

Polythene Pollution Management by Converting them into Fuel

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Abstract

Energy has many forms such as electricity, transportation fuel and so on. A large amount of energy is produced from crude oil, Energy consumption in the G20 increased by more than 5% in 2010 which is used to produce petroleum and petroleum to produce daily usable plastics. Over 500 billion pounds of new plastic is manufactured each year and roughly 33% of that is single use and thrown away. Considering 70% of total plastic consumption is discarded as waste, thus approximately 5.6 million tons per annum (TPA) of plastic waste is generated in India alone, which is about 15342 tons per day (TPD). Only 8% of waste plastic is recycled in the U.S., 15% in Western Europe, and much less in developing countries, this reuse of plastic could potentially keep enormous amounts of plastic out of landfills and out of the oceans. In developing countries, due to economic growth as well as changes in consumption and production patterns, the increase in use of plastics has been higher than the world average and waste plastics are becoming a major waste stream. Waste plastics are often found to be as litter across cities; they are burnt, buried or disposed of in open dumps along with other waste. The solution to the above mentioned problems can be solved through the utilization of the new develop technology. This new developed technology will remove these hazardous waste plastics from the environment and convert them into eco friendly liquid fuel. The process is used to convert these waste plastics into liquid fuel creates no harmful emissions and can be produced at a very little overall cost. We need to stop polluting our oceans with plastic before it is too late, and start collecting all plastics suitable for this new fairly simple technology, a technology that is available now.

Polyethylene (abbreviated PE) or polythene (IUPAC name polyethene or poly(methylene)) is the most common plastic. It is used worldwide as synthetic fiber, polyester, packaging material, soft drink containers, etc. Many kinds of polyethylene are known, with most having the chemical formula $(C_2H_4)_n$. Thus PE is usually a mixture of similar organic compounds that differ in terms of the value of n . The increased demand and high prices for energy sources are driving force to convert organic compounds into useful hydrocarbon fuels. Waste plastic disposal and excessive use of fossil fuels have caused environment concerns in the world. Both plastics and petroleum derived fuels are hydrocarbons that contain the elements of carbon and hydrogen. The difference between them is that plastic molecules have longer carbon chains than those in LPG, petrol, and diesel fuels. Therefore, it is possible to convert waste plastic into fuels. The main objectives of this study were to understand and optimize the processes of plastic pyrolysis for maximizing the diesel range products, and to design a continuous pyrolysis apparatus as a semi-scale commercial plant. Pyrolysis of polyethylene (PE), polypropylene (PP), and polystyrene (PS) has been investigated both theoretically and experimentally in a lab-scale. We have tried a simple and economically viable process to decompose the hydrocarbon polymers of waste plastic into the shorter chain hydrocarbon of liquid fuel. Initial tests with several widely used polymers indicate a high potential for commercialization. Clearly there is growing interest in doing something different with waste plastic than dumping it in landfills or the oceans. The global community must force itself to change its present path and become truly concerned about the environment in which its descendents will be raised, for what people do today affects everyone tomorrow.

The thermal process utilized to break down the hydrocarbon chains of the polymers and convert them into liquid fuel. A Steel reactor with temperature range from 100 °C to 400 °C is utilized for the plastic thermal degradation process in general. At lab scale we have used simple glassware in sealed form. The process yield about 80-90% liquid product. The experiment is conducted under a fume hood and open air system, no vacuum process is applied in this particular thermal cracking process. Polyethylene chips and pellets are used in the experiment. Titanium Dioxide (TiO_2) was used as a catalyst with a ratio of 50:1 (for better yield the other catalyst like Al_2O_3 , Al_2O_3/SiO_2 may also be used). The oil was of yellow colour having obnoxious odour and burnt completely.