Introduction

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Globally, demand for textiles has been steadily increasing along with the ever increasing world population Gross Domestic Product (GDP).The vision statement for the textile industry for the 11^{th} five year plan (2007-2012) sees India securing seven percent share in the global textiles trade by 2012, state Amsamani and Priya (2011). The main reason for this growing demand is the multiflex role of textiles, in every walk of life. Textiles which were mere drapes around the body for protection has changed into hi-tech fabrics with various finishes to cater specific functions like medical textiles, home textiles, geo textiles, built tech, agro tech, oeko tech, smart textiles, defence textiles, mobile tech, sports tech, pack tech, cloth tech, and indu tech through advances in textile wet processing.

The textile wet processing industries line up as processing, dyeing and finishing units. Water plays a very important role in all areas of textile wet processing such as heating, cooling and washing. The processes also produce considerable amount of waste water, due to the use of dyes and auxiliaries. Environmental concerns are not only threatening the textile industry, but the entire chemical industry. The process being heterogeneous phase reactions, complete removal of dyes and chemicals is highly impossible.

Among many engineering disciplines like civil engineering, mechanical engineering, and electrical engineering, textile engineering has a direct connection with environmental aspects. Out of various activities in textile wet processing industry, chemical processing contributes about 70% of water pollution. It is well known that cotton processing units consumes large volumes of water for various processes such as sizing, desizing, scouring, bleaching, mercerization, dyeing, printing, finishing and washing. Due to the nature of various chemical processing of textiles, large volume of waste water with numerous pollutants is discharged.

Since these streams of waste water affect the aquatic eco-system in number of ways such as depleting the dissolved oxygen content or settlement of suspended substances in anaerobic condition, a special attention needs to be paid to this. Thus a study on methods to be adopted to treat the waste water discharged from textile chemical processing industries and to safeguard our surrounding from possible pollution problem has been the focus point of many recent investigations.

Textile industry involves wide range of dyes, auxiliaries and processes to engineer the required shape and properties of the final textile product. Waste stream generated in this industry is essentially water-based effluent. The main cause of generation of this effluent is, the use of huge volume of water, either in the actual chemical processing or during re- processing in preparatory, dying, printing and finishing. It has been found that 45% of material is preparatory processing, 33% in dyeing and 22% are reprocessed in finishing process. The effluent generated in different steps is well beyond the standard permitted level and thus it is highly toxic and dangerous. The effluent is characterized primarily by measurement of BOD, COD, TDS, TSS, Color and heavy metals.

On the basis of dying process, textile dyes are classified as reactive , direct, disperse, acid, basic and vat dyes, state Murugesan *et al.,* (2007). Many synthetic dyes show toxic, carcinogenic and genotoxic effects, view Ozfer *et al.,* (2003). It is assumed that a loss of 1–2% of dyes in production and at least to ten percent during the dyeing process, does not bind to the fibers and therefore released into the effluent, view Mandezpaz *et al., (*2005).

Although decolorization of effluent is a challenge for textile industry, as well as waste water treatment systems, the literature suggest that there is a great potential for developing microbial decolorization systems, with total color removal in some cases within few hours, say Balan and Manterio (2001). Biological treatment methods are attractive due to their cost effectiveness, diverse metabolic pathways and versatility of micro-organisms, put forth Singh *et al.,* (2004).

On a general fact, higher the intensity of color, higher is the toxicity of the effluent and in turns greater the harm to the ecology. Such colored industrial effluents from the dyeing industries represent major environmental problems. Unbound reactive dyes undergo hydrolysis due to temperature and pH values during the dyeing process. The strong color of discharged dyes even at very small concentrations has a huge impact on the aquatic environment caused by its turbidity and high pollution strength; in addition toxic degradation products can also be formed, reports Aksu (2005).

Many of the south Asian countries are experiencing severe environmental problems due to rapid industrialization. This phenomenon is very common where the polluting industries like textile dyeing, leather tanning, paper and pulp processing thrives as cluster. The effluent discharged by these industries leads to serious pollution of surface water sources, groundwater, and soils and ultimately affects the livelihood of the poor, state Vandezee and Villaverde (2005) and Pandey *et al., (*2007).The pH of the effluents affects the physio–chemical attributers of water which in turn adversely affects aquatic life, plant and human.

From environmental protection point of view, color removal becomes an integral part of textile effluent treatment prior to its discharge into the environment or reuse. Most of synthetic dyes are toxic and highly resistant to degradation due to their complex chemical structures, view Lu *et al.*, (2009).

Several chemical and physical decolorization methods that are available include: Adsorption, precipitation, coagulation, flocculation, oxidation, electrolysis and membrane extraction. They also concentrate the pollutants into solid or liquid side streams which require additional treatment or disposal thus escalating cost of effluent treatment, remark Robinson *et al.,* (2001).

Biological decolorization is the most common and widespread technique used in textile effluent treatment. There are two types of biological treatment: aerobic and anaerobic. Aerobic systems require oxygen for fungi and bacteria to perform the degradation process whereas, anaerobic operate in the absence of air and under static conditions.

Biodegradation process ascend now a days to reduce the contamination and pollution by effluents released. Microorganisms can help us to clean the contaminated soils and water. They are tiny biological reactors, which can convert harmful synthetic chemicals into simple, less toxic, or completely benign products. Microorganisms can even mineralize organic pollutants, that is, to completely degrade them and converted into water, carbon dioxide, and salts. Such microorganisms are a valuable gift from nature.

Biodegradation can occur in the presence of microorganism that can degrade a specific chemical structure. It depends on the environmental conditions that allow the microorganisms to grow and release their degradation enzymes and also the good physical contact between the organic substrate and the organism.

Cotton is the backbone and basic foundation of the world's textile industry, mentions Ghosh (2004). It enjoys a unique position among textiles and is often referred to as the "King of Textiles", states Ragavan (2002). It is most popular among natural fibre is admired by consumers in the world, over for its fascinating feel, comfort and versatility. Cotton is the white glowny fibrous substance, says Singh (2007). It is a hygroscopic material hence it easily drops to the atmospheric air condition mentions Kaplan (2002). Cotton is termed as the "White Gold" the king of fibers. (www.fabrics.manufactures.com)

One of the most critical requirements of waste water management is the prevention and odor controls of odors. Odors are substances resulting from the reception of a stimulus by the olfactory sensory system, which consists of two separate sub-systems, the olfactory epithelium and the trigeminal nerve. The olfactory and epithelium located in the nose is capable of detecting and discriminating between many thousands of different odors and detect. Substances that trigger the sense of smell are known as odorants.

Odor can be defined as a physiological stimulus of olfactory cells in presence of specific molecules detected by olfactory cells varies between individuals and with environmental conditions, such as temperature, pressure and humidity. According to this definition, the term odor includes some volatile inorganic compounds (VIC), as well as organic compounds (VOC).

Odor may be caused by a variety of odorous compounds that are released or generated by various waste water processes. Odorous waste gases are a special kind of air pollutants. Humans can perceive even extremely small amounts of an odorant. It is estimated that only 10^8 or 10^9 molecules of odorant vapor in the nose is enough to trigger detection, views Sivaramakrishnan (2008).

A biological odor treatment system has many advantages compared to conventional physical and chemical treatment technologies. It is highly efficient in the treatment of waste gases characterized by high flow rates and low concentrations of contaminants and the pollutants are completely destroyed and its cost is also low. Considering these facts the research was planned with the following objectives.

The objectives of the study are:

- To collect the textile waste water effluent,
- To isolate the *Bacillus Subtilis* and *Thiobacillus Bacteria* by biochemical tests,
- To decolorize the textile effluent under different parameters,
- To optimize the decolorizing medium by using different parameter like pH, temperature, inoculums size and co-substrates,
- To measure the odor degradation by gas chromatography,
- To reuse the decolorized effluent water for dyeing,
- To evaluate the dyed samples.