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A STUDY ON ETP LOAD DURING SQUANDER WATER ISOLATION

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ABSTRACT

Mehedi H, Hossain T (2012) A study on ETP load during squander water isolation. *Ins. Engg. Tech.* 2(3), 14-17.

The main focus of this study was to determine or find out the stages or steps of dyeing process to discharge the squander water of those steps without treating in ETP to reduce the load of ETP i.e. reducing processing cost of ETP and encourage the industrialists or manufacturers to use the ETP at low operating cost which will save the environment from the water pollution. From the results of this study, it appears that some stages waste water of dyeing industry is suitable for discharge directly and some are not suitable. From this study it is clear that if Textile dyeing factories discharge the wastewater of the above selected steps then, they will be able to save about 50% of ETP processing cost without hampering the environment.

Key words: *water, ETP, treatment, dying, cost*

INTRODUCTION

Presently garments industries have become the backbone of the economy of Bangladesh. To support those garments industries hundreds of full-scale textile industries have emerged in the past few years and a lot more are going to be setup within a short time. These textile dyeing industries are contributing in the development of Bangladesh and at the same time are coursing serious water pollution (Fig. 1 & 2). It is a matter of great concern to understand and adopt adequate treatment technologies for the remediation of this problem. Environmental Management Methods in Textiles (Choudhury 2006). Echo-Friendly Techniques Solvent dyeing, foam dyeing, dyeing in ionic liquids, enzymatic treatment with ultrasound, supercritical fluid dyeing, use of nano technology etc. are useful Echo-friendly techniques in Textiles.

Echo-Friendly Techniques: Solvent Dyeing

Solvent dyeing is a dying process carried out from a continuous non-aqueous phase (organic solvents) is used as dyeing media. Solvent dyeing is not effective for natural fiber dyeing. It is only suitable for dyeing man- made fiber mainly polyester, nylon and acetate (Eswaramoorthi *et al.* 2005).

Solvent dyeing is on focus due to:
Fresh water unavailability wastewater disposal problem Considerable energy saving because solvents usually. Solvents can be more o less completely recycled by means of standard operations. It can eliminate costly dyeing process and also potential water pollution problems.

Echo-Friendly Techniques: Foam Dyeing

Foam Processing Technology:
There are several common commercial applications of foam processing, including carpet dyeing, coating operations, foam dyeing, and foam finishing. Textile dyes can be applied through foam media by replacing water with air.
Advantages of foam processing are as follows:
• Reduced water and energy consumption
• Reduced chemical waste
• Less time required for drying (less water to evaporate)

Echo-Friendly Techniques: Super critical CO_2 fluid dyeing Dyeing

Increasing consideration of ecological consequences of industrial processes as well as legislations enforcing the avoidance of environmental problems have caused a reorientation of thinking and promoted projects for replacement of conventional technologies (Abdessemed and Nezzal, 2002).

Supercritical fluid (SCF) dyeing is an emerging P2 technology that uses carbon dioxide as the fluid medium for disperse dyeing on synthetics. No water or pollution is associated with the SCF process (Fig. 3).

Fig. 1. Wastewater Discharged At Open Areas

Fig. 2. Wastewater Sample

METHODS

Types of Effluent Treatment Plants

Physicochemical
Biological
Physicochemical followed by Biological

ETP Diagram

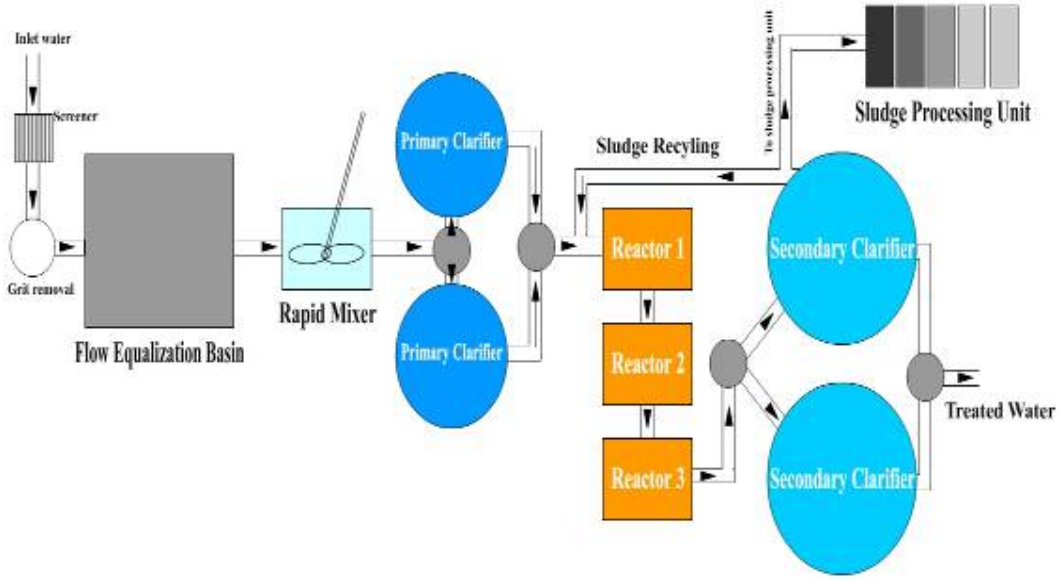

Fig. 3. ETP Diagram

Different Types of Biological Treatment Plants

Dispersed Growth
Activated sludge (Retention time 20 h for 40 m^3/hr wastewater)
Membrane Bio-Reactor
Oxidation ditches/ponds
Aerated lagoons, stabilization ponds
Fixed Growth
Trickling filters
Rotating Biological Contactors (RBCs)

Activated Sludge Process

Process in which a mixture of wastewater and microorganisms is agitated and aerated
Leads to oxidation of dissolved organics
After oxidation, separate sludge from wastewater
Induce microbial growth
Membrane Bio-Reactor (MBR)
The membrane bioreactor (MBR) process that uses both a biological stage and a membrane module has recently been developed for wastewater treatment. The bioreactor and membrane module each have a specific function:

1. Biological degradation of organic pollution is carried out in the bioreactor by adapted microorganisms;

2. Separation of microorganisms from the treated wastewater is performed by the membrane module. The membranes constitute a physical barrier for all suspended solids and therefore enable not only recycling of the activated sludge to the bioreactor but also production of a permeate, free of suspended matter, bacteria, and viruses.

RESULTS AND DISCUSSION

Table 1. Typical Textile Effluent Characteristics

Parameter	Woven Fabric Finishing	Knit Fabric Finishing	Stock & Yarn Dyeing Finishing	Cotton Textile Mill	Woolen Textile Mill	Synthetic Textile Mill
BOD (mg/L)	550-650	250-350	200-250	760	900	50
COD (mg/L)	850-1200	850-1000	524-800	1418	-	500
SS (mg/L)	185-300	300	50-75	-	100	-
pH	7-11	6-9	7-12	9.8-11.8	9-10.5	7.5

Table 2. Textile Effluent Characteristics: Bangladesh Perspective

Parameter	Minimum Value	Maximum Value
BOD (mg/L)	-	8100
COD (mg/L)	16.7	17100
SS (mg/L)	5126	15221
pH	3.9	11.0

Table 3. Discharge Quality Standards (By DoE)

Parameter	Inland Surface Water
BOD_5 (20^oC, mg/L)	50
COD (mg/L)	200
TDS (mg/L)	2100
Oil & Grease (mg/L)	10

ETP Design & Optimization

According to the table no. 1, 2 & 3 Computer-Aided Design & Optimization of Effluent Treatment Plant (ETP) Developed by the Harbinger Team of Engineers
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Fig. 4. Re Use

Fig. 5. Wastewater Reuse in Agriculture

Fig. 6. Wastewater Reuse in Gardening

Echo-Friendly Techniques: Caustic Soda Recovery

In Bangladesh, Beximco textile uses caustic soda recovery plant (CRP) to recover NaOH from mercerization. Fabric production 50,551 metre and 10 ton caustic used for mercerization. So for 1 metre fabric, 5 kg caustic used. After mercerization, excess caustic soda goes to CRP and approximately 94% caustic soda is recovered. Caustic soda price 40 Tk. per Kg. They can save moch money by using CRP (Gohl and Vilensky, 1999).

Echo-Friendly Techniques: Ionic Liquid Dyeing

Ionic liquids are low melting salts with melting temperatures around 100^oC. The term “room temperature ionic liquids” has been assigned to organic salts that are liquid at ambient conditions.

As we know that, the textile industry is believed to be one of the biggest consumers of water. The development of ionic liquids that exhibits useful and unique properties has created a huge untapped potential for commercial applications to increase operating efficiencies of many chemical production operations including the processing of textiles. Ionic liquids have been called: green solvents: because they are excellent solvents for a broad range of organic compounds. In 2006 there were 2000 papers published in different Journals. The nanotechnology is a very effective way in various applications. Such as fuel cell, industrial processing etc (Fig. 4, 5 & 6).

Echo-Friendly Techniques: Nano Technology

The nano sized (10^{-9}m) metal particles can reflect different colors. If the particles are of the same size as the blue rays, would reflect yellow. When these particles are embedded in fiber, the resulting fabric becomes a color to the eye without any use of dyes or pigments. By manipulating the size of these nano particles, researchers can then create virtually any color fabric.

Echo-Friendly Techniques: Ultrasound Enzymatic Treatment

The ultrasound technique is an environmentally tool for textiles. Val Yachemnev, who works in the cotton Textile Chemistry Research Unit (CTCRV) at Southern Regional Research of Agricultural Research Service (USA) in New Orleans, Lousiana, has found that ultrasound can boost enzymatic activity during several different types of treatments to cotton fibers. Use of enzymes in the cotton industry has become more popular in

recent years. Enzymatic treatments have been used for a long time to remove the starch size added to cotton yarns to smooth and protect from breaks during weaving.

Echo-Friendly Techniques: Dyeing Machines: Low liquor machine

In Bangladesh 1:8 machines are popular. Recently 1:6 and 1:5 machines are installed by some factories like ECHOTEX LTD.

Echo-Friendly Techniques

For best achievement pollution control at source is the best way.
Should think about zero waste concept.
Reuse of third time ringing water is a good method to reduce effluent load.

ETP Costing

1. Construction Cost: Civil, Electrical and Mechanical
2. Manpower Cost
3. Operation Cost: Chemicals and Power Consumption, Construction Cost: Minimum 1 crore
   Operation cost: 3-3.5 Tk/kg fabric (for combined ETPs); Monthly around 5 lac taka
   Biological: 3-4.5 Tk/m^3 wastewater
4. Minimum construction cost: conventional ETP: 1crore
5. Minimum construction cost MBR: 2.5-5 Crore taka.

Central ETP Concept

Effluent should be collected from same type of textiles and should be treated in a central ETP for small scale industries.

CONCLUSION

A large quantity of wastewater generated from dyeing houses. Highly polluted water bodies. Treatment essential: various treatment methods. Physicochemical, Biological (Conventional & MBR) and Physicochemical & Biological. ETP-CAD can be used for ETP designing and optimization. 1 crore taka minimum cost for construction of an ETP. Central Etp concept is useful for small scale factories. High liquor ratio machines should be replaced by low liquor ratio machines.Ionic liquid dyeing, supercritical fluid dyeing, solvent dyeing technologies should be used. Strong RND in Textile Environment and production areas required to control polution Major conclusions derived from the analysis of these results are summarized as pH values satisfy the limit of Bangladesh standards (DoE Standard) and ECR guideline values. Total solids and Total dissolved solids concentration in all selected segregated wastewater satisfy the limit of Bangladesh standards and ECR guideline values for discharging wastewater and gradually decreases with increasing the time of rinsing. Hardness in all hot washes wastewater has exceeded the Bangladesh standards for discharging wastewater. Hardness concentration of all rinse wastewaters is less than DoE standard for discharging wastewater in the Environment without treating in ETP.BOD_5 values satisfy the limit of Bangladesh standards and ECR guideline values. The color concentration in some wastewater has exceeded the Bangladesh standards and ECR guideline values for discharging wastewater in the Environment without treating in ETP. In some wastewater samples, color, TDS, TSS, pH concentrations have exceeded the ECR, 97 guideline values.

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