

## Utilization of Waste Plastic to Save the Environment

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### ABSTRACT

Go green & go green is the prime demand of the environment. In this paper we will discuss the way to get green environment by utilizing the waste plastic. The use of plastic is essential today, so it is not the matter of concern today whether it can be used or not, the main matter of concern is the utilization of plastic wastes. For fulfilling this objective plastic waste should be converted into resources e.g. it can be used as fuel, landfill, in energy generation & for making road. Small business can be started to buy this plastic wastes to save the environment. Hence according to the environmental desire, by following the above discussed things with proper waste management we may hope about a clean and green environment. Plastics have now become indispensable materials in the modern world and application in the industrial field is continually increasing. The properties of the oil derived from waste plastics were analyzed and found that it has properties similar to that of diesel. Waste plastic oil (WPO) was tested as a fuel in a D.I. diesel engine and its performance characteristics were analyzed and compared with diesel fuel (DF) operation. It is observed that the engine could operate with 100% waste plastic oil and can be used as fuel in diesel engines.

Keywords: Plastic Waste, Waste Plastic Oil, Plastic Road.

### 1. INTRODUCTION

The term "global warming" refers to the increase in the average temperature of global surface air and oceans. Global Warming has adverse effect on environment and it is increasing day by day. So in order to reduce global warming it's necessary to think about something. Greener technology is the best way to solve this problem [1]. Green technology means to develop new methods to use natural environment and resources which reduces negative impact of human activities.

With the increase in generation, use of plastic is increasing and plastic waste becoming a major obstacle to greener technology. Waste plastic is often the most visible component in waste dump and landfill. Recent studies says to us that plastics remain 4500 years long on the earth and since plastic waste is growing rapidly hence the improper disposal of plastics causes problems as distant as breast cancer, reproductive problems in humans and animals, genital abnormalities and much more. Plastics wastes are found in different forms which almost 5% of the municipal solid wastes which is toxic in nature. It is a common sight in both urban and rural areas to find empty plastic bags and other type of plastic packing material littering the roads as well as drains. Due to its biodegradability it creates stagnation of water and associated hygiene problems [2]. So this paper will concern about, sources of plastic wastes, how plastic waste affects the environment and how we can utilize the plastic wastes.

The plastic consumption is shown in table 1

Table1. Plastics consumption, by major world areas, in kg and GNI dollars per capita:

Main world areas	Plastics consumption, 000s tons	Population, millions	Kg/capita	GNI/capita
Europe W, C, E	40 000	450	90	18 000
Eurasia, Russia, others	4 000	285	14	1 600
North America	45 000	310	145	32 000
Latin America	11 000	500	22	3 500
Middle East, incl. TR	4 000	200	20	2 500
Africa, North & South	2 500	190	13	2 000
Other Africa	500	610	<1	300
China	19 000	1285	14	800
India	4 000	1025	4	450
Japan	11 000	125	90	35 000
Other Asia Pacific, rest	13 000	1120	11	600
Total world	154 000	6 100	25	5 200

## 2. NEED FOR THE STUDY

- 1) Disposal of waste plastic is a major problem.
- 2) It is non-biodegradable.
- 3) Burning of these waste plastic bags causes environmental pollution.
- 4) Dump yard and waste pits mainly consists of low-density polyethylene.
- 5) To find its utility of waste plastic in road construction.
- 6) To know about all the application of waste plastic

## 3. SOURCES OF PLASTIC WASTE [4]

There are many sources of plastic waste, municipalities are one of them. The term municipal solid waste (MSW) describes those waste materials that are collected by the municipality itself or by the authorized organization. The municipal solid wastes come from residential, commercial, institutional and industrial sources MSW consists of waste materials such as news paper, cans and bottles, food waste, food packaging, clothing, appliances, yard wastes, household hazardous waste, corrugated boxes, office papers and plastics film etc. MSW normally does not include processing residuals from the industry as this material has residual value and most of the industries will know the commercial method to dispose this material of some value. The respective part of each category in the MSW stream differs in various communities. Plastic wastes and plastic recycling can be classified as follows:

**Waste Plastic:** Consists of plastic resin or product that must be reprocessed or disposed of

**Industrial Plastic:** waste is generated by various industrial consumers.

**Post consumer Plastic:** waste is generated by the consumer.

**Nuisance Plastic:** Wastes are those that cannot be processed under the existing knowledge and technology.

**Scrap Plastic:** Waste is generated by fabricators or converters and can be re-processed. Waste plastics are recycled by four methods viz. primary recycling, secondary recycling, tertiary recycling and quaternary recycling is the processing of scrap plastics in to same or similar types of products of scrap plastics in to plastic goods with less demanding properties. In case the plastic wastes does not possess requisite quantity; tertiary processing of the waste done to recover chemicals. Unrecyclable waste is finally converted in to energy under controlled conditions.

Fig-1 shows the flow of plastic waste, most of the plastic wastes generated by the resin manufacturer, compounder, fabricator, converter, distributor and recyclers. The consumer generates only nuisance plastics generated by industrial sectors in landfills or in incinerator.

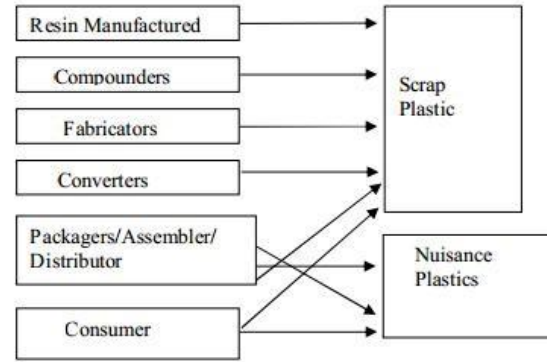


Fig. 1: Sources of plastic waste

## 4. INCORRECT PLACE FOR PLASTIC WASTE

Due to ignorance of the people, the plastic waste that can be a source of resources were thrown at wrong places which is responsible for pollution of environment and creates problem to the health of human beings living around those places [5]. It is also hazardous to the animals. Indiscriminate throwing of plastic cause accidental ingestion by the animals, that causes blockage of the digestive system, leads to bloat even death. The plastic waste causes landfill and incineration. Here are some self explanatory figures of waste and the plastics [6]



Fig. 2: Plastic waste at wrong places



Fig. 3: Plastic waste at wrong places



Fig. 4: Plastic eaten by animals

## 5. PLASTIC WASTES AS RESOURCES

- The reprocesses will use the pallets for manufacturing.
  - Plastic wastes can be used for energy generation.
  - Plastic wastes can be used for landfill.
  - Waste Plastic Oil as A Diesel Fuel in The Diesel Engine
  - It can be used for making road [7]
- Among all the resources we will discuss about some.

### 5.1. PLASTIC WASTE FOR LANDFILL

20-25% of landfill weight is plastics. Landfills are most common way to dispose of Municipal Solid Waste (MSW) in the US, with an overall increase in MSW consistent with increases in the population. Plastics made up only 1% of MSW in 1960. This has increased to 12% (30 million tons) in 2008. 43% of this is containers and packaging, 22% is nondurable goods, and 35% is from durable goods. This means that 11.3 million tons of just containers and packaging end up in landfills each year.

Most people agree that recycling is a preferred method of dealing with plastics. However, only 24% of municipal waste is recycled and 9% is composted, for a total of only 33% of waste that is recovered.

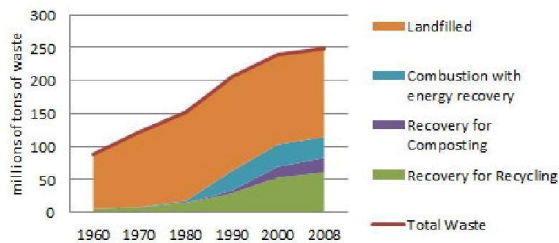


Fig. 5: Plastic waste in different stages

### 5.2. PLASTIC OIL IN DIESEL ENGINE

There are two series of waste plastic cracking. The first series of polymer cracking experiments was carried out in a glass reactor at atmospheric pressure and in a temperature range 350-420°C, the second one in autoclaves under hydrogen pressure (~3-5MPa) in temperature range 380-440°C. The application of catalyst results in lowering of polymers cracking

temperature, density of obtained liquid and increased the gas fuel yield. The main problems with the use of neat plastics oil in diesel engines are high smoke levels and relatively low thermal efficiency due to high viscosity and carbon residue as compared to diesel[9]. But it is concluded that the engine performance is Good.

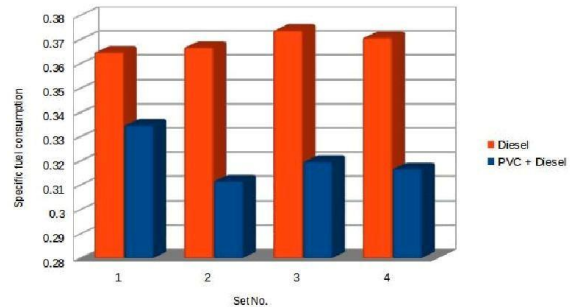


Fig. 6: Comparison of specific fuel consumption

In this above bar chart it is showned that the rate of fuel consumption of PVC+Disel fuel is less than the pure Disel. And further more in the bar chart which is shown in below showed that the thermal efficiency of PVC+Disel fuel is more than pure Disel. So it will be a great opportunity to make the plastic waste as a good fuel mixture known as plastic oil.

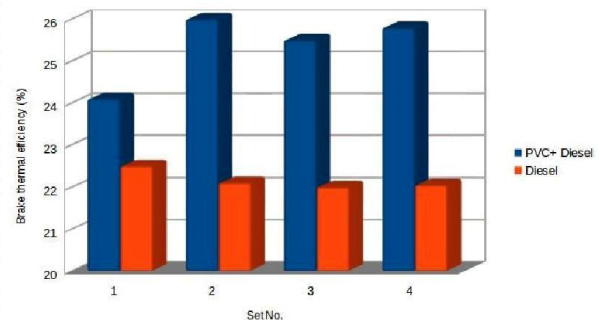


Fig. 7: Comparison of Brake thermal efficiency

In this regard Senthilkumar Tamilkolundu et al.[3] investigated Total Fuel Consumption (TFC), Brake Power (BP), Specific Fuel Consumption (SFC) and BT) for PVC/diesel oil Brake Thermal Efficiency.

### 5.3. PLASTIC WASTE FOR MAKING ROAD

UNEP has developed a programme on integrated solid waste management to support capacity building and technology transfer [7]. In order to contain this problem experiments have been carried out whether this waste plastic can be reused productively in the construction of roads [8]. The experimentation at several institutes indicated that the waste plastic, when added to hot aggregate will form a fine coat of plastic over the aggregate and such aggregate, when mixed with the binder is found to give higher strength, higher resistance to water and better performance over a period of time.





Fig. 8: Plastic waste road



Fig. 9: Plastic waste road in Bangalore

## 6. CONCLUSION

In the full paper we discuss about the sources and incorrect places of plastic wastes, also mentioned the application area of plastic waste. By the proper utilization of plastic waste in the mentioned area we can hope for a green environment. Now a day's plastic waste is a common phenomenon in our daily life. If we can properly utilize this waste & make them as a handy one then we can save our nature as well as we can be benefitted economically. In fine we can say that Bangladesh is one of the wasteful countries so the proper authority should have the necessary steps for waste minimization for this point of view this papers information will be beneficiary one.

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