

Environmental Impacts Of Textile Industry In Sri Lanka

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Abstract: In present consumers are becoming more aware of protecting the environment because of the generating the waste through the industries have a higher impact of polluting the environment. Therefore the companies use sustainable methods to prevent pollution by promoting eco-labels with their products and managing the generated waste. Clothing is an integral part of our lives, and the increment of establishing textile industries has a higher rate than the past in Asian countries. Sri Lanka has only the internal market during the 1960s. Nowadays it grows 40% of total export in here. So that each and every industry should concern about the disposal methods for greening textile industry, this paper briefly explains the product cycle, from the raw material through the design, production, and logistics up to disposal and focus on the waste generation types and suggestions to reduce for a sustainable world.

Index Terms: Environment, Textile history, Pollution, Environmental Impact, Waste disposal

1. INTRODUCTION

Until the industrial revolution, many products in the textile industry were made at home and without the use of machines led to the creation of factories, and soon, the fabric was produced. The textile industry was quickly spread all over the countries with newer technologies. Textiles production is one of the biggest industries in Sri Lanka, and it keeps the country's economy in a higher position which produces more products relative to its population. The average solid waste generation in Sri Lanka is 6400 tons per day, which about 2683 tons are collected (Anon, 2004a). The textile waste composition of municipal waste collection Sri Lanka, which amounts to 7344 tons per annum [1]. This research mainly discusses the production process of the textile industry, waste generating activities, and their environmental impact, ongoing waste disposal methods used in the textile industry. Also, here we suggest some advanced techniques of waste disposal methods and waste minimizing techniques which can be implemented in the textile industry. Our main objective is to improve the social and environmental responsibility of those industries to contribute for a green future. Textile manufacturing is a very complex and lengthy process. It is based in the conversion of three types of fibre into yarn, then fabric and textiles. Production process of textile industry consist of following steps;

1. Fibre production
2. Yarn production
3. Fabric production
4. Pre-treatment
5. Dyeing and printing
6. Finishing treatments

Textiles are creating based on fibers that are managed in different ways to create the desired strength, durability, appearance as well as the texture. Fibers can be either natural fibers or synthetic fibers. The first step in the textile process is spinning, which transform fibers into yarn. Here the fibers are twisted or laid together to form the yarn, and the method used depends on the type of fiber used. Once the spinning process has completed, yarns are sent for weaving with the objective of transforming yarns into fabric. There are many different ways that can be used to generate fibers, such as weaving, knitting, or through the production of non-woven fabrics. Then, they are sent for the pre-treatment process, which enables subsequent processing. The next step includes dyeing and printing. Textile dyeing gives textiles colors and shades. The final process of the textile industry is finishing treatments. This step of the process is all about adding special technical properties or an aesthetic appeal to the finished fabric [2].

2 WASTE GENERATION

Textile waste is a material that is deemed unusable for its original purpose by the owner. Textile manufacturing industries have a wide range of waste generating activities.

SOLID WASTE

In the fabric manufacturing process, there are two techniques. In knitting process includes wastage trial run quantity, leftover yarn in the cones, yarn in the machine tube knitting defects, roll making. These are leftover row materials. In the weaving process, the wastages occur here are balance yarns in warping creel and cones, trial run quantity, weaving defects, roll making. The fabric cutting process is the major percentage of wastage of the fabric occurs. The apparel sewing wastage occurs in the form of the defective pieces which are not as per the standards of the requirement of the customer. This type of wastage is known as rejection. Production scraps wastage arises during the manufacturing process due to machine breakdown, cutting, shaping, or finishing, etc. and they cannot be reused for the manufacturing. Apparel or clothing manufacturing used various type of accessories. Poor inventory and handling of these accessories may lead to more wastage.

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WASTEWATER POLLUTION

Material handling in all the department play a vital role in the amount of wastage creation. If they have poor material handling of dyes and chemicals in wet processing may lead to seepage or spilling of costly dyes and chemicals. Wastewater from textile includes a large variety of dyes and chemical additions which generally are organic compound of complex structure. That make the environment challenge for textile industry. And also, this processes used great amount of water depending on the technical specifications of the machines, as the major pollutants in textile wastewaters are high suspended solids, chemical oxygen demand, heat, colour, acidity, and other soluble substances. COD, BOD, nitrogen, heavy metals and dyestuffs are the main substances which need to be remove from textile wastewater.

FLUE GAS PRODUCTION

For textile industry they consume vast quantities of natural resources like water, oil, land. They use toxic chemicals and generate large amount of co₂. That large amount of co₂ also one of waste type which is release from the industry and that highly affect for the air pollution.

NOISE POLLUTION

Noise is an unwanted or unpleasant sound. Much discussion and legislation have been involved in recognizing and combating the problem of noise pollution. They evaluated (Table 1) quantitatively the noise level of conventional automatic looms and observed that the noise during weaving is mostly impulsive and periodic in character [2]. High noise level causes psychological effects and physical damage, including irritability, loss of concentration, anxiety, and increased pulse rate. Any noise rating above 80dBA produced physiological effect and range of 90-100 decibels can produce permanent damage to a person's hearing [3]. The studies show that many textile workers especially weavers, suffer from occupational hearing loss.

Table 1. Noise level in different department of a textile mill.

section	noise level, dB
Blow room	80-83
Carding	84-89
Draw frames	84-88
Inter frames	82-86
Ring frames	86-90
Winding	82-86
Warping	80-86
Sizing	73-86

Mainly industrialization, contemporary lifestyle, rapid change of fashion, change in lifestyle, easy and cheap availability of textile, lake of consumer awareness about

environment friendliness, no strict government policies and lake of systematic pipeline of textile recycling are the reasons for the increase of waste generation rate in the textile industry [4, 5].

3 ENVIRONMENTAL IMPACT

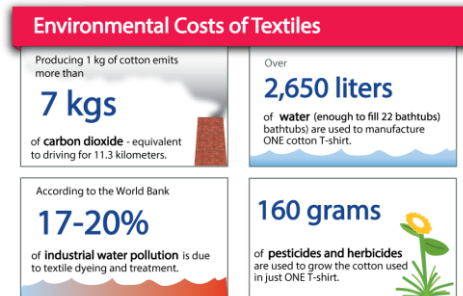


Fig. 1 is representing environmental impact by textile industry [6].

Fig 1. Environmental impact by textile industry [6]

4 WASTE TREATMENT

Waste treatment can be achieved with six different ways.

- Source Reduction
- Landfill
- Incineration
- Decomposition
- Recycling
- Waste water treatment

SOURCE REDUCTION

Source Reduction is considered as 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. In the textile industry also we have to minimize waste generation and should enhance efficiency.

LANDFILLING

At present, land filling is the most common practice for textile sludge disposal. The sludge from the wastewater treatment plant in textile is considered hazardous as it is often consist with heavy metals of dyeing process chemicals. It has a huge & bad environment impact as leachate toxic metals to the soil.

INCINERATION

It is a process of burning the solid waste to recover the heat energy. Textile waste e.g. short, shredded, loose fibers can also be reincorporated into a palatalized fuel. However, Incinerator flue gases emit dioxins, heavy metals, acidic gases and dust particles, which has highest potential to harm humans and the environment. Disposing of residual ash which is likely to contain a concentration of toxic material.

DECOMPOSITION

Decomposition used in landfill and wastewater treatment but most of the nylon and other materials can't be decomposed. However, during the landfill process, methane and other harmful greenhouse gases are

released to the atmosphere. Moreover, synthetic fabrics will take over hundreds of years to biodegrade. In wastewater treatment, decomposition is much useful because by using microorganisms textile sludge can be decomposed easily.

WASTEWATER TREATMENT

Textile industry consumes a huge amount of dyes and chemicals as well as a large amount of water and also produces large volumes of textile wastewater effluents. The textile effluents contain a different type of dyes, organic acid, and salts, inorganic acid and salts, bleaching agent, trace metals in variable concentration as the textile wastewater is harmful to the environment and people. The wastewater treatment is undergoing primary, secondary & tertiary processes. The process is undergoing various steps like screening, sedimentation, equalization, neutralization, chemical coagulation, mechanical flocculation. The various sustainable wastewater treatments, namely granular activated carbon (GAC), electro-coagulation (EC), ultrasonic treatment, an advanced oxidation process (AOP), Ozonation, membrane biological reactor (MBR), and sequencing batch reactor (SBR) can be used to treat the wastewater in the textile industry.

5 CONCLUSION

Above we discussed the waste generating methods and ongoing waste treatment methods in the textile industry. But the question is these treatment methods are sufficient to cover up the pollution. In reality, the amount of pollution is much higher, and all the waste don't go through proper treatment processes. So the remaining waste directly adds to the environment upsetting the ecological balance and impairing human health. Here we suggest some methods which can be implemented to minimize these waste and to introduce environmental-friendly production in the textile sector.

1. WASTE MINIMIZATION

Application of the systematic approach to reducing the generation of waste at the source is called waste minimization. At present most of the textile industries are concerned about the environment, and they are using different methods to treat their waste. But they are less interested in waste minimization.

▪ Reducing water consumption

The most wanted utility in the textile industry is obviously water for the operations. Almost all dyes, chemicals, and finishing chemicals are added textile substrate from water baths. Water consumption in the textile factory can be reduced by implementing various changes ranging from simple procedures such as fixing leaks, turning off the water when machines are not running to more complex options such as optimizing water use and reducing the number of process steps.

▪ Reducing chemical consumption

The reduction of chemical consumption can lead to a reduction in effluent strength and therefore lower the treatment cost. Dosing control, pre-screen chemicals and raw materials, chemical substitution, chemical recovery,

and reuse are some ways of reducing chemical consumption.

▪ Reducing solid waste

Solid waste is the second-largest waste stream in the textile industry next to the liquid effluent. Minimization options to reduce solid waste are reducing the amount of packaging material, purchasing yarn on reusable plastic cones rather than cardboard cones, selling waste fibers and cloth scraps.

2. APPLY THE 5R PRINCIPLE USED IN WASTE MANAGEMENT TO THE TEXTILE INDUSTRY.

- Reduce
- Reuse
- Recover
- Replace
- Recycle

3. USE TEXTILE SOLID WASTE AS A RAW MATERIAL IN PRODUCING CEMENT BLOCKS.

Cement blocks can be prepared with cut textile wastes and cut and ground textile waste as admixtures. Here the cement component in volume was kept constant while the aggregate composition is changed to include textile wastes by partially replacing sand. In preparing mixtures with textile waste, first sand and cement are mixed, and after which the textile waste is added according to the volume ratio. In order to obtain a homogeneous mixture, water is sprayed onto the ingredients while mixing. This method will reduce the cost of production of cement block since the sand quantity is the key factor affecting the cost of a cement block.

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