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Fuel from Domestic Waste Used in Petrol Engine

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ABSTRACT: Waste a term which is woven in our lives since civilization and now gradually is becoming a challenge in terms of waste land required and functionary pollutants of them in environment specially for non-degrading waste thus a threat to the environment. Over a 100 billion tones of waste is produced yearly worldwide, and the overflowing bins and landfills are a very common example for it. Waste though common for us in our home and around refers to the debris which is produced by industries also. Work has been done to make waste into productive asset for wealth generation and more of it is focused on key elements such as biodegradable plastics, Non-Biodegradable plastics but under-degraded scraps of utensils, remaining packaged and un packaged food, which is broadly classified as solid and liquid waste can be handy sometimes in certain fields yet to be explored. Here, the process of converting waste of home into value added fuels is explained as a viable solution for reuse of waste. Thus two big problems such as problems of waste and problems of fuel are being tackled simultaneously. In this study, we will be using the household waste under pyrolysis to get fuel oil that has the same physical properties as the fuels like petrol, diesel etc. Pyrolysis runs without oxygen and in high temperature of about 300°C which is why a reactor was fabricated to provide the required condition for the reaction. The waste are subject to chain breakdown specially the waste's most important component Plastic goes under depolymerisation, pyrolysis, thermal cracking where the end product is widely mixed and finally the whole solution (some part coming from decaying of liquid waste from perishable goods) goes under distillation to obtain different value added fuels such as petrol, kerosene, and diesel, lube oil etc. Converting waste into fuel holds great promise for both the environmental social and economic scenarios..

KEYWORDS: Pyrolysis, Plastic, Waste, Flash Point, Fire Point, Density, Viscosity, Mixture, Bio-degradable, Non-Bio-degradable, Perishable Goods.

I. INTRODUCTION

Plastics are an integral part of our modern life and are used in almost all daily activities and or created as waste by different activities along with other household wastes. According to the International Solid Waste Association Plastic in waste has rose up by 13.4% YoY in comparison to organic matters which has shown a rise of 2.04% YoY. Now that makes the figure dangerous and situation alarming. The total waste produced per day if left idle will fill up the earth all space in just 9 months 16 days. So we need a method to either Re-use it and convert it in some productive form. Since plastics are synthesized from non-renewable sources and are generally not biodegradable, plastics in waste are the cause of many of the serious environmental problems the world faces today. In recent years, huge amounts of waste are available in municipal solid waste (MSW) and many other places. With an annual increase rate of approx 67.6%, in 1998, the production of waste in the world had reached 0.47 billion tons only from household. Now adding to the pace due to the industrial revolution and urbanization at its pace the MSW as seen by World Bank is around 1.3 billion tons per year. Established technology can convert waste into a renewable source of hydrocarbon fuel. This technology plans to acquire waste from City / Local Municipalities and Recycling Facilities. For waste fuel production purposes the waste can be collected and separated into different categories. Another source of large amounts of waste is floating on our oceans and seriously damaging the ecosystem and the environment most of which is plastic and unused grains.

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II. METHODOLOGY

1. Pyrolysis process for conversion of waste into fuel

The main two components of waste is Plastic waste and Non Plastic Waste. So we deal with two different methods to achieve what we finally call as Waste Fuel The two methods are hydrocarbon fuel Pyrolysis and biomass conversion to biofuel.

Pyrolysis is the chemical decomposition of organic substances by heating, the word is originally coined from the Greek-derived elements pyro meaning "fire" and lysis meaning "decomposition". Pyrolysis is usually the first chemical reaction that occurs in the burning of many solid organic fuels, cloth, like wood, and paper, and also of some kinds of plastic. Anhydrous Pyrolysis followed by process can also be used to produce liquid fuel similar to diesel from plastic waste. Pyrolysis technology is thermal degradation process in the absence of oxygen. Plastic waste is treated in a cylindrical reactor at temperature of 310°C – 355°C.

2. Bio-Fuel Formation from Bio mass of agricultural and perishable waste

Biomass resources run the gamut from corn kernels to corn stalks, from soybean and canola oils to animal fats, from prairie grasses to hardwoods, and even include algae. Today, the most common technologies involve biochemical, chemical, and thermochemical, photobiological conversion processes. Ethanol, which is largest volume of biofuel, along with mixture of methanol propanol butanol n- heptanol etc. is produced through a biochemical conversion process in which yeasts ferment sugar from starch and sugar crops into ethanol. The starch used in this process is a result of rapid decomposition (in presence of excess of nitrogen and oxygen with temperature ranging 140-170°C) of the perishable waste generally developed from remainings of our food items and day to day life.

Plastic is not easily decomposable its affect in fertilization ,atmosphere ,mainly affect on ozone layer so it is necessary to recycle these waste plastic into useful things. The Agricultural waste is a large component of bio-degradable waste and it occupies large landfill area so an attempt has been given to use waste in total as a source of fuel.



Fig:- Pyrolysis Fuel Collected

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Fig:- Waste Fuel collected after mixing

III. OBSERVATION TABLE

Table 1:- COMPARISION WASTE FUEL, PETROL & DEISEL OIL

Fuel properties	Fuel From Waste	PETROL	DIESEL
Density	726.37 kg/m ³	711 to 737 kg/m ³	820 to 900 kg/m ³
Viscosity	0.654 poise	1.5 to 4 poise	1 to 3.97 poise
Specific gravity	0.706	0.82	0.81 to 0.96
Flash point(°C)	21	22	26
Fire point (°C)	24	25	29
Cloud point (°C)	Below 2.4	1 to 3	2.5 to4
Pour point (°C)	-5 to -26	-4 to -20	-2 to -12
Colour	Light Golden Yellow, transparent	Brown, transparent	blue

IV. RESULT AND DISCUSSION

By heating the close combustion chamber with heater of 2500 Watt in a temperature range of 300 to 350 degree Celsius we get approx 600 ml pyrolysis fuel. By heating of combustion about 45 minutes the layer of oil appears on the water level. After two hour thirty minutes we get 550 ml of fuel oil.

Along with by rapid decomposition of the rotten agricultural and household perishable waste in a closed chamber in presence of excess of nitrogen and oxygen with temperature ranging 140-170°C we get the starch solution mostly in dense state. It further when cooled to about 60°C yeasts are allowed to decompose the starch further so as to obtain the carbon complex. This fluid when mixed to pyrolysis plastic waste fluid in different ratios gives different mileage results. For which the Graph 1 has been plotted by using different mixing ratio of the waste fuel component at different speeds in a 100 cc Hero Honda Passion Plus bike.

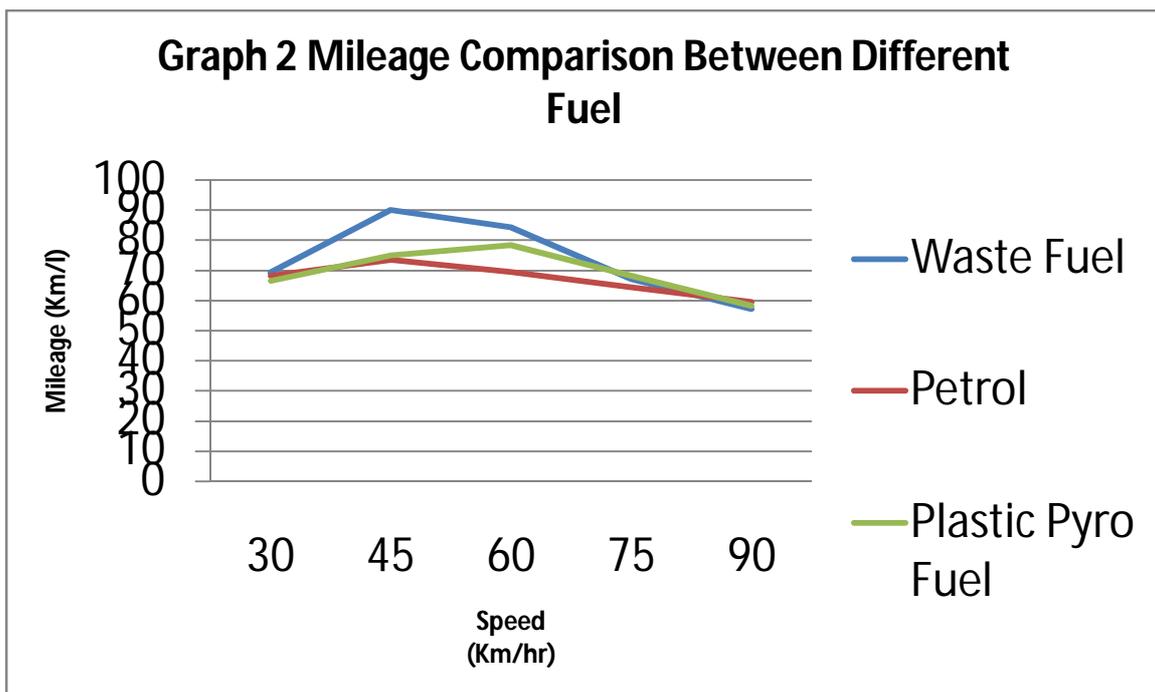
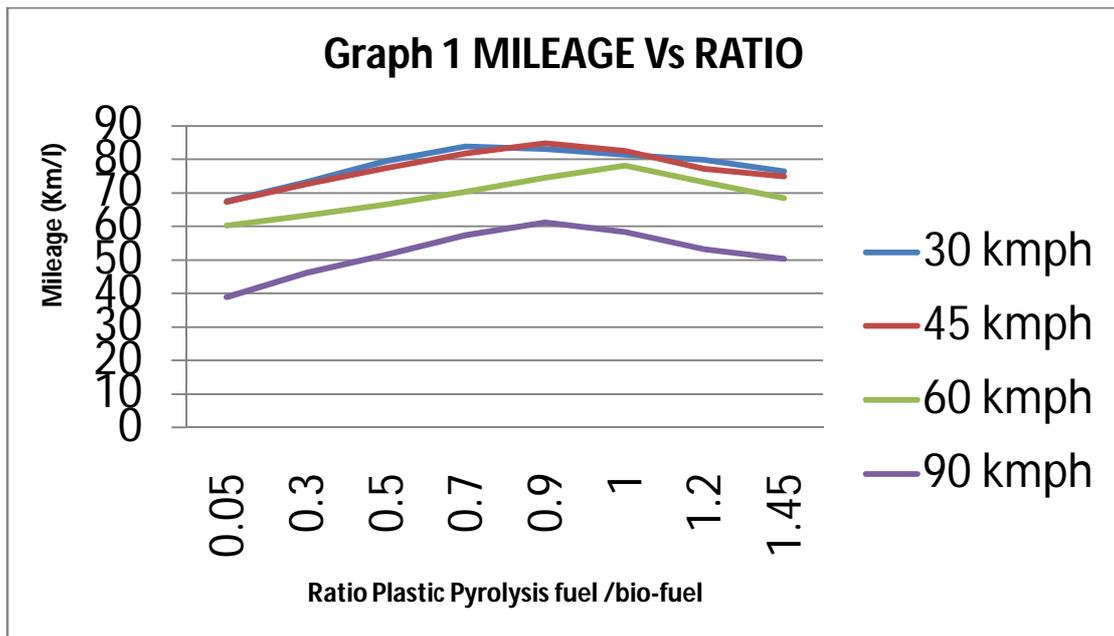
Different Fuel has been used in a 100 cc Passion Plus Engine of Motorcycle and we graphically note down the results represented in Graph 2. The variation in mileage with change in speed for different fuel has been plotted for a comparative study.

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We can see that for an optimum range the Waste fuel is giving a good average of around 80 and above hence it proves of great use as its performance shows that it can replace Petrol in same engine without any modification done for use of this fuel.



II. CONCLUSION

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By using this fuel oil in 100 cc Passion Plus bike it increases efficiency of bike by 25 to 30% as compared to petrol used in the bike. Engine fueled with waste plastic oil exhibits higher efficiency but it gets its performance better when mixed with a suitable mixture with the fuel made from day to day waste material. By comparing the density of waste oil with petrol its gives approximately same value. It could be concluded, that thermal pyrolysis of plastic mixed with perishable waste fluid in a given ratio leads to the production of fuel oil, valuable resource recovery and reduction of waste problem. Thermal pyrolysis of waste plastic waste has also several advantages over other alternative recycling methods. It has been shown that the conversion at lower temperature in the presence of catalyst into liquid is a feasible process. The use of perishable based fluid with Pyrolysis fuel enhances its quality to a extent that its mileage is improved by about 10 to 15% more. So the day to day life problem has been found to create a solution. As according to different surveys around world by World Bank it has been observed that the MSW is going to increase by nearly 200% in next 10 years. So this increase can be controlled and used of landfills can be checked in a limit by the proper utilization of the waste to use it in petrol engines.

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