EFFECT OF RECYCLED ELASTOMER WASTE OIL ON PARAFINIC OIL

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Abstract— Elastomers is an essential part of our daily life. Its production and consumption has been rising very rapidly due to its wide range of applications in everyday life. Due to its non-biodegradable nature it cannot be easily disposed of. So, nowadays new technology is being used to treat the waste tyre. One of such process is pyrolysis. Under the pyrolytic and cracking conditions the tyro wastes can be decomposed into three fractions: gas, liquid and solid residue. A chemical recycling process that can convert elastomer into high quality oil. The aim of the present work is to evaluate the potential of oils that have been derived from the **waste Elastomer** on **Crude oil** of different place. The elastomer pyrolysis oils were then tested in a with fractions of 5%, 15% and 25% vol of diluent and their combustion, performance and characteristics analyzed and compare with it.

Index Terms— pyrolysis, crude oil, pour point

1 INTRODUCTION

1.1. Elastomer waste: A non-degradable but recycled

Polymer recycling, or rubber recycling, is the process of recycling waste Elastomer. Elastomers are a source of non-degradable waste, because the large volume produced, the durability of the manufactured products, and the components in the polymer product that are ecologically problematic. Because Elastomers are highly strong and non-biodegradable, they can consume much more area in land. If waste Elastomers are improperly managed they may cause pollution in Environment. In 1990, it was estimated that over 1 billion scrap Elastomers were in stockpiles in the United States. As of 2015, only 68 million Elastomers are in stock. From 1995 to 2011, the European country increased the amount of Elastomers recycled from 25% of annual waste to nearly 96%, with rough half of the end-of-life Elastomers used for energy, mostly in cement manufacturing.(1)

Globally, there are efforts to recover fuel from the recycled waste to overcome the fuel problem, thereby rising crude oil prices and strong emissions. More money is invested in oil production and exploration. On the other hand, rapid industrial growth around the world has led to an increase in car production as a major means of mobilization and economic growth. At the same time, oil consumption in the transport sector is increasing rapidly, leading to a rapid decline in non-renewable fuel-based fuel. Other renewable and environmentally friendly sources of automotive fuel, such as biodiesel, gasoline-based fuels, and fuel-based combinations, have received much attention in recent decades. However, because of economic and environmental concerns, wasteful technology has received much attention from researchers around the world in recent years. Garbage dumping in landfills is expensive and harmful to the environment. As a result, waste disposal technology provides great potential to reduce land waste while using petroleum-based fuels. (2)

1.2 Problem with crude oil

Crude oil and many of its derivatives contain complex substances and a variety of hydrocarbons that lead to the breakdown of molecular structures. The paraffin pipes have become the largest component representing 22% wt. of the hydrocarbon compound. In today's world the economy is dependent on the price of crude oil. A major parameter in controlling the price of crude oil is transportation by underground pipelines. Underwater pipes paraffin waxes disperse under the scene of wax (WAT) temperature. A temperatures of the wax point it shines brightly in ‘buildings with orthorhombic wax crystals intertwined and combined to provide three networks. The crystallization rate accelerates near the inner wall of the pipe and slows down the center of the pipe due to temperature differences. (3)

Heavy oil with high kinematic viscosity changing from 110 cP to more than 11,000 cP, and is highly resistant to move in pond

phase. Moreover, the problem increases during its installation due to the use of wax and asphaltenes on the inner walls of the pipe. Generally, the maximum acceptable viscosity for pumping oil pipelines is 200 - 400 cP at room temperature. The transportation of crude oil is technical issue that needs to be reduced in order reduce the cost of transportation and loss of total amount of crude oil produced which ultimately leads to be profit. In industry, many techniques is used to decrease travel costs, among which the viscosity reduction method is one suitable method. The principle involved are heat treatment, and emulsification with surfactants and many methods. The Serious problems with pipeline oil are related to the viscosity and quantity of crude oil. [4]

1.3 Waste management in India

It includes the processes and actions needed to manage waste from the time it is finally disposed of. The process includes the collection of the waste, segregation as per the requirement transportation, treatment and discard of the waste, as well as the monitoring and control of waste management policies and regulations related to waste, technology, and economic measures. Waste in form of solid, liquid, or gas and each type has a many style of discard and recycle methods. Waste management determine to all types of waste, including degradable, biological, household activities, corporation, environmental, environmental, E-waste waste. Garbage is dangerous to human health. Health problems go hand in hand with the whole waste management process. Health problems can also happen by directly and indirectly through solid waste manage by the use of water and air. Garbage is product of human unnecessary activity, for example, the synthesis and processing of materials and equipment's needed for human life style. Waste management motto is to reduce, reuse and recycled the waste and protect negative effects of garbage on human health, the environment. Waste manage methods varies from country to country and regions as well as residential and industrial sectors can all take different approaches. Good waste manage is important for building good cities, but it remains a problem for many countries and cities. The report says that good waste manage is very costly, often with municipal budgets of 20% -50%. To fulfill this important municipal function, integrated, effective, sustainable and community-based programs are needed. Most waste manages deal with corporation solid waste which is a large amount of waste generated by us. The important point of waste manage for us is the reuse of waste.

The Many technique to reuse, recycle and reduce are

1. Biological reprocessing
2. Energy recovery
3. Pyrolysis
4. Resource recovery
5. Waste valorisation

1.4 Pyrolysis of Elastomers waste

The use of Elastomer pyrolysis oil as a substitute for fuel is an opportunity to reduce the use of natural resources. Numerous research projects have been carried out on pyrolysis of Polymers. Pyrolysis is a chemical reaction that breaks down a substance into smaller, more complex molecules. Pyrolysis creates three primary products: pyrolysis oil, pyrolysis gas, and pyrolysis char. The quality of Elastomers and quantity of Elastomers of these products depends on the temperature of the reactor and its construction. In the process of Pyrolysis, large chains of hydrocarbon drop to certain temperatures in the absence of oxygen providing the final products, which usually contain solids, liquids, and gases. When the temperature is maintained at 550 ºC, the main product is liquid, which can be a mixture of various hydrocarbons depending on the initial composition of the waste.

At temperatures above 700 ºC, gas becomes the main product due to the liquid's constant breaking Gas primarily comprises CH4, but it also contains C2H6, C2H4, C2H2, and other hydrocarbons in trace levels. The quality and quantity of Elastomers of these products are determined by the reactor's temperature and structure. Vacuum pyrolysis is used to obtain pyrolysis oil from discarded Elastomers in this study. Despite the availability, Elastomers of solid carbon black gas and pyrolysis, the pyrolysis process will primarily rely on the production of liquid pyrolysis of Elastomers in a nitrogen-purged static-bed batch reactor, which is used to pyrolysis 3 kg of hot metal Elastomers at temperatures ranging from 450 ºC to 600 ºC. [5]

2. MATERIAL & EXPERIMENTS

(A)Crude Oil Sample

(B)Pyrolysis oil sample

2.1.1 Material Synthesis

CONSTRUCTION:-

The pyrolysis reactor construct for the experiment include cylindrical chamber of inner diameter 116 mm, outer diameter 111 mm, and height 200 mm which is totally insulated. LPG cylinder supplied to the reactor for external heating to burner. The temperature of the reactor is observed by a thermometer. The process is carried out at 450–550◦ C. The heating rate is maintained at 5 C^0/min. The time of the feedstock in the reactor is 110-120 minutes.

PROCESS:-

The pyrolysis process is shown in the figure below with pyrolysis chamber. The waste Elastomers were cut into small pellets ranging from 5mm to 20mm. Then the Elastomers cut are heated in the chamber. The temperature required is 400°C – 500°C which is acquired by using an external source of heating. Once this temperature is reached to 400°C, the Elastomers wastes are vaporised. Vaporized gas get condense in condensor. The products of pyrolysis in the phase of vapour are sent to a collector bottle.

2.2 EXPERIMENTS

2.2.1Analysis of Samples

PARAMETERS	***PCO***	***LCO***	***PEO***
Pour Point	+32 C	+36 ^{0}C	-2 ^{0}C
Aniline Point	20 C	+10^0 C	20 ^{0}C
natic ViscosiElastomers	Not Found	Not Found	2.05Cst
ɔecific GraviElastomers	0.929gm/ml	0.817gm/ml	0.849gm/ml
API GraviElastomers	20.81gm/ml	41.69gm/ml	35.16gm
IBP	69^0 C	95^{0}C	60^0 C
Water Content	3.15%	2.89%	0.14%
Carbon Residue	0.36%	15.02%	1.28%
Salt Content	NIL	NIL	Nil
Nitrogen Content	0.40%	0.50%	0.95%
Metal Content	0.15%	0.19%	0.08%

2.2.2 Blending of Crude Oil and EPO

The liquid pyrolysis oil obtained from pyrolysis synthesis was used to blend with PCO and LCO crude oil which affect the pour point of oil and act as flow improver. A total of 6 blend test tube of crude oil was prepared

and similarly the PPO samples were prepared with blending ratio 5%, 15% and 25%.

BLENDING PROCESS

The blend is mixed with the crude oil in water bath for make it homogeneous, so we heating our both sample PCO and LCO up to 60^0 C.

Water-bath

Crude at Room Temp

Pour point analysis

EPO addition was done in crude oil drop by drop with continuous stirring. After blending, it was again heated with this blended sample into water bath at 60^o C temperature. Then after the sample was cool down at room temperature, and the temperature was again observed, The sample when cooled to normal room temperature it was then cooled in pour point apparatus to check the decrease in pour point after addition of blend.

BLEND-1 (5%)

The Second blend was prepared by mixing 20 ml of both (PCO and LCO) oil and 3 ml of EPO. It was observed that pour point goes down by the by some degree when blended with EPO which was found to be as -PCO pour point - 30^0 C and LCO - 32^0 C

BLEND-2 (15%)

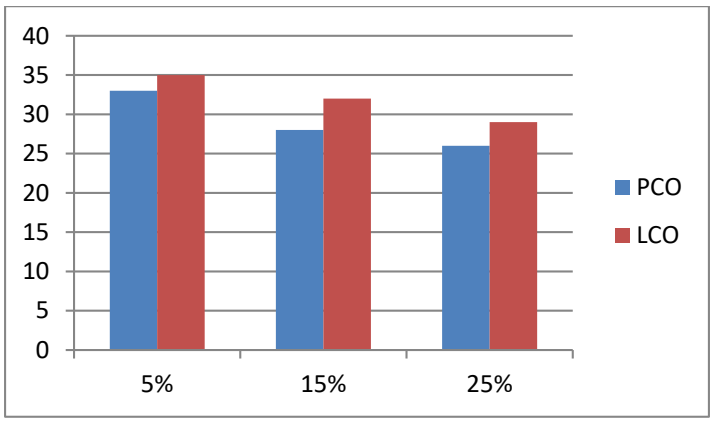
The third sample was prepared by mixing 20 ml of both (PCO and LCO) oil and 4 ml of EPO. It was observed that pour point goes down by this blend was - PCO pour point - 25^0 C and LCO - 29 C^0 .

BLEND-3 (25%)

For this blend we using of 20 ml of both (PCO and LCO) oil and 4 ml of EPO. We observed that pour point get down by the blending. PCO pour point is 23^0 C and LCO is 26^0 C.

3. RESULT

From the Experiment it was determine that waste elastomer's pyrolysis oil of plastic when blended with crude of sample redeuced the pour point. The decrease in the pour point of the crude was found to be - 5% its reduce 3-4 C^0 temp,15%of blending reduce 5-6^0 C temp and 25 % decreased 9-10^0C temp.



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