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COMMUNITY AWARENESS DURING THE PANDEMIC OF COVID-19: PLASTIC WASTE AS AN ALTERNATIVE ENERGY

**Andry Prima^{1*}, Samsol¹, Abdul Hamid¹,
Imam Setiaji Ronoatmojo² and Heru P. Sanusi³**

¹Petroleum Engineering, Faculty of Earth and Energy Technology, Trisakti University,
Jl. Kyai Tapa No.1, Grogol, Jakarta 11440, Indonesia

²Geological Engineering, Faculty of Earth and Energy Technology, Trisakti University,
Jl. Kyai Tapa No.1, Grogol, Jakarta 11440, Indonesia

³Faculty of Law, Trisakti University,
Jl. Kyai Tapa No.1, Grogol, Jakarta 11440, Indonesia

*Correspondent Author:
andry.prima@trisakti.ac.id

Abstract

The increasingly hoarding volume of plastic waste has attracted numerous researchers to conduct studies in finding the blessing in disguise behind such unpleasant conditions. On the other hand, plastic is one of the end products derived from the refining process of crude or known as petroleum. Thus, the silver lining can explain the connection between plastic waste and the possibility of using it as alternative energy. By utilizing plastic waste as alternative energy that can substitute the use of conventional fuel, the stage in which people will have a more economical energy source. As such conditions are established, the micro or household level economy will significantly improve. This community service reached out to residents of relatively small neighbouring houses in Kebun Jeruk Area, Jakarta, Indonesia. During the service, the activity was aimed to provide counselling and training for the community to empower the community on how to make use of plastic waste and process it into an alternative fuel. Such alternative energy should help reduce dependency on the conventional fuel consumed regularly by the household.

Abstrak

Volume penimbunan sampah plastik yang semakin meningkat telah menarik banyak peneliti untuk melakukan penelitian dalam menemukan berkah tersembunyi di balik kondisi yang tidak menyenangkan tersebut. Di sisi lain, plastik merupakan salah satu produk akhir yang berasal dari proses pemurnian minyak mentah atau dikenal dengan minyak bumi. Dengan demikian, lapisan perak tersebut kemudian dapat menjelaskan keterkaitan antara sampah plastik dan kemungkinan pemanfaatannya sebagai energi alternatif. Dengan memanfaatkan sampah plastik sebagai energi alternatif yang dapat menggantikan penggunaan bahan bakar konvensional, maka masyarakat akan memiliki sumber energi yang lebih hemat dan perekonomian di tingkat mikro atau rumah tangga akan meningkat secara signifikan. Kegiatan PkM ini menjangkau penghuni rumah tangga yang relatif kecil di area Kebun Jeruk, Jakarta. Kegiatan tersebut bertujuan untuk memberikan penyuluhan dan pelatihan kepada masyarakat untuk memberdayakan masyarakat tentang cara memanfaatkan sampah plastik dan mengolahnya menjadi bahan bakar alternatif. Pada akhirnya, energi alternatif tersebut akan membantu mengurangi ketergantungan pada bahan bakar konvensional yang dikonsumsi secara rutin oleh rumah tangga.



Keywords:

- Community service
- Plastic waste
- Pyrolysis
- Oil fuel

Kata Kunci

- Bahan bakar minyak
- Pengabdian Masyarakat
- Pirolisis
- Sampah plastik

1. INTRODUCTION

Throughout the history of humanity, energy will always be needed to fuel all aspects of day-to-day activities. Without having a source of energy, life will never survive. It was considered that the need for energy increases from time to time. At the same time, energy cannot be created. Therefore the existing energy must be utilized and used as economically as possible. (Iskandar et al., 2021; Jaya et al., 2020) (Trivedi, 2021)

Every single household contributes to the increasingly pill-up plastic waste. Moreover, during the Covid-19 crisis, where people spent most of their time at home, plastics waste piled up. Such a condition is also actual that cannot be separated from the environment in the Kebun Jeruk area. Plastic waste from household waste is mounting as people keep throwing it into the nearest open space. This unideal situation is even escalated during the pandemic of Covid -19 (source LIPI), where most people spend time at home. From the macro perspective, during Large-Scale Social Restrictions, plastic waste treatment can be seen in Figure 1.

Waste, especially plastic, if managed properly, will generate opportunities for the economic benefit of the community. (Humaira et al., 2021) Given life in this environment, the level of welfare is not uniform. For economically vulnerable communities, this waste can be used if processed to produce fuel oil and sold at an economical price. In this activity, the community is also given the education to take energy-saving actions. Besides that, it is hoped that this training will utilize waste plastic that can no longer be used so that it can be processed into fuel oil. (Almohamadi et al., 2021) In addition, this training is one of the means to create community skills in utilizing plastic waste. If it is developed, it will produce economic value to support the burden of life.

From a macro perspective, plastic waste can be hazardous if not properly managed and might cause a profound impact on the environment, i.e. environmental pollution and human health. (Iskandar et al., 2021). Nevertheless, plastic waste can be utilized as alternative energy. Specifically, plastic is one product resulting from the cracking process chain when refining petroleum. In the implementation phase, the supply and demand of plastic should be regulated to control; first, the side effect of having an unexpected surplus in the production of plastic and, secondly, to preserve the sustainability of petroleum natural resources.

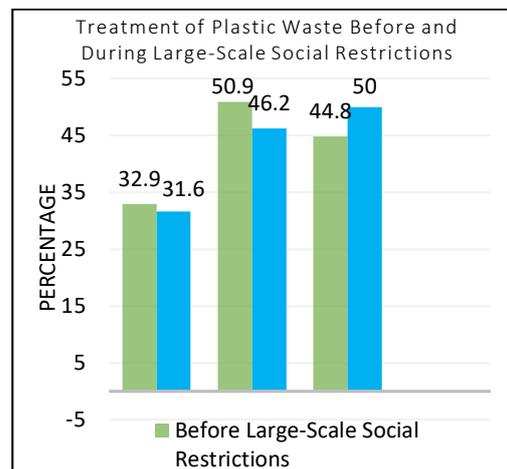


Figure 1. Treatment of plastic waste before and during large-scale social restrictions (LIPI)

2. METHOD

The methodology used in this community service is campaigning awareness on the issue of plastic waste (Figure 2) as another source of alternative energy (Ancira-Moreno, M; Smith, N; Lamadrid-Figueroa, 2002; Veses et al., 2020). Purposefully designed to explain the step by step process of an effort to deliver effective dissemination of information that can be easily comprehended by the audience representing the local community in Kebun Jeruk area, in the western part of Jakarta

within the Special Capital Region of Jakarta, Indonesia (Setyawan et al., 2020).

2.1. State of the Art

The first stage should refer to state of the art. Thus, articles collections of the previous works from various researchers (Acheampong et al., 2021; Carrier et al., 2020; Frigo et al., 2014; Miandad et al., 2018) play essential roles in strengthening the quality of presentation that can effortlessly digest by the audiences (Cahyono et al., 2020).

2.2. Pyrolysis

After sorting plastic waste that consumers have used, plastic waste must be put into a specific tube that functions as a vacuum. The thing to note is that the sorted plastic waste must be dry and clean from soil or other solid mud (*Pyrolysis_of_Waste_Tyre*, n.d.; Yihunu et al., 2019; Zhou et al., 2013). Another critical stage during the demonstration is the combustion process or technically identified as pyrolysis. The combustion stage will generate the desired level of steam, which will be sequentially

flowed into a pipeline that has to be set and immersed in cold water (Aburto, 2020).

Until this phase, the entire series of processes is categorized as distillation. In the final stage, dew or liquid will be produced from a specific and less complicated distillation process. The expected ended-product is a liquid oil that should be ready to be accommodated in a leakproof container (Aburto et al., 2015; Cahyono et al., 2020).

A methodology consists of an attempt and approach explanation of the procedure used during a community service program. The method and procedure should be combined with one narrative passage. The method could refer to some relevant references as found in academic books or journal articles. Some published methods should be cited appropriately by referring to the relevant literature. For commercial purposes, all of the materials, the name of the institution or company, and the town name in which the community service has been conducted should be indicated (Chen et al., 2014; Junjian Liu, Qidong Hou, Meiting Ju, Peng Ji, 2020).

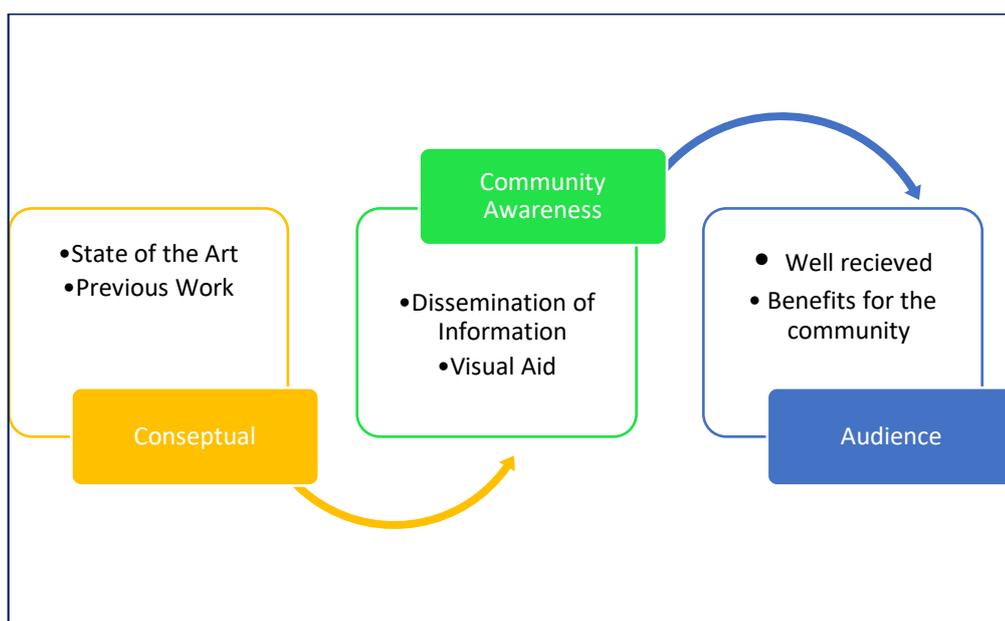


Figure 2. The method used during the community service

3. RESULT AND DISCUSSION

The next process of this particular study about of on this specific community awareness conducted several months before was to review all previous works completed by several some many researchers across disciplines of knowledge and thus compares with fact found in the field during the activities of campaigning the use of waste to be utilized as alternative source energy in a small group of a community member of a residential area in Kebun Jeruk, West Jakarta, Indonesia (Figure 3).

At this stage of implementation, the civic service in campaigning the awareness of the benefit of processing household plastic wasted into alternative energy before a group of residents in the above-mentioned area.



Figure 3. Residents of Kebun Jeruk

First of all, a team consisting of lectures, students dan alumni interchangeably explained to the audience the background and objectives of this particular awareness. In addition, the team also demonstrated by using a unique set of visual aid that portrayed a trivial vacuum device made out of paint cans waste. Furthermore, after cautiously sorting the plastic waste to be used, the plastic waste that was then inserted into the vacuum is a must-have

condition; the sorted plastic waste must be dry and clean from soil or other solid mud.

Another important stage during the demonstration was carried out, was the combustion process or scientifically known as pyrolysis, wherein the combustion stage took place to produce the desired level of steam, which was sequentially flowed into a piping system that had been set and immersed in cold water. By and large, the entire series of processes was categorized as distillation. In the final stage, from a unique but uncomplicated distillation process, it will eventually produce dew or liquid, which end product was identified as liquid oil that should be ready to be accommodated in a leakproof container (Figure 4).

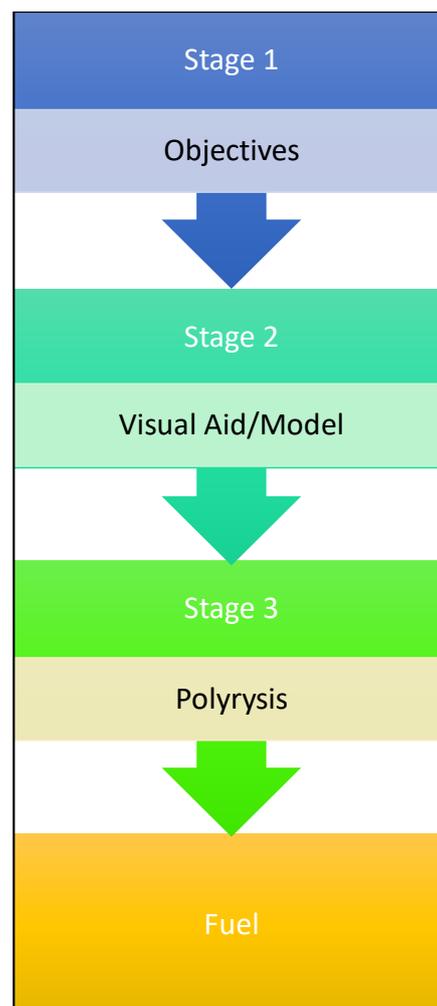


Figure 4. Activities during community service

3.1 Further Illustration

By far, the waste of plastic bags has become a viral topic of daily conversation recently in waste management. The fact is that the price is relatively low, can be easily found, and is never uneasy about using, making the waste of plastic bags have become a part of human life. Almost all food packaging and packaging of goods make use of plastic and plastic bags. Plastic is for other needs such as household appliances and furniture, children's toys, sports equipment, electronic and medical equipment, etc.

New plastics have been widely developed and used since the 20th century. However, its use has grown tremendously from only a few hundred tons in the 1930s to 150 million tons/year in the 1990s and 220 million tons/year in 2005. Plastics are excellent because of their unique properties. They are easy to shape, lightweight to save transportation costs, durable, safe from chemical contamination, water, and its effects, safe as packaging for goods and food, resistant to changing weather and temperature, and, more importantly, cheap. The phenomenon of the plastic waste boom has become a frightening spectre in every hemisphere, not only in developing countries but also in developed countries such as America, England, and Japan. Currently, plastic materials in Western European countries reach 60kg/person/year. In the United States, it reaches 80kg/person/year, while it is only 2kg/person/year in India.

As a result of plastic waste that takes hundreds or even thousands of years to decompose back to earth, 57% of the waste found on beaches is in the form of plastic waste. There is 46,000 plastic waste floating in every square mile of the ocean. Even the depth of plastic waste in the Pacific Ocean has reached almost 100 meters. Even according to the records of more than 1 million birds and 100 thousand sea animals

According to statistical data on Indonesian domestic waste, the type of plastic waste ranks second at 5.4 million tons per year or 14% of the total waste production in Indonesia. Thus, plastic has shifted the paper-type waste from second to third place with 3.6 million tons per year or 9% of the total waste production.

According to a US Environmental Protection Agency (EPA) report, in America alone, plastic waste production increased from less than one per cent in 1960 to 12% or about 30 million tons in 2008 of the country's total domestic waste production. The largest category of plastic waste comes from packaging and containers such as; drink bottles, bottle caps, shampoo bottles, and more. Plastic waste is also found in types of plastic goods whose use lasts a long time, such as equipment and furniture, and plastic goods whose use does not last long, such as diapers, plastic bags, disposable cups, utensils and medical supplies.

Meanwhile, the UK produces at least 3 million tonnes of plastic waste every year. As much as 56 % of this amount comes from packaging, 75% (from the percentage of packaging) comes from household waste. The plastic bag waste produced by the City of Jakarta alone reaches 1,000 tons a day. There has been no exceptional management of plastic waste at the city level until now. However, scavengers have a significant role in the informal recycling chain of plastic waste.

Nevertheless, along with plastic production that has increased sharply from year to year, America's recycling capability has also shown a very satisfactory condition. Currently, 80% of the people there have access to plastic recycling activities. This is in line with the increasing growth of the recycling business, with more than 1,600 business units involved in plastic recycling so that various types of plastic can be recycled.

In addition to introducing plastic recycling activities, scientists are also constantly encouraged to find other alternatives to conventional plastic substitutes promptly. Hence, the future will be the environmentally friendly, degradable, biodegradable plastics, widely known as bioplastics, introduced into the community. In Jakarta, three manufacturers recently introduced their products that are environmentally friendly plastics in Indonesia. All three have applied the strategy of horizontal product differentiation, although the three focus on the products providing alternatives to plastic bags and packaging that are environmentally friendly.

4. CONCLUSIONS

Plastic waste can be hazardous if not properly managed and might cause a profound impact on the environment, i.e., environmental pollution and human health.

Nevertheless, plastic waste can be utilized as alternative energy. More specifically, plastic is one product resulting from the cracking process chain when refining petroleum. In the implementation phase, the supply and demand of plastic should be regulated to control; first, the side effect of having an unexpected surplus in the production of plastic and, secondly, to preserve the sustainability of petroleum natural resources.

Plastic waste can be reprocessed through pyrolysis, resulting in fuel products. Moreover, the fuel oil produced has the potential to improve additional economic advancement for the community if professionally managed.

Last but not least, a suggestion to improve such community service is to use a more advanced visual aid of the pyrolysis model to more effectively convey the message to the audience. The step process that occurs during the combustion of plastic waste

disseminating into the air will be effectively comprehended by the target audience.

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