

Recycling of Plastics for a Better Tomorrow

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Abstract: Correct Packaging for any food product is an important aspect and it should be done with intense care and plastics are the ideal choice. Multilayered Packaging materials are widely used in packaging industry in order to combine the physical properties of different substances to get an ultimate product. It is an excellent concept to increase the durability of plastic by arranging multiple layers of two or more components. Tetra Pak is one of the best packaging available in India, because it is easy to recycle. This review provides information about the recycling of Tetrapak, Multilayered plastic and Polystyrene. In addition, an effort is made to show the current status of polystyrene recycling.

Keywords: Multilayered, Tetrapak, Durability, Recycling.

I. INTRODUCTION

Plastics are probably the best material available in our globe in terms of cost, availability, and compatibility, but in India certain individuals think that plastics are destructive as they do not know the real scientific fact. Plastics are widely used in food industries because plastic packaging is very flexible and adaptable form of packaging which permits the manufacturers to customise its shape, size and standard as per the customer's requirement, also, plastic packaging is capable of bearing extreme climatic conditions and hence it is used for palletising and for products like Ice-cream which have to stay under extreme wear and tear, and cold temperatures respectively. In history, packaging mostly consist of single material and in many situations this concept works absolutely fine, such as for Aluminium cans, PET, Soda bottles or for glass containers, however, they have limitations that prevent their broader utilization: glass is a fragile and heavy, aluminium can tends to leak under heavy pressure but, sometimes they are unable to provide sufficient oxygen barrier for a plethora of food products and causes problems like rancidity, so multi-layered plastics are used to prevent all the above stated problems as it combines the individual properties of the components which are used in make itself. Different layers are placed in such a way that it gives a sustainable property relation, for instance: plastics are present on the outermost layer in order to give water proofing.

Multi-layered plastics are the one which consist of many layers, out of which minimum percentage belongs to plastic. Multi-layered plastics are heavy in demand and hence the resulting waste increases, it is the fault of those people who throw it anywhere in the city instead of dumping it in a dustbin.

2. RECYCLING FOR TETRAPAKS:

Tetra Pak cartons are mainly made from 75% paper board, 20% poly ethylene and remaining 5% by aluminium. These three material are layered together using thermal energy and pressure which ultimately forms a six layer shield which protect it from oxygen, dirt, air, moisture, and light. Helena Raclavska et al (2018), reported on the basics -of tetra Pak and stated that Tetra Pak is divided into medically clear form (for durable product) and non-aseptic (for pasteurised product). Medically clean form or aseptic cartons are made up of 6 layer (4 polyethylene 1 paper and 1 aluminium) whereas non aseptic carton consist of 4 layer out of which 1 layer is of paper and 3 layers are of polyethene. Aluminium protect the product against sunlight, polyethylene creates water proof packing and paper provides strength and some minerals are reinforced for strengthening of aseptic packaging, the mineral is calcite and the remaining is formed by talc and muscovite. Used Tetra Pak packs are taken to a paper mill. Paper mill recover virgin fibre from used pack by blending. The packs are transported into huge drum which is filled with water and the rotating blades separates paper fibre from polyethylene and aluminium. It is called as hydra popping. After hydra popping fibre is recovered and is rolled out into pulp sheets which are then used to make different grades of paper products. The residue remain is polyethylene and aluminium. By adding heat and high pressure to the resulting Poly aluminium, it is transformed in a tough light weight and attractive board which are useful for structural engineers and architect. Polyethylene is converted into fuel by electro-thermal process.

RECYCLING OF MULTILAYER PLASTIC:

The technology which uses the critical condition of water totally depends on use of water as a separating material and it is operated between the condition of its boiling point and its critical point is maintained by keeping pressure constant. A tube made up of stainless steel of known volume with Swagelok caps are combined to form a reactor. The Plastic aluminium laminated material is sample. Distilled water is fed to the reactor tube. The water is taken to lowest level and as further the reactor temperature increases the water evaporates and hence water volume increases and the excess volume of water is reduced in order to keep the pressure inside the reactor tube internal pressure unchanged and for monitoring process. Argon is a disinfect and is to the fed air out of the reactor volume before reaction starts and then the reactor tube is dipped in the salt solution of Potassium nitrate and Sodium nitrate. The reactor is rotated horizontally inside the salt bath with the help of a motor. The pressure inside the reactor tube is based on the data from the steam table and the super vertical water condition of the necessary temperature pressure and density is accomplished.

The reaction time is 10-30 minute and after the reaction the reactor is cooled with the help of water and the solid and aqueous material is separated. From this reaction we get, one part s of Aluminium foil and one is of Polymers.

A. Kulkarni et al. [3] in 2011 introduce a recycling of pure aluminium in a stainless tube in which Swagelok caps are used in a reactor.

RECYCLING OF PLASTIC WASTE FROM PYROLISIS PROCESS:

After the use of plastic bottles, they become waste, and this plastic waste pollute the environment in many different way, therefore it is necessary to recycle the plastic bottle. Recycling can be done from Pyrolysis process. J. Haydary et al. (2013), reported on the pyrolysis of Tetra Pak in a screw type reactor [1].

In material recycling process first the bottle have to be collected from homes, schools, markets and public places sites .Then every plastic bottle must be separated from elements like metals and glasses which people put into the recycled bins, after the separation process they are sorted by the type of plastic they are made from , It should be noted that plastics which are to be recycled must be free from any kind of food product or liquid product like Milk, so cleaning should be done with water, and after cleaning the waste plastic bottles they are crushed or cut into tiny pieces or are transformed in the shape of flakes with the help of thermal and pressure energies. Finally they are melted and ultimately they are transformed into tiny pellets. These pellets are sold to companies which melt these pallets in order to get new plastic products. This entire process can be done with the help of a reactor vessel. Commercially, reactor vessels used for the recycling process are Batch reactor, Semi-batch reactor and Continuous reactor. Wu and Chang (2001, Wu et al. (2003), Reyesetal (2000) and Grammelis et al. reported on kinetics of pyrolysis of tetra Pak [2]. Chemical recycling is a method in which same heat and pressure is provided to the waste plastic bottles, for converting them into petroleum and petrochemical raw material, it is also called as Thermal cracking. It also decomposes plastic bottles into Tera phthalic acid and ethylene glycol, however, this process is usually needs for the integrated flow of material.

SOLVENT PROCESS FOR RECYCLING OF POLYSTYRENE

It is one of the expanded form of plastic. It is a synthetic aromatic hydrocarbon polymer which is derived from the monomer styrene . A fire retardant is added for safety purpose, however, it highly toxic to aquatic animals, so it should be extracted safely from Polystyrene foam. A website has stated that the recycle process consist of dissolving the HBCD reinforced polystyrene foam into a solvent. The interaction results in the formation of two layers where the precipitate layer consist of HBCD which is dissolved in the solvent solution .This solvent is then evaporated and hence HBCD sets as a sludge. The process is carried out in a closed loop for a purpose of re-use. The HBCD remains chemically unchanged and is destructed further. The polystyrene is recovered and can be reused.

WHY RECLYCLING? –

There is a need for recycling of plastic products because it harms our environment such that it can adversely affect our future generations. So, recycling is the only way to keep the our future more safe and reliable.

CONCLUSION

This review summarised information about recycling of various plastic waste which are used in India, they were tetra pak , multi-layered plastic and polystyrene this review also showed information about pyrolysis process and solvent process and ultimately it tells about the need of Recycling plastic products.

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