EFFECT OF INJECTION TIMING ON PERFORMANCE AND EMISSIONS OF TYRE PYROLYSIS OIL FUELED DIESEL ENGINE

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1. INTRODUCTION

The standard of living, quality of life, and development of a nation depends on its energy consumption. The global energy supply that depends on fossil fuels is depleting day by day. It is estimated that energy consumption may increase in upcoming years. Due to crisis in fossil fuel, it is necessary to find an alternative technology. Pyrolysis is an efficient alternative fuel technology which can produce oil, gas product from waste materials. The Extracted oil from pyrolysis process consisted similar properties to that of diesel fuel. Nearly 1.5 billion tires are produced every year which will eventually enters the waste stream presenting major waste for the environment. Tires contain long chain polymers which have excessive resistance to degradation. Tires are void, bulky, and therefore filling of waste tires has difficulties. They tend to float and comes to the surface when landfilled. If the waste tyres are scattered it comes with rain water and other harmful bacteria. This causes many problems for human beings health. If the tyres are burnt directly, they produce enormous amount of gases like CO2, NOx and SOx that causes the environment pollution and human health. Conversion of these waste tyres through pyrolysis is the best alternative technologies, in minimizing the waste and to convert these waste of the production of alternative fuel. The advantage of pyrolysis process is to handle the waste tire. This process is non toxic and there is no emission of harmful gases to the environment. These process may lead us to replace the diesel fuel if its distilled properly. Therefore, these waste tires should be used for producing energies helpful for mankind.

2. LITERATURE SURVEY

The disposal of waste tyres from vehicles becomes inexhaustiable. Although there are many ways to dispose the waste tires, still the problem persists. Pyrolysis process produce pyrolysis oil, pyrolysis gas, and char. Its is observed that the TPO has similar properties to that of diesel fuel. Common way to dispose tire is land filling. However land filling has several difficulties.The heating pyrolysis system has been designed and fabricated for liquid

production from waste tires of vehicles like rickshaws, bicycles, and trucks etc. The liquid char for truck tires was maximum compared to that of bicycle tires. Thus the production of fuel from waste vehicle tires by pyrolysis shows the same properties to that of diesel fuel by various desulfurization methods. But in the process it was found that the density and sulphur content of the fuel was slightly higher than that of diesel fuel, but other features and curves were close to diesel fuel.

3. MATERIALS AND METHODOLOGY

The tires are cut in large number of pieces and the steel wires and fabrics are removed from the tires. The feed stock is heated through externally in the absence of oxygen. The design for the experiment is cylindrical chamber of inner diameter, outer diameter, and height is fully insulated. The heating rate should be maintained at 5K/min. Three products are obtained in pyrolysis process, TPO, pyro gas and char. Feedstock is used to produce 1kg of tyre pyrolysis oil.

The TPO involves three stages:

a) Removal of moisture
b) Desulfurization
c) Distilliation

Removal of moisture

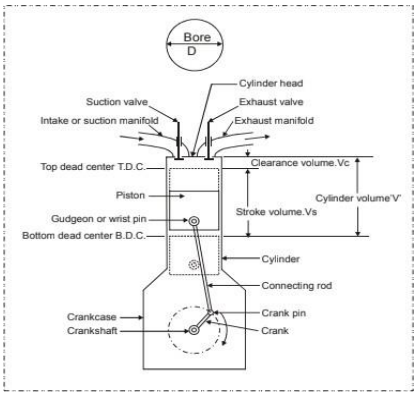
Initially the crude oil is heated upto 100^0c,in the vessel to remove the moisture content present in it,before chemical treatment.

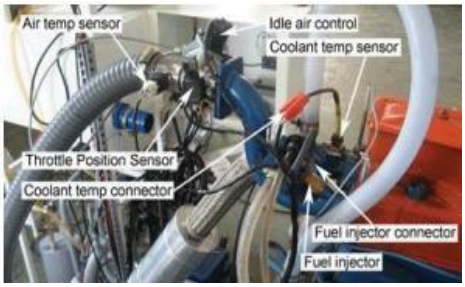
Desulfurization

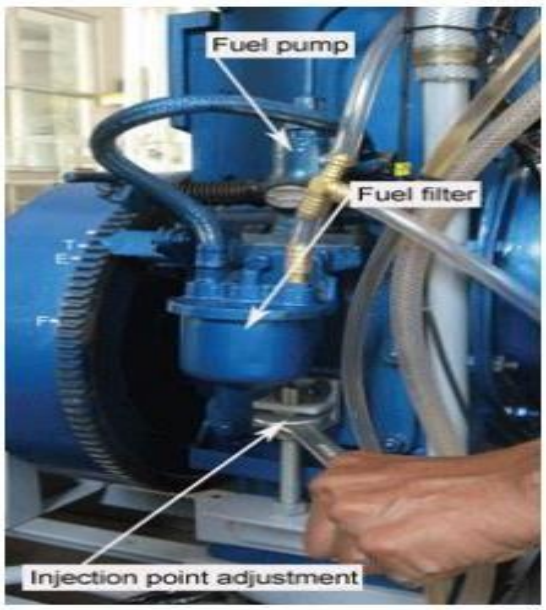
After the removal of moisture content it consists of impurities and carbon and sulphur particles in it. Hydrosulfuric acid is mixed with the crude oil and the mixture is stirred well. The stirred mixture must be kept of 40 hours, after 40 hours the mixture will contain two layers. Top layer contains thin and bottom layer consists of thick sludge. In this process the efficiency of sulphur removal is 61.6%.

Distillation

This is a commonly used process for purifying liquids and separating mistures into individual compenents. This process is carried out to separate the lighter and heavier fraction of the hydrocarbon oil. A known quantity of chemically treated TPO is taken for distillation process. The distallition is carried at 150-200^0 temperature, as maximum amount of DTPO is obtained in this process.







4.RESULTS AND DISCUSSIONS

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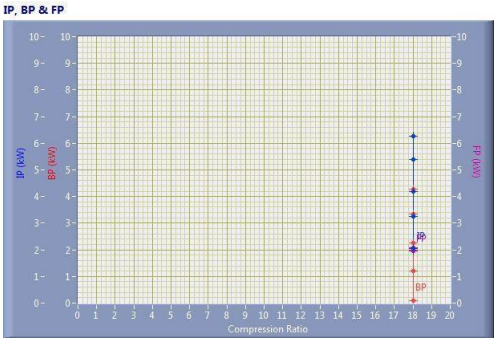

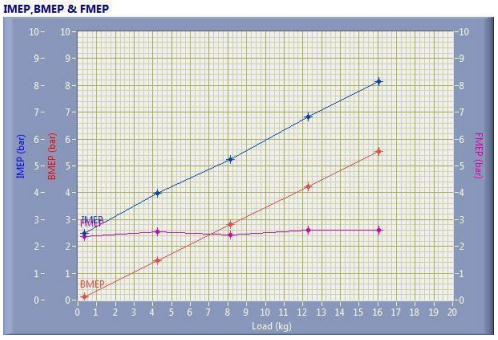

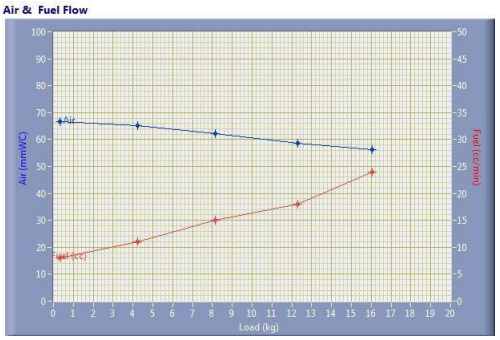

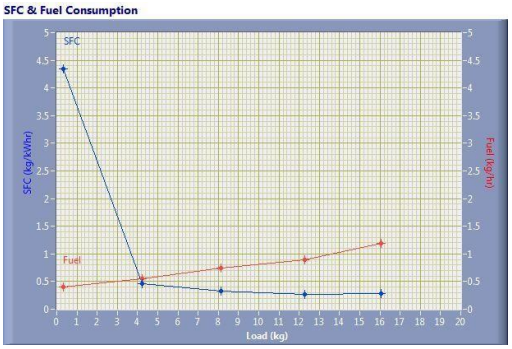

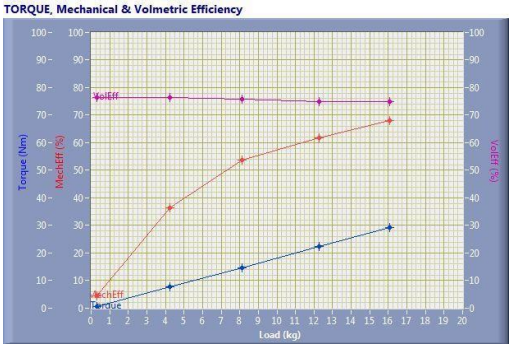

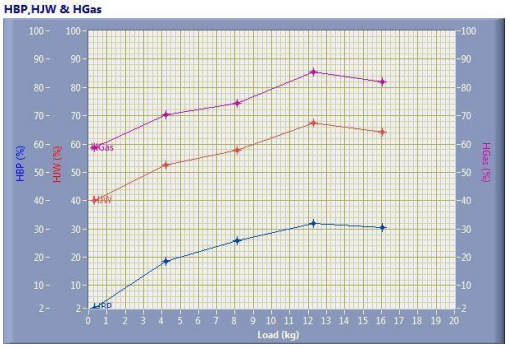

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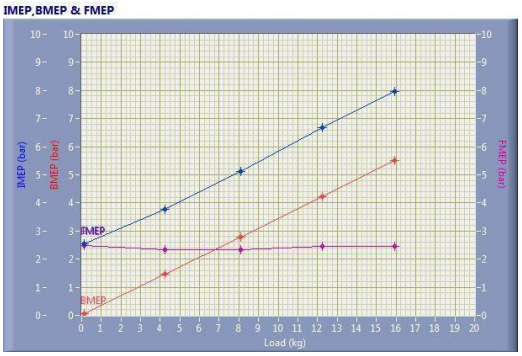

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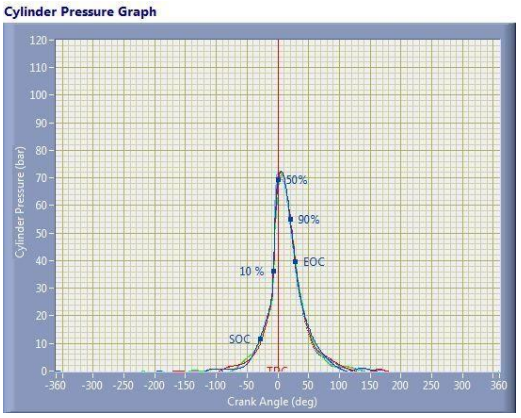

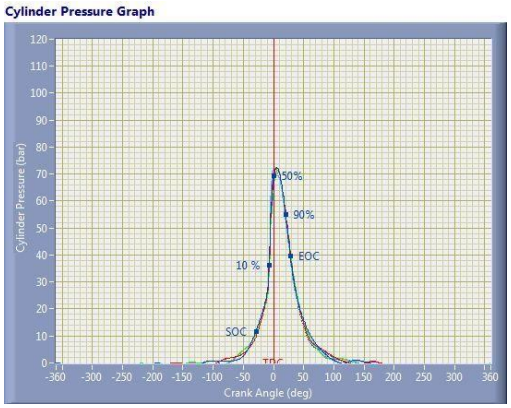

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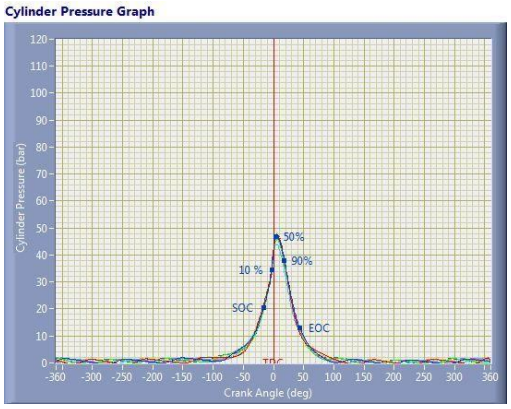

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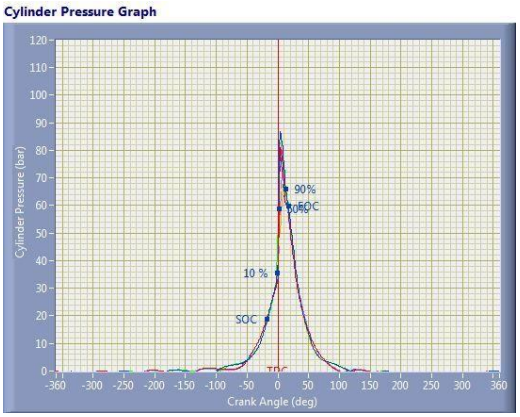

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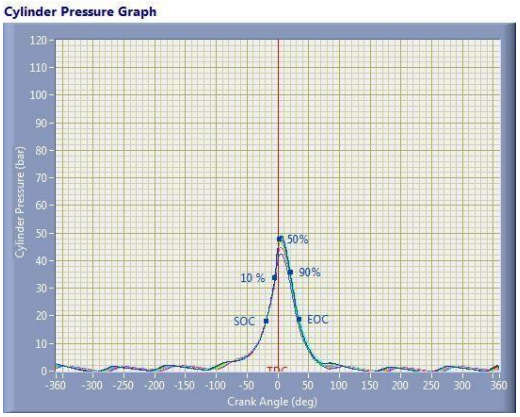

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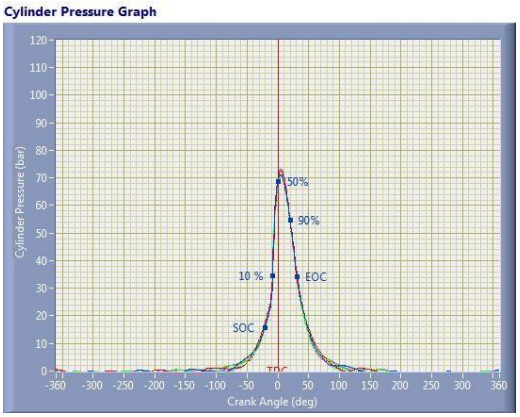

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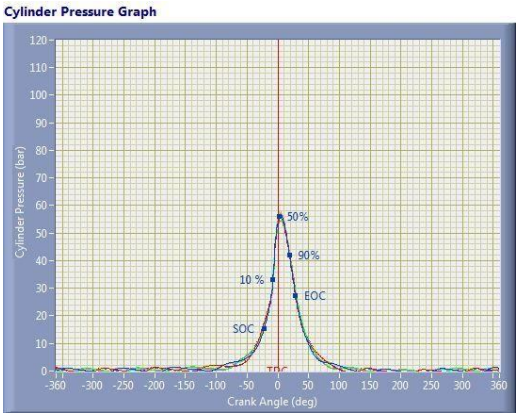
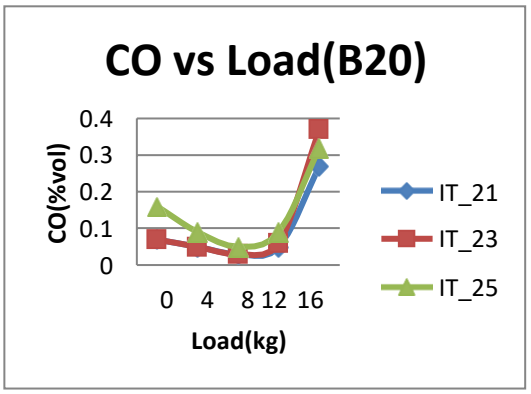


Emission graphs:

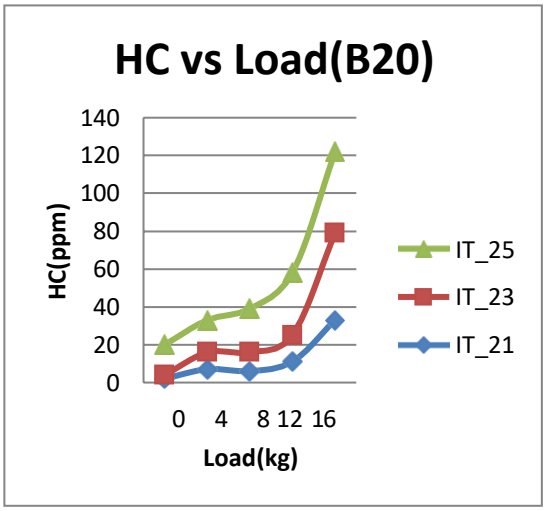
1)CO VS LOAD

Load	IT_21	IT_23	IT_25
0	0.07	0.07	0.16
4	0.05	0.05	0.09
8	0.03	0.03	0.05
12	0.05	0.06	0.09
16	0.27	0.37	0.32



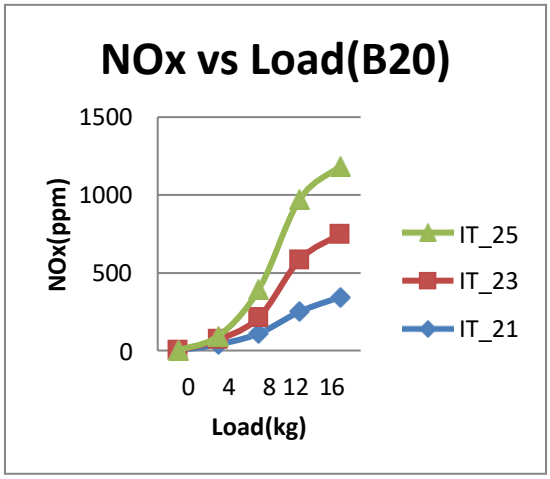
2) HC VS LOAD

Load	IT_21	IT_23	IT_25
0	2	2	16
4	7	9	17
8	6	10	23
12	11	14	33
16	33	46	43



3) NOx vs load

Load	IT_21	IT_23	IT_25
0	0	0	1
4	38	32	22
8	109	105	181
12	249	335	387
16	343	406	436



6. CONCLUSION

The use of alternative fuels in diesel engines has been attracting researchers over the last decade in order to decrease in petroleum-based fuels due to the environmental concerns. It is also found that the distilled tyre pyrolysis oil is similar to diesel fuel and can replace the diesel fuel in small engine. The following are the conclusions based on the DTPO blends:

i) DTPO 25 blends can be directly utilized in diesel engine without any modifications.

ii) The brake thermal efficiency of DTPO 25 is slightly lower then that of diesel fuel. But for DTPO 50 and DPTO 75 is much lower compared to diesel fuel.

iii) The fuel consumption of DTPO 25 is slightly close to diesel, but the fuel consumption of DTPO 50 and DPTO 75 it is slightly higher. So it is clear that DTPO 50 and DTPO 75 shall not be used in CI engines.

7. SCOPE FOR FUTURE

It is an alternative fuel for engines which uses diesel. Environmental pollution through waste automobile tyres can be reduced. The TPO oil can be used for various industrial purposes because of its high thermal efficiency than diesel fuel.

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