

Design and Fabrication of Burning Stove Using Waste Oil

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Abstract - This paper presents the design, fabrication, and performance evaluation of a stove that utilizes waste engine oil (WEO) as an alternative fuel. Waste engine oil, a hazardous byproduct from automobiles, poses environmental challenges when improperly disposed of. The developed stove incorporates a preheating and controlled combustion mechanism to efficiently burn WEO. Experimental analysis was conducted to evaluate thermal efficiency, fuel consumption, and emission characteristics. Results indicate that WEO can be a cost-effective and sustainable alternative fuel when proper combustion techniques are employed.

1. INTRODUCTION

The increasing use of motor vehicles is the main factor causing the increasing volume of waste oil. Used oil waste from motor vehicles in quite large quantities can be used as fuel either directly or through recycling, both on a small and large industrial scale. The above explanation is one of the causal factors in the increasing volume of waste oil, which requires effective waste management to prevent environmental pollution.

Meanwhile, kerosene can currently be considered a rare commodity, and subsidies on it are likely to be reduced or even stopped due to the switch to gas. This is expected to be difficult, especially for low-income people, considering that kerosene prices tend to rise, especially in areas far from urban areas. Efforts continue to be made in the search for alternative energy to reduce fuel consumption, especially in motor vehicles. Some alternative fuels that have been used to overcome dependence on fossil fuels.

However, even though these efforts have been made, the number of alternative energy sources is still insufficient to meet the world's energy needs, especially with the continued development (Arif et al. 2021). One of the treatments that can reduce the waste oil is to make it as fuel for the stove as an alternative energy. Used oil stove is a stove that uses used oil fuel, this stove mechanism is not much different from other stoves, because this stove needs to heat the furnace first and requires a *blower* as a tool to blow the wind so that the fire is stable.

1.1 Research Purposes

- Developing a stove using waste oil as fuel.
- Evaluate its efficiency compared to conventional stoves.
- Assess its potential in reducing environmental waste.

2. BODY OF PAPER

Design is a series of procedures to translate the results of a system analysis with the aim of describing in detail how the components of the system will be implemented. Meanwhile, system development includes activities to create, replace, or repair existing systems, either in whole or in part. Design is closely related to system design.

So, design is a planning process that describes a systematic sequence of activities related to a program or application. Design is also related to system design, where it functions as a translator of analysis results used to create or improve the system.

Design and Construction Flow

Analysis → Design → Implementation → Testing

2.1 Waste Oil and Its Potential

Used oil is included in the category of B3 waste, which can be used but can harm the environment if not managed properly. According Government Regulation No. 101 of 2014, B3 waste is the remains of businesses and/or activities that contain hazardous and/or toxic materials that can pollute and damage the environment and endanger health, human survival, and other living things.

In addition, waste that is included in B3 waste is waste that has one or more of the following characteristics: explosive, flammable, reactive, toxic, corrosive, infectious and others.

2.2 Used Oil Handling

Decree of the Head of the Environmental Impact Management Agency (Bapedal) Number Kep-03/BAPEDAL/09/1995 of September 5, 1995 concerning the processing of B3 waste Technical Requirements for the Processing of Hazardous and Toxic Material Waste: B3 waste is processed in the following manner: collected in the laboratory, taken from the laboratory, temporarily stored in a temporary storage warehouse, and transported to the final processor, which is an authorized institution appointed by the government (Minister of Health of the Republic of Indonesia 2014)

2.3 How the Stove Works

The combustion chamber is filled with used oil by opening the stopcock on the oil tank, the oil will flow into the combustion chamber through a hollow pipe that is directly connected to the combustion chamber, insert tissue or paper as a fire starter then burn the tissue or paper until the combustion chamber is hot then turn on the mini blower at low speed, after the flame turns blue then adjust the blower fan speed

3. METHODOLOGY

Research on making waste oil stoves was carried out in stages. The research began with literature studies and observations carried out simultaneously to obtain a selection of tools, materials and processes for making used oil stoves. The next stage was making used oil stoves.

4. RESULTS AND TESTING OF WASTE OIL FUELED STOVE

- Flame temperature

The flame temperature is the heat energy resulting from the combustion of raw materials in the form of used oil. The used oil waste raw material used is radiated upwards from the fuel to the outer side of the bottom of the pan. The flame temperature is measured with an industrial thermometer at the mouth of the combustion chamber of the used oil- fueled stove or under the surface of the bottom of the pan. After the data is arranged in a table and depicted in a graph, the flame temperature is 324°C for the treatment of used oil.

- Length of time the fire burns

The duration of the flame burning is the duration of the flame burning during the test of the results of the used oil-fueled stove. The duration of the flame burning is measured using a stopwatch. After the data is arranged in a table and depicted in a graph, the duration of the flame burning is obtained, which is 15 minutes.

- Temperature of Water

Boiling point is the temperature at which the vapor pressure of a substance (liquid) is equal to the outside air pressure, so that the evaporation process occurs throughout the liquid.

In graph it has been concluded that the boiling temperature of water in the test results of this used oil stove is 100°C. 89

- Water Boiling Time

The boiling time of water is the boiling point of water in the

Tools	Material
a. Welding machine	a. Iron plate
b. Ground cable	b. Pipe galvanized
c. Mass clamp	c. Galvanized iron socket
d. Electrode Cable	
e. Electrode Holder	d. 12v mini blower
f. Welding hammer	e. Hollow iron
g. Steel brush	f. Stop the tap
h. Meter	g. Sandpaper
i. Grinding	h. Bolt
j. Electric drill	
k. Spray gun	
l. Compressor	
m. Screwdriver	

test of used oil stoves. The time required to boil water on this used oil stove is 7 minutes.

- Tools and Materials

Charts: Stove Test Results Fueled by Used Oil





ASSEMBLY OF MODEL

5. CONCLUSIONS

The developed waste engine oil stove demonstrates an efficient and cost-effective alternative to conventional gas stoves. Experimental results show that it can boil 5 liters of water faster (7 minutes) compared to a gas stove (9 minutes), due to improved combustion aided by a blower system. The design highlights the importance of proper material selection and insulation, such as clay lining, to enhance thermal efficiency and safety. Overall, the stove offers a sustainable solution by converting waste oil into useful energy, though further improvements in design and emissions control are recommended.

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