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Design and fabrication of oil-revamp system using solar power

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ABSTRACT

A Physical method using solar powered is applied to revamp the used engine oil by the process of sedimentation in addition with filtration process through the micron oil filter combined with different filtration process and finally by heating the oil to the 40°C temperature to evaporate all the water contents. The friction between rubbing parts is one of the important factor in contamination of oil due to contamination barium & sulphure content is increased if that oil is used in engine then there is increase in carbon, ash, soot content in oil which are highly toxic & cause pollution to the summit if not filtered also the dumping of used oil into soil can leads to degradation & barren of land & if the same oil lead to water ways via drainage the one gallon of waste oil is capable if polluting 10 million gallon water also revamping aids benefit to consumer by being able to use that same oil, hence adds benefits to consumer by being able to use that same oil hence adds benefits to both nature & consumers.

Keywords— Sedimentation, Micro Filtration, Evaporative Heating, Revamping

1. INTRODUCTION

The used engine oil which is coming out form automobile sectors consist different contaminants. This contamination mostly contains metals, acidic compound, phenolic compound & other asphaltic compounds orienting form overlay of bearing surfaces and degradation of oil components [1]. In spite of impurities, most of the base oil part in the waste oil is not existed. Due to its toxicity engine oil is difficult to handle & become undesirable for use. Recycling of used engine oil may be an appropriate & cheap alternative to burn incineration. During recycling the chemical, physical & mechanical impurities are removed [2]. Disposal of used oil in environment create series of problems; their disposal in water bodies not only contaminate water but also harmful to fresh water & marine life [1]. During working in engine it picks up number of impurities & additional components form engine wear. These components include metal partials (iron, steel, copper, lead, zinc etc.), & other compounds of barium sulphr water dirt burnt carbon & ash most of the highly toxic in nature; therefore, these contaminants must be separated in order to reuse of engine oil [3]. This is archived in oil revamp system using solar power.

1.1 Motivation

This project deals with separation & filtration of used engine oil from the different contaminants which is added during the applications in engine. Its Qualitative analysis is done so that we come to know about differences in various properties between used engine oil & filtered engine oil.

1.2 Literature Review

Table 1: Literature survey on Regeneration of used Engine oil

S no.	Author Name	Methodology	Conclusion
1.	Ihsan Hamawand Talal Yusaf & Sardasht Rafat	Recycling of waste engine oil using a new washing Agents.	Used engine oil can be recycled using Glacial Acetic acid. Oil having the quality comparable to that of Acid-Clay method. It also having potential to use in cars.
2.	M.J. Chaddha	Reclamation or re-refining of used engine-Lubricating.	The oil has to be drained or changed after every 4800 km or as per automobile manufacturers.
3.	Nabil M. Abdel-	Re-refining absorption process	The absorption/Extraction process was able

	Jabba	by different Absorbent materials.	to dispose asphaltitic contaminants from the waste oil to lower values.
4.	Harold Beuther	Solvent Extraction	This new oil has very excellent color & low carbon residue & Sulphur contents regardless of their crude Sources.
5.	H. Bridjanian	Thermal Degradation	Disposing the used oil off in a nature creates an intense dangerous pollutant. But by proper recovery & refining of it, a lot of valuable product can be obtained.
6.	University of Moratuwa Sri-Lanka Electronic These & Dissertations	-	Oil pollution & its Causes, Deep water horizon oil spillage, different types of spills & oil pollution control techniques.

According to above data it was concluded that the oil is the main worldwide energy sources & the basic element for the Modern Industrial Society. Oil can be used more than 3000 km by removing Carbon & Unburnt gases dissolve in Engine oil [4]. So our aim is to Study, Design, and Development & Fabrication of Solar powered Oil Revamp system with minimum cost which will be affordable & low maintenance

1.2.1. Summary of Literature Review: “Solar Powered Oil Revamp System” is effective, environmentally, eco-friendly system to tackle the global oil crises of oil spill. The system is capable to collecting most of usable engine oil from used engine oil & lots of human efforts reduced & also hazards effects of oil pollution & oil spill get faster.

2. WORKING PRINCIPLE

Filtration process begins with the sedimentation process. In this process the metallic particles with higher weight get settled down [1]. To get this into action we need to add used engine oil which is coming out from an automobile servicing sectors. At initial stage, the heavy metallic particles get settled down at the bottom of the tank. The oil after the sedimentation is then needed to be transfer in the filter for the filtration process. For these we have made arrangement of oil revamp belt along with the shaft bearing. The revamp belt is Nylon belt which is totally repellent to the water & has adhesiveness toward oil hence the oil is stacked to the belt or the AL plate it is transferred to the filter. Here filter used is Lupax Filter having best filtration capability hence the oil is filtered in the filter & the oil free from any metallic particles obtained. After the filtration still oil contains small amount of dust, carbon particles which needed to be removed hence for this we are employing different filters like strainer, sand filter, charcoal filter (AA filter), carbon filter. After going through above filters, the contaminants like dirt particles, ash contents, barium & sulphur contents removed respectively. Finally, the oil is heated between 40-50°C by means of coil heater to remove any remaining water particles. Hence oil is finally ready to reuse in automobiles again.

The oil filtration process is classified briefly as follows:

2.1 Sedimentation

Sedimentation is considered to be the first & necessary stage of the purification process. It consist in quiescent sedimentation of mechanical impurities & water that are in a suspended state. In this case gravitational force plays a very essential role. According to stroke equation we may said that greater size & specific weight of the mechanical particles, the faster there mechanical particles will settled down. Metallic particles, resinous substances, coke-like materials are most likely to settled down than any other substance. It is worth mentioning that the used oil sedimentation method does not always need to the desired effect. Sometimes even when the processing time is increases the majority of impurity will remain in a separation phases [5]. This always happens when purifying used diesel & automobile oil that contains depressing additives as well as oil that are contaminated by finally divided additives.

2.2 Oil Separation

It is a process in which oil is getting separated out from a waste which is coming out from automobile sectors. For this purpose Nylon Belt is used. The belt is mounted over two rotating shafts so that when shafts are rotates, belt also rotates. Nylon belt having special property of repellency of water particles & adhesiveness towards oil particles. Oil particles are stacked on the surface of rotating nylon belt & stacked oil is going to further filters for filtration process through L plate which is mounted on belt. Thus, separation of oil is done at this stage.

2.3 Filtration Process

The oil which is separated out is passes through filters for filtration purpose. Oil is firstly passes through Lupax Filter in which oil is getting free from any metallic particles. Then it is further oases through three layers of filters which is enclosed in one Filter Assembly. The Filter Assembly consist of following three layers:

- (a) Strainer: Remove ash contents in oil.
- (b) Sand Filter: Removes Heavy Dust particles.
- (c) Carbon Filter: Through the process of physical absorption, the activated carbon powder removes the liquid contaminants like sulphur & Barium in oil. Because of Attraction force of carbon, the contaminants in oil getting adhere towards carbon. Carbon gives its best result in powdered form than the results which is getting by keeping it suspended within solution.
- (d) Charcoal Filter: It helps to removes Unburnt Carbon from oil.

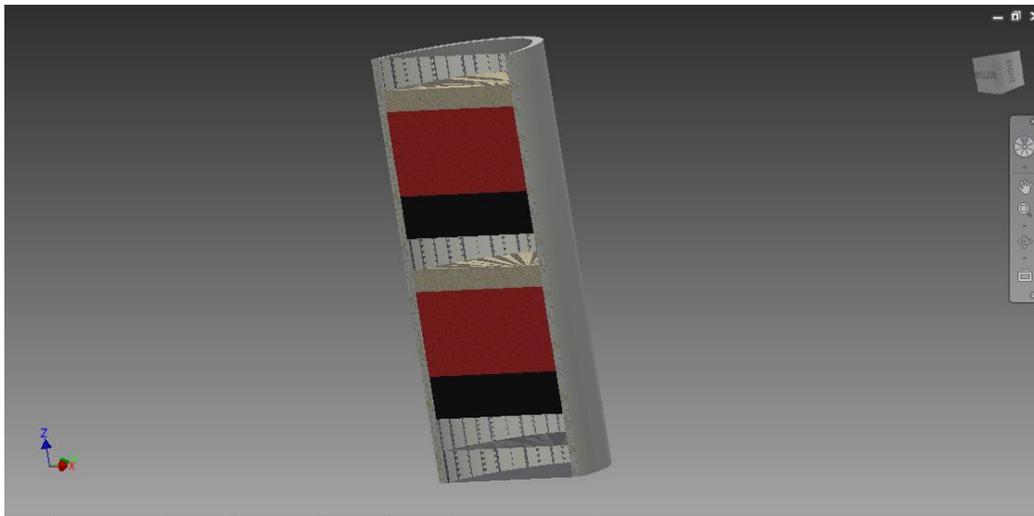


Fig. 1: Section view of filter

2.4 Heating Process

The filtered oil is then passes in the tank having heating coil is attached to its bottom surface. The heater coil is used for heating the filtered oil. The filtered oil is heated up to 40-50°C around 3-4 minutes. By heating process the water contents which is still remaining after filtration is evaporated. & oil is completely free from water contents & impurities, hence it is ready to reuse in automobiles again.

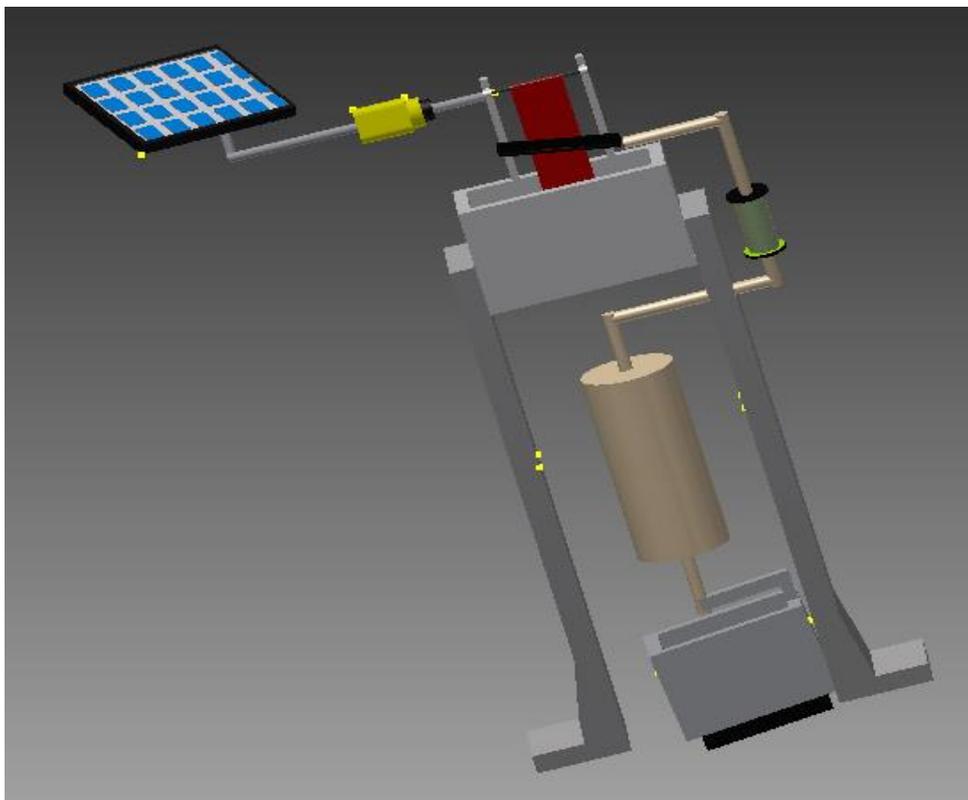


Fig. 2: 3D model of working setup

3. RESULT AND CONCLUSIONS

3.1 Result

The results are based purely on testing of filtered oil which is obtained by all filtration process. The result state difference between oil before & after filtration.

Table 1: Comparison between properties of use oil & revamped oil

S no.	Properties	Before oil filtration (unit)		After oil filtration (unit)	
1	Viscosity	78.07	Cst	65.50	Cst
2	Lead	3.40	mg/kg	1.25	mg/kg
3	Arsenic	<0.01	mg/kg	<0.01	mg/kg
4	Carbon content	46.30	%	7.98	%
5	Flash point	122	°C	136	°C

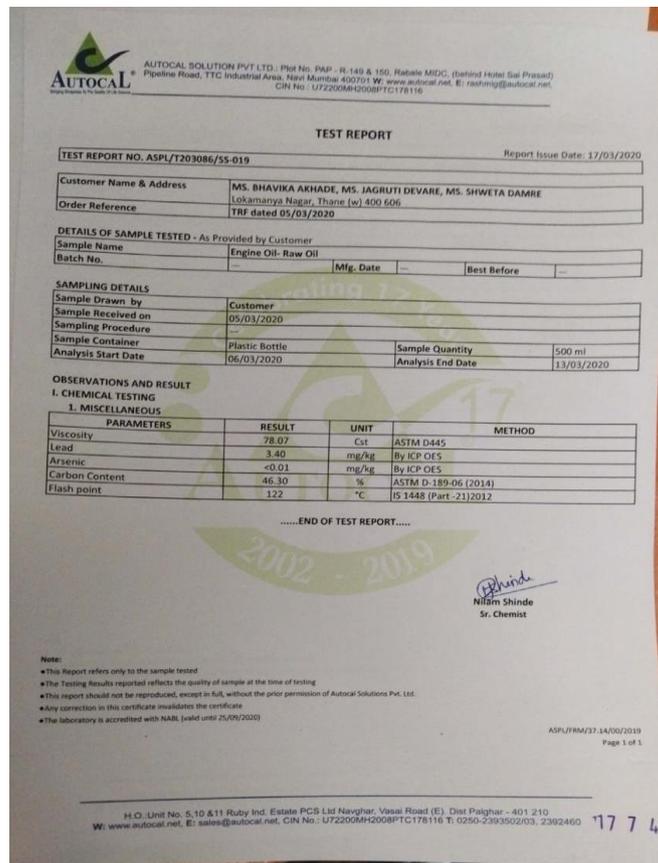


Fig. 3: Before oil filtration testing report

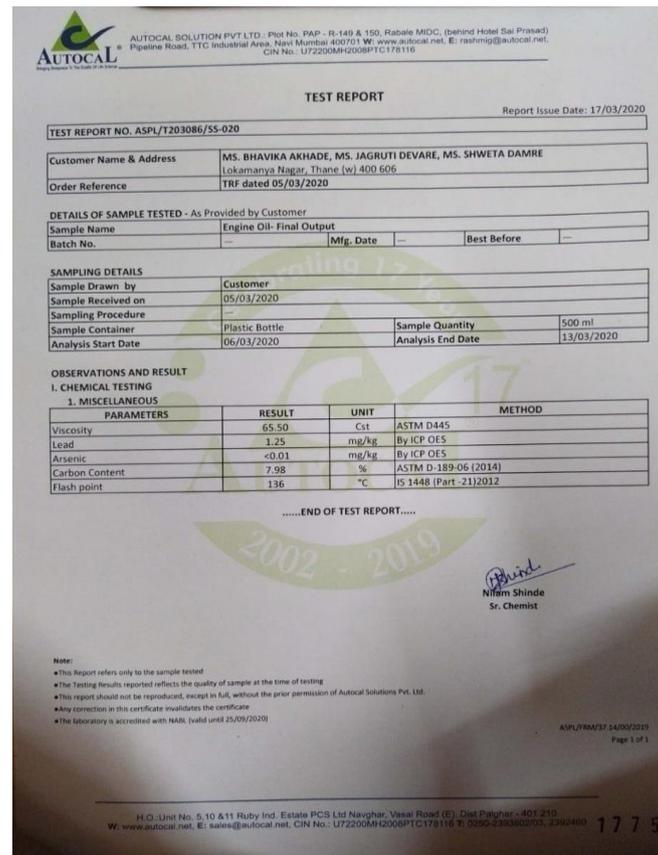


Fig. 4: After oil filtration tasting report

3.2 Conclusion

The filtration process has thus result into possibility of obtaining good quality revamped oil from used engine oil with help of solar power the cost of revamped oil is so less by applying this setup, the cost which is required for the set up can be overcome within one day only .Finally we can observed that the revamping of spent oil is useful to avoid pollution caused by directing the used oil into the waste chamber & beneficial from economical side.

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