

EDUCATION IN GREEN TECHNOLOGY FOR A SUSTAINABLE FUTURE

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Abstract

Textile Industry is known to be the second largest polluting industry. Circularity in production streams through emerging green technologies in reuse or recovered or environmentally friendly raw materials is one solution. Some environmental issues need to be addressed at the Industry level. Environmental impact of textile wet processing: water consumption, energy consumption, CO₂ emissions, waste water and sludge, air emissions, chemical consumption. This paper reviews natural, regenerated and biodegradable fibres which are eco-friendly and alternative sustainable processes to conventional production. Sustainable alternatives in processing, process optimization, recovery and reuse of bath liquors, effluent treatment plant are some of the technologies being practised. Ecological compliances, both National and International through Eco labels and certification. Designers need to ethically design and develop products. Ethical fashion aims to reduce the carbon footprints. Individual green Initiatives have been taken by major brands. Awareness of these are important to designers of products and its consumers. The consumer can then make conscious choices in selecting, using and disposing products. Awareness on green technologies at each stage in the supply chain from designing, processing, manufacturing and marketing are important for both transparency and traceability.

Key words: *Textile processing, Designing, Production, Retailing, Consumption.*

Introduction

Sustainable products are designed and made to have less adverse impact on the environment. The words ethical and sustainable are used interchangeably and to clearly define them 'Ethical' refers to people and 'Sustainable' refers to the environment. 'Ethical'

fashion refers to garments that have been produced in an environment that is conscious and engaged in many social issues that affect the fashion industry. This is important for a number of different reasons. One, is the fact that the textile industry is the second most polluting industry after oil. In the production, large quantities of chemicals are emitted into air, soil and waterways. Additionally, exploitation of humans working in the industry- regardless of the concern for their health and safety. As the fashion industry has grown and become more fragmented over the years, it has become rife with ethical and social issues. There is an urgent and serious shift needed in a world where the social implications of these negative effects is considered casually.

Objective

To identify areas where adoption and awareness in green technology will be necessary.

Methodology

Exploratory study by informal interaction with experts from the Industry and Academicians. Secondary sources of information has been reviewed.

Findings and Discussion

Green technology has been covered in the curriculum of textile technology and fashion design, each with a different focus. There is a need to integrate both, the manufacturers must know production of sustainable raw materials and processes. The designers must have a focus of designing products sustainably and ethically. The consumer must be able to make informed decisions on the purchase of products; be it apparel or home fashion.

Manufacturing stage

Eco-friendly and organic fibres as raw materials like natural, regenerated or organic or fibres can be used in the fabric production. Synthetic biodegradable fibres and resins are being used and existing modified for use in green composites with improved properties (Netravali, 2011). In comparison the synthetic polymer fibres, these surely create a positive impact on the textile industry.

The growing emphasis on reducing carbon footprints in textile wet processing are by the use of enzymes in scouring and bleaching as an alternative to chemical treatments; bioscouring instead of peroxide bleaching. Combining processes of bioscouring and

biopolishing in one step; bleach clean-up and dyeing; dyeing and biopolishing; continuous desizing and bioscouring are some of the ways to save water, energy and time (Nielsen *et al* in Blackburn, 2009). Foam techniques, ink-jet printing and first-time-right dyeing are some green technologies (Easton in Blackburn). Plasma treatment is considered a dry alternative for textile wet processing (Kan Chi-wai, 2015).

In the colouration industry, for the enhancement of servicability and quality of product hazardous pollutants which are accumulated during processing phase (Chakraborty 2013) must be eliminated. Cold brand reactive dyes can be used instead of hot brand; waterless dyeing technologies. Natural dyes can be selected for dyeing these natural fibres. Processing of fabrics and raw materials without the use of toxic chemicals like bleaches, dyes and auxiliaries.

Discharging the effluent water after neutralising and zero waste production are ethical practices. Various sustainable waste water treatments, like granular activated carbon, electrocoagulation, ultrasonic treatment, advanced oxidation process such as ozonation and biological reactors are now available (Dinsdale *et al* in Muthu: 2018). Increasing the water efficiency during manufacturing and use of energy saving devices can contribute to sustainability.

Saving of fuel and energy in the form of electricity, water and raw materials. Use of alternative sources of energy such as solar energy for generation of steam or any kind of heating, lighting and to power looms and machines. Energy efficient lighting through the use of LED bulbs, terrace gardens for cooling interior work spaces. Automation in conserving man power and improving efficiency of existing manpower. Skill training of existing staff and on the job training of new recruits.

Ethical fashion talks about specific issues such as no child labour, no forced labour, health and safety for workmen ensured, freedom of association and rights to collective bargaining, fair wages and working hours. The principle SA 8000 of Social accountability standard for decent working conditions and management systems to implement them (Kan Chi-wai, 2015). Animals should not be harmed for the fur or skin. Applying and obtaining certificates from Certification Bodies like REACH. Conforming to Standards. use of

certified raw materials such as GOTS and Bluesign ensure green practices. Safety features are even more important while designing for infants, children and the elderly. The ZDHC Roadmap to Zero Programme (2019) is a coalition of fashion brands, value chain affiliates and associates. It helps empower the global textile, leather, apparel and footwear value chain to substitute chemicals for safer ones in the production process.

Product design and development stage:

While sourcing fabric designers must also familiarize themselves on the production of raw materials. Sustainability must be kept in mind from the start of the design process to the final packaging. Keeping the production as local as possible will save on transportation costs and the fuel costs. During the garment production stage, the layout of the pattern is important to make sure there is no wastage of fabric. Fabrics, components from textile waste materials, fabric cut-offs or slightly damaged and preused fabrics can be used to create unique products. Fashion products can be designed with the use materials that are easy to recycle. The product may also have a potential of reuse, being recycled or upcycled. This will save cost, energy in newly manufacturing raw materials. For quality products, the raw materials must be of superior quality. This will ensure that the product will be durable and last longer thus increase the life span of the product and promote prolonged usage. A designer, while designing products must keep in mind recycling friendly construction. More the number of composite products more difficult it will be to recycle. A product using single material system which are non-composite in nature for example: Polypropylene, Polyamide these are easy to recycle. If the designer uses multi-polymer material composite system, then it is hard to recycle compared to single material system. For example, backpack bag, is made of many layers of materials, it can be called as multi material composite system which most difficult from the rest for recycling.

Promotion of Brands:

Greening the supply chain initiatives are part of a process for implementing a sustainable development plan (Eastman in Blackburn, 2009). Brands/Production Companies must use sustainable alternatives throughout the production in the supply chain. The use of recycled

raw materials aligns with the larger movements of Global industries toward a circular economy (vs. linear) and closed loop production (Leonas, K.K. in Muthu: 2018). Leading clothing retailers and Brands now publish their standards on chemicals and operate systems to assess the performance of their suppliers with regard to safe use of chemicals. Increasing transparency and traceability in supply chains will be the future trend (Eastman in Blackburn, 2009). Use of paper or cloth bags instead of plastic in packaging products. In the marketing stage, it is the responsibility of the designer and the Brand to spread awareness on ethical production processes along with promoting new innovations.

Consumer awareness:

Consumers are becoming more conscious of the benefits of environmentally friendly products and garments. It is therefore the responsibility of the designers to make products that have less impact on the environment and use processes that are provide improved working conditions and economic security to those who make the product. Use of easy care finishes and superior quality of detergents can enhance the life of textile products. Hiller Connell (2011) suggested educating consumers how to identify quality, classically styled apparel products and teaching ways to refashion and update preowned garments. Products from recycled materials should be treated as being equal to products produced from viegin materials by designers, consumers and manufactureres in order to gaurentee the same standards as the consumer demands from normal clothes.

Another important point in promoting sustainability is labelling. When consumers see products with recognisable marks such as Ecolabel, Ecocert etc, they feel the confidence to buy the product. As life cycle transparency becomes an accepted Standard label criteria, Eco-labels will be used for product differentiation. According Bhamra in Miraftaband Horrocks (2007), consequently opportunities exist for research partnerships between academia and the sector in order to better understand the imapcts and develop suitable tools and methods for designers. Nowadays, the consumers have become aware of sustainability and want to 'buy green'. They demand products that are beneficial to them, but at the same time not harmful in any way to the environment.

Conclusion

Awareness building needs to be the focus at every stage of the textile supply chain from raw material selection, manufacturing, processing, packaging and marketing. This awareness can come with education in green technologies and green practices. Inculcating the practice of using green materials must start from the design stage of any product. This can result in development of sustainable products. Sustainable products should help improving economic security of those making the product. Designers should consider the life of the product- the energy used in the life span and its disposability. Designers are expected to develop products that consume less resources and energy; are easy to dispose and are easy to recycle. The product should be of good quality if it has to have a longer life cycle for a sustainable future.

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