

## **Household Waste Management System Using A Mini Portable Incinerator**

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**Abstract:** The use of plastic-based goods is increasing along with the development of technology, industry and also the number of population. The use of plastic materials is increasingly widespread because it is strong and not easily damaged by weathering. Burning waste using used oil and water is one way to speed up the burning of unleaded plastic waste, so that all plastic waste that is put into the tool will turn into ashes. The mini incinerator built in this community service activity consists of a combustion chamber, 2 mm iron plate, angle iron, pipe iron, PVC pipe, spray nozzle, water reservoir, oil reservoir and other supporting materials. Therefore, the method of treating waste by burning using an incinerator is something that can be done effectively to reduce accumulation and odor in temporary waste collection points. From the results of trials that have been carried out in the combustion process carried out in the Lido Property Gemilang residential area, it can be seen that the results are very satisfactory from the incinerator that has been made. Incinerators can make a good contribution to waste management in the residential area of block D. Waste that accumulates in temporary landfills does not accumulate as much as usual. The accumulated garbage is reduced by 50% from before.

**Keywords:** Incenerator, Waste, Garbage, Plastic

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### **Introduction**

Garbage is a problem faced by society today, the amount of waste growing every day is increasing rapidly along with population growth[1]. In simple terms, waste is defined as unwanted residual material (eventually disposed of) after a process is completed or ends, so that it can be stated that waste is a concept aimed at humans as well as a consequence of the existence of human activities[2]. The composition of the waste generated from human activities is organic waste as much as 60-70% and the rest is non-organic waste 30-40%, while the second most composition of non-organic waste, namely 14%, is plastic waste. The most plastic waste is a type of plastic bag or plastic bag besides plastic packaging[3].

The high use of plastic causes people to become dependent on plastic, because plastic has functional, practical properties, and is used for single use, so it has high hygiene and plastic production requires a low cost so that it can be mass produced and easy to find[4]. Therefore, dependence on plastic has a negative impact, which makes plastic a potential hazard to human health and the environment. Plastic material is a type of macromolecule that is formed by a polymerization process. Polymerization is the process of combining several simple molecules (monomers) through chemical processes to become large molecules (macromolecules or polymers)[5]. Plastic is a polymer compound whose main constituent elements are carbon and hydrogen. To make plastic, one of the raw materials that is often used is naphtha, which is a material produced from the distillation of petroleum or natural gas. As an illustration, to make 1 kg of plastic requires 1.75 kg of petroleum, to meet the needs of the raw materials and the energy needs of the process[6].

The use of plastic-based goods is increasing along with the development of technology, industry and also the number of population[1]. The use of plastic materials is increasingly widespread because it is strong and not easily damaged by weathering. There are two ways to reduce plastic waste, namely physical waste transformation and chemical waste transformation. Physical transformation of waste is by eliminating plastic waste by separating the components of plastic waste and reducing the volume of plastic waste by compacting or compacting[4]. Chemical waste management can be done by burning it so that a chemical process occurs during combustion. So that one way to deal with plastic waste is to burn the waste quickly and economically[7]. Burning waste using used oil and water is one way to speed up the burning of unleaded plastic waste, so that all plastic waste that is put into the tool will turn into ashes.

Incinerator is a waste treatment system with chemical transformation, namely by chemically changing the form of waste using the principle of the combustion process or waste incineration[8]. The waste incineration process is the conversion of solid waste into gas, liquid and solid product phases which are converted, with the

release of heat energy. Incinerator technology is a waste destruction tool that is carried out by burning at high temperatures and is integrated, safe for the environment, easy and safe to operate, because the emissions produced are environmentally sound. The use of incinerator can meet the requirements of the Ministry of Environment in accordance with Kep. MenLH No.13/MENLH/3/1995.

The mini incinerator built in this community service activity consists of a combustion chamber, 2 mm iron plate, angle iron, pipe iron, PVC pipe, spray nozzle, water reservoir, oil reservoir and other supporting materials. However, purification of the smoke produced must be carried out, so that the impact of air pollution can be minimized. In a relatively short time, the incinerator is able to burn all of this waste down to ashes. Garbage incineration uses a double chamber, so that emissions through the chimney minimize smoke and smell, so that pollution to the environment can be minimized. In its operation, large and heavy waste can be separated or chopped[8]. Metal and glass waste must also be separated, and not allowed to enter the combustion chamber, to maintain complete combustion and prevent damage to the incinerator burner walls. It may be necessary to regulate the activities of scavengers who handle waste sorting so that there are no fights over work areas and cause social conflict.

Gemilang housing property Lido Blok D, is a housing complex located in Ciburuy Village, Cigombong District, Bogor Regency, which is a block with about fifty families living in it. The waste generated every week reaches five hundred kilograms. The waste is transported to the final disposal site by way of being transported every week. As a result, the garbage that has been piling up for a week smells bad and pollutes the surrounding environment, especially the temporary waste collection points at public facilities located next to residents' homes. it gives a bad effect with the existence of temporary waste storage. Therefore, the method of treating waste by burning using an incinerator is something that can be done effectively to reduce accumulation and odor in temporary waste collection points.

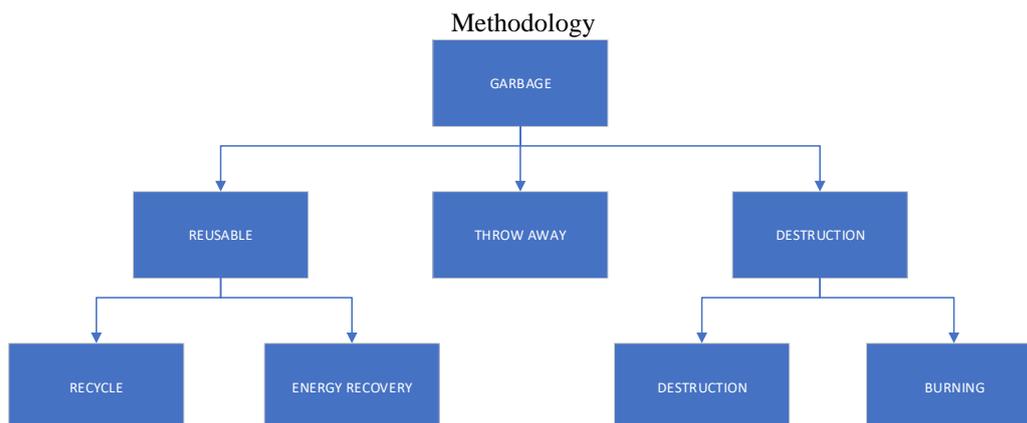


Figure 1

The method used in the processing of waste consists of three stages seperti pada figure 1., namely

1. Reducing (reducing) is carried out by minimizing the amount of goods used.
2. Reuse, namely by reusing plastic goods directly.
3. Recycling is processing unused waste into new goods. This method requires the manufacturer to handle it. However, some waste can be recycled directly by the community.
4. Energy Recovery is widely applied to waste that has a high fuel calorific value. Organic waste can also be applied to this effort through the methane gas produced during decomposition. The energy capture effort can be applied before or after the waste disposal effort takes place.
5. Disposal is the last alternative if all the methods above have been optimized. Garbage disposal must also be carried out safely at an agreed location.
6. Crushing Usually carried out when transporting by using a special garbage truck plus a chopper or crusher. Pieces of waste are used as piles on flat land.
7. Incineration On a household scale, manual burning of waste is indeed practical for large volumes of waste which is carried out using an incinerator.

The mini incinerator built in this community service activity consists of a combustion chamber, (chamber) capacity of 50 kg, 2 mm iron plate, angle iron, pipe iron, PVC pipe, spray nozzle, water reservoir, oil reservoir and other supporting materials. The incinerator is ignited using used oil which is ignited and then kept on fire in the furnace provided. After the fire has started to heat up, put the garbage that is ready to be burned,

the relatively short burning time is able to burn all the garbage down to ashes. Garbage incineration uses a double chamber, so that emissions through the chimney minimize smoke and smell, so that pollution to the environment can be minimized. In its operation, large and heavy waste can be separated or chopped. Metal and glass waste must also be separated, and not allowed to enter the combustion chamber, to maintain complete combustion and prevent damage to the incinerator burner walls. The method used in waste processing that is carried out at the Lido property gemilang housing is by using the combustion method. The agreed combustion method is using an incinerator. The incinerator made for this activity is an incinerator as shown in Figure 2.

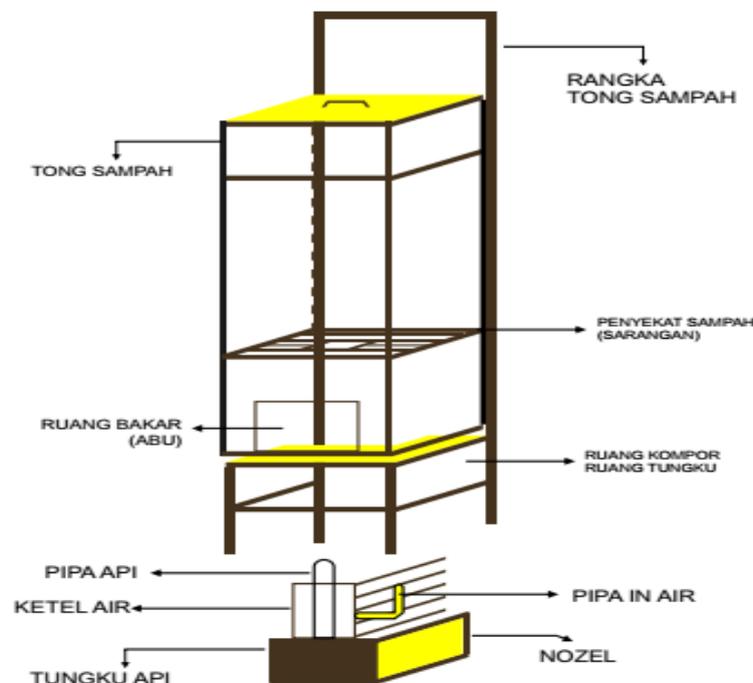


Figure 2 Incenerator

The incinerator consists of three parts, namely the incinerator frame which consists of the main frame and the incinerator furnace chamber, the incinerator furnace and the incinerator chamber which consists of a waste bin, the remaining combustion or ash chamber and the waste separator with ash. Incineration of waste that is carried out using an incinerator is carried out in three stages, namely as follows:

1. The furnace is filled with about 1 liter of water in the furnace water pipe that has been provided.
2. The furnace is filled with used oil as fuel for heating the furnace.
3. The furnace is ready to be inserted into the stove room.
4. When the fire comes out of the fire pipe of the furnace, waste is added to the combustion chamber.
5. Garbage can burn quickly when the fire that comes out is big.

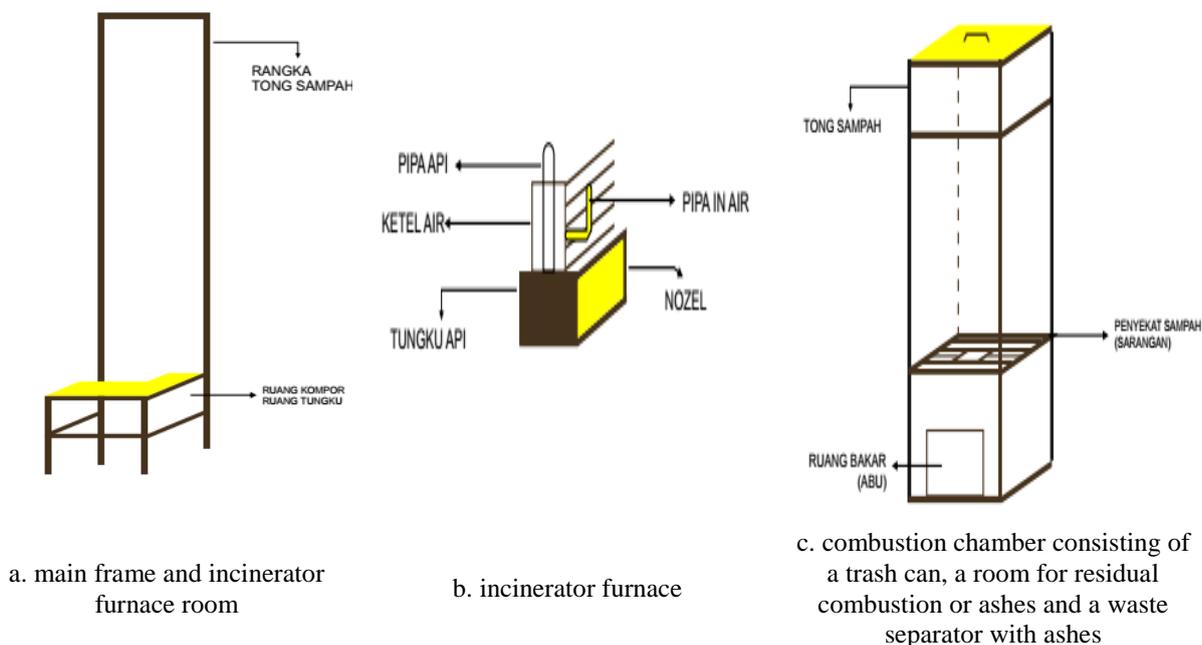


Figure 3 path of Incinerator

### Results and Discussions

The incinerator that has been built consists of a frame, combustion chamber and a pre-made shape furnace as shown in Figure 4. The incinerator has a capacity of fifty kilograms per combustion with a burning time of thirty minutes. The heat generated from the fire furnace reaches five hundred degrees Celsius. The fire generated in the incinerator is as shown in Figure 5. Figure 4 shows two types of box and tube incinerators. The two incinerators function the same as a combustion chamber with a capacity of fifty kilograms for the cylinder type and sixty kilograms for the box type. The incinerator can already be used in the combustion process with a capacity of fifty kilograms with an average time of thirty minutes. The following is the sequence of types of household waste that is burned in the incinerator.



Figure 3 Incinerator

Tabel 1 Long Burning Time of Various Types of Garbage

No	Jenis Sampah	Lama Pembakaran
1	Dried Leaves	3 Menit
2	Wet Leave	6 Menit
3	Dry Plastic	3 Menit
4	Wet Plastic	7 Menit
5	Diapers	10 Menit

Tabel 2 Long Burning Time Based on the weight of the Waste

No	Berat Sampah	Lama Pembakaran
1	50 Kg Dried Leaves	10 Menit
2	50 Kg Wet Leave	20 Menit
3	50 Kg Dry Plastic	12 Menit
4	50 Kg Wet Plastic	24 Menit
5	50 Kg Diapers	20 Menit
6	50 Kg Mix	30 Menit

Prior to the burning process, leaves, plastic and diapers are separated. Each waste is tested in the combustion process. The duration of the burning process depends on the type of waste being burned. The duration of the type of waste that is burned depends on the type as shown in table 2. From the results of trials that have been carried out in the combustion process carried out in the Lido Property Gemilang residential area, it can be seen that the results are very satisfactory from the incinerator that has been made. Incinerators can make a good contribution to waste management in the residential area of block D. Waste that accumulates in temporary landfills does not accumulate as much as usual. The accumulated garbage is reduced by 50% from before.

The implementation of burning waste using an incinerator is very effective for use by residents so that it reduces the waste that usually accumulates in temporary landfills which results in less odor. The incinerator that has been built is still in the development stage. this tool still has many shortcomings such as the smoke produced from combustion is not optimally used as water vapor which can circulate in automatic water filling.

### Conclusion

The use of plastic-based goods is increasing along with the development of technology, industry and also the number of population. Burning waste using used oil and water is one way to speed up the burning of unleaded plastic waste, so that all plastic waste that is put into the tool will turn into ashes. Incinerator is a waste treatment system with chemical transformation, namely by chemically changing the form of waste using the principle of the combustion process or waste incineration. The waste incineration process is the conversion of solid waste into gas, liquid and solid product phases which are converted, with the release of heat energy. Gemilang housing property Lido Blok D, is a housing complex located in Ciburuy Village, Cigombong District, Bogor Regency, which is a block with about fifty families living in it. The waste generated every week reaches five hundred kilograms. . Incinerators can make a good contribution to waste management in the residential area of block D. Waste that accumulates in temporary landfills does not accumulate as much as usual. The accumulated garbage is reduced by 50% from before. The implementation of burning waste using an incinerator is very effective for use by residents so that it reduces the waste that usually accumulates in temporary landfills which results in less odor. The incinerator that has been built is still in the development stage. this tool still has many shortcomings such as the smoke produced from combustion is not optimally used as water vapor which can circulate in automatic water filling

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