

Experimental process of re refining used lubricating oil (straight or branched paraffinic synthetic oil) by vacuum distillation and extraction through additives

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ABSTRACT

Used engine oil is a very poisonous butane content environmental pollutant. And the lubricating oil are extracted from a fossil fuel are drying out from the world so therefore to re-use the engine oil. several process are carried out to re refine the used lubricating oil to remove the water, fuels, macro contaminants, and additives to reuse the engine oil. Several analysis and tests and contaminants are carried out in this project for testing the re-refined oil is suitable for working purpose in engine.

KEY WORDS: ASE (Automobile Society of Engineering), ASTM d (Automobile Standard Testing Method for distillation of petroleum products), ASTM 4007 (water removing standard testing method), IBP (Initial Boiling Point).

1. INTRODUCTION

Therefore to re-refine the engine oil four step processes are carried out water stripping diesel stripping filtering through carbon membrane filter adding additives (Durrani, 2012). This process is carried out step by step to attain the better quality grade oil. for the automobile users the process are carried out for a four stroke petrol engine oil and the analysis report of re-refined oil are carried out by step by step by standard ISO testing methods of petroleum distillation processes.

2. EXPERIMENTAL SECTION

Experimental Process carried out: Dehydrating water stripping, Fuel stripping, Filtration through carbon membrane, Liquid extraction.

Dehydrating water stripping: The process is carried out to remove the compounds of hydrogen broken down in the engine oil because of the hydrogen brake down compounds in a engine oil decreases the viscosity of engine oil water compound present in the engine oil make the combustion process illegible and decreases the power of a combustion stroke.

Also the water molecule present in the engine oil increases the aeration and accelerates the rust and corrosion of combustion chamber. The oil is heated up to 120⁰c in a glass beaker the water molecule present in the engine oil are burnt out as vapour and the engine oil formed like mud light clay.

Fuel stripping: This the main part of the re-re fining process of a engine oil there are different kind of distillation process are carried out in re refining we are using vacuum distillation method to re refine the used engine oil (Durrani, 2011).

Principle of vacuum distillation process is to drown out the atmospheric air from the apparatus to distil or heat the flammable liquid at minimum than desired temperature to avoid being formed vapour due to heating process followed in a stripping process according to the standard testing process we use ASTM d 12 method is used for distillation process.

The dehydrated oil is then fed continuously into the vacuum distillation plant is exactly like the fractions occur in the crude oil distillation process.

The initial boiling point at 202°C the process starts and the maximum heating value ranges at 470°C the used engine solvent is distilled in to various fractions as comes under Light fuel and diesel.

The used engine oil gives enough light fuel and diesel because of the involvement of combustion process this fuel are enough to run feedstock and boilers gives self-sufficiency in fuel about 15%.

Lubricating oil: The bulk residue of engine oil will produce 75 % of engine oil from given amount of used engine oil.

Residue: At 1st fraction this used engine oil will produce 10 % of bitumen carbon wear metals aromatic compounds most of the carbon lead and oxidation residue in the final fractions is used as a road extender.

Filtration: Process it's an essential process in refining to remove the macro particles and to give clean original colour to the engine oil.

The specially designed three layers of cotton nylon filter and carbon charcoal attached with one another 10 cm radius of each filters 1mm thick of cotton and nylon filter with 2mm thick carbon charcoal is used to filter the distilled oil. Removes the strain and macro particles and in homogeneous colour of the engine oil.

Liquid extraction:

There is different kind of additives used to increase the flash point pour point and viscosity of the engine oil there are n numbers of additives used for a engine oil n methyl pyrrolidone is selected additive to give a standard physical quality of the engine oil.

The engine oil is then condensed and extracted through a liquid tower with the proportion of 92% of engine oil and 8% of additive is added and to improve the better quality different amount of additives are used and check their physical properties before the running in engine (Hamad, 2005)

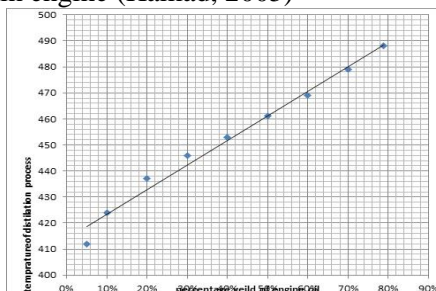


Fig. 1. Percentage yield of engine oil vs temperature of distillation process.

Flow chart of the re refining process:

Used Engine Oil → Water Stripping → Diesel Stripping → Filtration →
Adding Additives → Properties Check → Re Use the Oil

3. RESULT AND DISCUSSION

Table. 1. Analysis report of used engine oil

Properties	Results
Free Fatty Acid	0.4106%
Kinematic viscosity@ 40°	41.86 cSt
Density	0.855 gm/cc
Flash point by PMCC method	121°C
Fire Point by PMCC method	137°C
Copper Strip Corrosion @60°C for 3hrs	1a (slight tarnish)
Cloud Point°C	1°C
Pour point°C	-13°C
Calorific value cal/gm	16493.43 cal/gm

Because of the combustion process in the engine the density of the oil kinematic viscosity of the oil are decreased flash and fire point are increased and calorific value is increased because of the mixture of fuels in the used engine oil.

Table.2. Analysis report of re-refined engine oil

Properties	Results
Kinematic viscosity@ 40°	512.14 cSt
Density	0.885 gm/cc
Moisure Content	0.001%
Flash point by PMCC method	219°C
Fire Point by PMCC method	233°C
Copper Strip Corrosion @60°C for 3hrs	1a (slight tarnish)
Cloud Point°C	5°C
Pour point°C	-8°C
Calorific value cal/gm	8537.7981 cal/gm

Because of the re refining process kinematic viscosity density of the engine oil are increased flash and fire point are increased and calorific value is decreased

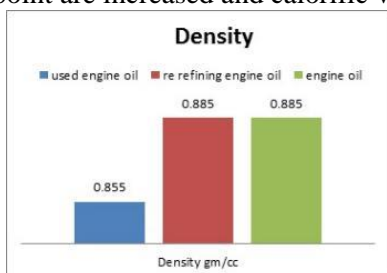


Fig.2. comparison of density of the engine oils

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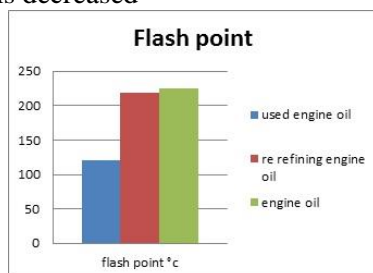


Fig.3. comparison of flash points of the engine oil

739

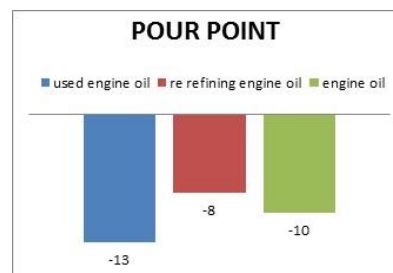


Fig.4. comparison of pour point of engine oils

JCPS Volume 9 Issue 2

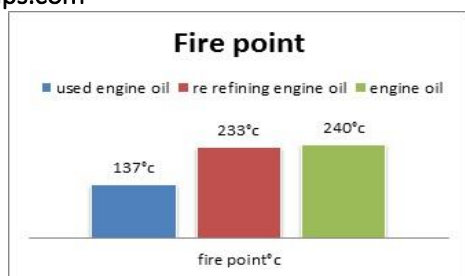


Fig.5. comparison of fire point of engine oils

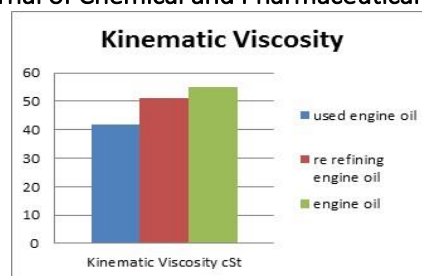


Fig.6. comparison of kinematic viscosity of engine oils

The detailed report of the compared values of engine oil, re-refined engine oil and used engine oil are analysed and values are plotted in the bar graph.

It is analysed that the re-refined engine oil properties are quiet equal to the properties of engine oil used in auto mobiles so the re-refined oil is better used as engine oil.

4. CONCLUSION

Therefore the used engine oil processed through various experiments to remove the water light fuel resistive aromatics carbon waves and to submit additives to improve the properties of engine oil. All this process is carried out to obtain the better quality re refined engine oil. So that the re-refined oils are used as engine oil in automobile lubrication systems. Through refining we could obtain the properties similar to unused engine oil.

All people's thinks that re-refined oil is are not suitable for better performance but actually its acts as better engine oil. This process plants are not be working in public sector refineries government just we take measurable steps to control pollution caused by used engine oil need to take measurable steps to start Re-Refineries for used engine oil.

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