Indonesia Journal of the World
Vol. 2, No. 1, Februari 2025, pp. 24~29

https://kampungjurnal.org/index.php/IJTW/index

DESIGN AND BUILD A STOVE (BURNER) FUELED BY USED OIL AND WATER VAPOR

Hasan Santosa *, Agung Pranoto, Dwi Yuliaji
Universitas Ibn Khaldun Bogor
Jl. Sholeh Iskandar No.Km.02, RT.01/RW.010, Kedungbadak, Kec. Tanah Sereal, Kota Bogor, Jawa Barat 16162, Indonesia
Email: santosahasan96@gmail.com

Abstract

This study aims to find out the design of a burner fueled by used oil and water vapor pressure, along with its specifications and find out the results of tests using used oil burning stoves (burners). Departing from the lack of utilization of waste oil and the lack of good tools to utilize the used oil. On the other hand, when used as fuel, used oil does not produce perfect combustion. This study uses the French design model. This study concluded that the stove (burner) designed has a large shape compared to burners in general. Stove (burner). The fire produced by used oil is orange. Fuel comparison results in data that LPG is 10 minutes faster than used oil in used plastic smelting. The highest flame length is 40 cm at stable flame variations. There is an effect of pressure variations on combustion temperature. The existence of water can be used for water vapor when the water temperature has risen. The hot water will release steam to press the fire so that the pressure is greater.

Keywords: Used Oil, Water, Build Plan

INTRODUCTION

Oil is a residue of other petroleum products. Some of the residual products are residual fuel oil, fuel oil for diesel, road oil, spray oil, coke, asphalt, etc [1]. In general, there are 2 types of used oil, namely light industrial oil and black oil. Industrial waste oil is relatively cleaner and easier to clean with simple treatments, such as filtration and heating. Black oil comes from automotive lubrication[2]. So far, the use of used oil carried out by the community is still not optimal, especially used as fuel. This happens because there are few stoves (burners) that are directly fueled by used oil without the presence of a mixture of other substances. Some tests require additional substances so that the used oil can be used as fuel. One of the additions of these substances is using propolis oil. The result of the mixture is in the form of the characteristics of the resulting flame that is yellow-red with a maximum height of 40 cm [3]. In general, used oil is used by the community in various ways such as being recycled to be used again by giving the used oil additional chemicals to purify it. But recycled products are not like new oil. In addition, it is used as a rust remover in exhaust, as a wood preservative and chain lubricant.

Submitted: January-2025 Received: January-2025 Available online: February-2025

Quoting from the motorcycle plus magazine online, the use of used oil waste for recycling is around 30% [4]. The impact of the lack of utilization of used oil that has not been maximized results in environmental pollution. The oil waste can pollute the air, soil, and water. Waste lubricating oil plus online, likely contains metals, chlorine solutions, and other pollutants. One liter of waste lubricating oil can damage millions of liters of fresh water from groundwater sources. If waste lubricating oil spills on the ground, it will affect groundwater and will be harmful to the environment. This is because waste lubricating oil can cause soil to lose nutrients [5]. In addition, oil waste dumped into the ocean will affect marine ecosystems which can kill corals, fish and other habitats in the sea.

Oil is the result of petroleum refining. The characteristics of oil are also not far from petroleum used as fuel. So it is not impossible that used oil can be used as fuel. However, used oil cannot achieve a perfect combustion, such as diesel or gasoline. This happens because used oil is not flammable so that fogging does not occur like fuel in general. However, used oil can be used as fuel by optimizing combustion. Used oil requires special treatment so that it can become a fuel. In this special treatment, there are two options, namely by adding substances or by combustion. However, to produce an economical stove, of course it is hoped that without the addition of substances but by burning the used oil.

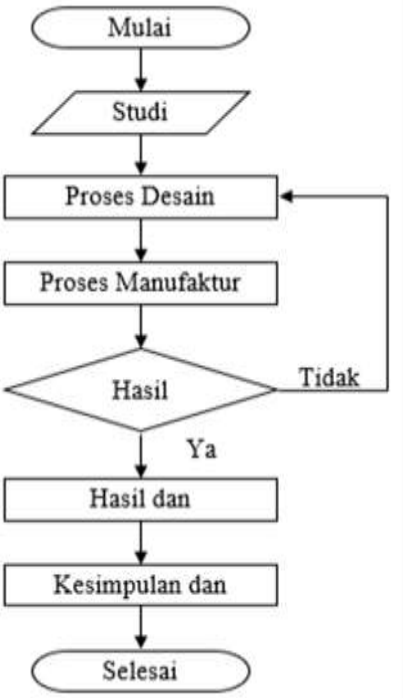
The stove design is expected to have better economic value than using fuel in general such as gasoline, LPG, and so on. Combustion of used lubricants by evaporation to produce much cleaner exhaust emissions. So that the smoke produced is not much and does not disturb the surrounding area. In addition, the design of the stove must have convenience for maintenance [6]. An easy maintenance process can increase the value of the stove. The presence of water vapor is water in the form of gas that occurs due to the process of heating water into water vapor. It can be used to increase combustion pressure. Based on some models of stoves that have been made, they do not have a good level of maintenance.

Based on the above problems, the researcher is interested in taking the title of the research on "Design and Construction of Stoves (Burner) Fueled by Used Oil and Water Vapor".

LITERATURE REVIEW

Research flow diagram

In this study, the research methodology in the design of stoves fueled by used oil and water vapor will follow the following research flow diagram



Pictures 1. Research flowchart

Semi-offline Real Work Lecture (KKN) activity schedule

The following is a schedule of activities for the design of stoves for the smelting of recycled plastic waste and used oil into bricks.

Table 1. Activity schedule

Kegiatan	Hari ke-																											
	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30
Studi pustaka																														
Perencanaan dan pembuatan desain																														
Proses manufaktur																														
Pengujian lapangan																														
Penyusunan laporan																														

RESEARCH METHODS

The research method uses the French descriptive design method, directly tested by melting plastic waste.

Research Tools and Materials

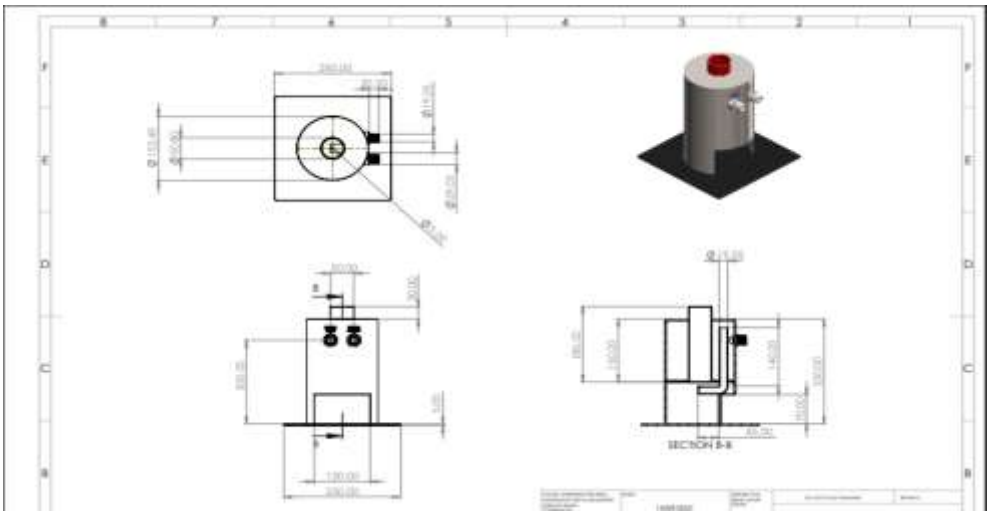
The tools used in this study are welding machines, hand grinders, pliers, as for the materials used used oil, water, iron plates for stove bodies, iron pipes, ball valves, plastic hoses.

Research Procedure

This research is in the form of design, using a descriptive method. The research method begins by understanding the needs of the design of used oil-fueled stoves, after which analyzing the problem and problem statements. The next step is to design product concepts in order to get the desired specifications. Choose a sketch that matches the effectiveness and efficiency of the tool. The next step is the form of sketches, details and drawings of the work tools, and the last step is the design of the components as a whole. Next, a comparison is carried out through testing. The tests in this study help test waste melting.

RESULTS AND DISCUSSION

Design and Build a Stove (Burner) Fueled by Used Oil and Water Vapor.The stove (burner) that is designed has a large shape compared to burners in general. This is because there is a large enough oil reservoir in the burner body so that the oil can produce steam that can be used as fuel with a pressure of 2 bar and reach a temperature of 1120 ºC. The shape of the stove (burner) is large and made of fairly thick plate iron used in the melting furnace, besides that this stove is not easy to move from one place to another because the load is quite heavy. For faucets, air hoses, spuyers and nozzles use raw materials in the form of brass. For oil hoses and water tanks, materials in the form of plastic hoses are used. Operating this stove (burner) is a little time-consuming at the time of starting a fire. Because oil is not a fuel like gasoline or LPG gas that ignites easily. The resulting combustion is also not included in the complete combustion. So for this baking process, 1 liter of oil will produce 8 pcs of bricks.



Pictures 2 of used oil and water vapor fueled stoves

How a combustion furnace with used oil fuel works
Tool components

1. Water in control valve;
2. Steam regulating valve in the water container;
3. Reservoir air;
4. Steam line pipe out;
5. Fire and steam pipelines;
6. Reservoir oli bekas.

How the tool works

1. Open the water in valve to fill the water into the water reservoir to a predetermined limit;
2. Pour oil into a 0.5-liter used oil reservoir then add gasoline to speed up the used oil to reach its burn point;
3. The heat generated from the combustion of this used oil will heat the water in the water reservoir and the steam in the water reservoir will flow through the steam out line pipe to the fire and steam line pipe;
4. Steam coming out of the steam line pipe that has pressure due to the process of heating the water in the water reservoir will help to encourage the fire in the used oil reservoir that will be used to heat the plastic melting container;

CONCLUSIONS

1. This waste recycling machine is able to produce 8 pcs of bricks for one plastic waste melting process with a total of 8 kg of plastic waste raw materials used and 1 liter of used oil for smelting and 1 liter for one combustion process in the furnace.
2. The test also produced data that using LPG was 10 minutes faster than used oil. This is influenced by the difference in calorific value between LPG gas and used oil. The temperature of the fire

Used oil produced has a difference of approximately 100 °C with LPG gas, which incidentally is a fuel. There is an influence of time on the temperature increase that occurs in the furnace. This effect occurs when the longer the furnace is heated, the hotter the furnace will be. Based on the economy, used oil has a value of Rp. 3,000. As for LPG gas Rp. 24.. For its economic value in the smelting of used oil plastic waste, it is cheaper than LPG gasEffect of pressure on flame properties Results Testing show that the higher the variation in steam pressure, the higher the flame produced and vice versa. The most stable flame.

REFERENCES

A. Amri, H. Hamri, & F. A. Sofyan, “Analisis Nilai Ekonomis Oli Bekas Pada Kompor Bertekanan Berpemanas Awal.” J-Move: Jurnal Teknik Mesin, vol. 1, no. 1, 2019.

W. P. Raharjo, “Pemanfaatan TEA (Three Ethyl Amin) Dalam Proses Penjernihan Oli Bekas Sebagai Bahan Bakar Pada Peleburan Aluminium.” Jurnal Penelitian Sains & Teknologi, vol. 8, no. 2, pp. 166 – 184, 2007.

G. Rubiono, dan R. Mustika, “Sosialisasi Manajemen Limbah Oli Bengkel Mobil Pengabdian Masyarakat di Desa Pesucen Kecamatan Kalipuro Kabupaten Banyuwangi.” vol. 1, Pp. 5-9, 2017.

Asidu, L. A. Darsono, M. Hasbi, and P. Aksar. "PEMANFAATAN MINYAK OLI BEKAS SEBAGAI BAHAN BAKAR ALTERNATIF DENGAN PENCAMPURAN MINYAK PIROLISIS." ENTHALPY 2.2, 2017.

Ridho, A. 2018. Serius, Oli Bekas Bisa Jadi Baru Layak Pakai Cuma dengan 2 Langkah? Begini Kata Ahlinya. https://www.motorplus- online.com/read/251260061/serius-oli-bekas- bisa-jadi-baru-layak-pakai-cuma-dengan-2- langkah-begini-kata-ahlinya. 28 Juli 2020. (18.48).

W. P. Raharjo, “Pemanfaatan Oli Bekas Sebagai Salah Satu Alternatif Solusi Untuk Mengurangi Kebutuhan Minyak Bakar.” Jurnal Mekanika, vol. 3, no. 1, pp. 23 -25, 2004.

H. D. Harsokoesoemo, “Pengantar Perancangan Teknik.” Bandung : ITB, 2004.

Y. W. Atmojo, “Pengaruh Variasi Tekanan Udara Terhadap Waktu Konsumsi Bahan Bakar dan Sifat Nyala Api Pembakaran Oli Bekas Pada Kompor.” Skripsi. Universitas Negeri Semarang, 2020.

G. W. Ramadhan, “Pengaruh Tekanan Udara Terhadap Temperatur Pembakaran Oli Bekas Pada Kompor.” Skripsi. Universitas Negeri Semarang, 2020.

A. R. Hidayat, “Pengaruh Jenis Oli Bekas (Jarak Tempuh Perjalanan) Sebagai Bahan Bakar Kompor Pengecoran Logam Terhadap Waktu Konsumsi dan Suhu Maksimal Pada Pembakaran.” Skripsi. Universitas Negeri Semarang, 2020