UPCYCLING TEXTILE WASTE TOWARDS A SUSTAINABLE INDUSTRY

Behera Bijoya K. , Kamble Zunjarrao B.
Department of Textile Technology, Indian Institute of Technology Delhi, New Delhi, India
behera@textile.iitd.ac.in

ABSTRACT

The linear way of operating textile system has laid world to face the serious issue of sustainable textile waste management. Textile waste is challenging today's world in terms of its sustainable disposal and recycling of waste textiles became very important. It has been anticipated that total fashion waste in 2030 will be 148 million tons which would be equivalent to annual waste of 175 kg per capita across the planet. Also, more than 150 million tonnes of clothing would be landfilled or burned in 2050. Approximately 15% of textiles manufactured for clothing are wasted as cutting waste in garment making. About 95% of the textiles that are landfilled each year could be reused or recycled. In US alone, 21 billion tonnes of municipal solid textiles waste is being generated every year. An estimate of 16 million tons per year of textile waste is being generated by European textile industry.

The present research reports application of textile waste generated in the textile industry for thermoset composites manufacturing. The textile waste fabrics obtained from the textile industry and used lot for the land fill were converted into the shoddy fibre form using the rag-tearing machine. A structured fibrous web was produced by carding process. Compression moulded thermoset epoxy reinforced composite specimens were produced. It has been observed that mechanical properties of the composites reinforced with fibres recovered from textile waste change with fibre volume fraction, fibre orientation, resin type and composite thickness. The experiment is carried out with a wide range of fabric waste such as used cotton and polyester cloth, waste from garment industry, textile industry waste, denim waste and wool shoddy waste. An addition of graphite oxide, graphene and other nano fillers improved the mechanical properties of the composites drastically. Hybrid composites using nonconventional natural fibre waste and unidirectional glass fabric with above textile wastes as reinforcement were produced to develop several structural materials. Different fibre wastes with polypropylene fibre as resin was also used to produce composites for special applications. Effect of water absorption by composite on its mechanical properties was investigated. The life cycle assessment test was also carried out to explore the techno-commercial advantage of the complete technology and finally proved that the upcycling of textile waste is a true sustainable industry for future.