International Journal of Recent Engineering Research and Development (IJRERD)
ISSN: 2455-8761
www.ijrerd.com || Volume 02 – Issue 10 || October 2017 || PP. 75-83

Extraction of Diesel from the Plastic Wastes

Sourabh M. Hanji
Student, KLS's Gogte Institute of Technology, Belgavi, Karnataka, India

Abstract: Different advances are being created to beat the disadvantage of plastics, in particular, their Non-biodegradability. In spite of the fact that work has been done to make advanced biodegradable plastics, there have not been numerous definitive strides towards tidying up the current issue. Reusing waste plastics into reusable plastic items is a customary system took after to address this issue for quite a long time. However this procedure has not given noteworthy outcomes as Cleaning and isolation of waste plastics was discovered troublesome. Over 100 million tons of Plastics are created yearly around the world, and the utilized items have turned into a typical Feature at flooding containers. Plastics is set in a landfill, it turns into a carbon sink, Incineration, impact heater, gasification are very little refreshing answer for the issue, as Toxic gasses are created and their cost of generation is very high. Pyrolysis of waste plastics into fuel is extraordinary compared to other methods for moderating significant oil assets notwithstanding Protect nature. This procedure includes synergist debasement of waste plastic into fuel Range hydrocarbon i.e. petroleum, diesel and lamp oil and so forth. A synergist splitting procedure in which Waste plastic were broken at high temperature, the subsequent gasses were consolidated to recuperate fluid powers. Kind of plastics likewise impact the rate of transformation of into fuel and the Results of this procedure are observed to be superior to other exchange techniques which are utilized for the transfer of waste plastic.

Keywords: Plastic wastes, Diesel, Reusing.

1. Introduction

The first plastics were developed in 1862, but a later invention really got the New Zealand plastic industry started. A German inventor Adolph Spitteler discovered a dairy product named casein in the 1890s. In the early 1900s New Zealand was already a major dairy producer, manufacturing butter and cheese for the world. This meant there was an abundance of skim milk and curds, which apart from being used for pig feed, was often thrown out. As far as we know the first casein was produced in a Rapanui factory near Wanganui in 1912. Taranaki dairy representatives had earlier visited England to look at the skim milk waste problem and came up with casein as the solution. By 1914, 22 dairy factories were making casein in Taranaki and the Waikato. The last of these was closed in 1945. Casein was used in England to produce: glues, pens, knife handles, and buttons [1].

The First Conservators. Somewhat surprisingly to many people, the plastics industry had its origins in conservation — long before conservation was a popular cause[1].

Billiard Balls. Last century billiard balls were made from ivory from the tusks of elephants. In the 1860's billiard ball manufacturers in the United States became concerned because elephants were being shot in large numbers in Africa to harvest the ivory, thus rapidly depleting the potential supply. One firm in America offered a prize of $10,000 to anybody that could come up with an alternative to ivory.

John Hyatt, an American chemist, produced a ball coated with celluloid (cellulose nitrate + camphor). Celluloid was one of the first plastic products to be developed. It had a major drawback - because of its nitrate content it was highly inflammable and explosive.

For a long time movie pictures were also produced on celluloid. Today Celluloid has largely been superseded by more modern materials there are a few that remain like table tennis balls — along with a limited number of items such as knife handles and spectacle frames.

Plastic pollution involves the accumulation of plastic products in the environment that adversely affects wildlife, wildlife habitat, or humans. Many types and forms of plastic pollution exist. Plastic pollution can adversely affect lands, waterways and oceans. Plastic reduction efforts have occurred in some areas in attempts to reduce plastic consumption and promote plastic recycling. The prominence of plastic pollution is correlated with plastics being inexpensive and durable, which lends to high levels of plastics used by humans.

Plastic pollution has the potential to poison animals, which can then adversely affect human food supplies. Plastic pollution has been described as being highly detrimental to large marine mammals, described in the book Introduction to Marine Biology as posing the "single greatest threat" to them. Some marine species, such as sea turtles, have been found to contain large proportions of plastics in their stomach. When this occurs, the animal typically starves, because the plastic blocks the animal's digestive tract. Marine mammals sometimes become entangled in plastic products such as nets, which can harm or kill them.

Over 260 species, including invertebrates, have been reported to have either ingested plastic or become entangled in the plastic. When a species gets entangled, its movement is seriously reduced, therefore making it very difficult to find food. Being entangled usually results in death [2, 3, 4] or severe lacerations and ulcers. It has been estimated that over 400,000 marine mammals perish annually due to plastic pollution in oceans. In 2004, it was estimated that seagulls in the North Sea had an average of thirty pieces of plastic in their stomachs.

2. Leterature

In 1600 BC, Mesoamericans used natural rubber for balls, bands, and figurines. Early plastics were bio-derived materials such as egg and blood proteins, which are organic polymers. Treated cattle horns were used as windows for lanterns in the middle Ages. Materials that mimicked the properties of horns were developed by treating milk-proteins (casein) with lye. In the 1800s, the development of plastics accelerated with Charles Goodyear's discovery of vulcanization as a route to thermoset materials derived from natural rubber. Many storied materials were reported as industrial chemistry was developed in the 1800s. In the early 1900s, Bakelite, the first fully synthetic thermoset was reported by Belgian chemist Leo Baekeland. In 1933, polyethylene was discovered by Imperial Chemical Industries (ICI) researchers Reginald Gibson and Eric Fawcett. After the First World War, improvements in chemical technology led to an explosion in new forms of plastics; mass production began around the 1940s and 1950s. Polypropylene was found in 1954 by Giulio Natta and began to be manufactured in 1957.Among the earliest examples in the wave of new polymers were polystyrene (PS), first produced by BASF in the 1930s, and polyvinyl chloride (PVC), first created in 1872 but commercially produced in the late 1920s.In 1954, expanded polystyrene (used for building insulation, packaging, and cups) was invented by Dow Chemical. Polyethylene terephthalate (PET)'s discovery is credited to employees of the Calico Printers' Association in the UK in 1941; it was licensed to DuPont for the USA and ICI otherwise, and as one of the few plastics appropriate as a replacement for glass in many circumstances, resulting in widespread use for bottles in Europe. The development of plastics has come from the use of natural plastic materials (e.g., chewing gum, shellac) to the use of chemically modified natural materials (e.g., rubber, nitrocellulose, collagen,galalite) and finally to completely synthetic molecules (e.g., bakelite, epoxy, Polyvinyl chloride)[5].

A brief outline of plastics development in the world[1].

1862 Alexander Parkes developed "Parkesine" - cellulose nitrate.

1907 Dr Leo Baekeland developed "Bakelite" - phenol formaldehyde.

1912 First casein factory opened in Ranganui.

1920 Hermann Staudinger developed the theory of "polymers".

1926 Bunting & Co Brushmakers of Christchurch import celluloid & casein plastic sheets for hair & clothes brushes. Bakelite sheets were imported to cut and drill for radio receivers.

1930s Low density polyethylene, polystyrene, polyvinyl chloride commercially developed.

1932 Andersons Ltd engineers in Christchurch bought a hydraulic press to mould imported bakelite. One of the first orders was for 5,000 telephone earpieces for the Post and Telegraph Department.

1936 H C Urlwin Ltd in Christchurch started moulding electric iron connectors and flush switch parts. Buttons (NZ) Ltd began producing cast resin, casein, and compressed moulded buttons in addition to the wooden and pearl types already being made.

1936 H C Urlwin Ltd started making coloured plastic tableware and picnic sets. Fears Brush Company started producing plastic toothbrush handles in Auckland.

1941 Optoplast Ltd was established in Wellington producing plastic bullet tips under contract from the Munitions Controller.

1942 Up till 1943 most plastic mouldings were thermosets but thermoplastic moulding was increasingly being used. Plastic manufacturers, compression moulding machines and injection moulding machines continued to grow in numbers.

1944 Plastics Institute of New Zealand (PINZ) was formed. There were 10 founding member companies. The founding Chairman of the Plastics Institute was Mr Harry C. Urlwin, affectionately known as the "Father" of plastics in New Zealand.

1946 The Biro pen was invented.

1950s High density polyethylene and polypropylene commercially developed.

1950 The first New Zealand plastic pipe and tube extruders started business.

1950 An electrical iron handle won the Industrial Award, a hand mirror the Fancy Goods Award, an egg tray the Household Award and Lawn Bowls the Sports Section in the first New Zealand design moulding competition.

1960s Global production reached over 4 million tonnes per annum.

1962 By 1962 the New Zealand industry had:
86 Injection Moulding Machines
101 Compression Moulding Machines

52 Extrusion Machines

21 Vacuum Forming Machines

In addition there were also an unknown number of forming and sheet processors, foam plants, fibreglass processing equipment and fabric coating plants.

1970s International production grew by around 3 million tonnes per annum until the early 1970s when the first oil crisis caused a drop in global annual production from 42 million to 38 million tonnes. Rapid growth resumed in the mid-seventies. Many innovations and products were developed over this period - one was the first plastic toilet - with cisterns, seats and fittings all made out of Polypropylene.

1980s In the mid-1980s, the plastics industry in New Zealand was a protected, mainly domestically focused sector. Its fortunes initially dropped away in the late 1980s as protection was removed, but recovered with the national economy after deregulation of the labor market, and the economic reforms in the period between 1986 and 1993.

1990s Considerable investment in new plant and technology took place from 1990, so that New Zealand's plastic products became competitive in both commodity and added value markets. The growth over the three years to 1994 was not matched in 1995, as some slowing down in economic growth occurred, coupled with an increase in the value of the New Zealand dollar. Production increased in 1996 and 1997. Continued increasing production rates, product innovation and rapidly developing technologies in resource and energy recovery. Global production now stands at about 110 million tonnes.

2000s National production now exceeds 200,000 tonnes each year. Global plastics production has now reached 155 million tonnes. With no local resin manufacturing capacity, the industry continues to take advantage of duty-free entry of raw materials from any part of the world. The small home market has meant for many processors the need to be able to engineer small production runs at short notice, and this experience is now being exploited in a number of areas for overseas customers. Given the small size of the domestic population base, the industry will continue to look overseas to expand its markets and is already succeeding in niche market areas [1].

3. Methodology

The Diesoil process takes unwanted mixed plastic waste excluding PVC. This plastic is shredded and cleaned and then it enters a process called cracking. Basically here the molecules are cracked and then vaporized. Following the cracking, products are then taken through a condenser where they are liquefied. During the process some gas is produced, which is then re-used in the process to power the machine. Due to this and other techniques, Diesoil claims its process produces no emissions or pollution of any sort.

Using technology developed in Germany and in conjunction with our global partners in Europe, Waste Tech Industries have a solution to our dependency on fossil fuels and the misuse of recyclable waste that is going into land fill and incinerators all over the world. Using Fractional Depolymerisation, our facilities can convert most waste oil and plastic waste (plastic to diesel) into the highest quality synthetic EN 590 diesel fuel for heating or transportation.

3.1 Heating Element:

Heating process occurs in several methods. The main two methods are,

- Resistance Heating
- Induction Heating

The heating is directly proportional to the Current Flow Rate, Time value of Resistance or Inductance variables Power supply is a reference to a source of electrical power. A device or system that supplies electrical or other types of energy to an output load or group of loads is called a power supply unit or PSU. The term is most commonly applied to electrical energy supplies, less often to mechanical ones, and rarely to others.

3.2 Electrical power supplies

This term covers the power distribution system together with any other primary or secondary sources of energy such as: Conversion of one form of electrical power to another desired form and voltage. This typically involves converting 120 or 240 volt AC supplied by a utility company (see electricity generation) to a well-regulated lower voltage DC for electronic devices. Low voltage, low power DC power supply units are commonly integrated with the devices they supply, such as computers and household electronics. For other examples, see switched-mode power supply, linear regulator, rectifier and inverter (electrical).

- Batteries
- Chemical fuel cells and other forms of energy storage systems
- Solar power

- Generators or alternators (particularly useful in vehicles of all shapes and sizes, where the engine has torque to spare, or in semi-portable units containing an internal combustion engine and a generator) (For large-scale power supplies, see electricity generation.)

Constraints that commonly affect power supplies are the amount of power they can supply, how long they can supply it without needing some kind of refueling or recharging, how stable their output voltage or current is under varying load conditions, and whether they provide continuous power or pulses. The regulation of power supplies is done by incorporating circuitry to tightly control the output voltage and/or current of the power supply to a specific value. The specific value is closely maintained despite variations in the load presented to the power supply's output, or any reasonable voltage variation at the power supply's input. This kind of regulation is commonly categorized as a Stabilized power supply.

3.3 Power supply types

Power supplies for electronic devices can be broadly divided into linear and switching power supplies. The linear supply is a relatively simple design that becomes increasingly bulky and heavy for high current devices; voltage regulation in a linear supply can result in low efficiency. A switched-mode supply of the same rating as a linear supply will be smaller, is usually more efficient, but will be more complex.

3.4 Finding a Use for Waste Gases.

Crude oil is separated into its component parts by fractional distillation. Crude oil was initially processed to extract petrol, diesel oil and greases, and for a long time the gases left had no use and was simply burned off. Scientists then turned their attention to finding a use for this final 40% of the crude oil. Included in this fraction is ethylene (ethene) and a number of other gases. Many of these gases — especially ethene — are the monomers (or basis) from which synthetic plastics are made. Burning these gases would release a considerable amount of carbon dioxide into the atmosphere. By manufacturing synthetic polymers a major pollution problem has been averted. Today the global plastics industry still only uses an estimated 4% of all the oil consumed.

3.5 Changing Raw Materials.

While most modern plastics are based on petro chemical raw materials - this was not always the case. The very first natural polymer used was horn. The plastics extruder was invented in 1847 to utilize rubber and gutta percha (tropical tree gums) to protect and insulate the first submarine telegraph cables. The first synthetic plastic material was “Parkesine” - invented by Alexander Parkes and first displayed in 1862. Parkesine was cellulose nitrate made from cotton wool and nitric acid.

At the turn of the century, casein plastics were invented - based on casein protein that was extracted from skim milk. Casein could be highly coloured and was hardened with formaldehyde to form buttons and buckles. In 1907 a Belgian born scientist Dr. Leo Baekeland made phenolformaldehyde from coal tar - a by-product from the extraction of gas from coal — and formaldehyde. It is credited as the first truly synthetic plastic - since it was not a modified “natural” material. Baekeland called his product “Bakelite” - and for a long time “Bakelite” and “plastics” were synonymous. In the 1920’s the first commercial production of Rayon or artificial silk was carried out. In the early 1930’s urea formaldehyde was developed - and in the mid 1930’s melamine formaldehyde was developed - both as alternatives to the original Bakelite. It was not until the 1930’s that synthetic plastics were manufactured from petro chemical raw materials. Nylon was discovered in 1928 and came into production in the late 1930’s. Polystyrene and Poly vinyl chloride also came into production in the 1930’s. Most other common plastics were added in the 1940’s & 50’s. The modern plastic industry is based almost solely on synthetic plastics from petrochemical raw materials. It has progressed from small beginnings in the 1930’s to be a 155 million tonne industry. Plastic material is any of a wide range of synthetic or semi-syntheticorganic solids that are moldable. Plastics are typically organic polymers of high molecular mass, but they often contain other substances. They are usually synthetic, most commonly derived from petrochemicals, but many are partially natural.

4. Diesel

Diesel products are useful materials derived from crude oil (diesel) as it is processed in oil refineries. Unlike petrochemicals, which are a collection of well-defined usually pure chemical compounds, diesel products are complex mixtures. The majority of diesel is converted to diesel products, which includes several classes of fuels.

According to the composition of the crude oil and depending on the demands of the market, refineries can produce different shares of diesel products. The largest share of oil products is used as "energy carriers", i.e.

various grades of fuel oil and gasoline. These fuelsinclude or can be blended to give gasoline, jet fuel, diesel fuel, heating oil, and heavier fuel oils. Heavier (less volatile) fractions can also be used to produce asphalt, tar, paraffin wax,lubricating and other heavy oils. Refineries also produce other chemicals, some of which are used in chemical processes to produce plastics and other useful materials. Since diesel often contains a few percent sulfur-containing molecules, elemental sulfur is also often produced as a diesel product. Carbon, in the form of diesel coke, and hydrogen may also be produced as diesel products. The hydrogen produced is often used as an intermediate product for other oil refinery processes such as hydrocracking andhydrodesulfurization.

5. Heaters and Heat Loss

Heaters are devices used to heat a variety of materials. Heaters are available in many unique sizes, shapes, and heating configurations.

5.1 Band Heater

Band heaters are ring-shaped heating devices that clamp around a cylindrical element. Heat transfer from band heaters occurs via the conductive method. Most band heaters will clamp around the outer diameter of a cylindrical element and heat the element from the outside, but some may clamp around the inner diameter of a pipe. Cable and coil heaters are heating elements formed from straight (uncoiled) segments of round, square, or rectangular heating cable. Straight cable may be formed into simple coils, spiral, sinuate, star wound, or other patterns.

5.2 Cartridge Heater

Cartridge heaters are generally used in immersion applications. However, due to the compact cylindrical shape of cartridge heaters, they can also be used in a variety of other applications.

5.3 Ceramic Fiber Heater

Ceramic fiber heaters consist of a heating element integrated with a thick layer of ceramic fiber insulation. This type of industrial heater is available in cylindrical and flat configurations.

5.4 Curculation Heater

Circulation heaters are used primarily to heat moving, flowing, or circulating fluid streams. Fluid flows through the heater, which transfers heat to the stream.

5.5 Drum Heater

Drum heaters are used to heat drums of various sizes, or the materials within. Drum heaters can heat many different substances, such as honey, wax, grease or other viscous solutions.

5.6 Duct Heater

Duct heaters are used to heat moving gas streams. The heater is installed in the middle of a moving air / gas stream, and heats the air as it moves through the heater. A duct heater can also be used to radiantly heat an object at the end of a moving gas stream.

5.7 Flexible Heater

Flexible heaters are devices that may be formed to fit a variety of items. Flexible heaters are constructed from no rigid materials such as rubber or neoprene. Most flexible heaters can be bent around small radii, and can be bent more than once without damaging the internal heating elements.

5.8 Immersion Heater

Immersion heaters are used in applications where it is necessary to immerse a heater in the substance being heated. Flange and screw plug immersion heaters are equipped with pipe threads, flanges or similarly convenient mounting mechanisms. Over-the-side heaters are immersion heaters that hang over the side of a tank of heated material. Over-the-side heaters are available in a variety of configuration options, which are designed to work optimally with fluids of specific viscosity.

5.9 Radiant Heater

Radiant flat panel heaters are used to heat objects via radiant heat transfer, usually infrared. Radiant heater elements are replacement heater elements used with radiant flat panel heaters and radiant reflective heaters. Replacement elements are of the same types and configurations used in full heating systems. Radiant reflective process heaters use a reflective shield to direct radiant heat onto a heated surface. Many radiant reflective process heaters are so precise that heat can be directed to pinpoint locations. Radiant reflective process heaters are used in food service, as well as in a variety of other applications.

5.10 Strip Heater

Strip heaters are clamped onto objects and used to heat a variety of different materials. Strip heaters can also be used as radiant heaters. Many strip heaters (when used as radiant heaters) come with finned strips to maximize surface area and heat transfer to the air

6. Control of Heat Loss

Losses may be divided into three categories

- Optical losses
- Radiation losses.
- Conduction and convection losses.

Conceptual methods of controlling these losses are listed and discussed the following sections.

6.1 Optical Losses

Optical losses are defined here as those, which reduce the amount of, heat being absorbed by the collector. They are “off the top” as apposed to the heat loss after the absorption by receiver

Optical losses are reduced by

6.1.1 Low Reflectivity Covers

At normal incident glass reflects about 4.3% of the incident solar radiation at each glass to air interface and 1.3% is absorbed in the glass. Reflection losses are doubled when incident is 60 above from the normal. This can be controlled by light etching may thus only 2 or 3 percent of incident radiation is reflected.

6.1.2 High Transmissivity Covers

Green tinted glass may leave extinction co-efficient of 0.8 per inch, which means 10% energy will be absorbed in 8 inch of glass. However clean glass has 0.2 per inch i.e., 25% absorbed. This may double at incidence of 60% and thus increased absorbed energy of the collector plate is not considered as a loss, but the increased temperature of the glass plate prevents loss of heat from the collector.

6.1.3 High Absorptivity Covers

Absorptivity of the collecting surface is the weighted average of energy absorbed at all wavelength of the incident solar radiation. Absorptivity ‘a’ is related to reflectivity ‘r’ by

$a=1-r$

The absorbed energy is increased by the reflection of glass. Fraction of normally incident radiation.

Fe = 1.008 Ta

Where, T-effective transmittance of cover plate.

T and α should made closed unity and effort should not be taken to increase α beyond 0.95 where τ may be only 0.8. The Absorptivity of the plates may be high. But consideration should be taken to reduce the emissivity.

6.2 Radiation Losses

Methods used to control radiation loss may be classified as spectrally selective surfaces, radiation trapping surfaces and radiation shielding.

6.2.1 Spectrally Selective Surfaces

For any material under monochromatic radiation the sum of Absorptivity α (or emissivity ξ) The absorbing plate must be perfectly opaque (= 0) so only (or) need to be defined overall wavelength of interest. A selective surface is one for which Absorptivity and emissivity differs with respect to the wavelengths of solar radiation (shorter than 2 or 3 microns) and the wavelength of intra red radiation (longer than 2 or 3 microns). Thus, a surface may have an infrared emissivity much lower than solar absorptivity, when reduced will is also reduced. So, to produce a selective surface.

6.2.2 Thin Films

High reflectivity material of one visible light wave length (0.5 microns). The thickness is sufficient to absorb visible light efficiently and reflect long wavelength thermal radiation.

6.2.3 Geometric Trapping

A metallic surface is polished on 5 microns wavelength but pitted on the scale of 0.5 micron. So, it absorbs visible light.

A carbon black surface have = 0.95, = 0.95. But a selective surface example Nickel black has

= 0.94
= 0.97 is very good for application.

6.2.4 Radiation Trapping Systems

The losses can be controlled by use of honeycombs and cellular structure effectively increases absorptivity and reduces effective emissivity. Vee corrugations increase absorptivity by requiring the sunrays to undergo two or more reflections.

6.2.5 Radiation Shielding

The principle method of radiation shielding is the use of multiple cover plates between a hot surface and cold surface there is an effective heat transfer resistance, which depends on the emissivities and temperature of two surfaces. Some plastics may be more important in controlling convection loss than is controlling radiation losses.

6.3 Conduction and Convection Loss

When radiation loss from the collector is reduced convection quickly becomes dominant loss. Convection loss control unless plate to plate is reduced one half inch is less, and then conduction losses are dominant. The following concepts of conduction convection losses can be employed to control the heat loss.

6.3.1 Multiple Glazing

It can be closely placed in the order of one centimeter. However when air is stagnant in the air gap convection across gap ceases and only conduction remains. A small gap will stand a higher gradient before convection sets in, but conduction losses are inversely proportional to the width of the gap.

6.3.2 Honey Combs or Cells

The honeycombs are useful in the control of convection losses as well as radiation losses. In practice air gaps are of about 1.25 cm or less for temperature differences an order of 50° C. Experiments have shown that a 1cm calls just suppresses convection. Therefore the cells can be mode narrow C to prevent convection) and long (to reduce conduction).

7. Evacuation

At pressure in the range of 10^{-2} to 10^{-4} atmosphere convection is suppressed and the heat transfer is determining by conduction. However the thermal conductivity of air is not reduced until path of molecules becomes comparable to wall spacing. As a result for vacuum 10-^{5} to 10 atm thermal conductivity is reduced about 10% for another decade reduction in pressure (10 mm of Hg). The conductivity is about 1% of that of air at 1 atm.

A plastic material is any of a wide range of synthetic or semi-synthetic organic solids that are moldable. Plastics are typically organic polymers of high molecular mass, but they often contain other substances. They are usually synthetic, most commonly derived from petrochemicals, but many are partially natural Composition Most plastics contain organic polymers. The vast majority of these polymers are based on chains of carbon atoms alone or with oxygen, sulfur, or nitrogen as well. The backbone is that part of the chain on the main "path" linking a large number of repeat units together. To customize the properties of a plastic, different molecular groups "hang" from the backbone (usually they are "hung" as part of the monomers before the monomers are linked together to form the polymer chain). The structure of these "side chains" influence the properties of the polymer. This fine tuning of the properties of the polymer by repeating unit's molecular structure has allowed plastics to become an indispensable part of the twenty-first century world.

8. Additives

Most plastics contain other organic or inorganic compounds blended in. The amount of additives ranges from zero percentage for polymers used to wrap foods to more than 50% for certain electronic applications. The average content of additives is 20% by weight of the polymer[citation needed]. Fillers improve performance and/or reduce production costs. Stabilizing additives include fire retardants to lower the flammability of the material. Many plastics contain fillers, relatively inert and inexpensive materials that make the product cheaper by weight. Typically fillers are mineral in origin, e.g., chalk. Some fillers are more chemically active and are called reinforcing agents. Since many organic polymers are too rigid for particular applications, they are blended with plasticizers (the largest group of additives), oily compounds that confer improved rheology. Colorants are common additives, although their weight contribution is small. Many of the controversies associated with plastics are associated with the additives. Organizing compounds are particularly toxic.

9. Classification

Plastics are usually classified by their chemical structure of the polymer's backbone and side chains. Some important groups in these classifications are the acrylics, polyesters, silicones, polyurethanes, and halogenated plastics. Plastics can also be classified by the chemical process used in their synthesis, such as condensation, polyaddition, and cross-linking.

There are two types of plastics: thermoplastics and thermosetting polymers. Thermoplastics are the plastics that do not undergo chemical change in their composition when heated and can be molded again and again. Examples include polyethylene, polypropylene, polystyrene and polyvinyl chloride.[6] Common thermoplastics range from 20,000 to 500,000 amu, while thermosets are assumed to have infinite molecular weight. These chains are made up of many repeating molecular units, known as repeat units, derived from monomers; each polymer chain will have several thousand repeating units.

Thermosets can melt and take shape once; after they have solidified, they stay solid. In the thermosetting process, a chemical reaction occurs that is irreversible. The vulcanization of rubber is a thermosetting process. Before heating with sulfur, the polyisoprene is a tacky, slightly runny material, but after vulcanization the product is rigid and non-tacky. Other classifications are based on qualities that are relevant for manufacturing or product design. Examples of such classes are the thermoplastic and thermoset, elastomer, structural, biodegradable, and electrically conductive. Plastics can also be classified by various physical properties, such as density, tensile strength, glass transition temperature, and resistance to various chemical products.

Biodegradable plastics break down (degrade) upon exposure to sunlight (e.g., ultra-violet radiation), water or dampness, bacteria, enzymes, wind abrasion, and in some instances, rodent, pest, or insect attack are also included as forms of biodegradation or environmental degradation. Some modes of degradation require that the plastic be exposed at the surface, whereas other modes will only be effective if certain conditions exist in landfill or composting systems. Starch powder has been mixed with plastic as a filler to allow it to degrade more easily, but it still does not lead to complete breakdown of the plastic. Some researchers have actually genetically engineered bacteria that synthesize a completely biodegradable plastic, but this material, such as Biopol, is expensive at present. Companies have made biodegradable additives to enhance the biodegradation of plastics. Most plastics are produced from petrochemicals. Motivated by the finiteness of petrochemical reserves and threat of global warming, bio plastics are being developed. Bio plastics are made substantially from renewable plant materials such as cellulose and starch. In comparison to the global consumption of all flexible packaging, estimated at 12.3 million tonnes/year, estimates put global production capacity at 327,000 tonnes/year for related bio-derived materials. Some plastics are partially crystalline and partially amorphous in molecular structure, giving them both a melting points (the temperature at which the attractive intermolecular forces are overcome) and one or more glass transitions (temperatures above which the extent of localized molecular flexibility is substantially increased). The so-called semi-crystalline plastics include polyethylene, polypropylene, poly (vinyl chloride), polyamides (nylons), polyesters and some polyurethanes. Many plastics are completely amorphous, such as polystyrene and its copolymers, poly (methyl methacrylate), and all thermosets.

10. Conclusion

Various technologies are being developed to overcome the drawback of plastics, namely, their Non-biodegradability. Though work has been done to make futuristic biodegradable plastics, there have not been many conclusive steps towards cleaning up the existing problem. Recycling waste plastics into reusable plastic products is a conventional strategy followed to address this issue for years. However this technique has not given impressive results as Cleaning and segregation of waste plastics was found difficult. Over a 100 million tones of Plastics are produced annually worldwide, and the used products have become a common Feature at overflowing bins. Plastics is placed in a landfill, it becomes a carbon sink, Incineration, blast furnace, gasification are not much appreciated solution to the problem, as Toxic gases are produced and their cost of production is quite high. Pyrolysis of waste plastics into fuel is one of the best means of conserving valuable petroleum resources in addition to Protect the environment. This process involves catalytic degradation of waste plastic into fuel Range hydrocarbon i.e. petrol, diesel and kerosene etc. A catalytic cracking process in which

Waste plastic were cracked at very high temperature, the resulting gases were condensed to recover liquid fuels. Type of plastics also effect the rate of conversion of into fuel and the Results of this process are found to be better than other alternate methods which are used for the disposal of waste plastic.

References

[1] http://www.aoteaplas.co.nz/technical/history_of_plastics_in_new_zealand
[2] Laist, D. W., "Impacts of marine debris: entanglement of marine life in marine debris including a comprehensive list of species with entanglement and ingestion records," In Marine debris: sources, impacts and solutions (eds J. M. Coe & B. D. Rogers), pp. 99–141. Berlin, Germany: Springer., 1997.
[3] Derraik, J. G. B. "The pollution of the marine environment by plastic debris: a review. Mar. Pollut. Bull. 44, 842–852. (doi:10.1016/S0025-326X(02)00220-5). 2002.
[4] Gregory, M. R. "Environmental implications of plastic debris in marine settings"—entanglement, ingestion, smothering, hangers-on, hitch-hiking and alien invasions. Phil. Trans. R. Soc. B 364, 2013–2025. (doi:10.1098/ rstb.2008.0265). 2009.
[5] http://www.omnitek.nl/plastics
[6] http://www.ssiproject.com/mechanical_projects
[7] http://en.wikipedia.org/wiki/Plastic#History