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Recycling of PET Clothes and Bottles

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Abstract: **- For industries that produce man-made textiles, managing waste disposal is a difficult problem. It has negative environmental effects and upsets the natural equilibrium. In the world, 70% of all synthetic fibre production is made up of polyester base fibres. Due to the fact that many researchers have been working on the creation of recyclable and pollutant-free textile materials, the development of man-made textiles is always influenced by the issue of recycling synthetic solid waste. This review article will concentrate on the techniques used in various textile companies throughout the world for recycling polyester fibre.**

***Keywords*- Pollutant, Recycling, Solid waste**.

I. INTRODUCTION

It is an important term used is different industries for reducing waste disposal in to environment. Now a days developed and developing countries aimed to reduce pre and post manufacturing waste and focused on recycling [Shukla et al., 2008; Paszun, D. and Spychaj, T., 1997]. One of the major advantage of recycling is to reduce the solid waste by converting it in to new product. It is very necessary that every man-made fibre production industry should focus on reducing waste of useful raw material, energy and reuse of waste chemical and polymer. Polyester polymer is mostly recycled all over the world these are fibers, bottles, films etc [Al-Salem et al., 2009].

II. PROCESSES FOR RECYCLING PET BOTTLES AND CLOTHES

1. Recycling mechanically.
2. Thermal recyclability.
3. Recycling of chemicals.
4. *Mechanical Recycling*

Humans have three essential needs: clothing, food, and shelter. As the population grows, so does the demand for clothing, which can only be met by creating man-made fibres. These days, the manufacture of PET fibre, textiles, and clothing is the only source of support for the entire world. Fabrics made of manufactured polyester cannot be melted back into polyester. It is a special technique to recycle waste polyester fabric by altering its shape to make it useable. For example, a shirt that has been torn can be used again by being turned into a pillow cover, or without altering the chemical composition, for other uses outside energy recovery or disposal. Collected waste material is shredded and converted in to yarn which can be used in manufacturing different value added articles.

Figure 1. Flowchart showing mechanical recycling of polyester fabric

1. Thermal Recycling-

This is the best method of polyester recycling in which the waste PET bottles are initialy cuts in to small pieces the washed and melted to spin through the spinneret to get desired polyester filaments, which further converted into fabric and garments. Repeatedly melting of polymer reduces crystallinity and strength of the filament [Williams, et al., 2005; Kubota, S. and Ito, O., 1997]

Following flow chart gives idea about thermal recycling of PET bottles

Figure 2. Flowchart showing recycling of PET bottles in to fibers, yarn into fabric

2. Chemical Recycling

Polymerization is process of joining monomers by strong covalent bond to form a long chain called polymerization. Disposed polyester waste can be treated chemically back to get the monomers the process known as depolymerization. Following figure shows operations involved in PET manufacturing. [Shukla, S.R., and Kulkarni, K.S., 2002]. The term chemical recycling is most often applied to the depolymerization of certain condensation or addition polymers back to monomers. In this method the polymer is subjected to different processes so as to get the original raw material back i.e. total depolymerization of polymer, or partial depolymerization to the oligomers, and again reacting them back, will give a polymer of virgin quality. Depending on the source and morphology of the polymer and fibrous waste, recycling is generally done so that the waste is converted into a polymer or as monomer, which can be reused in the same plant for fibre production or in the production of value-added products like adhesives, resins, thickeners, etc. This is the most widely used and most effective way to recycle PET. Long chain polymers will be treated with chemicals to interrupt the chains into short segments. Once the treatment is finished to re-create the chemicals from that the polymers were at first created, it's referred to as feedstock or chemical compound creation. If the treatment breaks the polymers into associate degree assortment of chemical species, the processor will decide whether or not to recover specific chemicals for feedstock use or to use the assortment of chemical species for fuel or to use some combination of each finish product [Sinha et al ., 2010]

II. BENEFITS OF RECYCLING WASTE

- Reducing cost of purchasing materials.
- Increasing profitability.
- Minimizing costs of disposal and treatments.
- Minimizing environmental impacts by reducing use of new raw materials and producing products from earlier one.
- Textile recycling requires less energy than any other type of recycling.
- Textile recycling does not create any new hazardous waste or harmful by-products.
- Reclaiming fibre avoids many of the polluting and energy intensive processes like dyeing, scouring etc.[Williams et al., 2010]

III. CONCLUSION

A major technological achievement is the advanced recycling of polymers. Several polymer recycling techniques seem to be theoretically feasible and reliable enough to enable further growth. The technology is still evolving at this point. With this most recent advancement in polymer recycling, the industry's objective of enhancing the environmental and Polymer recovery that is both economically sensible and has the potential to one day offer alternatives to traditional recycling.

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