

A Review :

## Eco-textile: path to sustainable environmental development

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The textile industry is among the most essential consumer goods industry, however, the most polluting industry. The economic-problem in this industry occurs during some production processes and are carried forward to the finished products. Therefore, with respect to clothing textiles the phrase 'Ecology' can be classified into three groups: (1) production ecology; (2) user ecology, (3) disposal ecology. So, the materials can be considered 'environmentally friendly for a variety of reasons'. First and foremost is the renewability of the products. Renewable resources are items that can be replenished in a relatively short amount of time (an opposed to millennium). The second factor is the ecological footprint of the resource – how much land (usually measured in acres) it takes to bring one of the individuals to full growth and support it. The third thing to consider in determining the eco-friendliness of particular product is how many chemicals it requires to grow and process it to make it ready for market.

This paper represents a review of general strategies and work that has been carried out in textile manufacturing industry.

Known as 'the elephant in the room' the textile industry has a heavy impact on the environment as current practices are unsustainable, companies, environmentalists and consumer are looking at strategies for reducing the textile carbon footprint. Taking incremental steps in supply chain processes to make it happen, that is need to believe in environmental sustainability; and need to be aware about the social, economical and ecological benefits of environmentally sustainable products and development

processes. So, the care for the environment must influence the supply chain to use sustainable processes, run business operations in an environmentally friendly way, work to conserve energy and reduce waste. Exploring and implementing sustainable textile materials and products through sustainable design approach.

Since, the very idea of sustainable development revolves around the progress which is being taking place in the present, keeping in mind the future, somewhere. Since, eco-textiles are the need of hour and also are of the primary goals of millennium development goals in sustainable environmental development.

Growing cotton uses 22.5% of all insecticides used globally. Growing enough cotton for one t-shirt requires 257 gallons of water. Bleaching and then dyeing the resulting fabric creates toxins that flow into our ecosystem. The use of rayon for clothing is contributing to the rapid depletion of the world's forests. Petroleum based products are detrimental to the environment on many levels. The total area dedicated to cotton growing (30-35 million hectares) has not changed significantly since the 1950s but the output has nearly tripled during the same period. This increase in output is largely due to pesticides and fertilizers used in conventional cotton production.

Conventional cotton farming can also reduce soil fertility, lead to soil salinisation and cause pest resistance, water pollution and presents a risk to biodiversity (Blackburn, 2005). Another huge impact of conventional cotton farming has on the environment is its impact on the earth's water balance. 'Water consumption' –

especially the extensive use of water in cotton crop cultivation – can also be a major environmental issue as seen dramatically in the Aral sea region. The drying up of the Aral Sea is one of the biggest man made ecological disasters. The Aral Sea has shrunk by three quarters even the past few decades after water was diverted from two feeding rivers to water cotton plantations. If water is flowing back into the Aral Sea it is polluted by pesticides which have a huge impact on the livelihoods of the people relying on fishing and agriculture.

The “spinning, weaving and knitting” stages use a lot of energy, produce solid waste and generate dust and noise and also involve the use of lubricants and oils to strengthen and protect the fibers from the stresses of processing. These substances are removed before the next production phase which involves a huge amount of water and the use of more chemicals, like pentachlorophenol, a rot proofing agent added to cotton fabric to protect it in transport and storage.

#### **Fabric finishing stage:**

##### *Bleaching:*

In Europe hydrogen peroxide is used for bleaching as chlorine-based bleach is toxic and has negative effects on the immune system and reproductive system. This kind of bleaching is not permitted in Germany and has largely been substituted by other methods throughout the rest of Europe, but the practice is still common worldwide.

##### *Dyeing:*

Before 1956, the majority of clothes were dyed using natural dyes – but technological changes, industrialization and population growth brought about a rapid increase in textile production due to the amount of land needed to grow the dyes, natural dyes could no longer fulfill the demands. Modern dyes are based on petrochemicals, a non-renewable resource and there are many risks to human health and the environment from modern dyes.

#### **Eco-friendly fibres:**

Organic cotton – is much more environmentally friendly than the traditional variety. Organic cotton is grown using methods and materials that have a low impact on the environment. Organic production systems replenish and maintain soil fertility, reduce the use of toxic and persistent pesticides and fertilizers, and build biologically diverse agriculture. Organic cotton production provides an alternative to grow cotton without chemicals (Kumar, 2007).

Bamboo – The great thing about bamboo clothing is that, not only it is soft and comfortable, but it also has

some great environmental benefits. Bamboo clothing is said to be softer than cotton, with a texture more like that of silk or cashmere. It also absorbs moisture quickly. It actually draws moisture away from skin, so it is perfect for summer months as well as for vigorous activities such as playing sports.

Bamboo plants can grow successfully without any fertilizers or pesticides. Bamboo grows very fast (approx. 3-4 feet per day), it does not require a lot of water to grow, also it is very hardy plant – it can survive drought and flood conditions. Bamboo plants release a lot of oxygen into the air. A grove of bamboo releases 35% more oxygen than an equivalent stand of trees.

Bamboo is very earth friendly plant. It can reduce soil erosion and desertization. It can actually improve soil quality in degraded and eroded areas. Bamboo clothing is 100 per cent biodegradable.

#### **Rare eco-friendly fibres:**

##### *Stinging nettle fibre:*

This fibre is obtained from the Brennessel plant which naturally resist to vermin and parasites. It can be grown without pesticides and herbicides and with very little fertilization as the minerals do not get leached out of the ground. The environment friendly process requires the plant stems to be cut and left on the field for retting. Retting is exposure to rain, moisture and sun to facilitate the removal of fibre from the woody tissue. Then the straw is collected, pressed into bales and placed in a barn to dry. Fibre is separated from the stem mechanically *i.e.*, by removing the wood from the fibre. The fibres are then cleaned by combing. They can be mixed with organic cotton and spun into yarn.

Nettle fibre is stronger than cotton and finer than linen fibre. They can be made into a wide range of woven as well as knitted fabrics. Due to its fine weft and glossy look, nettle fabrics were very popular in middle ages but lost its position to inexpensive cotton.

##### *Pineapple fibre:*

One of the eco-friendly fibres gaining fast popularity is the pineapple fibre, the pina fiber. It is extracted from the pineapple leaves by hand scraping, decortication or retting. Decortication uses a motorized machine with blades to scrape off the pulp in order to separate the fiber. The fibres are hand spun into ivory-white coloured and naturally glossy fabric. Pineapple fiber is light weight, soft, shining, transparent and a little stiff fabric used for making clothes having elegant looks.

*Milk protein fibre:*

These fibres are used to make yet another healthy and eco-friendly yarn – the milk yarn. Milk is dewatered and then skimmed. With the help of bio-engineering technique, protein spinning fluid is made. Wet spinning process converts this fluid into high grade textile fibre. The skin friendly milk yarn goes to make glossy fabric similar in appearance to silk fabrics that have anti-bacterial and antifungal properties too. Their hygroscopic character makes them one of the finest moisture management fabrics. They can be blended with a number of fibres to get many characteristics – blending with bamboo gives cool fibre and with wool fibre provides a thermal protective fibre.

*Banana fibre:*

The banana fibre is extracted by hand stripping and decortications. Thus is 100% eco-friendly fibre. This fibre looks like bamboo fibre and ramie fibre. It is strong, shiny, light weight and bio-degradable. It can even absorb moisture very efficiently. With its qualities getting popular, the fashion industry is now fast adopting this fibre for making various fashion clothing and home furnishings.

**Steps towards sustainable textiles:***Sustainable processing of textiles:*

Number of sustainable practices has been implemented by various textile processing industries such as eco-friendly bleaching; low impact dyes, also bio processing of textiles. Bio-processing can simply be defined as the application of living organisms and their components to industrial products and processes, which are mainly based on enzymes. Bio-processing also offers the potential for new industrial processes that require less energy, less water and less effluent problems with effective results. Enzymatic desizing, enzymatic scouring, enzymatic bleaching and bio polishing and enzyme based softeners are few examples of bio-processing of textiles. Eco-wash laundering system consists of a plastic disc with ceramic pellets. The activated ceramic pellets inside the disc are agitated within the machine to release ions. These ions reduce the surface tension of the water, allowing it to penetrate the fabrics and release the dirt. The result is clean clothes without the risk of chemicals damaging the garments.

While caring the fabrics – sunshine instead of bleach.

Lemon juice and sunshine powerful combination for stubborn stain

**Eco fashion:**

Designers have made a difference by understanding

the theoretical, technical and practical considerations of the entire production process of a product, collaborating with technologists, scientists, growers, manufacturers and marketing departments, understanding the performance and aesthetic qualities that are high on the consumer agenda. A new concept of 'Eco-fashion' has emerged in the last few years. Eco-fashion refers to stylized clothing that uses environmentally sensitive fabrics and responsible production techniques. The non-profit Sustainable Technology Education Project (STEP) defines eco-fashion as clothes "that take into account the environment, the health of consumers and the working conditions of people in the fashion industry."

Swapnil Shinde, a designer said "Designers should revive eco-fabrics. Internationally there is a lot of demand for eco-friendly clothing line. So, India should revive its potential and make the best of eco-fashion."

*Khadi:*

Making of khadi is eco-friendly since it does not rely on electric units and the manufacturing processes do not generate any toxic waste products. It is light and soft, making it comfortable to wear. Its weave creates air pockets which make it cool in summers and warm in winters.

**Environmental damage:***Textile dyeing and finishing:*

The textile dyeing and finishing industry has traditionally generated large volumes of waste and has been a large consumer of energy. A large proportion of the environmental issues affecting the industry are related to the use and discharge of water. Washings from dyeing and rinsing operations may produce hot, alkaline, highly saline and highly coloured effluent.

Other environmental issues requiring consideration is energy. Chemical usage, solid wastes, emissions to atmosphere, contaminated land, noise, hazardous materials, groundwater and other environmental issues particular to the location. In order to impart the required functional properties to the fibre or fabric, it is customary to subject the material to different types of physical and chemical treatments.

Finishing can lead to high levels of pollutants in wastes, e.g. the moth proofing agents most commonly used – pyrethrins – have a high degree of insect toxicity. If this material is overapplied, does not adhere well to the fibre or washes off in post treatments, the resulting wastes can be highly contaminated with pyrethrins.

Heavy metals in finishing treatments and other contaminants such as fluorides used for flame proofing

can also lead to contamination of wastewater that is difficult to treat.

#### **Dyestuffs:**

Dyes have many different and complex chemical structures and there is a large range of products in commercial use.

Some reactive dyes are recognized respiratory sensitizers and breathing in respiratory sensitizers can cause occupational asthma.

Some dyes can cause similar allergic skin reaction. Certain reactive, vat and disperse dyes are recognized skin sensitizers. A number of dyes based on the chemical benzidine are thought to cause cancer.

Perhaps the most prevalent health problems associated with dyeing and finishing processes arise from exposure to chemicals acting as irritants. These may cause skin irritation, itchy, stuffy nose, sneezing. They include formaldehyde-based resins, ammonia, acetic acid, some shrink resist chemicals, optical whiteners, soda ash and bleach.

#### **Eco labels:**

– Consumers are becoming increasingly concerned with the adverse impacts of industrial pollution on the environment and their health. Mounting pressure on industry to adopt more eco-friendly manufacturing processes has led to an increased demand, particularly in

the textile sector, for manufacturers to have an eco-label for their products. In addition to assisting the entry to new markets and maintaining existing ones, obtaining an eco-label can also generate financial savings through process optimization and reduced consumption of raw materials, reduce processing time, improve environmental performance and improve working conditions.

The 'Cradle to grave' approach to environmental management will include consideration of the recyclability or reusability of the textiles after the products have finished their natural life (Wang, 2006).

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