



Recycling of plastic waste into fuel by pyrolysis – At a glance

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ABSTRACT

In everyday life mostly used material is plastic due to less in weight, durability and versatility. Plastic to added strength made up with different combinations of polymer which leads problem in recycling. The plastic waste usually good in recycling and getting fuels by plastic pyrolysis method. The high quantity of daily consumption of plastic leads larger amount of wastes therefore production of fuel increases. Recycling is a method in which production of fuel from waste plastic by means of plastic pyrolysis. The aim of this review was focused the introducing the various technologiess used to convert plastic waste to fuel, recycling strategies and recovery perspective.

Keywords: Plastic waste Pyrolysis Recycling Fuel

1. Introduction

Plastic have been essential material and their applications in industrial field are consciously increasing. Plastic production and consumption is increasing day by day at alarming rates with increase of human population, rapid economic growth, continuous urbanization and change in life style. The global plastic production was estimated around 300 million tons per year and continuously increasing every year. The major portion of waste plastic has been subjected to landfill. Plastic waste has created very serious envi- ronmental challenges because of huge quantities and their disposal problem. Recycling of waste plastics is expected to become the most effective way of regenerating and utilizing. Plastic Pyrolysis has great potential to convert plastic waste into oil to achieve max- imum economics and environmental benefits. Usually catalysis process of several types of plastic waste as single or mixed ratio in the presence of catalyst. Ioannis Kalargaris and Guohong Tian *et al.* [9] worked on Experimental evaluation of a diesel engine fuelled by pyrolysis oils produced from low - density polyethylene and ethylene – vinyl acetate plastics where they input as low den- sity polyethylene (LDPE) and ethylene – vinyl acetate (EVA) for finding the oils in which engine operates stably. Shikui Wu and Kaixiong Xu *et al.* [4] experimented on The co-cracking experiment and application route of waste plastics and heavy oil, in that the raw materials are heavy oils and waste plastics on temperature at 400 °C

and pressure not more than 2.0 MPa, and found that waste plastic and heavy oil has a better synergistic effect than pure heavy oil cracking. Abdul Wahab Ogunbiyi and Adeshola O. Open-ibo *et al.* [7] analyzed the Smelting of waste Nylon and low - den- sity plastics (ldps) in a fluidized bed system in this waste nylon and low density plastic feed as input in fluidised bed system and found out the excellent working performance. M. A. Hazrat and M. G. Rasul *et al.* [6] focused on Utilization of polymer wastes as trans- port fuel resources- a recent development where they found that pyrolysis process for waste plastic to fuel as LDPE and HDPE and lots of advantages as reduce the hazardous impact. Pappula Brid- jesh and Pitchaipillai Periyasamy *et al.* [10] experimented on MEA and DEE as additives on diesel engine using waste plastic oil diesel blends where they found out the engine performance and emission characteristics under different loads for different tests of fuels. For inputs in pyrolysis method high density poly- ethylene (HDPE), low density polyethylene, poly – ethylene terephthalate, polypropylene (PP) and polystyrene on temperature range 450–500 °C in 4–5 h. Leonidas Matsakas and Qiuju Gao *et al.* [5] reviewed on green conversion of municipal solid wastes into fuels and chemicals and found out in pyrolysis method tempera- ture 300 – 650 °C is suitable for plastic oil instead of traditional method as landfills and burning. Vikram Kathe and Akshay Gan- gurde *et al.* [2] found that Green Concrete using plastic waste such as polyvinyl chloride (PVC), polypropylene, polyethylene replacing sand in concrete minimizes difficulties of dumping and reduce environmental issues by plastic wastes. Rajkumar Joshi and Sira- juddin Ahmed *et al.* [3] found that the Status and challenges of

municipal solid waste management in India: A review in which they search the causes of health hazards in developing countries like India. Desideri [14] describe the sanitary land fill for potential analysis for energy conversion from waste. Muhmmad *et al.* [12] prescribed and introduced electronic reactor for small amount of production of fuel without much incineration. In Indian municipal solid waste

bottles, plastic cans and different types of plastics and their disposal methods as solid waste management and their chal- lenges in India. Over the years several wastes to wealth mechanism have been adopted to recycle and reuse innovative ways one such trend has been the conversion of plastic waste into fuel. Large number of research has been done in conversion of plastic waste into fuel by catalytic and non catalytic pyrolysis process of plastics.

Raw material
Pre treatment
Pyrolysis process
Filtration
Purification
Fuel testing
Analysis
Documentation

1.1. Major issues for disposal of plastic waste

- During polymerization process toxic fugitive emissions are released.
- Open burning of plastic waste is very common phenomenon in cities/town which generate toxic emissions such as carbon

monoxide, chlorine, hydrochloric acid, amines, nitrides, styrene, benzene, butadiene, CCL and acetaldehyde are pollute environment.

Non recycle plastic waste such as multi layered and metalized pouches/sachets and thermo set plastics like SMC/FRP etc pose

several disposal problems.

- Garbage mixed with plastic waste interferes in recycling and solid waste processing facilities and also cause problem in land fill operations.
- In India during the period of 2018–2019 on general total over 6000 tonnes per day of plastic waste generated in seventy major cities [11].

they will decompose at 450 °C to 550 °C. The resulting oil (mixture of liquid hydro carbons) is continuously distilled once waste plastics inside the reactor are decomposed enough to evap-

1.2. Fuel demand

The present rate of economic growth is unsustainable without saving of fossil energy like crude oil, natural oil or coal. John N. Hahladakis and Costas A. Velis *et al.* [8] Reviewed an overview of chemical additives present in plastics: Migration, release, fate and environmental impact during their use, disposal and recycling in that they found that the disposal methods are more accepted by means of changing in another energy.

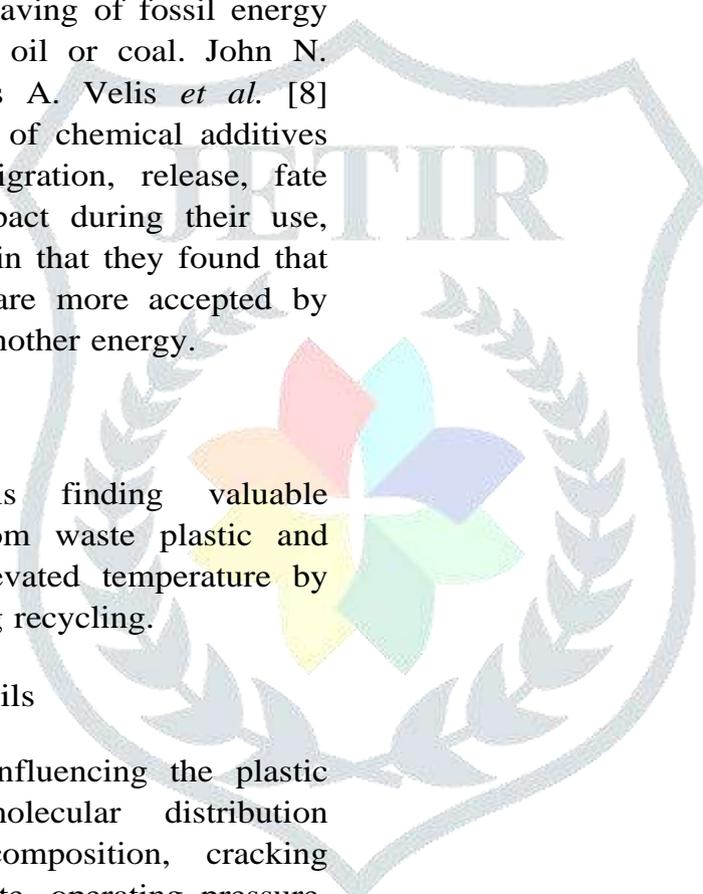
1.3. Objectives

Main objectives is finding valuable hydrocarbon fuel from waste plastic and catalyst mixture at elevated temperature by pyrolysis method during recycling.

2. Experimentation details

The major factors influencing the plastic pyrolysis product molecular distribution including chemical composition, cracking temperature, heating rate, operating pressure, reactor type and application of catalyst. Liquid fuel is defined plastic liquid hydro- carbons at normal temperature and pressure. PP, PS and PE are pre- pared for the feed stock of production of liquid hydrocarbons. The procedure of fuel synthesis of plastic waste is shown in Fig. 1.

The production method for the conversion of plastics to liquid fuel is based on the pyrolysis of plastics and condensation of result- ing hydrocarbon. For the production process of liquid fuel, the plas- tic that are suitable for the conversion are introduced into a reactor where



orate upon reaching the reaction temperature. The evaporated oil is further cracked with a catalyst; hydrocarbons are distilled from the reactor. Some hydrocarbons with high boiling points such as diesel, kerosene and gasoline are condensed in water called condenser.

The fuel collected in the collecting chamber will be impure, there will be wax, grease and other impurities, hence remove the impurities. In filtration process substance which are in colloidal state can be removed, the filter paper will allow the molecules which are smaller than its pores, will give more clean fuel. The purified fuel is to be tested to find out its characteristics, in order to interpret the quality and properties of fuel. Roopa Farshi and Ravishankar R *et al.* [1] experimented on Clay catalyst in PP and LLDPE conversion to fuel where they mixed Bentonite catalyst with polypropylene (PP) and linear low density polyethylene (LLDPE) in a batch reactor, in feed ratio 1:4 for getting fuel oil on temperature 430 – 450 °C up to 3 hrs and found all physical properties as density, specific gravity, flash point and fire point (Penske martin Apparatus), viscosity (Redwood Viscometer), calorific (Bomb calorimeter) of oil samples. Sadhan Kumar ghosh [13] described various issues and challenges of bio waste management. The various tests such as color, density, viscosity, calorific value, flash point, cloud

point, pour point and gas chromatography are to be conducted to find characteristics of plastic oil. The various technologies were developed to convert plastic waste into fuel. By using modern plastic pyrolysis technology, we could solve the waste plastic problem and also significantly reduce the landfills which are caused of infertility of agriculture land, waste plastics can also become a very good source of energy and an alternative to fissile fuel which have caused an environment imbalance.

3. Conclusion

Wonder technology fixes such as pyrolysis for recycling plastic to fuel and green energy from waste are therefore offered up as the future solution. For if such machineries were capable of simply sustainability correcting plastic into fuel of energy. Plastic Pyrolysis has great potential to convert plastic waste into oil to achieve maximum economics and environmental benefits. From literature review, recycling of plastic pyrolysis is the best method to resolve the issues of good alternative fuel and waste plastic management. The current union government focus on waste management vis Swachh Bharat Abhiyan also addresses the issues of plastic waste and ways with which the problem could be dealt with. The government takes some initiation to start pyrolysis plant for convert plas-

tic waste in to fuel and insist to implement all municipal corporation and corporation cities in India.

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