

Research Poster

Textile Industry and Environmental Impacts in India

COLORFUL POISONS

Introduction

The Indian textile industry is a major contributor to the economic growth. The sector is a leading employer for skilled and non-skilled workers. The production process involves the usage of dye to give colour to the clothes. Thousands of different kinds of chemicals are utilized in textile industry. Invention into new chemical types has reduced the usage of natural dye that has minimal environmental impacts. The common synthetic dyes are affordable and easy to produce.

The textile industry is a major polluting industry across the world. The ecological impacts demonstrate the unsustainable life-cycles in textile and clothing industry mostly due to the usage of harmful chemicals. The discharge of dye effluents into water ways and land contributes to accumulation of undesirable impacts because of colour, carcinogenic toxins such as benzidine and aromatic compounds. The sector is blamed for high levels of water and energy consumption.

The finished products contribute to accumulation of large quantities of gaseous and solid waste to the environment. The adverse environmental impacts of textile dyeing in India necessitate for formulation of strategies to reduce pollution.

CLEAN OUR ECOSYSTEM NOW!

About Dyes

Dyeing is the process that helps improve the appearance of textile fabric through the addition of colours during the process of conversion from raw materials to finished products. Dyes come in synthetic or natural form. The synthetic dyes are commonly used because they are affordable and easy to manufacture in bulk. Some dyes are soluble while others are insoluble. Other properties of the commonly used dyes include possession of negative ions and cationic. Figure 1 shows some of the common types of dyes.

Type of dyes	Specific use
Acid dyes	Dyeing wool, silk, and nylon
Substantive dyes	Cellulose fibers
Mordant dyes	Cellulosic fibers, wool, and silk
Sulfur dyes	Cellulose fibers

Figure 2 Input-output analysis of dyeing

Environmental Impact of Dyeing

The impact of Dyeing on environment can be summarised in Figure 3; three aspects of the environment are often vastly affected by the process of dyeing the garments.

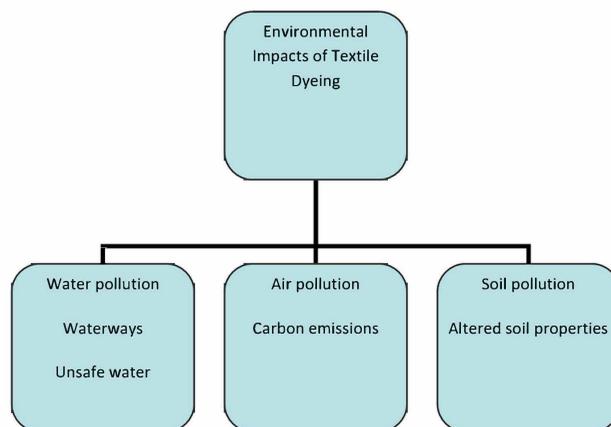


Figure 3 Environmental Impact of Dyeing

Air pollution

The textile production process is characterized by the production of harmful gaseous emission. These emissions are known to contribute significantly to pollution effects in the textile sector. The list of harmful gases includes Sulphur dioxide, nitrogen oxide, suspended particulate matter (SPM) (Hassaan et al., 2017). The end products come from boilers, diesel generators, and thermo pack that are all part of the production process. Other notable sources of emissions include dyeing, finishing, and fabric preparation.

Resin finishing and other processes in the spinning mill lead to accumulation of fiber fluff to the immediate environment. The pollutants contained in the emissions are harmful to air environment and other ecological components that use air. This undermines air quality to a large extent against the acceptable standards and regulations. The concern is serious in India due to higher number of textile industries and large population depending on the end products (Hassaan et al., 2017).

Water pollution

The dyeing and finishing stages are associated with chemical concentration. Thousands of dyes produced to support the industry end up as effluent products. Textile sector utilizes large amounts of water to ensure completeness of the production process. Effluents are normally released upon undergoing treatment though not all chemicals are removed. The effluent contains harmful chemicals that drain into soil and water ways (Hassaan et al., 2017).



Figure 1 Types of Dyes

In the production of textile, the input and output analysis indicate the areas for which dyeing has significant impact on environment. The Chemical inputs have been shown to contribute to environmental degradation in the outputs. (figure 2).

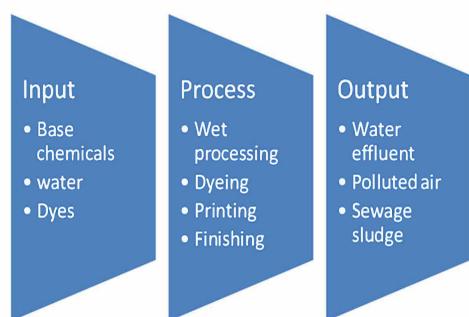


Figure 4 Contaminated wastewater from textile manufacturers

The textile effluent water is known to have high acidic value, suspended solids, nitrates, carcinogenic metals, nitrates, and chlorides, among others. Apparently, the chemicals in the process come from diverse chemical constituents including polymers, organic and inorganic compounds. The processing operations also involve chemicals for use in machine cleaners and boiler treatment. This increases the pollution load in effluent water. The biodegradation process is mostly difficult due presence of grease and suspended solids.

Soil pollution

The release of water effluent containing toxic compounds ends up infiltrating into soil. Research indicates that some chemicals are difficult to biodegrade while others are composed of solid matter whose treatment is complex process. Dyes generate ecological risk to the soil resource. The chemicals lead to poor formation of physico-chemical properties of the soil. The resource becomes susceptible to erosion, loss of productivity and sustainability. In the end, the plants are adversely affected by chemical presence in the soil (Chavan, 2001).

Preventive measures

The extent of environmental impacts from textile industry should worry the industry players, public, and government. The country lacks appropriate laws to help address the concern. The formation of Central Pollution Control Board has worked toward developing measures limiting the usage color of effluents (Konwar and Boruah, 2020). Some of the popular laws are listed below:

1. The Water Prevention and Control of Pollution Act
2. The Air Prevention and Control of Pollution Act
3. The Environment protection Act
4. The Public Liability Insurance Act

The industry players are required to develop innovative and safer pollution control strategies. The cleaner production technique through a comprehensive approach can help in elimination and minimization of waste. The product life cycle for resources used in the manufacturing process should be optimal. The strategy should include substitution of toxic compounds and changes to operational parameters. Also, a review of end-of-pipe treatment is necessary. An efficient method should involve separate treatment for specific effluent streams (Madhav et al., 2018). Companies need to continuously engage in research and innovation to formulate effective chemical and biological treatment methods.

Summary

The textile manufacturing sector is associated with usage of essential resources such as water, energy, and chemical varieties that generate environmental concerns. In India, the industry is among the top contributors to economic growth. However, the Indian textile industry has been argued to be among top contributors of environmental degradation. For example, water effluent contains harmful chemical compounds that adverse impact on environmental components, including air, soil, and water. This is a serious threat to country's environmental resources. The government has not done enough through laws and regulations toward addressing the problem. It is necessary for industry players to work in close collaboration with government and public to develop innovative measures in addressing environmental pollution by textile industry.

References

- Chavan, R.B., 2001. Indian textile industry-environmental issues. Indian Journal of Fiber & Textile Research 26, pp. 11-21.
- Hassaan, M.A., El Nemr, A. and Hassaan, A., 2017. Health and environmental impacts of dyes: mini review. American Journal of Environmental Science and Engineering, 1(3), pp.64-67.
- Konwar, M. and Boruah, R.R., 2020. Textile Industry and Its Environmental Impacts: A Review. Ind. J. Pure App. Biosci, 8(3), pp.134-139.
- Madhav, S., Ahamad, A., Singh, P. and Mishra, P.K., 2018. A review of textile industry: Wet processing, environmental impacts, and effluent treatment methods. Environmental Quality Management, 27(3), pp.31-41.