

# “EFFECT OF PLASTIC FUEL ON 4- STROKE PETROL ENGINE USED AS ALTERNATIVE FUEL OF PETROL”

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**ABSTRACT** - In the current scenario of the world traditional methods, machinery and complications are overcome by the latest modern technology as we know now a days plastic is used in abundant quantity about of 100 million tones out of which the used products have become a common feature at overflowing bins and landfills. Though work has been done to make futuristic biodegradable plastics, there have not been many conclusive steps towards cleaning up the existing problem. Here, the process of converting waste plastic into value added fuels is explained as a viable solution for recycling of plastics and as a replacement of petrol and other fuels along with their effects on the engine. Thus two universal problems such as problems of waste plastic and problems of fuel shortage are being tackled simultaneously. In this study, plastic wastes (low density polyethylene) were used for the pyrolysis to get fuel oil that has the same physical properties as the fuels like petrol, diesel etc. The waste plastics are subjected to de-polymerisation, Pyrolysis, thermal cracking and distillation to obtain different value added fuels such as petrol, kerosene, and diesel, lube oil etc. Converting waste plastics into fuel hold great promise for both the environmental and economic scenarios. Thus, the process of converting plastics to fuel has now turned the problems into an opportunity to make wealth from waste. In this work waste material of high density polythene and low density polythene is converted into recycled fuel by pouring in the close combustion chamber, then by heating the close combustion chamber in temperature range of 110 to 300 degree Celsius for approximately 30 minute to 1 hour. Afterwards we observed that waste material is converted into fuel. Then plastic fuel is used in four stroke petrol engine in place of petrol engine for 01 hours for 15 days then we observed that the plastic fuel gives the higher mileage than the normal fuel about of 8km per litre. But the effect of plastic fuel on petrol engine is slightly different than the petrol engine like exhaust air for silencer is having more blur the exhaust came through silencer after run by petrol engine, knocking sound is slightly different and the percentage of carbon on the valve of the engine and on the spark plug is more.

**Key Words :** Close combustion Chamber, Exhaust gases, knocking, Fire point, Viscosity, Specific gravity, 110cc, Bajaj calliber, Fuel, Distillation, Polyethylene, Pyrolysis, Depolymerisation.

## INTRODUCTION

In recent years, huge amounts of waste plastic are available in municipal solid waste (MSW) and many places. With an annual increase rate of approx 50%, in 1995, the production of plastic in the world had reached 150 million tons. According to information the yield of waste plastic is 100 million tons. Various type waste plastic use now a days. As a result of the increasing level of various harmful effects. Plastic materials are cannot be decomposed easily in a short period of time. These plastic wastes can be classified as industrial and municipal according to their origins; these groups have different qualities and properties. The level of waste plastic continuous increase it is generating environmental problems worldwide. classification of plastics includes high-density polyethylene, (High-Density Polyethylene Milk, detergent & oil bottles, toys, containers used outside, parts and plastic bags) .low-density polyethylene (LDPE , Many plastic bags, shrink-wraps, garment bags or containers), polypropylene and polystyrene. Also, plastics are classified by their chemical structure of the polymer's backbone and side chains. Some important groups in these classifications are the acrylics, polyesters, silicones, polyurethanes, and halogenated plastics. Poly Propylene. Refrigerated containers, some bags, most bottle tops, some carpets, and some food wraps. There are two main types of plastics: thermoplastics and thermosetting polymers. These waste plastic convert to useful oil and reduces the many problems increasing in world.

## Objective of present work

The overall objective of the project is to study the effect of plastic fuel on the inner parts of engine cylinder, valves and on the exhaust air.

The specific objectives of this study are as follows:-

- First objective of this work is to identify the effect of plastic fuel on the sound of engine.
- Second objective of my work is to determine the percentage of carbon develops on the valve of the engine as an comparison to petrol.
- Third objective is effect on petrol engine efficiency due to plastic fuel.
- Final objective is on exhaust gases due to plastic fuel.



**OBSERVATION TABLE 2:**

**COMPERISION LDPE OIL WITH PETROL AND DEISEL OIL:**

Fuel properties	LDPE	PETROL	DIESEL
Density	530.35 kg/m <sup>3</sup>	711 to 737 kg/m <sup>3</sup>	820 to 900 kg/m <sup>3</sup>
Viscosity	0.652 poise	1.5 to 4 poise	1 to 3.97 poise
Specific gravity	0.655	0.82	0.81 to 0.96
Flash point ( °C)	25	22	26
Fire point ( °C)	29	25	29
Cloud point ( °C)	Below 0	1 to 3	2.5 to 4
Pour point ( °C)	-2° C	-4 to -20	-2 to -12
Colour	Pale yellow	Brown transparent	Dyed blu

**METHODOLOGY**

In this research a closed combustion chamber is employed to heat the waste plastic by the help of electronic heater .the closed combustion chamber is made air tight with the help of covering lid . a pipe of suitable diameter is fitted on the lid up the transparent plastic bottle .the transparent plastic bottle is also made air tight so that the flue gases should not be leaked . transparent plastic bottle is half filled with water, above the water level a tap is provided to collect the fuel from the combustion chamber.

**RESULT AND DISCUSSION**

In this work we found that when we use plastic fuel of low density on the four stroke petrol engine of Bajaj caliber instead of petrol its mileage get better then the petrol but the percentage of carbon mass is twenty percent more we get after run by petrol for fifteen days on the valves of the engine, along with that the knocking sound on the engine is arises up due to plastic fuel and with that the percentage of un burnt fuel inside the cylinder of engine is getting higher and finally the color of exhaust gases is little bit blur than we get after run by petrol engine. so after getting above mention parameters we realize that there must be an requirement to design an engine which is run over plastic fuel of low density to minimize the constraints of above parameters which will benefitted in the future to increase the mileage of engine with reducing the wastage of un burnt fuel and with environment friendly.



Figure 5.1 Experimental setup

**OBSERVATION TABLE 1;**

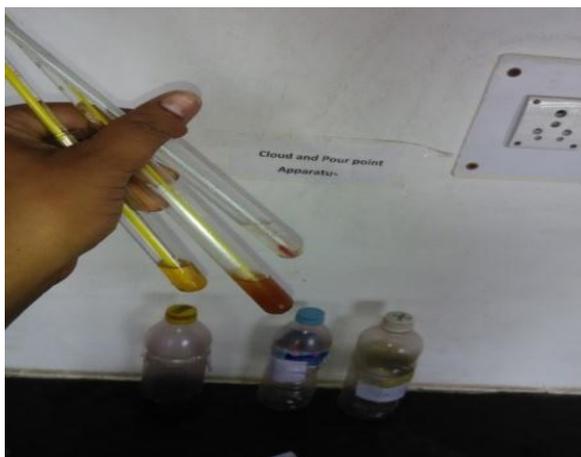
**COMPERISION HDPE OIL WITH PETROL AND DEISEL OIL:**

Fuel properties	HDPE	PETROL	DIESEL
Density	795.45 kg/m <sup>3</sup>	711 to 737 kg/m <sup>3</sup>	820 to 900 kg/m <sup>3</sup>
Viscosity	0.775 poise	1.5 to 4 poise	1 to 3.97 poise
Specific gravity	0.776	0.82	0.81 to 0.96
Flash point( °C)	24	22	26
Fire point ( °C)	27	25	29
Cloud point ( °C)	Below 2	1 to 3	2.5 to 4
Pour point ( °C)	-3.5 to -4	-4 to -20	-2 to -12
Colour	Yellow, light transparent	Brown transparent	Dyed blue



Figure 6.2 Flash and fire point

### CLOUD AND FOUR POINT OF HDPE OIL



### COMPERISION HDPE OIL WITH PETROL AND DEISEL OIL:

Fuel properties	HDPE	PETROL	DIESEL
Density	795.45 kg/m <sup>3</sup>	711 to 737 kg/m <sup>3</sup>	820 to 900 kg/m <sup>3</sup>
Viscosity	0.775 poise	1.5 to 4 poise	1 to 3.97 poise
Specific gravity	0.776	0.82	0.81 to 0.96
Flash point( °C)	24	22	26
Fire point ( °C)	27	25	29
Cloud point ( °C)	Below 2	1 to 3	2.5 to 4
Pour point ( °C)	-3.5 to -4	-4 to -20	-2 to -12
Colour	Yellow, light transparent	Brown transparent	Dyed blue

### CONCLUSION

By using this fuel oil in 110 cc bajaj caliber bike it increases efficiency of bike by 20 to 25% as compared to petrol used in the bike. By comparing the density of HDPE oil with petrol its gives approximately same value. Also comparing the density of LDPE oil WITH diesel oil its gives approximately same value. So this research help in the degradation of waste plastic , which is very harmful for both environment and human being.

Based on the reviewed paper for the performance of waste plastic oil , it is concluded that the waste plastic oil represents a good alternative fuel for diesel or petrol and therefore must be taken into consideration in the future for transport purpose. Further it is concluded that, i. Engine was able to run with 100% waste plastic oil.

So, from the studies conducted we can conclude that the properties of the fuel obtained from plastics are similar to that of petrol or diesel and further studies on this field can yield better results.

### REFERENCES

- [1] Achilias DS, Roupakias C, Megalokonomosa P, Lappas AA, Antonakou EV. Chemical recycling of plastic wastes made from polyethylene (LDPE and HDPE) and polypropylene (PP). *J Hazard Mater*, 2007; 149: 536-542.
- [2] Buekens AG, Huang H. Catalytic plastics cracking for recovery of gasoline-range hydrocarbons from municipal plastic wastes. *Resour Conserv Recy*, 1998; 23:163-181.
- [3] Balakrishnan RK, Guria C. Thermal degradation of polystyrene in the presence of hydrogen by catalyst in solution. *Polym Degrad Stabil*, 2007; 92: 1583-1591.
- [4] Bahr A, Kozmiensky T. The sorting of plastic wastes. *International Recycling Congress*, Berlin FreitagVerlag, 1979:1202-1210.
- [5] Delattre C, Forissiera M, Pitault I. Improvement of the micro activity test for kinetic and deactivation studies involved in catalytic cracking. *Chem Eng Sci*, 2001; 56(4):1337-1345.
- [6] Gerald Scott, *Degradable Polymers: Principles and Applications*, Edition: 2, Springer, 2002, ISBN 1402007906, 9781402007903.
- [7] Garforth AA, Ali S, Martínez JH, Akah A. Feedstock recycling of polymer wastes. *Curr Opin Solid State Mater Sci*, 2004; 8: 419-425.
- [8] Gupta S, Mohan K, Prasad R, Kansal A. Solid waste management in India: Options and opportunities. *Resour Conserv Recy*, 1998; 24: 137-154.
- [9] Luo G, Suto T, Yasu S, Kato K. Catalytic degradation of high density polyethylene