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Eco-friendly Production & Processing of Textiles

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Abstract—*Years of human ignorance diminished our natural resources and aged our planet. Now, people are trying to change the way to save planet. So, it's the time to being conscious about the impact of toxic & harmful materials used in industry by reducing waste and help to enable a better world. Textile industry is one of the major industries which cause environmental pollutions. During textile wet processing, large amount of effluent is released in air, soil and water. Due to these wastes, all species in the ecosystem are affected badly. In order to manufacture a ton of textile, approximately 300 tons of water is used. After the textile production, the water is undertaken with heavy chemicals and this waste is released in the environment. In textile production industry, there are many efficient methods to decrease the environmental pollution. Constructed of large and highly effective effluent treatment plants, use of natural raw materials and ecological production methods. Recently, researchers have been seeking for ecological, sustainable, and biodegradable natural raw materials Especially, natural textile raw materials have been begun to use accelerating in comparison with synthetic raw materials in textile industry. Furthermore, new natural fibres have been obtained from different source and the use of these fibres has searched in textile industry. In textile wet process, especially, effluent with heavy chemicals load is a major problem. In order to eliminate the negative effect of effluent, researchers have been searching for solutions. In literature, coating, microencapsulation, plasma applications, using of ultrasonic and microwave energy, using of supercritical carbon dioxide and ozone treatment are described as some of the eco-friendly process in textile wet industry.*

Keywords: *Microencapsulation, plasma, ozone, effluent etc.*

INTRODUCTION

Environmental technology or green technology or clean technology is the application of the environmental science and green chemistry to conserve the natural environment and resources and to curb the negative impacts of human involvement. Scientists continue to search for clean energy alternatives to our current power production methods. Sustainable development is the core of environmental technologies. Some technologies like anaerobic digestion produce renewable energy from waste materials. The worldwide reduction of greenhouse gases depends on the adoption of energy conservation technologies at industrial level in addition to this clean energy generation. That has using solar energy, unleaded gasoline and alternative fuel vehicles, as well as plug-in hybrid and hybrid electric vehicles.

Textile and apparel, being labour intensive industries, code of conduct at the workplace is difficult to overlook. However, the main challenge before the textile production industry is as to how to produce a product at a competitive price by using environment friendly process and by reducing emissions and pollution treatment price. Biosphere is underneath serious hassle and impact on its atmosphere, hydrosphere and lithosphere by human can't be avoided. Man-made activities on water by domestic , industrial, agriculture, shipping, radio-active, aqua-culture wastes, by industrial pollutants, mobile combustion, agricultural activities, burning of fuels, ionization radiation, suspended particular matter, cosmic-radiation, on-land by domestic wastes, acid-rain, animal waste have negative influence over biotic, a-biotic components on different natural eco system.

To an industry plagued by increasing environmental concern and mounting cost pressure, these clean technology solutions aimed at sustainable development, environmental protection and significant reduction in costs. That is what the textile industry needs most today. Industrial activities should comply with the regulatory norms for prevention and control of pollution. Additionally, it is also imperative to go beyond compliance through adoption of clean technologies and improvement in management practices. Voluntary initiatives and commitment of industry for responsible care of the environment will help in building a partnership for pollution control.

Table 1: Waste generated by Textile manufacturing process

Summary of the Wastes Generated During Textiles Manufacturing Process		
Process	Source	Pollutants
Energy Production	Emissions from boiler	Particulates, nitrous oxides (Nox) sulphur dioxide (SO2)
Coating, drying and curing	Emission from high temperature ovens	Volatile organic components (VOCs)
Cotton handling activities	Emissions from preparation, carding, combing, and fabrics	Particulates

	manufacturing	
Sizing	Emission from using sizing compound (gums, PVA)	Nitrogen oxides, sulphur oxide, carbon monoxide.
Bleaching	Emission from using chlorine compound	Chlorine, chlorine dioxide
Dyeing	Disperse dyeing using carriers Sulphur dyeing Aniline dyeing	Carriers H2S Aniline vapours
Printing	Emission	Ammonia Hydrocarbons
Finishing	Resin finishing Heat setting of synthetic fabrics	Formaldehyde Carriers - low molecular weight Polymers - lubricating oils
Chemical storage	Emissions from storage tanks for commodity and chemicals	Volatile organic components (VOCs)
Wastewater treatment	Emissions from treatment tanks and vessels	Volatile organic components, toxic emissions

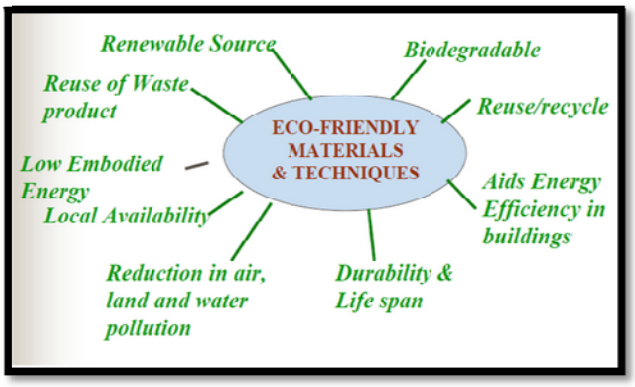

Figure 1: Techniques to be used to overcome waste

In the present study the focus is given to the textile (effluents) wastes and their methods of preventing waste disposal, recovery and water treatment, transporting hazardous material, energy efficiency to ensure lower carbon dioxide emission preventing storm pollution, bio-solids management and domestic sewage and ground and underground storage. Several initiatives have been taken by the government lately in favour of a clean textile industry.

In the whole world, textiles could be one of the most un-sustainable products. In their entire lifecycle from growing the raw material or creating it from oil to manufacturing and selling and final disposal they can create a serious problem. The textile industry creates a host of pollution problems. Dyes and chemicals are discharged into waterways by factories, and they release heat, formaldehyde, fly ash and sulphurous and nitrous compounds into the air and as a result, it contributes to acid rain. Toxic chemicals, textile packaging and drums are dumped into landfills. Also, the used fabrics themselves are a problem.

The subsequent fabric makes a toxin that swells into our ecosystem in the production process like bleaching and then dyeing. During the production process controlling pollution is as vital as making a product free from the toxic effect. The utilization of rayon for clothing has added to the fast depleting forests and opened the door to the development in natural sustainable fibres like organic Cotton, Hemp and Bamboo fibres. Petroleum-based products are harmful to the environment.

Textile manufacturing by its very nature has major ecological and social impacts. The process of making textiles can require several dozen gallons of water for each pound of clothing, especially during the dyeing process. Its Air Dye technology, used for the occasional window shade or T-shirt, employs air instead of water to help the dye penetrate the fibre; a process that Colour claims uses no water and requires less energy.

The water intensive textile processing industry needs to find ways to recycle and reuse water, with India's water resources depleting, both stemming out of its own concern for the shrinking ground water table and to comply with regulatory requirements. ETPs, based on conventional RO technology or advanced VSEP technology, are the answer for the textile processing sector to this growing need.

For wet processing of textiles, textile industries consume large volumes of water and chemicals. The chemical reagents used are very diverse in chemical composition, ranging from chemical compounds to polymers and organic products. As environmental regulation became stringent, new and novel process for efficient treatment of various kind of water waste at relatively low operating cost are needed. Furthermore, treatment cost of textile waste effluents has been escalating fairly rapidly in recent years. Electrochemical processes (electrolysis and electro-coagulation) have successfully demonstrated potential for removing pollutants in various industrial wastewaters. Removal mechanism reported in the electrolysis process generally includes oxidation, reduction, decomposition, whereas the mechanism in the electro-coagulation process include coagulation, precipitation, adsorption and floatation. The treated effluent of these processes may be reused for various inferior water usages, thus results in saving of precious fresh water.

Phytoremediation is an alternate cheaper technology for pollution abatement, since it operates with minimum man-power and energy inputs, and also the system can be developed as a part of over-all landscape development. Considering simplicity and economic feasibility phytoremediation, ecological engineers are looking back to ecological systems with diverse enzymatic pathways of microbial system, and complex surfaces for the exchange of gases and the nutrient of lands, to design technologies with the

potential of several orders of magnitude greater efficiency then contemporary mechanical and chemical technologies.

The wave of nanotechnology application has already explored the huge potential in the textile industry. Nanotechnology has broad, a new area of finishing applications in the textile industry. Coating the surface of textiles and clothing with nanoparticles has become a common approach for the production of highly active surfaces to have UV blocking, anti-microbial, flame-retardant, water-repellent or self-cleaning properties. Due to the increasing use of the synthetic nanoparticles, also an increasing introduction of such particles into the environmental media has to be expected in the future. The assessment of the risk involved in nanoparticles will decisively depend on the form in which these materials come into contact with humans and the environment. Toxicological information and data on nanomaterials is limited. Finally, we conclude that Environmental issues.

Environmental issues are playing an increasingly important role in the textile industry, both from the point of view of government regulation and consumer expectations. As the damaging effect of chemicals become more apparent, our society is demanding cleaner and more efficient production methods. In recent years, different approaches have been discussed to tackle man-made environmental hazards. Clean technology, Eco mark and green solutions are some of the most high-lighted practices in preventing and reducing the adverse effect on our surroundings.

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