THERMOLYSIS OF WASTE PLASTICS TO LIQUID FUEL

Mr. Manoj Kumar Dewangan, Dept. of Mechanical Engineering

Dr. C.V. Raman University, Bilaspur

Abstract

The current pace of economic growth is unsustainable without saving fossil fuels such as crude oil, natural gas or coal. Humans must therefore depend on alternative / renewable power sources such as biomass, hydropower, geothermal energy, wind energy, solar energy, nuclear energy, etc. On the other side, an appropriate waste management strategy is another significant element of sustainable development. Recycled plastics remains to advance with a broad spectrum of old and new techniques. The article examines the accessible literature in this field of active research and identifies gaps that need further attention.

Key words: fossil fuel, plastic waste, recycle.

Introduction

Plastics is ' ' one of the greatest innovations of the millennium " and has certainly proved their reputation to be true. There are a number of ways plastic is and will be used in the years to come. The fact that plastic is lightweight, does not rust or rot, low cost, reusable and conserves natural resources is the reason why plastic has gained such popularity. Plastics save energy and Carbon dioxide emissions during their use phase. If, in all applications, we were to replace all plastics with the prevailing mixture of alternative materials and look from a life-cycle perspective, then 22.4 million additional tons of crude oil per year would be required. The fast pace of plastic consumption throughout the globe has resulted to an increase in the amount of waste, which, in turn, presents higher problems for disposal. This is due to the reality that the life span of plastic waste[1], [2] is very low (about 40 per cent of the life span is less than 1 month) and, depending on the region of implementation, the service life of plastic products varies from one month to the next thirty-five years.

Methodology

Pyrolysis is usually described as regulated combustion[3] or heating of a material in the lack of oxygen. In plastic pyrolysis, the macromolecular structures of polymers[4] are broken down into smaller molecules or oligomers and sometimes into monomeric units.

Thermal pyrolysis of polyolefins

Non-catalytic or thermal pyrolysis[5] of polyolefins is a high energy, endothermic process requiring a temperature of at least 350–500 ºC. In some research, temperatures as high as 700–900 ºC are crucial for the achievement of good product returns. A large amount of these heat cracking research is conducted on polyethylene, polystyrene, and polypropylene. Generally, thermal cracking results in liquids with a low octane value[6] and greater residue content at mild temperatures, resulting in an inefficient fuel range production method. Gaseous products produced by heat pyrolysis are not appropriate for use as fuel products and require further refining to be upgraded to useable fuel products. A few scientists have tried to enhance the heat pyrolysis of waste polyolefins without the use of catalysts; however, these modifications have either brought significant improvements or added another level of complexity and cost to the scheme.

Conclusion

According to present statistics, there is a constant increase in consumption and therefore in the price of petroleum, although there has been a temporary decrease in demand development owing to the global financial crisis. However, the large quantity of plastic waste generated may be handled with a suitable technique for the production of fossil fuel replacements. The technique should be superior in all ways (ecological and economic). Thus, an appropriate method that can convert plastic waste to hydrocarbon fuel, if designed and applied, would be a cheaper partial replacement for petroleum without emitting any pollution.

References

[1] L. Rick, “An Introduction to Polypropylene Recycling,” *the balance small business*, 2019. .

[2] A. Amato, L. Rocchetti, and F. Beolchini, “Environmental impact assessment of different end-of-life LCD management strategies,” *Waste Manag.*, 2017.

[3] J. H. Zhou, C. S. Cheung, and C. W. Leung, “Combustion, performance, regulated and

unregulated emissions of a diesel engine with hydrogen addition," *Appl. Energy*, 2014.

[4] L. Hollaway, "Polymers," in *Construction Materials: Their Nature and Behaviour, Fourth Edition*, 2010.

[5] J. Yu, L. Sun, C. Ma, Y. Qiao, and H. Yao, "Thermal degradation of PVC: A review," *Waste Management*. 2016.

[6] N. Rankovic, G. Bourhis, M. Loos, and R. Dauphin, "Understanding octane number evolution for enabling alternative low RON refinery streams and octane boosters as transportation fuels," *Fuel*, 2015.