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Fabrication of Fuel Burner By Re-Using Automobile Engine Oil

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Abstract: Pure lubricating oil may contaminate large volumes of water, including groundwater, as well as the area where it spills. Used engine oil itself is polluted by contaminants and leftovers from combustion and contains a variety of additives. Some of them, like lead and PAHs (poly-aromatic hydrocarbons), are toxic and cancer-causing. Additionally, PCBs (polychlorinated biphenyls), which are also very carcinogenic, are present in the oils used in transformers. Such spent lubricating oils are produced from a variety of sources and are poorly disposed of. Incinerators and kilns that burn spent oil create a lot of ash and toxins that pollute the environment. Due to the presence of contaminants, used lubricating oil cannot be disposed of carelessly. The practice of recycling and reusing used lubricants is becoming more popular as a solution to both economic issues and environmental concerns. It can be properly recovered and refined to yield a lot of valuable products. Re-refining's goal is to get rid of impurities and damaged additives while bringing the oil's characteristics back up to SAE (Society of Automobile Engineers) standards.

Index Terms– Base oil, contaminants, crude oil, lubricating oil, re-refining, SAE standards, used engine oil.

I. INTRODUCTION

Lubricant oils have largely been used to reduce friction between moving components of various machinery or equipment, to minimize material wear, to increase the efficiency of equipment/machinery, and to save fuel and energy. Lubricants are necessary for any contemporary culture because they not only minimize friction and wear by interposing a thin liquid coating between moving surfaces, but they also eliminate heat, keep equipment clean, and prevent corrosion. Among its many applications are petrol and diesel engine oils.

Lubricants typically include 90% base oil (often petroleum fractions known as mineral oils) and fewer than 10% additives. A great range of additives is utilized to improve the performance of lubricants.

II. LITERATURE REVIEWS

Nabil M. Abdel-Jabbar

Nabil M. Abdel-Jabbar (2010) experimented to study the waste lubricating oil re-refining adsorption process using various adsorbent materials. These included date palm kernel powder, egg shale powder, oil adsorbent, and acid-activated date palm kernel powder. Investigated was the adsorption process over a given volume of adsorbent under ambient circumstances. Asphaltenic and metallic pollutants from the waste oil might be deposited at lower concentrations thanks to the adsorption/extraction process. The date palm kernel powder with a 4-hour contact time was discovered to be able to provide the ideal conditions for processing the waste oil. The recovered solvent may potentially be put to use again. Additionally, it was shown that date palm kernel powder trailed activated bentonite in terms of having the finest physical qualities. The amounts of carbon residue, ash, and asphaltenes were reduced to 68.2 weight percent, 72.9 weight percent, and 92.3 weight percent, respectively. Additionally, this procedure reduces the level of heavy metals in treated oil. It is possible to recover and reuse the solvent that was collected from the procedure.

Shri Kannan C

C. Shri Kannan (2014) Used oil is gathered from vehicle repair shops and put through a dehydrating, vacuum distilling, and solvent extraction process. Atmospheric distillation is used to recover the solvent used in solvent extraction. The re-refined oil then receives additives. Lubricating oil parameters such as density, viscosity, viscosity index, flash point, fire point, pour point, cloud point, and total acid number were calculated and compared to the Society of Automotive Engineers standards.

M. J. Madu

Madu, M. J. (2014) To save money, an admixture burner for the atomization and burning of spent motor oil and kerosene for foundry applications was built and tested. The nozzle, springs, screws, tank, and gasoline pipe were the primary components utilized in its creation. A test was performed to determine the time required for certain engineering materials to melt. The thermal efficiency of the burner is 66%. The experiment also revealed that as the temperature rises, the density of the admixture drops, making it easier to mix and ignite for combustion.

Bharathi K V1, Divya2, Raseeda S3, Tejaswini N S4, Dr.Shankaralingappa C B

This study aims to showcase the technology used for metro transport in the majority of developed countries. ARM 7 is used for the CPU, and when the train arrives at the endpoint, the infrared sensor detects it and stops immediately. The doors will then close and the train will depart at the time programmed into the controller. An LCD connected to the ARM 7 displays passenger counts and stations. A motor driver IC connected to the ARM7 controls the movement of the train. Trains have buzzers to alert passengers before the doors close and before departure. This study aims to demonstrate the technology used for metro transport in most developed countries. As a processor, they used ARM 7. An infrared sensor detects the arrival of the train at the terminus, so it stops immediately. Then the door closes and the train leaves at the time specified by the program in the controller. An LCD screen connected to the ARM 7 shows the number of passengers and stations. The motor driver IC communicates with the ARM 7 which controls the motion of the train. The train is equipped with a siren that warns passengers before closing the door and also before departing ARM 7. The train incorporates a horn to warn passengers before closing the door and also warn them before starting.

Madhusudan

Madhusudan (2017) collected discarded product that has some properties similar to petroleum distillates and is a non-renewable energy source. By turning waste oil into valuable fuel, considerable attention is paid to heat recovery from used engine oil by practicing eco-friendly recycling by designing and manufacturing an incinerator. the oil that ignites used engine oil and supplies the resulting energy for domestic and even commercial purposes

Merai Yash P.

According to Merai Yash P. (2015), burning old oil in kilns and incinerators creates a lot of ash and toxins that pollute the environment. Due to the presence of contaminants, used lubricating oil cannot be disposed of carelessly. The practice of recycling and reusing used lubricants is becoming more popular as a solution to both economic issues and environmental concerns. It can be properly recovered and refined to yield a lot of valuable products. Re-refining's goal is to get rid of impurities and damaged additives while restoring the oil's characteristics to the SAE standards. Only one-third of the energy needed to refine crude oil to create virgin base oil is needed to create re-refined oil from used oil. Re-refining is therefore viewed by many as the best alternative in terms of resource conservation, waste reduction, and environmental protection.

III. Material

Mild steel

Reasons:

1. It's simple to find mild steel on the market.
2. It is inexpensive to use.
3. Standard sizes are offered.
4. It is easily machinable and has high mechanical qualities.
5. It has a modest factor of safety since a high factor of safety leads to heavy selection and wasteful material waste. Unnecessary danger of failure stems from low safety factor.
6. The tensile strength is strong.
7. A low thermal expansion coefficient.

Properties of Mild Steel:

The carbon content of M.S. ranges from 0.15% to 0.30%. They can only be toughened because they can be handled readily. About characteristics, they resemble wrought iron. With increasing carbon content, these steels' ultimate tensile and compressive strengths rise. They are readily arc, electric, or gas welded. Welding ability reduces as carbon percentage rises. Mild steel serves the function, hence it was chosen for the aforementioned reason.

IV. Working of System

A forced hot air heating system uses waste oil burners. The burner draws in cold air and blows it over a heating element to increase the temperature of the heating element. To heat your company, hot air is blown out of vents and through ductwork.

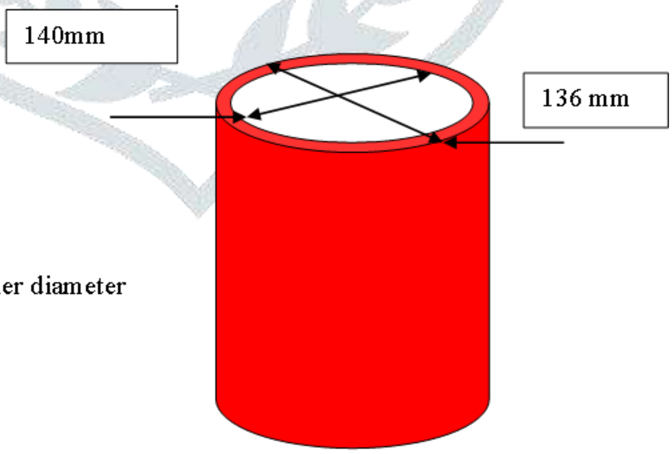
Fig.6 Actual Working Model

V. Calculations

1. Design of pressure vessel

Material for shell selected = C45 = 0.45 % carbon.

Design pressure $p_i = 9$ bar = 0.9 N/mm^2



FOS for pressure vessel, take = 4

Now,

The pipe used for heating chamber is 136mm inner diameter

and 140mm outer diameter

So, we will check for its failure

Material for shell selected = C45 = 0.45 % carbon.

Design pressure $p_i = 9$ bar = **0.9** $\mathbf{N/mm^2}$

Material C45 – 0.45 % carbon

FOS for pressure vessel, take = 4

Now,

$\sigma_t = \sigma_b = 540 / FOS = 135 N/mm^2$.

Joint efficiency of fillet welding ήT: 80%

Thickness of shell obtained from formulas:

Based on theory of Thin cylinders with modifications

$t = (Pi \times Di) \div (2 \times \sigma t \times ήt)$

$t = (0.9 \times 136) \div (2 \times 135 \times 0.8)$

$t = (122.4) \div (216)$

t = 0.56 mm

Based on theory of Thin cylinders with modifications

$t = (Pi \times Di) \div ((2 \times \sigma t \times ήt) - Pi)$

$t = (0.9 \times 136) \div ((2 \times 135 \times 0.8) - 0.9)$

$t = (122.4) \div (215.1)$

t = 0.569 mm

The values obtained from both the above formulas are approximately equal to 0.6 mm.

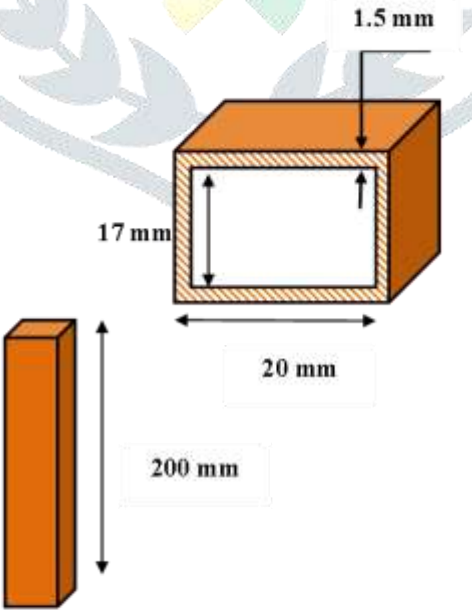
Hence final value of thickness t = mm but we are using 5 mm thick cylinder, so our design is safe. Outer diameter of shell will be $D_2 = 136 + 4 = 140$.

1. **Design of frame**

Square pipe of 20x20 section is used as a column, we will check for its bending load.

Let the maximum load of machine weight = 20 kg

So, load = 200 N



M = W L / 4 = 200 x 800/ 4 =40000 N/mm

$Z = B^3 - b^3 / 6 = 20^3 - 17^3 / 6 = 514.5 mm^3$

$\sigma_b = M / Z$

$\sigma_b = 40000 / 514.5 = 77.74 N/mm^2$

$\sigma_{b\ INDUCED} < \sigma_{b\ ALLOWED}$

$77.74 N/mm^2 < 270 N/mm^2$

Hence our design is safe.

VI. CONCLUSION

Re-refining waste lubricants may have both environmental and economic advantages. Our device burns the oil properly with a yellow flame at roughly 1000 C and may be utilized for a variety of purposes. The yellow coloration is caused by the incandescence of very small soot particles created by the flame. This form of flame can only burn at temperatures of about 1,000 °C. You could have seen the soot rising from the flame, depending on the lighting. You will find that various gases required varying quantities of air for full combustion when comparing them.

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