

Presentation to The Industries Commissioner

Government of Gujarat

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PET Recycling – A Great Environmental Concern

Polyethylene Terephthalate (PET) is a widely employed polyester having several applications due to its high strength and its physical and chemical properties, particularly in Textiles and Packaging.

Industrially PET is obtained from two different raw materials via **Pure Terephthalic Acid (PTA)** and **Mono Ethylene Glycol (MEG)** through polymerization process.

With worldwide increase in population and increased per capita consumption of PET products, accumulation of its non-bio-degradable waste is generating a very big environmental and economic concern.

All sorts of PET waste are being either incinerated or are used for land filling or are spread on grounds, water, rivers, canals, and seas damaging natural environment and creating a non-conducive atmosphere for habitation of Humans, animals and marine bio-diversities.

Therefore, there is a growing interest in PET recycling technologies as PET & plastics can be recycled and reused.

Recycling Technologies can be grouped into two macro-categories: **Mechanical** and **Chemical** recycling.

Mechanical recycling is being mainly done by using bottle flakes, by waste sorting, removal of contaminants, crushing and grinding, and are directly sent to extrusion for producing generally low-grade fibers and filament.

This mechanical process often leads to thermo-oxidative and thermo-mechanical degradation, resulting in lower molecular and impure polymer formation.

Most importantly it limits the number of cycles the polymer cannot be subjected to further recycling process. De facto, after maximum one recycle, polymer no longer can be recycled and must be used for land filing.

Chemical recycling technologies are in accordance to sustainable development principles, bringing back waste to virgin PET raw materials, which of course are of much higher quality compared to mechanically recycled PET.

Chemical recycling involves depolymerization of the polyester by using reactants/ solvents and reclaiming basic/intermediate raw materials from PET chains. Chemical recycling is a process to convert polymer into its original or intermediate monomer form so that it can eventually be repolymerized and remade into a virgin state polymer.

Chemical recycling is the best way to achieve circular economy of PET as it does not limit the number of recycling for the same product.

Chemical recycling can be done either by Hydrolysis or Methonolysis or Glycolysis.

- Hydrolysis depolymerizes PET to Terephthalic Acid (TPA) and Ethylene Glycol (EG) by reaction with water.
- Methonolysis degrades PET to Dimethyl Terephthalate (DMT) and EG by reaction with methanol.
- Glycolysis causes depolymerization by reaction with EG, to produce bis (2hydroxyethyl) terephthalate (BHET), an intermediate formed at the first stage of PET production from the starting monomers.

Since PET is formed through a reversible polycondensation reaction, the polymer can be transformed back to its monomer or oligomers by shifting the reaction to the opposite direction by adding EG. This reverse reaction, called glycolysis.

Glycolysis of polyester waste generates polymerization intermediate BHET which is purified and repolymerized into polyester resin. It does not involve high handling of hazardous chemicals and is an energy saving process.

Environmental benefits of chemical recycling are low use of energy, low consumption of water and minimum generation of solid waste in comparison of production of virgin PET polymer.

There is one more underdeveloped Enzymatic process in which waste is subjected to suitable enzymes which breaks it into monomer. However, unimpeded availability of enzyme and its conversion ratio is still not established.

Filatex India Limited

Courageous Contribution towards World's Circular Sustainability

Filatex India Limited, Dahej is a PET continuous polymerization plant producing various kinds of PET Chips & Polyester yarns to the tune of 365000 Tons every year having a turnover of 4000 Cr and employing 4000 nationals.

We participated in the worldwide concern of PET & Plastic waste recycling and for last 3 years have been conducting various trials in our laboratory, R & D unit and a unique continuous running pilot plant of PET recycling.

Our R & D facility is registered with the Department of Scientific and Industrial research under the aegis of Ministry of Science & Technology.

We have invested more than **Rs.25 Crores** in the **last 3 years** in our research and installation of a pilot plant for continuous recycling of polyester waste.

We designed our own Glycolysis recycling technology and have obtained patent of this Intellectual property from government of India.

Our raw material inputs are Bottle waste flakes and Yarn/Fabric waste of all kinds and nature.

We are now envisaging to put up a large-scale industry for continuous PET recycling to the tune of 35000 Tons per year at Village Koliyad, Taluka Vagra, Dahej, Gujarat. (Land Procured).

This will be first of its kind project in India and even world over with this capacity for converting dream into reality for the vision of **CIRCULAR ECONOMY**.

The project is estimated at a cost of **Rs. 300 Crores** and will bring the world's best equipments and technologies under one roof to do the most economical Chemical recycling of PET.

Going with **GREEN** fundamentals we will use only Biofuels, Solar/wind energy and will be a world class **ZERO DISCHARGE** entity.