DEMAND OF PLASTIC FUEL IN INDIA

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Abstract— India Facing a bigger challenge today of recession in Public sector, Indian economy slowing down. The Major sector which is highly affected is FUEL. We all complain about the rising fuel prices, while the government is trying to promote biofuel across the country, many commuters have also started opting for electric mobility, which is costing them half the price of Petrol and Diesel Vehicle. At this point of time we should rethink about Fuel availability from non-biodegrable waste. If the plastic waste converted into energy our country will be able to solve the demand of power and plastic waste management. Plastic remain under the Ground for 500 years, which leads to the contamination of soil and thus pollute the Environment. Over the Years several waste to wealth mechanism have been adopted to recycle and reuse plastic in innovative ways. One such trends has been the conversion of Plastic waste to fuel and making it usable for both domestic and industrial purpose. Daily Generation of over 15,000 tonnes of plastic, the prospect to conversion to fuel are abundant, provided there is enough Infrastructure available. The current Union government also addresses the issues of plastic waste and ways with which the problem could be dealt with.

Index Terms—Waste Management, Fuel, power, energy, wealth mechanism

I. INTRODUCTION

we all are aware about the R's Recycle, Reuse and Regenerate. In the case of plastic which is non-biodegradable and very harmful for environment and major solid waste for municipal and Industries, due to lack of integrated solid waste management, most of the plastic waste neither collected properly nor disposed of in appropriate manner to avoid its negative impact on environment. Worldwide Plastic production is predicted to increase by 3.8% every year until 2030.Flexible non-recycle plastic material are used in an increasing range of application like packaging,3D printing and construction. We need to expand our range of option for keeping this plastic waste out of landfill. One potential approach is "plastic to energy", which unlock

II. WORK AHEAD FOR FUEL GENERATION FROM PLASTIC

Few Indian and company have taken initiative in this regard for plastic waste management and power generation to fulfil our demand of economic growth and to protect the environment from health hazard.

A. IIP(Indian Institute of Petrolium)

A constituent Laboratory of the council of scientific and Industrial Research (CSIR) in 2014, developed a unique process of converting plastic waste like polyethylene and polypropylene, both together accounting for 60 percent of plastic waste, can be converted to either gasoline or diesel. The technology can

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convert 1 kg of plastic to 750 ml of automotive grade gasoline. Due to nearly nil presence of Sulphur in the produced fuel, IIP'S plastic converted fuel is pure and meets the EURO-III standard. IIP also stated that a vehicle using this fuel would be able to run at least two Km more per liter. The technology was developed by IIP after nearly a decade of research in hope of commercializing it for Industrial usage.

B. Mechanical Engineer and Professor (Satish Kumar)

Mr. Satish Kumar has come up with a three-step process called plastic pyrolysis to convert plastic into fuel. Today, the fuel is being sold to local industries for as less as Rs. 40 per liter. He has registered the company with ministry of micro, small and medium Enterprises (MSME). Since 2016, he has converted 50 tonnes of unrecyclable plastic into fuel. At present, his company is recycling 200 200kg o plastic and producing 200 liters of petrol out of it every day. "The process helps recycle plastic into diesel, aviation fuel, and petrol. About 500 kg of non-recyclable plastic can produce 400 liters of fuel. It doesn't pollute the air as the process happens in a vacuum." However, using this fuel for vehicles is yet to be tested.

chemical energy stored in waste plastic and uses it to create fuel. Countries like Japan, Germany and united states have already implemented the plastic to fuel conversion process with much success. These three is also been successful in creating business model out of the conversion process, resulting in a conversion model becoming a profitable business one. Though India still has long way to go in terms of adopting plastic to fuel as a business model, discoveries are being made to convert plastic to usable fuel.

III. METHODOLOGY INVOLVED IN CONVERSION OF PLASTIC INTO FUEL

There are several processes of plastic conversion into fuels.

Out of which two are Gasification and pyrolysis.

Gasification involves heating the waste plastic with air or steam, to produce a valuable industrial gas mixture called "synthesis gas", or syngas. This can then be used to produce diesel and petrol or burned directly in boilers to generate electricity.

Pyrolysis is generally defined as the controlled heating of a material in the absence of oxygen. In plastic Pyrolysis, the macromolecular structure of polymer is broken down into smaller molecules and sometimes monomer units. Further degradation of these subsequent molecule depends on a no. of different condition including temperature, residence time, presence of catalyst. Accordingly, the reaction will be thermal and catalytic pyrolysis. Plastic waste is continuously treated in a cylindrical chamber. The plastic is pyrolyzed at 300 C -500 C.

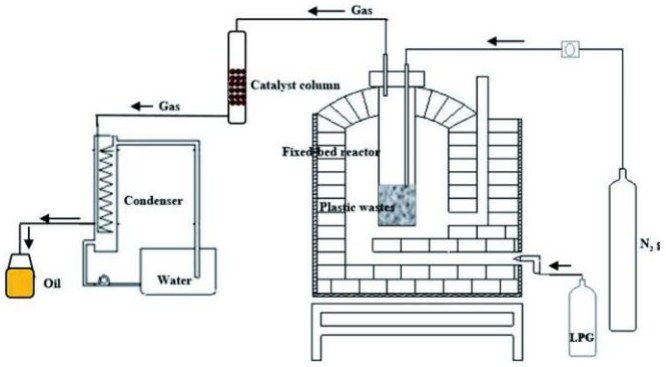

Fig. 1 Schematic diagram of bench scale pyrolysis unit.

A. Pyrolysis Process.

A bench scale fixed-bed pyrolysis stainless steel batch reactor (diameter 35 cm, length 60 cm, maximum capacity 5 kg) was used for production of oil from plastic packaging wastes (Fig. 1). 1 kg of plastic wastes was loaded into the reactor for each pyrolysis reaction. The reactor was heated externally by liquid propane gas to the required operating temperature at heating rates of 10, 15, 20 and 25 °C min−1. Reaction was carried out at 500 °C for 10 minute under a flow of nitrogen purge gas. The pyrolysis gas was passed through catalyst column at a ratio of 0.05, 0.1, 0.15 and 0.2 by weight of catalyst to plastic. The catalyst column made from glass (diameter 5 cm, length 100) and load with catalyst in pellet form. Pellets are

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formed on compression of the catalyst powder with hydraulic press at pressure of 50 bar, the resulting pellet have a diameter of 1 cm and length of 1.5 cm. No binder was used in the formation of the pellets. Fig. S1 in the ESI† demonstrates the bentonite clay, hydraulic press machine, palletization block and catalyst in pellet form. The resulting gas products were collected via water cooled condenser. The oil yield was determined based on the initial mass of plastic waste.

TABLE I

Resin	Conversion Rate
PET	30%
HDPE	Data not Available
PVC	30%
LDPE	70%
PP	50-60%
PS	80-85%

IV. RESULT AND DISCUSSION

The solution of plastics -to-fuel holds promise in not only curbing such pervasive pollution but also providing a significant economic benefit to regions. The American Chemistry Council estimates plastic-to-fuel facilities in the US alone would create nearly 39,000 jobs and almost $9bn in economic output, making the global market potential of such an industry huge.

Plastic-derived fuels are also capable of producing a cleaner burning fuel than traditional sources due to their low Sulphur content, considering the majority of developing nations use Sulphur-heavy diesel. Though slow, progress is being made on the waste to fuel conversion front in India. Unfortunately, despite the big stride in waste management, extensive setting up of waste to fuel plants across the country is still awaited. The technologies employed to convert plastic waste to fuel are not complicated to replicate, and if done so on a large scale, will only help in addressing the growing issue of India's plastic waste. Like other country such as Australia we could create direct job opportunities in plastic conversion plant, and indirect jobs around installation, maintenance and distribution of energy and fuels. We might even see jobs in R&D to explore other waste conversion technologies. This could be a better and upcoming job opportunities for Indians.

PTF technologies can address a critical fraction of the plastic waste stream that has been historically difficult to reutilize, such as LDPE, PP and PS, preventing littering and the landfill disposal of end-of-life plastics. When PTF technologies target end-of-life plastics that are not easily or economically absorbed in recycling markets, they are considered complementary to recycling and existing waste hierarchies. The development of PTF infrastructure can also:

- Create green indirect and direct jobs,
- Divert end-of-life plastics from landfill disposal, extending the lifespan of existing disposal sites and prolonging the siting and construction of new ones,
- Create local demand for low-value plastics that can find their way into streets, streams and the ocean,
- Produce a local source of synthetic crude oil and/or refined fuels to displace fossil fuel derived imports, and
- Reduce air pollution in many parts of the world by substituting low or ultra-low sulfur content fuels for high-sulfur content fuels.

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