



Assessment Of Plastic Pollution of Dholpur City (Rajasthan), India

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ABSTRACT

Polyethylene has become the most important polyolefin plastic with excellent mechanical properties, processing properties and chemical stability. It is used in the production of film, packaging and pipe. However, the non-polar property and low rigidity limit its application in certain fields. The new progresses of chemical and physical modification upon polyethylene are reviewed. The former includes graft modification, chlorination, copolymerization modification, cross linking modification, Chlorosulfonation modification and plasma modification. There are different methods of polyethylene production which include high-, medium- and low-pressure polyethylene. All three methods had their own benefits and shortcomings which coexist in the industry.

Keywords: High pressure, Production process, plasma modification.

Introduction

Polyethylene products are very common in our daily life. For examples food and pharmaceutical packaging film, wire and cable insulation and pipe. Therefore, the production of polyethylene is humongous as is one of the most popular used polymer materials in day-to-day life. A large number of products could be manufactured from plastic which include plastic bags, plastic film and milk barrels which are suitable for hollow molding, injection molding and extrusion of various products. For instances, various containers, cable cladding, pipe, profile and sheet. Polyethylene is among the top five world's largest productions and consumptions of synthetic resin. The main varieties are low-density polyethylene (LDPE), high-density polyethylene (HDPE) and linear low-density polyethylene (LLDPE). In 2002, the production capacity of polyethylene in the world had reached 68,517,000 t/a, of which Western Europe accounted for ~20%, North America accounted for ~30%, and Japan accounted for ~5%. Beside Japan, the Asia-Pacific region accounted for ~24%, Africa/Middle East accounted for 12% whereas Central and South America accounted for ~4%. In 2001, the global operating rate had dropped to less than 80% due to the rise in the prices of global production and raw material as a result of economic slowdown. In 2002, as the recovering of the global economy, the polyethylene operating rate restored ~80%

Structure of polyethylene -

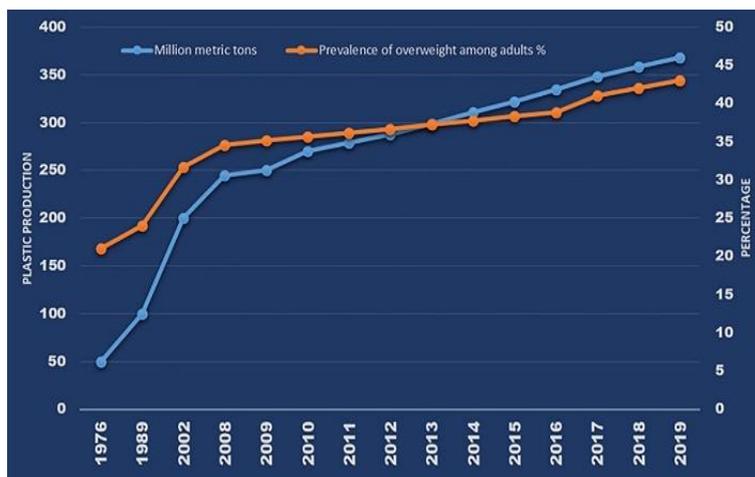
Polyethylene (PE) is a type of plastic. The plastic bags that we get from the supermarket are made of it. Although PE has the simplest structure of the polymer, it is still the most widely used polymer material. PE is synthesized by polymerization of ethylene ($\text{CH}_2 = \text{CH}_2$). Polyethylene in the industry development PE is the most widely used variety of synthetic resins in China. It is mainly used to make high-frequency insulating materials such as film, container, pipe, monofilament, wire, cable and many other daily necessities. With the development of petrochemical industry, PE production has been in rapid development with a production accounting for ~1/4 of total plastic production. The rapid expansion of China's economy had created a favorable environment for the development of synthetic resin industry. PE industry was expected to Rapid increase in production capacity and production row at a faster rate.

Polyethylene usage is a promising synthetic material with great physical and chemical properties. It has high degree of mechanical properties and excellent combination of good dielectric properties. In addition, the molding process is good and the price is low. They are particularly important in following aspects:

- (1) Electrical insulation Due to its high stability, moisture resistance and high dielectric properties, it is an excellent material in the making of insulation material in electrical, non-electrical engineering and many other relevant aspects.
- (2) Anti-corrosive agents Packaging Can be used for anti-corrosive materials such as pipes, lining and so on.
- (3) PE sheet has properties of low-density, soft, water impermeable, high tear strength and chemical resistance. These characteristics are necessary for packaging materials hence PE film has a high market value in the packaging industry and is gradually replacing celluloid.
- (4) After radiation treatment, PE

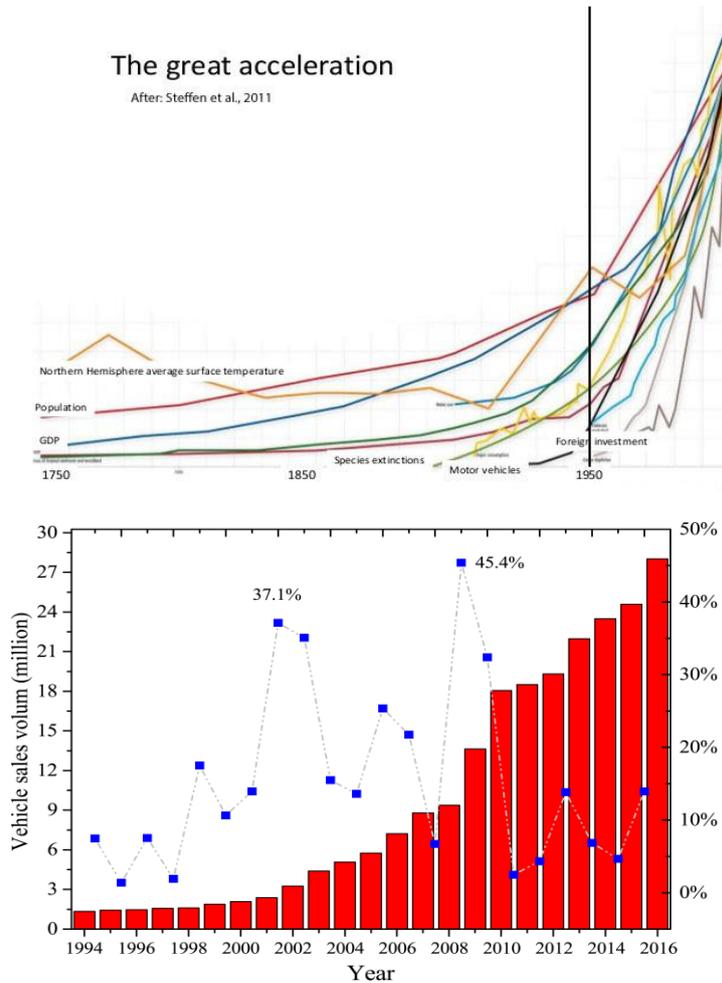
- (i) is hard to deform;
- (ii) Will not produce environmental stress cracking;
- (iii) Has strong elasticity;
- (iv) Has excellent electrical insulation and solvent resistance;
- (v) Has high temperature resistance;
- (vi) Has low power factor. Hence the greater performance after radiation puts it into a wider range of uses.

For examples: insulating materials for capacitors and transformers and higher temperature parts in aircraft. However, the cross-linking reaction of PE during radiation results in difficulty to undergo subsequent processing. In addition to the above-mentioned purposes, there are other uses such as various medical equipment, spraying metal, wood, fabric and other materials. HDPE can be used as rubber reinforcing agent.



Polyethylene Properties:-

Polyethylene physical properties Ethylene is transparent in the film state but is opaque in the presence of massive blocks due to a large number of crystals inside and strong light scattering. The degree of PE crystallization is affected by the number of its branches. The more branches, the more difficult to crystallize. The melting temperature of PE crystal is also affected by the number of branches, distributed in the range from 90 to 130 °C. PE Monocrystals can generally be prepared by dissolving HDPE in Xylene at 130 °C or higher. PE is a white waxy translucent material which is soft, tough, lighter than water, non-toxic and has excellent dielectric properties. It is flammable and continued to burn after the fire. Its water permeability is low and the organic vapor transmission rate is larger. The transparency of PE decreases with the increase of crystallinity. Under certain crystallinity, the transparency increases with the increase of molecular weight. HDPE melting point ranges from 132 to 135 °C, LDPE at ~112 °C. At room temperature it is not soluble in any known solvent whereas at 70 °C or greater it can be dissolved in toluene, amyl acetate, Trichlorethylene and other solvents



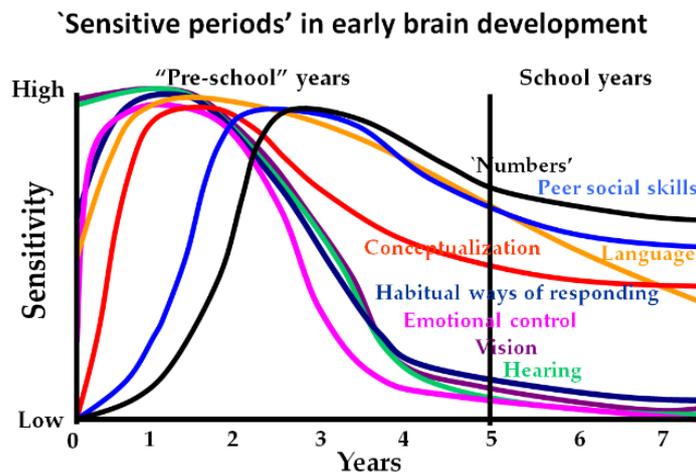
Production methods: -

1. High-pressure method:

High-pressure method uses oxygen or peroxide as the initiator to polymerize ethylene. The ethylene is fed into the reactor by secondary pressure and is polymerized into PE at a pressure of 100 to 300 MPa and at a temperature of 200 to 300 °C under the action of an initiator. The reaction is separated by pressure and the unreacted ethylene is recovered and recycled. PE in the addition of plastic additives creates granulation after extrusion.

2. Low-pressure method:

Polymerization by the low-pressure method, liquid phase method (also divided into slurry and solution method) and gas phase requires a pressure of below 2 MPa. General steps are the preparation of the catalyst, ethylene polymerization, polymer separation and granulate on.



Graph developed by Council for Early Child Development (ref: Nash, 1997; *Early Years Study*, 1999; Shonkoff, 2000.)

China is mainly using Ziegler catalyst slurry method. The most important gas phase bypasses the need for solvent recovery and polymer drying processes, saving 15% of the investment and 10% of the operating cost. Compared with the traditional high-pressure method, the investment is only 30% and the operating costs are only 1/6. Thus it has been a rapid development. However further improvement should be made for quality and variety in the gas phase

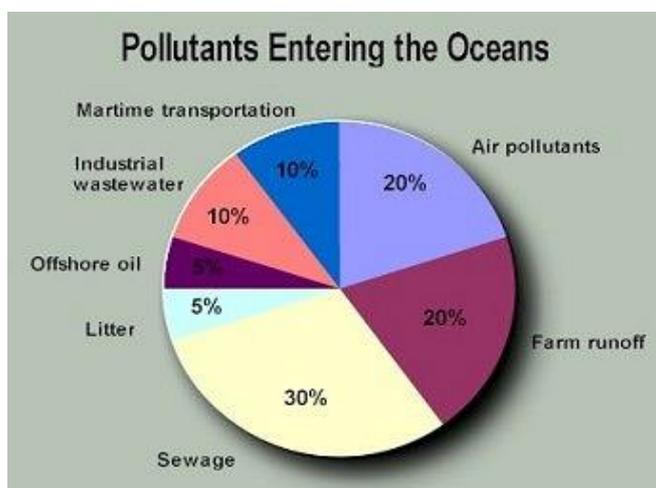


Features of polyethylene:

Its corrosion resistance and electrical insulation properties (especially high-frequency insulation) are excellent, but can be easily chlorinated, chemical cross-linked, irradiation cross-linking modified. Glass fiber reinforced with low-pressure polyethylene has lower melting point, great rigidity, hardness and strength, high water absorption, good electrical properties and resistance to radiation. Under higher pressure, it has good flexibility, elongation, impact strength and better permeability. High molecular weight polyethylene impacts strength and fatigue resistance. Ethylene is suitable for making corrosion-resistant parts and insulating parts while high-pressure polyethylene is suitable for making films. Polyethylene modified varieties

Chlorinated polyethylene: -A chlorine atom can be obtained by partially replacing the hydrogen atom in the PE with a chlorine moiety. Chlorination is carried out under the action of light or peroxide and is mainly produced by industrial suspension in the industry. Due to (i) the molecular weight of the raw material PE and its distribution, (ii) the degree of branching and chlorination, (iii) the distribution of chlorine atoms and (iv) the residual crystallinity, it is possible to obtain chlorinated PE of consistency varying from rubbery to hard plastic.

Chlorosulfonated polyethylene When PE reacts with chlorine containing sulfur dioxide, some of the hydrogen atoms in the molecule are replaced by chlorine and a small amount of sulfonyl chloride ($-SO_2Cl$) groups to give Chlorosulfonated PE. The main industrial system is the suspension method. Chlorosulfonated PE is resistant to ozone, chemical corrosion, oil, heat, light, abrasion and tensile strength.



Blending modified varieties- The LLDPE and LDPE after blending can be used for processing films and other products. PE and ethylene-propylene rubber blends can be used to produce a wide range of thermoplastic elastomers.

Metallocene Polyethylene -Metallocene PE is a novel thermoplastic which resembled the 90's polyolefin industry's most important technological progress following the LLDPE production. Since it uses metallocene as polymerization catalyst to produce PE, the performance of the traditional Ziegler-Natta catalyst polymerization in production of PE is therefore significantly different. Metallocene catalyst in the synthesis of metallocene PE is unique and has excellent performance and application. This had aroused widespread concern in the market and many of the world's leading petrochemical companies had invested huge manpower, material resources competing development and research



Result: -

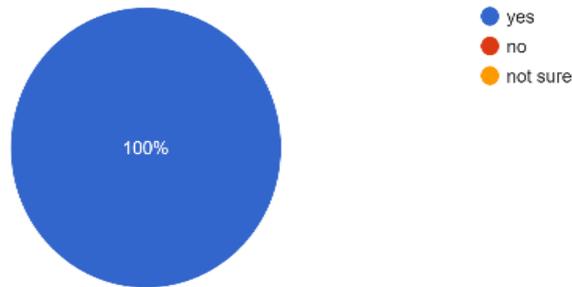
To measure the plastic pollution in the Dholpur city we have adopted the survey method for this we have prepared a Google form and circulate it to the public about 150 respondents have given their views related to the plastic Pollution in the Dholpur City related to the Questionnaire.

Responding result about Plastic Pollution are shown here in the form of chart. The link is given below.

https://docs.google.com/forms/d/e/1FAIpQLSd8KwAKsK2oMUHnJofxF4Mo1G87VFinggnHKJHJk_xwXLQ3bQ/viewform?usp=header

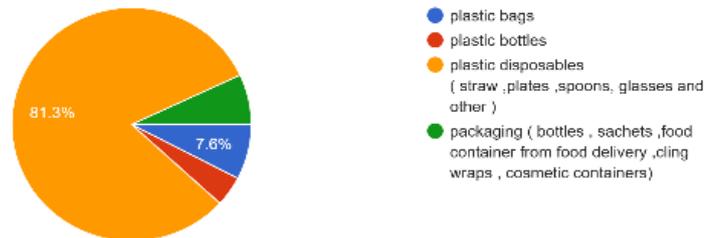
do you think plastic waste is a problem for health and environment ?

145 responses



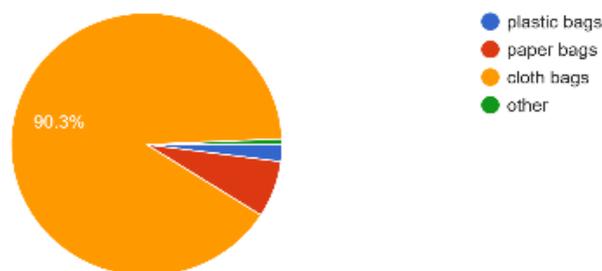
which plastic products do you use most often ?

144 responses



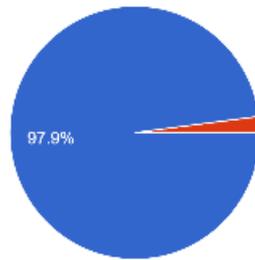
which types of bags do you prefers for shopping ?

144 responses



do you think we can recycle plastic ?

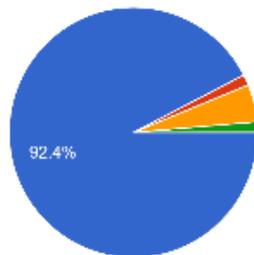
145 responses



- yes
- no
- no idea

do you carry your own bag for shopping

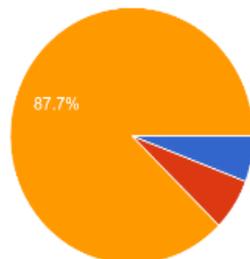
145 responses



- yes
- no
- sometimes
- usually

is not why ?

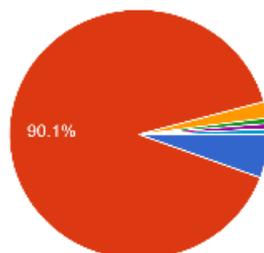
138 responses



- i usually forget
- i got plastic bag for free
- i am not concerned with the type of bag i use for shopping

if the shopkeeper gives you plastic carry bag, what is your reaction?

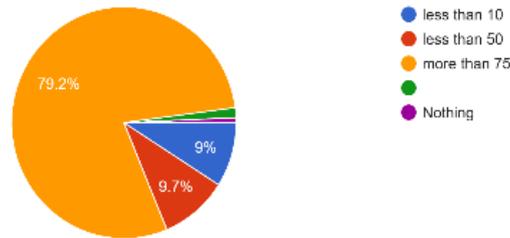
142 responses



- accept it always
- i get always and ask for paper/ cloth bags
- i am not concerned with the type of bag i use for shopping
- Get that
- Not Defined

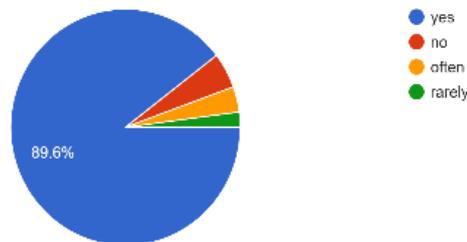
How many disposable plastic items get generated per month from the house?

144 responses



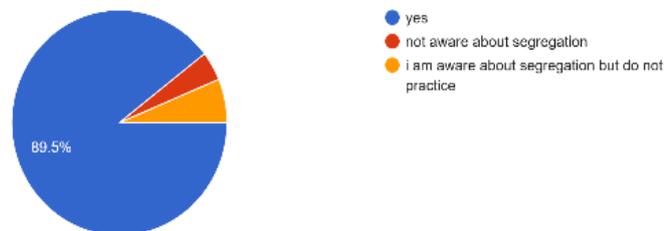
Do you reuse plastic carry bags?

144 responses



Do you segregate biodegradable and non biodegradable waste in your house?

143 responses



Discussion:

Plastic waste is big problem for environment and health. We should prefer cloth bags for shopping and 97.7 % people responded that we should recycle plastic. 90.1 % people responded that if shopkeeper gives you plastic carry bag, what's your reaction than we get and ask for paper cloth bags. How many disposable plastic items get generated per month from the house than 79.2 % people responded more than 75 and 89.6 % people responded that we reuse plastic carry bags. This could include reducing single-use plastics, recycling, and extended producer responsibility laws.

How can we address the health risks of plastics? This could include research into the effects of micro plastics on human health (2019), in study about awareness about single use plastic hazards observed that, there was no statistical difference in awareness about plastic hazards in male and females, employed, unemployed and housewives. But there was statistical difference in awareness between graduates and non-graduates, young adulthood and middle adulthood, lower class and middle class and nuclear family and joint family.

Conclusion

- Plastic pollution is caused by the accumulation of contaminated. Plastic materials in the environment.
- Plastic is a non-bio-degradable substance.
- Plastic wastes enter the water like rivers, seas and even the sea and pollutes our water very much.
- This water is then supplied to our areas.

- Plastic contaminations have many negative effects. They are not limited to one part of the ecosystem.
- Environment is affected and this results in the loss of biodiversity.
- We have seen how plastic pollution is increasing day by day. Due to its non-biodegradable nature use of it are responsible for various damage to the environment. In today's modern life use of it has become fashion irrespective of understanding its harmful effect.

Solutions

- * Reduce plastic consumption
- * Recycle responsibly
- * Support sustainable initiatives
- * Advocate for change
- * Improve waste management
- * Promote sustainable alternatives
- * Use waste plastic to create different product

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