



Training for Processing Plastic Waste into Oil Fuel

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Abstract:

This service aims to provide education to elements of the community in Padamulya Village, Cihaurbeti District, Ciamis Regency. Next, we introduce to the public about plastic waste that can be used as fuel oil. The target of this activity is the community of one Padamulya, Cihaurbeti District, Ciamis Regency. This activity was attended by all regional leaders and the community. The expected result is that plastic waste produced by households can be used as fuel oil and reduce plastic waste in Padamulya village. Furthermore, training activities are carried out regularly so as to make the village healthy and economically independent.

Keywords: environment, waste management, plastic waste, oil fuel

1. Introduction

Plastic waste is a separate problem that needs attention (Ermawati, 2011; Nasution, 2015). This is because plastic waste takes hundreds of years to decompose (Arico & Jayanthi, 2018; Wahyudi et al., 2018). Plastic waste is also not environmentally friendly and is one of the contributors to greenhouse gas emissions if the decomposition of this waste is done by burning (Suroso & Rajali, 2019; Okatama, 2016). Plastic waste has a negative impact on the environment because it cannot decompose quickly and can reduce soil fertility (Beyene, 2014; Chandran et al., 2002). Plastic waste that is disposed of carelessly can also clog drainage channels, ditches and rivers so that it can cause flooding. Plastic waste that is burned can release substances that are harmful to human health (Zhao et al., 2022).

The environmental condition of the people of Padamulya Village, Cihaurbeti District, Ciamis Regency has a very high need for plastic use and the level of awareness of the community to dispose of waste in its place is still very minimal. Making the Padamulya Village area, Cihaurbeti District, Ciamis Regency has a fairly high level of environmental pollution. Starting from public places such as parks, public facilities and rivers (Wedayani, 2018; Rafli et al., 2017; Purwaningrum et al., 2018; Kunwar et al., 2016; Martin et al., 2021).

In general, the mechanism for converting plastic waste into fuel is by using the pyrolysis method, which is heating the plastic at a temperature above 400°C without oxygen (Pebrianti & Salamah, 2021; Phanisankar et al., 2020). At that temperature, the plastic will melt and then turn into a gas. Converting plastic waste into fuel oil includes tertiary recycling. Converting plastic into fuel oil can be done by the cracking process. Cracking is the process of breaking polymer chains into lower molecular weight compounds (Bajad et al., 2017; Rudianto et al., 2020).

Research related to the processing of plastic waste into fuel oil has been widely studied by various scientists in the world. Owusu et al. (2018) investigated the potential of converting plastic waste into useful fuels in both continuous and batch pyrolysis reactors using an appropriate technology and to investigate the effect of silica-alumina catalyst on the yield and quality of pyrolytic liquid oil. Yeanny et al. (2019) presented convert plastic waste into fuel which has economic value and is environmentally friendly in Namo Bintang Village Deli Serdang Regency. Kusri et al. (2021) studied of the polypropylene plastic waste as co-feeding for production of pyrolysis oil from palm empty fruit bunches.

This service aims to implement appropriate technology education that introduces plastic waste processing tools into fuel oil. This tool was made directly by Mechanical Engineering Students, University of Muhammadiyah Tasikmalaya and will continue to be developed until its use is optimal. The introduction of the plastic waste converter into fuel oil is expected to help preserve the environment, especially in the Padamulya Village area, Cihaurbeti District, Ciamis Regency.

2. Material and Method

This service activity was carried out in Padamulya village, Cihaurbeuti District, Ciamis Regency in 28 July 2021. The implementation method used by this service refers to the training of horse processing skills in Padamulya village as shown in Figure 1.

This service activity was carried out in coordination between the Umtas Team and the Bumdes Padamulya Ciamis Team to plan training on processing plastic waste into fuel oil. This service activity was carried out in coordination between the UMTAS Team and the BUMDES Padamulya Ciamis Team to plan training on processing plastic waste into fuel oil. Furthermore, we provide socialization of the importance of public health caused by plastic waste. In addition, we provide training on making props producing fuel oil as well as demonstrations on processing waste plastic into fuel oil.

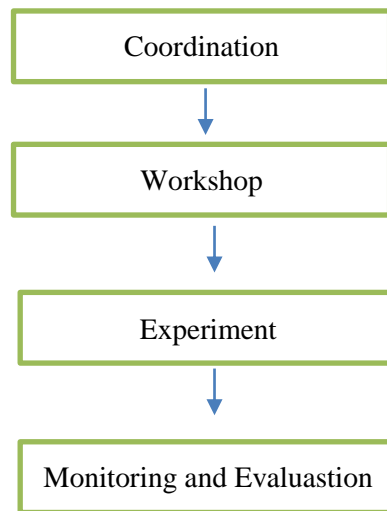


Figure 1. Methodology of community services

3. Results and Discussion

Urban waste is defined as solid waste, consisting of organic and inorganic substances which are considered useless and must be managed so as not to harm the environment and protect development investments (Panda et al., 2010). The accumulation of waste is caused by several factors, including the volume of waste that is very large so that it exceeds the capacity of the final landfill (Harussani et al., 2022). The government has not been so serious in thinking about this waste problem. Even though the government has made several breakthroughs, in some temporary dumps, mountains of garbage are still very disturbing to the community and are still a concern.

In planning a tool, it is necessary to take into account and choose the materials to be used, whether these materials are in accordance with the requirements needs, both in terms of size dimensions or in the nature and characteristics of the materials to be used. Based on the selection of appropriate materials, it will greatly support the success in the planning, as for the things that need to be considered in the selection of materials, namely: function of components, mechanical properties of materials, physical properties of materials and material prices.

Manufacture of waste plastic processing equipment into fuel oil includes frames, reactors, pipes and condensers. The tool frame is made of 4x4 0.5 mm Hollow Iron, with a length and width of 950 mm x 470 mm. Furthermore, reactors are made for chemical or nuclear reactions and not physical reactions. With the occurrence of this reaction, a material changes to another form of material, the changes occur spontaneously alias occurs by itself or it can also require the help of energy such as heat. The change in question is a chemical change, so there is a change in non-phase materials, for example from water to steam which is a physical reaction. The pipe is used to channel the steam produced by burning plastic in the reactor tube to the steam catcher pipe and then channeled it back to the condenser pipe (coolant). while the condenser is used for the cracking process in the distillation process.

The working principle of this plastic waste processing tool will work when plastic waste is inserted into the reactor tube and closes it tightly. Then, we carry out the combustion process without oxygen so that the plastic heating process occurs at a temperature of 150-261 °C. In this process the plastic will melt and then turn into steam. The results of the heating will enter the steam connection pipe after which the gas will go to the condenser pipe. Finally, the steam from the heating undergoes a cooling process and forms a liquid, so that this liquid becomes fuel in the form of plastic oil.



(a)



(b)

Figure 2. Workshop activities at Bumdes Mulyajaya Ciamis

In training activities on processing waste into fuel oil, we have provided material to the public related to waste, types of plastic (*PP, PET, HDPE, LDPE, LLDPE*) and the working principle of plastic waste processing equipment. This activity was attended by the community and village officials from Padamulya Village, Cihaurbeti District, Ciamis Regency, West Java. This activity is expected to make Padamulya village a healthy and clean village and become a model for other villages in Ciamis district.

4. Conclusion

In this paper, we have provided education to elements of the community in Padamulya Village, Cihaurbeti District, Ciamis Regency. Next, we introduce to the public about plastic waste that can be used as fuel oil. The target of this activity is the community of one Padamulya, Cihaurbeti District, Ciamis Regency. The expected result is that plastic waste produced by households can be used as fuel oil and reduce plastic waste in Padamulya village.

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