REVIEW ON FUEL OIL PRODUCTION FROM IN PLASTIC WASTES

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ABSTRACT

Plastics are an integral part of our modern life and are used in almost all daily activities. Since plastics are synthesized from non-renewable sources and are generally not biodegradable, waste plastics are the cause of many of the serious environmental problems the world faces today. Due to depletion of fossil fuel reserves and increasing cost of the petroleum products are the big troubles of today's world .from past to present, tendency of oil price have increased consecutively. Especially, India has deficient amount of fossil fuel .for this reason, India has to import fossil fuel, such as petroleum for domestic demand The waste can then be converted into hydrocarbon fuel either in the collection vessel itself or in off-shore facilities, using established technology.

Keywords*- Waste plastic, fuel, diesel oil, petrol oil, and pyrolysis.*

1. INTRODUCTION

Our plastic-to-fuel process converts, or “reverses,” petroleum made plastic solids into liquid-form petroleum products, namely high quality diesel and unleaded gasoline fuels. Corporation (PARC) converts plastic waste into diesel and gasoline and develops, designs and manufactures the equipment used in the pyrolysis conversion process. This compendium of technologies aims to present an overview of the technologies available for converting waste plastics into a resource. It emphasizes the typical methods for converting waste plastics into solid, liquid and gaseous fuels as well as the direct combustion of waste plastics.(1) Plastic is the general common term for a wide range of synthetic or semi synthetic organic amorphous solid materials used in the manufacture of industrial products. Plastics are typically polymers of high molecular mass, and may contain other substances to improve performance and/or reduce costs. Monomers of Plastic are either natural or synthetic organic compounds. The word is derived from the Greek (plastics) meaning fit for moulding, (plastic) meaning moulded. It refers to their malleability or plasticity during manufacture that allows them to be cast, pressed, or extruded into a variety of shapes such as films, fibers, plates, tubes, bottles, boxes, and much more.The common word plastic should

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not be confused with the technical adjective plastic, which is applied to any material which undergoes a permanent change of shape (plastic deformation) when strained beyond a certain point. Aluminium, for instance, is plastic in this sense, but not a plastic in the common sense; in contrast, in their finished forms, some plastics will break before deforming and therefore are not plastic in the technical sense.(2)

2.PRINCIPALS INVOLVED

All plastics are polymers mostly containing carbon and hydrogen and few other elements like chlorine, nitrogen, etc. Polymers are made up of small molecules, called monomers, which combine together and form large molecules, called polymers. When this long chains of polymers break at certain points, or when lower molecular weight fractions are formed, this is termed as degradation of polymers. This is reverse of polymerization or de-polymerization. If such breaking of long polymeric chain or scission of bonds occurs randomly, it is called Random depolymerisations. Here the polymer degrades to lower molecular fragments. In the process of conversion of waste plastics into fuels, random depolymerisation is carried out in a specially designed reactor in the absence of oxygen and in the presence of coal and certain catalytic additives. The maximum reaction temperature is 350oC. There is total conversion of waste plastics into value-added fuel products.(3)

Fig.1 – Waste recycle production

1. TYPES WASTE PLASTIC FUEL PRODUCTION

1. Solid plastic fuels
2. Liquid plastic fuels
3. Gases plastic fuels

1. Solid Fuel Production

1.1 Scope of solid fuel in this compendium

Solid fuel, as referred in this compendium, is prepared from both municipal and industrial non-hazardous waste. Additionally, the solid fuel unlined here excludes coal and coal-derived fuels as well as solid bio fuels such as firewood and ride manure but it may contain bio fuels as a component. This compendium differentiates two types of old fuel: refuse derived fuel (RDF), also called solid recovered fuel (SRF) and refuse-derived paper and plastic densities fuel (RPF).RDF is mainly produced from municipal kitchen waste, used paper, waste wood and waste plastics. Due to the presence of kitchen waste, prior to the conversion to a fuel, a drying process is required to remove the moisture from such waste to allow the solidification of the waste in suitable shapes and densities. This process is seen as a disadvantage due to the large amount of energy that the process requires. Solid recovered fuel

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(SRF) is defined in the European Committee for Standardization technical specification. On the other hand RPF is prepared from used paper, waste plastics and other dry Feed stocks. Within the plastics, the thermoplastics play a key role as a binder for the other components such as thermosetting plastics and other combustible wastes, which cannot form pellets or briquettes without a binding component. Approximately 15wt% of thermoplastics is the minimum required to be used as a binder to solidify the other components; however excessive amounts, higher than 50wt%, would cause a failure in the pellet preparation. The components of RPFs are mainly sorted from industrial wastes and are sometimes also obtained from well-separated municipal waste.(4)

Table1. Content of three elements of mixed plastics

	Moisture	Ash	Combustibles	total
Yield (wt%)	1.04	2.19	96.77	100

2. LIQUID FUEL PRODUCTION

Scope of liquid fuel in this compendium

The burner or the engine performance. The fuel properties such as viscosity and ash content should conform to the specifications of the fuel user's burners or engines. No additives would be needed for fuel used Liquid fuel within this compendium is defined as plastic-derived liquid hydrocarbons at a normal temperature and pressure. Only several types of thermoplastics undergo thermal decomposition to yield liquid hydrocarbons used as liquid fuel. PE, PP, and PS, are preferred for the feedstock of the production of liquid hydrocarbons. The addition of thermosetting plastics, wood, and paper to feedstock leads to the formation of carbon us substance. It lowers the rate and yields of liquid products. Depending on the components of the waste plastic being used as feedstock for fuel production, the resulting liquid fuel may contain other contaminants such as amines, alcohols, waxy hydrocarbons and some inorganic substances. Contamination of nitrogen, sulfur and halogens gives flu gas pollution. Un expect contamination and high water contents may lower the product yields and shorten the lifetime of a reactor for pyrolysis Liquid fuel users require petroleum substitutes such as gasoline, diesel fuel and heavy oil. In these fuels, various additives are often mixed with the liquid hydrocarbons to improve in a boiler.(4)

1. Gaseous Fuel Production

Scope of gaseous fuel in this compendium- The gaseous fuel described in this report refers to the flammable gas obtained from the thermal treatment of waste plastics. There are two types of gaseous fuel:

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Fig 2.-Liquid Fuel Production

(A) ***Gaseous hydrocarbon***:

Hydrocarbons that are in a gaseous state under normal Temperature and pressure (0 °C, 1 atm).

(B) ***Synthesis gas or syngas:***

Mixture of hydrogen and carbon monoxide. In the conversion of plastics to gaseous fuel, the waste plastics undergo thermal decomposition in a tank reactor, resulting in the formation of liquid fuel as the main product and gaseous fuel up to about 20 wt.%, as the minor product. Gaseous hydrocarbons become the main product after residing in the reactor for an extended time at a reaction temperature under controlled decomposition conditions and the use of a specific reactor. Under specific conditions, carbon and carbohydrates can be used as feed stocks for the production of gaseous fuel like methane and hydrogen.

4. OVERVIEW OF PYROLYSIS PLANTS AND ADVANCED TECHNOLOGIES

An engineering approach to improve the overall waste incineration efficiency is to separate pyrolysis from actual combustion and burnout processes of the waste. In industrial scale schemes, external separation requires pyrolysis reactors whilst firing products (e.g. char, waxes, etc.). This technology (dominant in the period between 1978 and 1996) is based on pyrolysis at 450–500 °C in an externally heated rotary drum and gas combustion at 1200 °C. Typical feed to the process is PSW (post-consumer mixtures), although the process was proven successful for other MSW streams pyrolysis process is based on a circulating fluidised bed system (two reactors) with subsequent combustion. Input to the process is shredded mixed waste including a high percentage of PVC waste. The main outputs consist of HCl, CO, H_2, and CH_4 and, depending on the feedstock composition, other hydrocarbons and fly ash. Residues from the process are screened and sorted to recover materials, mainly metals. The NRC process is another successful pyrolysis scheme. This process is based on the pyrolysis with subsequent metal extraction technology. The aim is to produce purified calcium chloride instead of HCl. The input to the process is PVC waste (cables, flooring, profiles, etc.). No other PSW type is fed to the processing, which results in calcium chloride, coke, organic condensate (for use as fuels) and heavy metals for metal recycling, as products. The technology

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comprises a modular pyrolysis and gasification concept at high temperatures. The process starts with a pre-processing step involving separation, screening and shredding of different kind of wastes such as MSW, ASR, ELTs, industrial and plastic waste as well as contaminated soil. The pyrolysis takes place at 500–550 °C for about 45–60 min in an externally heated rotary kiln. The yield is a de-dusted and homogenized CO/H_2 rich fuel gas. Char containing minerals and metals are conditioned by separating ferrous and non-ferrous metals, reduced in moisture to <10% and ground to <2 mm before being used as a fuel, a sorbent (i.e. activated carbon) or a raw material in brick production The feed to the process consists of MSW, hazardous waste, ASR and post-consumer plastic waste. Pyrolysis takes place prior to the combustion process and the resulting gas is subjected to multiple scrubbing steps using pyrolysis oil. This process cools the gas from the range of 500 to 600 °C down to 120 to 150 °C. However, the char is cooled to 50 °C and jointly combusted with a slurry composed of dust and heavy paralysis' oils in a melt furnace. One of the most important pyrolysis processes is the BP polymer cracking process. After a series of pilot trails (between 1994 and 1998), a plant was established in Scotland with a capacity of 25,000 tonnes/year. Fig. 6 shows a schematic of the BP polymer cracking process. Size reduction is required for the feed, which is then fed to a heated fluidized bed reactor (operating at 500 °C) in the absence of air.(5)

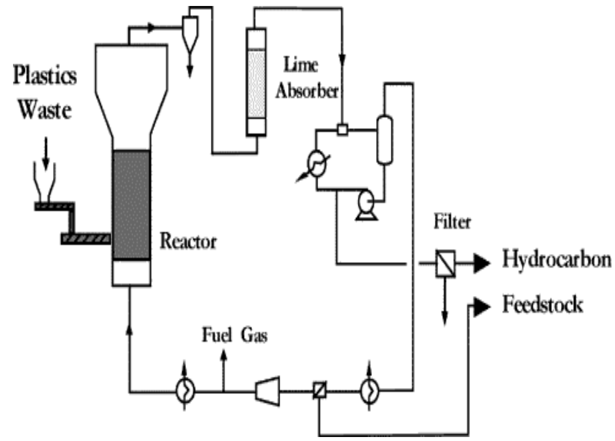

Fig.3-Plastic Waste polyme cracking process

5. APPLICATIONS

(1) Fuel oil:widely used as fuel oil in industries such as steel and iron factories, ceramics or chemical industries or hotels, restaurant etc. or used for generators to get electricity.

(2) Carbon black: Used form construction brick with clay, also can be used as fuel.

(3) Steel wire: sold or reprocessing

(4) Combustible gas: can be recycled and used during process as fuel

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CONCLUSION

This study shows without doubt that one-way PET bottles are as Ëœecologically favourable„¢ as refillable glass under non-deposit circumstances. A plausible alternative could be to revise the Packaging Ordinance, such that ecologically favourable packaging systems would be included in a deposit without being discriminated when compared to refillable packaging. It cannot be explained to consumers that they should return the empty bottles to the store if they are subsequently transported to the

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other side of the world for recycling. This way we are losing environmental gain that is the prime reason behind bottles collection. This study has shown that it does not matter whether collected PET is recycled into polyester fibre, sheet, strapping or back into PET bottles: they all offer equal benefits to the ecological profile of PET. Mandatory or semi mandatory requirements to recycle PET bottles into PET bottles would be ridiculous. Public perception does not always match reality. Not many people comprehend that PET bottles, even for single use, are as good as their glass counterparts. This calls for further improvements in balanced, reputable education, and independent and irrespective of local political.

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