPI

Indonesian Journal of Multidiciplinary Research

IJOMR Indonesian Journal of Multidiciplinary Research

Journal homepage: http://ejournal.upi.edu/index.php/ IJOMR/

Learning Simple Pyrolysis Tools for Turning Plastic Waste into Fuel

Mae Pebrianti, Fatihatus Salamah*

Universitas Pendidikan Indonesia, Jl. Dr. Setiabudi No.229, Bandung, Indonesia
Correspondence: E-mail: nurul@upi.edu

ABSTRACTS

Learning is an activity to gain useful knowledge. The time to study is not limited, we have to learn from the moment we are born. Elementary school children are those of elementary age, namely 6-12 years, this period is commonly referred to as the intellectual period. The Covid-19 pandemic has disrupted activities so that all activities require a revolution. Technology plays an important role in distance teaching and learning activities such as the use of social media or educational-based applications that make teaching and learning activities supposed to work. The method used is descriptive. The purpose of this study is to find out about distance learning in elementary schools which is still being asked whether it is effective or not, so it raises the question of whether students are well educated at basic age is very important for the foundation of character and talent.

ARTICLE INFO

Article History:
Submitted/Received 30 Jan 2021
First revised 10 Feb 2021
Accepted 11 Feb 2021
First available online 11 Feb 2021
Publication date 01 Mar 2021

Keyword:
Basic,
Covid-19,
Education,
Effective,
Fuel,
Technology

1. INTRODUCTION

Plastic waste is a big problem that is being faced by the world at this time. Plastic waste is very difficult to recycle because it is not easily biodegradable. With its non-biodegradable nature, plastic waste causes a continuous build-up, can cause pollution and have a negative impact on the environment.The increase in the use of plastic for household purposes has an impact on the increase of plastic landfills. At this time the amount of plastic waste every day that enters landfills is increasing and about 10%-20%. Destruction of plastic waste by means of combustion, less effective and risky because by burning the appearance of pollutants from gas emissions and some other pollutant particulates so that other processing methods are needed to process plastic waste (Anom, 2019).

The handling of plastic waste that is currently widely researched and developed is converting plastic waste into fuel oil. In this way two important problems can be solved, namely the danger of piling up plastic waste and the re-acquired fuel oil (Lesmana & Apriyani, 2019). Processing plastic into oil can of course be done in a very simple way, and can be applied by the community without incuring large costs (Ratnawati, 2020). Until now, Indonesia's dependence on Fuel Oil is very high. Various ways have been done to overcome the energy crisis, including developing alternative energy substitutes for petroleum (Cahyono *et al.*, 2018). Crude oil is the main ingredient of plastics and most of the chemicals. Of the total 100 million tons of plastic produced annually worldwide, 25 million tons are disposed of. Wasted energy can be restored using the pyrolysis process. This process saves conventional energy sources of crude oil (Arjal & Rafidah, 2020). Pyrolisis is a method of decomposition of organic and non-organic chemicals through the process of heating with no or little oxygen or other reagents, where raw materials will experience the breakdown of chemical structures into gas phases (Nofendri & Haryanto, 2021). The purpose of this research is to reduce the waste generated by plastic waste and to reduce the use of fossil energy as raw material for making fuel oil.

2. METHODS

Figure 1 shows the research method used in plastic waste pyrolysis is an experimental method and literature study which consists of several continuous stages so that the research objectives can be achieved. The initial stage is to prepare raw materials in the form of plastic waste of the PE and PP types. This type of plastic is easy to find and is classified as a type of plastic that can produce good oil. The preparations carried out include cleaning, drying, and shredding plastic waste. The next stage is the pyrolysis process of plastic waste to form oil. In this research, the equipment that will be used includes a plastic waste processing tool that will convert waste into fuel oil. This tool serves to melt and evaporate plastic waste. The plastic vapor is then condensed. The resulting condensation is collected in an oil reservoir. In addition, there is an LPG stove that functions as a heat source for heating plastic.

Figure 1. Tools used for pyrolysis

DOI: http://dx.doi.org/10. 17509/xxxxt.vxix
p- ISSN 2776-608X e- ISSN 2776-5970

As the main materials, we used water and plastic waste. The plastic waste we use is PE and PP waste. For PE: Bottle numbered 2 and for PP: aqua glass, straw, and biscuit wrap.
How it works:

1) Choose waste based on the type to be used, namely PE and PP.
2) Trash that has been selected then wash and clean then dry in the sun.
3) Make a hole in the can using a knife, then attach the iron and glue the iron with the tin using iron glue.
4) Next, connect the hose to the iron.
5) Put the dry plastic waste into the can, then close the can tightly.
6) Next, point the hose to the bottle to accommodate the combustion liquid.
7) Then turn on the stove.
8) Wait until the plastic waste burning has leached out the liquid through the hose.

As for the variables in this study, we used the following parameter:
Independent variables: Type of waste
Control variables: Burning time and mass of plastic
Dependent variables: Result of combustion (ml) and resulting odor

3. RESULTS AND DISCUSSION

From a series of trials that have been carried out as in the previous documentation, the results are obtained in the form of a liquid which is assumed to be a gasoline-type fuel. From the simple pyrolysis machine that has been successfully made, it still requires further trials because to be able to produce crude oil it takes a long time to evaporate and measure the purity of the oil. **Figure 2** shows plastic waste burning. From the trial results of processing plastic waste into oil above, it is not possible to obtain a specific type of fuel, such as the type of gasoline or kerosene. However, when viewed from the initial results, it is close to the type of gasoline oil.

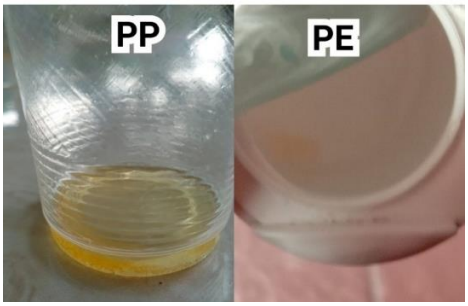

Figure 2. Plastic Waste Burning Results

Tabel 1. Table of research results

NO.	Type of Waste	Plastic Mass (gr)	Result of Combustion (ml)	Burning Time (minutes)	Odor produced
1.	PE	200	3	79	Smells like gasoline but still has the smell of burning plastic.
2.	PP	200	<1	79	Smells like gasoline but still has the smell of burning plastic.

DOI: http://dx.doi.org/10.17509/xxxx.vxix
p- ISSN 2776-608X e- ISSN 2776-5970

From **Table 1**, we used PE and PP waste, each weighing up to 200 gr. The garbage is burned for 79 minutes or 1 hour 19 minutes to get the result in the form of extract oil. For PP type waste it produces 3 ml of combustion products and for PE type waste less than 1 ml of combustion results. The odor produced both smells like gasoline, but there is still a smell from the burning of the plastic.

4. CONCLUSION

The results showed that the most oil from pyrolysis was obtained from the pyrolysis process of PP plastic waste. 3 ml of PP plastic waste that has been converted to oil, while less than 1 ml of PE plastic waste, as well as PP plastic waste pyrolysis oil and PE plastic waste approach gasoline and kerosene.

The results obtained from the innovation of plastic waste into fuel oil so far still need to be studied further in the laboratory, especially those related to the content and safety of oil produced from the pyrolysis process. On the other hand, carrying out these waste management activities is expected to be able to have a positive impact on the community.

5. ACKNOWLEDGEMENTS

The author's gratitude goes to the lecturers of MSTR19, the Faculty of Mathematics and Natural Sciences Education, University of Education of Indonesia, Mr. Nurul and Mr. Eka for their guidance in this research

6. AUTHORS' NOTE

The authors declare that there is no conflict of interest regarding the publication of this article. Authors confirmed that the paper was free of plagiarism.

7. REFERENCES

Anom, I. D. K. (2019). Destilasi kering sampah plastik pembungkus diterjen menjadi alternatif bahan bakar minyak. *Frontiers: Jurnal Sains dan TeknologI*, *2*(3), 229-235.

Arjal, T., and Rafidah, R. (2020). Pengolahan limbah plastik jenis polyethelene terephalate (pet) dan high density polyethelene (HDPE) menjadi bahan bakar minyak. *Sulolipu: Media Komunikasi Sivitas Akademika dan Masyarakat*, *20*(2), 266-273.

Cahyono, M. S., Liestiono, M. R. P., and Widodo, C. (2018). Proses pirolisis sampah plastik dalam rotary drum reactor dengan variasi laju kenaikan suhu. *Prosiding Seminar Nasional Teknoka*, *3*, M63-M68.

Lesmana, R. Y., and Apriyani, N. (2019). Sampah plastik sebagai potensi dalam pembuatan bahan bakar minyak. *Media Ilmiah Teknik Lingkungan (MITL)*, *4*(2), 47-50.

Nofendri, Y., and Haryanto, A. (2021). Perancangan alat pirolisis sampah plastik menjadi bahan bakar. *Jurnal Kajian Teknik Mesin*, *6*(1), 1-11.

Ratnawati, S. (2020). Processing of plastic waste into alternative fuels in the form of grounded (pertalastic) through pirolysis process in science laboratory of MTsN 3 West Aceh. *Indonesian Journal of Chemical Science and Technology*, *3*(1), 8-16.

DOI: http://dx.doi.org/10. 17509/xxxxt.vxix
p- ISSN 2776-608X e- ISSN 2776-5970