

Recycling of pre and post textiles waste

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ABSTRACT

Introduction : Due to the growth in world population and overall improvement of living standard, global fiber consumption has been steadily increasing in the past few decades, which leads to a higher amount of pre and post consumer fiber waste. Garments or household textile (such as sheets or towels) can effectively be recycled by sale or gift to another user. The UK based Recycling Association, estimates that up to 95 per cent of the textiles that are land filled each year could be recycled. Of the textile waste recovered by the charities, 60% is items of clothing that can be reworn or reused and 15 per cent can be torn into industrial wiper cloths.

Methodology : For this paper, I have compiled from few review paper for making new conceptual article related with recycling and reuse of textile waste.

Results : Recycling are a key concept of modern waste management. Recycling is the reprocessing of waste materials into new or reusable products. All textile waste streams are often unrealised sources of valuable raw materials that can be repurposed or regenerated into saleable and usable products by intelligent collection, sorting, reengineering and reprocessing.

Conclusion : In general, textiles can be used again formally or informally, recycled into new textile or other products, used for energy incineration with energy recovery, landfilled and waste dumps.

Key Words : Post consumer textile waste, Land filled, Fiber consumption

INTRODUCTION

Like all wastes, textile waste originates from the community via a number of streams including the fibre, textile and clothing manufacturing industry, consumers, the commercial and service industries. A growing sensitivity to environmental issues has stimulated increased consumer recycling of post industrial and consumer product waste. Post consumer textile waste is a largely untapped commodity with strong reuse and recycling potential (Domina *et al.*, 1999).

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by the charities, 60% is items of clothing that can be reworn or reused and 15% can be torn into industrial wiper cloths. These are defined as pre-consumer, post-consumer and industrial textile waste (Caulfield, 2009).

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Pre-consumer textile waste :

Pre-consumer textile waste is manufacturing waste that is generated by processing fibres, (be they natural or synthetic fibres) and the production of finished yarns and textiles, technical textiles, nonwovens, garments and footwear, including off-cuts, selvages, shearings, rejected materials and garments.

Post-consumer textile waste :

Post-consumer textile waste consists of any type of garments or household textile (such as sheets or towels) that the consumer no longer needs and decides to discard, either because they are worn out, damaged, outgrown, or have gone out of fashion. This category has typically been of reasonable to good quality garment that can be recovered and subsequently recycled by another user as second-hand clothing, much of which is sold to third-world nations (Caulfield, 2009).

Industrial textile waste :

Industrial textile waste is generated from commercial and industrial textile applications including commercial waste from properties such as carpets and curtains, hospital refuse in addition to industrial applications such as filtration, conveyor belting, etc.

In order to reduce the textile waste, some countries give high priority to waste prevention. As for the prevention of waste from textile, reuse is a common method. Actually the designer and consumer can contribute much to prevent the textile waste, while the practical situation makes the prevention of textile waste difficult, since the dominant element for the designer and consumer is apparel itself, not the environmental issue of the textile product, although they understand deeply the environmental concerning is very important for a product.

METHODOLOGY

For this paper, I have reviewed and summarized from few review papers for making new conceptual paper related with recycling and reuse of textile waste.

RESULTS AND DISCUSSION

It has showed that there are four ways of handling the waste. In order of priority, they are:

- Source reduction
- Landfills
- Recycling

Source reduction :

To have little or even zero waste source reduction is generally the first step that should

be considered in an integrated waste management system. e.g. avoiding waste generation, internal reuse of waste, reuse in other products etc.

Land fills :

It should be the last alternative in an integrated waste management system. Textile waste in landfill contributes to the formation of leachate as it decomposes, which has the potential to contaminate both surface and groundwater sources.

Cellulose-based synthetics decay at a faster rate than chemical-based synthetics. Synthetic chemical fibres can prolong the adverse effects of both leachate and gas production due to the length of time it takes for them to decay.

Post-consumer waste is more difficult to collect and separate, but it is very important as it keeps tons of material from going to landfill.

Recycling :

Recycling is a key concept of modern waste management. Recycling is the reprocessing of waste materials into new or reusable products. Ninety-nine percent of used textiles are recyclable. The least expensive and least adverse effect on the environment is when a component can be recycled into its original product, *i.e.* so called ‘closed loop’ recycling.

The second best is when it can be used in another article which usually requires less demanding properties, for example face car seat fabric being recycled into backing material. Typically, recycling technologies are divided into primary; secondary, tertiary. Primary approaches involve recycling a product into its original form; secondary recycling involves melt processing a plastic product into a new product that has a lower level of physical, mechanical and/or chemical properties. Tertiary recycling involves processes such as pyrolysis and hydrolysis, which convert the plastic wastes into basic chemicals or fuels (Dunn, 2007).

Recycling of garments :

- Select clothing markets
 - Recovery from the waste stream includes re-use of a product in its original form.
- The largest volume of goods is sorted for second hand clothing markets.
- Conversion to new products

Two categories of conversion to new products will be used:

Breakdown of fabric to fiber:

Shoddy (from knits) and mungo (from woven garments) are terms for the breakdown of fabric to fiber through cutting, shredding, V carding, and other mechanical processes. The fiber has re-engineered into value added by products. These value-added products include stuffing, automotive components and carpet under lays, building materials such as insulation and roofing felt, and low-end blankets.

Re-design of used clothing :

The other category for conversion to new products is the actual re-design of used clothing. Current fashion trends are reflected by a team of young designers who use and

customize second-hand clothes for a chain of specialty vintage clothing stores.

Wiping and polishing cloths :

Clothing that has seen the end of its useful life as such may be turned into wiping or polishing cloths for industrial use. T-shirts are a primary source for this category because the cotton fiber makes an absorbent rag and polishing cloth.

Mechanical processes to recover fibres:

With mechanically compacted nonwovens blends of chemical and natural fibres or with pure natural-fibre, the mechanical opening-up of the textile structure by means of breaking them down is carried. These are mechanical processes through which fibres are recovered:-

- Re-granulation: All the type of waste from thermoplastic fibres such as polyethylene, polypropylene, polyamide, polyester etc. can be processed on agglomeration plants so as to make free flowing granulates. The granulate can also be used to produce fibres (generally, for lower value application).

- Re-use of nonwoven waste: Re-use is the use of a product no more suitable for the original purpose without any or just small material modification for a new application. E.g. re-use of textile covers of paper-making machines to improve foundations in road construction and civil engineering.

Recycling of synthetic fibres:

- Chemical Methods Depolymerisation, Re-precipitation, hydrolysis, Glycolysis etc
- Thermal Route Hard waste (polymer blocks) and PET bottles are granulated, filament waste is compacted, and drawn filament waste is shredded or cut.

- Solvent extraction: It is generally used for carpet recycling. In this process, a consecutive chain of solvent is used to remove polymers of interest. E.g. Acetone and Hexane are used to remove oils; ethylene dioxide is used to remove PVC plastics etc.

- Cryogenic fracture: In this method, with or without mechanical or ultrasonic vibrations, the temperature of polymers has been reduced to below glass transition temperature with liquid nitrogen or other cold temperature materials which make the coating or film brittle. Polymers are then broken and separated.

- Powdering: Here high pressure at low temperature is used to grind the material for further processing. Generally, it is in the manufacturer's interest to keep production waste as little as possible. Easy-to-take measures as seen from the technical/technological point of view are, optimization of available production plants to better exploit the material in the production process optimization of the products with regard to recyclability (choosing the right materials and technologies) optimization of the production technology, e.g. choosing the optimum point of time to cut edges or process control when changing quality or assortment (Bhattacharjee).

Conclusion :

Textiles wastes are classified as pre-consumer, post-consumer and industrial textile waste. Garments or household textile (such as sheets or towels) can effectively be recycled

by sale or gift to another user. In general, textiles can be used again formally or informally, recycled into new textile or other products, used for energy incineration with energy recovery, landfilled and waste dumps. Conversion to new products

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