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A Review on Nobel Fuel from Plastic Waste

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Abstract: *Now a days plastic is becomes a very common material of our life because of their property like durability, light weight varsity. Over 100 million of tones of plastic is produced annually worldwide. But plastic are non biodegrable in nature hence its disposal is becomes a major problem and we can't deposited it in directly in environment and now a day we need the alternative fuel. This review exhibit the process of converting plastic into valuable fuel is known as pyrolysis. Two biggest problem of now a day is waste plastic and shortage of fuel is solving simultaneously. In the reactor plastic is melt along with nitrogen and absent of oxygen. The plastic along with crystal melt at temp of 350-600 C at atmospheric pressure .The vapour is out from reactor can be condense to obtain fuel.*

Keywords - *Fuel, pyrolysis, waste plastic, alternative fuel, oil, PE, PP.*

I. Introduction

As brief introduction to plastic, it can be said that plastic are synthetic organic material produced by polymerization. It has main substance is polymer and also used some material to improve performance and reduced cost. There are two main type of plastic are present thermoplastic and thermosetting. Thermoplastic melt if enough heat is supplied and thermosetting melt and take shape once. plastic have becomes common material of our everyday life and many of their property such as light weight, durability .plastic are often used only once before disposal. Disposal of plastic is not simply technical but it also economic, social and political aspects.

We can't deposit plastic in environment because it is hazardous for every living thing and others. The conversion of plastic waste into fuel is non-hazardous for everything and it could be economical variable as it generates resources which are in high demand. international energy outlook 2010 report the world consumption of liquid and petroleum product grow 86.1 million barrel per day in 2007 to 92.1 million barrel per day in 2020 and 110.6 million barrel in 2035 With the help of pyrolysis process we can produce fuel . We can melt the plastic in reactor. In reactor we melt plastic at high temp at presence of nitrogen and absence of oxygen at atmospheric pressure. The vapour is come out from reactor cooled by condenser and resulting fuel will produce. Electric heating is given to reactor to melt plastic along with catalyst. Reactor is isolated with mineral wool to prevent the heat loss from reactor and increase efficiency .also we can maintain the temp inside the reactor by observing with temp sense which fitted in reactor.

II. Use Of Different Types Of Plastic

Plastics play an important role in day- today life. It is unique material because of their toughness, light weight, resistance to water and chemicals, resistant to heat and cold, low electrical and thermal conductivity, ease of fabrication, remarkable color range, more design flexibility, durability and energy efficiency. Plastic waste management is biggest problem now due to their non- biodegradability nature. Now plastics manage by plastics recycling technologies.

Table 01 *Applications of Plastic*

Type of Plastics	Uses
Polyester	Textile fiber
PET	Carbonated drink bottles, plastics film
PE	Supermarket bags, plastics bottle
HDPE	Milk jugs, detergent bottles, thicker Plastics film, pipes
LDPE	Floor tiles, shower curtains, cling film
PVC	Agriculture (fountain) pipe, guttering Pipe, window frame, sheets for building material
PS	Foam use for insulation of roofs and walls, disposal cups, plates, food Container, CD and cassette box.
PP	Bottle caps, drinking straws, Bumper, house ware, fibre carpeting and rope.

III. Side Effects of Plastic

Due to the use of chemical additives during plastic production, plastics have potentially harmful to many of system of environment.

1. SIDE EFFECT OF PLASTICS IN NATURE

Durability and chemical structure greatly influences the biodegradability of some organic compounds therefore an increased number of functional groups (groups of atoms) attached to the benzene ring in an organic molecule usually hinders microbial attack. 2. Instead of biodegradation, plastics waste goes through photo-degradation and turns into plastic dusts which can enter in the food chain and can cause complex health issues to earth habitants. Plastics are produced from petroleum derivatives and are composed primarily of hydrocarbons but also contain additives such as antioxidants, colorants, and other stabilizers. 4. However, when plastic products are used and discarded, these additives are undesirable from an environmental point of view. 5. Burning of plastics give NOX, COX, SOX, particulate, dioxins, furans and fumes to increase air pollution with result acid rain and increase global warming. 6. Plastics in land fill area leaching of toxins into ground water.

2. SIDE EFFECT OF PLASTICS ON HUMAN AND ANIMAL LIFE

Plastics can be made of a selection of many different chemicals to improve its properties, to prevent degradation in the environment when exposed to light, humidity, temperature or microorganisms, to make it more or less flexible, to lessen flammability or to colour it. Many of these substances are not bound to the chemical chain of the plastic, which means that they can migrate under different circumstances as small as a change in temperature or light. Toxic ingredients can evaporate into the air and be breathed in. They can readily absorb into the skin. And they can leach into food or drink and then be ingested. Breathing near plastic trash being burned, opening a new plastic item that releases a strong odour, applying body lotion, drinking hot coffee from a Styrofoam cup, reusing a water bottle, eating food microwaved in a plastic container, or that has been frozen in a plastic container or even food that has simply been stored in a while… any of these common practices allow chemicals from plastic to migrate easily into the body. Plastic comes in many forms but there is general consensus that while a useful material, there are serious concerns about its effects on human health.

IV. Sources of Plastic Waste

Industrial waste (or primary waste) can often be obtained from the large plastics processing, manufacturing and packaging industries. Rejected or waste material usually has good characteristics for recycling and will be clean. Although the quantity of material available is sometimes small, the quantities tend to be growing as consumption, and therefore production, increases [3].Commercial waste is often available from workshops, craftsmen shops, supermarkets and wholesalers. A lot of the plastics available from these sources will be PE, often contaminated. Agricultural waste can be obtained from farms and nursery gardens form of packaging (plastic containers or sheets) or construction materials (irrigation or hosepipes).

V. Recycling Method

1. Chemical Depolymerisation:

Chemical depolymerisation, or chemolysis, involves the reaction of the used polymer with chemical reagents for the production of its starting monomers. Different processes have been developed which are categorized depending on the chemical agents employed, the most common being glycolysis, methanolysis, hydrolysis and ammonolysis.

2. Gasification Gasification:

Involves the partial oxidation of organic matter at high temperatures (typically between 1200-1500ºC) under mildly oxidizing conditions (usually steam, carbon dioxide or Sub-stoichiometric oxygen) for the production of synthesis gas (syngas). This gas, consisting primarily of carbon monoxide and hydrogen, has application in the synthesis of chemicals like methanol and ammonia, and can be used to produce synthetic diesel or may be combusted directly as a fuel.

3. PYROLYSIS

It is thermal degradation process in the absence of oxygen. It prevent of formation of C0X, NOX, SOX due to absence of oxygen. It breaks large hydrocarbon chain into smaller ones, but this type of pyrolysis requires higher temperature and high reaction time. Also resulting fluid have low octane value, higher pour point of diesel and high residue content.

4. **CATALYTIC CONVERSIONS:**

Catalytic conversion of plastic wastes implies several advantages over conventional pyrolytic methods. The most evident relates to the lower degradation temperatures at which degradation reaction takes place, which results in lower energy consumptions and higher conversion rates.

5. HYDROGENATION:

Hydrogenation of plastics is a potential alternative for breaking down the polymer chain. Compared to treatments in the absence of hydrogen, hydrogenation leads to the formation of highly saturated products, avoiding the presence of olefins in the liquid fractions, which favours their use as fuels without further treatments. Moreover, hydrogenation promotes the removal of hetero atoms, such as chlorine (Cl), nitrogen (N) and sulphur (S), in the form of volatile compounds. However, hydrogenation suffers several drawbacks, mainly due to the cost of hydrogen and the need to operate under high pressure.

VI. Conversion From Waste to Liquid Fuel

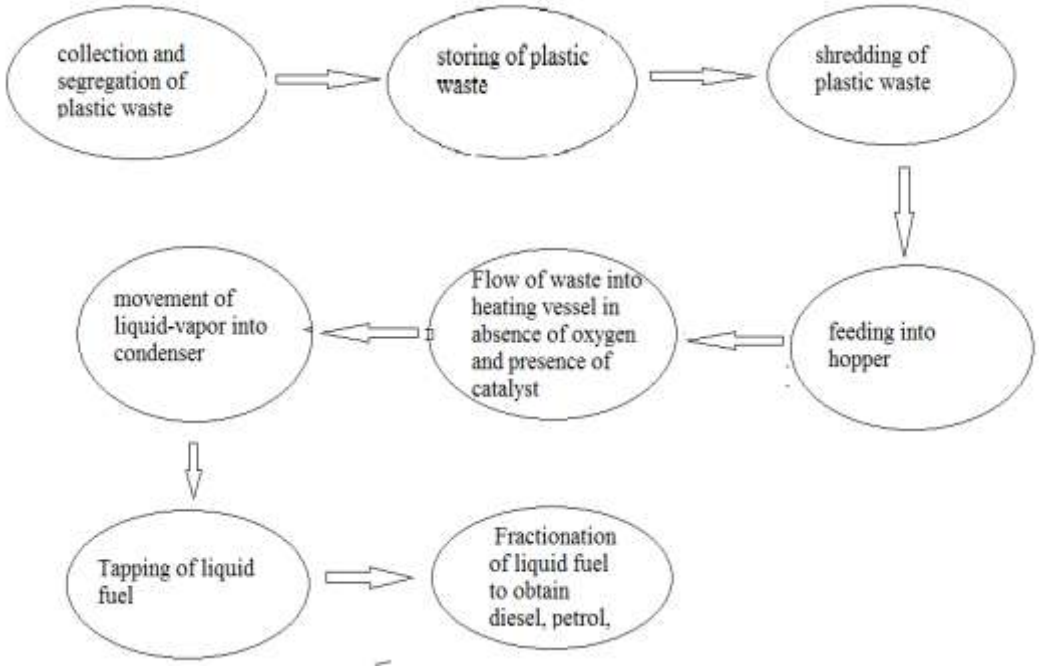

Fig 01 Conversion from waste to liquid fuel

VII. Production Method

The production method for the conversion of plastics to liquid fuel is based on the pyrolysis of the plastics and the condensation of the resulting hydrocarbons. Pyrolysis refers to the thermal decomposition of the matter under an inert gas like nitrogen. For the production process of liquid fuel, the plastics that are suitable for the conversion are introduced into a reactor where they will decompose at 450 to 550 0C. Depending on the pyrolysis conditions and the type of plastic used, carbons matter gradually develops as a deposit on the inner surface of the reactor. After pyrolysis, this deposit should be removed from the reactor in order to maintain the heat conduction efficiency of the reactor. The resulting oil (mixture of liquid hydrocarbons) is continuously distilled once the waste plastics inside the reactor are decomposed enough to evaporate upon reaching the reaction temperature. The evaporated oil is further cracked with a catalyst. The boiling point of the produced oil is controlled by the operation conditions of the reactor, the cracker and the condenser. In some cases, distillation equipment is installed to perform fractional distillation to meet the user's requirements. After the resulting hydrocarbons are distilled from the reactor, some hydrocarbons with high boiling points such as diesel, kerosene and gasoline are condensed in a water-cooled condenser. The liquid hydrocarbons are then collected in a storage tank through a receiver tank. Gaseous hydrocarbons such as methane, ethane, propylene and butanes cannot be condensed and are therefore incinerated in a flare stack. This flare stack is required when the volume of the exhaust gas emitted from the reactor is expected to be large There may be variations in the feeding methods used depending on the characteristics of the waste plastic. The easiest way is to simply introduce the waste plastics into the reactor without any pre-treatment. Soft plastics such as films and bags are often treated with a shredder and a melter (hot melt extruder) in order to feed them into the reactor because otherwise they would occupy a large volume of the reactor. There are also different types of reactors and heating equipment. Both

kiln-type and Screw-type reactors have been proposed, while induction heating by electric power has been developed as an alternative to using a burner. Due to the formation of carbonous matter in the reactor, this acts as a heat insulator, in some tank reactors the stirrer is used remove the carbonous matter rather than for stirring. After the liquid product of the Pyrolysis is distilled, the carbonous matter is taken out either with a vacuum cleaner or in some cases reactors are equipped with a screw conveyor at the bottom of the tank reactor to remove the carbonous matter. Operators should understand the relationship between the amount and composition of the waste plastics as well as the operating conditions. Energy consumption and plant costs relative to the plastic treatment capacity are the typical criteria for evaluating the plant performance. Operating skill and safety considerations are important in this type of chemical conversion due to the highly flammable liquid fuels which are formed.

VIII. Conclusion

Plastic present a major threat today society and environment. Over 14 million tons of plastic are dumped into the oceans annually. Killing the species about 1000000 mof ocean life. By converting plastic into fuel, we solve two issue one of the large plastic waste and other of the fuel shortage this is dual benefited and the process is provided A strong platform to build clean and green future. It is conclude that the waste plastic pyrolysis oil represent a good alternative fuel and we for transport purpose in future because the property is obtain from plastic are similar to that petrol and future studies on this field can yield better result.

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