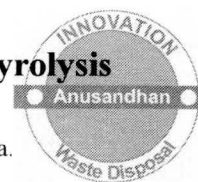


A Novel Technique to End Menace of Plastic Waste – Pyrolysis

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ABSTRACT

This paper proposes a technique that can kill two birds with one stone: It will put an end to the menace of non-biodegradable plastic wastes and discarded tyres which host dengue- and malaria-causing mosquitoes; and it will do so by recycling the plastic and tyres by breaking them into smaller molecules transforming them into usable fuel for industrial boilers and furnaces besides in generating electricity. The proposal is for setting up plastic and discarded tyres recycling units which uses a technique called pyrolysis. The term Pyrolysis has its genesis in the Greek word 'pyro' meaning "fire" and 'lysis' meaning "separating". The thermal cracking or pyrolysis degrades the polymeric or plastic materials by heating them in the absence of oxygen at temperatures ranging from 450-600 degree Celsius.

I INTRODUCTION

Pyrolysis is a chemical reaction which involves molecular breakdown of larger plastic molecules into much smaller ones in the presence of heat ranging between 4500 Celsius and 6000 Celsius. But it has to be done in the absence of oxygen to prevent burning that is extremely harmful for health and environment.

The chemical process of heat-induced breaking down of plastic molecules leads to smaller molecules that lead to the formation of pyrolysis oil, gas and carbon black. "The plastic thus recycled turns into a carbonised char and a volatile fraction that may be separated into condensable hydrocarbon oil and a non-condensable high calorific value gas,

Its constructively reusable potential ensures that civic authorities are not posed with the huge problem of dealing with non-biodegradable plastic wastes and discarded tyres, nor have to worry about dumping those at landfills.

It is important that the heating process is done in the absence of oxygen - because oxygen can burn the plastic and tyres, to release toxic gases like dioxins, furans, mercury and polychlorinated biphenyls into the atmosphere. The burning of polyvinylchloride (PVC) liberates hazardous halogens and pollutes air and adversely impacts the climate. The toxic substances pose a threat to vegetation, human and animal health, and the environment.

II RECYCLING UNITS

Burnt plastic releases another toxic gas, polystyrene, which affects the human central nervous system. The hazardous brominated compounds act as carcinogens and mutagens.

Dioxins settle on the crops and in waterways where they eventually enter the human food chain and the body system, she explained.

It is proposed that recycling units using the pyrolysis technique be set up at ward-level in the city and village-level across the state to ensure that non-biodegradable plastic waste is not only completely eliminated but also reused positively without harming the environment in any manner. Ideally this model can be replicated across the country.

The management of municipal solid waste such as plastic is at the core of increasing concerns over city's municipal waste management system. Further detailed study can be carried out on the various aspects of plastic recycling through pyrolysis, effective solid waste disposal and explore the feasibility of generating bio-diesel from municipal plastic waste.

Much of the ongoing efforts at solid waste management in big cities are not directed towards the non-biodegradable wastes and their proper recycling. According to a study over 91 per cent of municipality solid waste being collected daily across Indian cities make their way to landfills, dumping yards or open lands. The pyrolysis units can take care of agricultural, domestic and plastic wastes and recycle them into useful by-products which can also be sold or disposed appropriately.

III ALARMING SITUATION

A new report by World Economic Forum and Ellen MacArthur Foundation released recently has predicted that by 2050, there will be more floating plastics in oceans than fish. Keeping in view of the gravity of the plastic menace the focus needs to shift to plastic recycling especially its thermal utilisation. A manufacturer in India could be identified who matched the needs for treating waste and provides the lab scale prototype which would be further scaled up to community level. This unit will be used to produce industrial plastic oil and the product will be analyzed in the lab for important parameters such as quality check. Japan, USA, UK and China manage their plastic wastes by extracting fuel from plastic solid waste. In India's

context, fuel from plastic can be an alternative sustainable fuel. However, there is a need for more study and research into the fuel from recycled plastic, says the environmental scientist. As per a United Nations Environment Programme (UNEP) estimate in 2007 global plastic waste accounted for over 250 million tonnes. That number is said to have gone up many times more since as the unmanaged plastic waste pose a serious threat to the earth and its fragile eco-system and environment. Not being biodegradable and with low density, plastic is a very difficult waste to dispose of in a landfill.

IV PLASTIC PYROLYSIS

Plastic and tire pyrolysis involves subjecting plastic/tyres to high temperature of 400 to 450 degree Celsius, in the absence of oxygen. That is because if oxygen is present the plastic will start burning.

During pyrolysis plastic or discarded used tyres break down into smaller molecules of pyrolysis oil, pyrolysis gas and carbon black.

Like plastic and tyres, pyrolysis end products are also hydrocarbons. Pyrolysis is great way of recycling waste plastics and tires.

V CONCLUSIONS

- (a) Recycles synergy of waste plastic and tire into usable fuel, Offers renewable energy source.
- (b) The end-product can be used as fuel in existing industrial boilers and furnaces and also for generating electricity.
- (c) It eliminates hazard of land pollution by waste plastics and tyres.
- (d) It converts waste into energy, Clears dumping yards and environment of non-biodegradable plastic and tyre wastes.