SASMIRA DEVELOPMENT FOR DYE BATH REUSE FOR REDUCED DYEING COSTS

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Introduction

Most of the wet processing sequences such as dyeing, printing and finishing have been switched over from the composite units to small-scale process houses due to various economic reasons. This type of strategy has advantage of economy but have disadvantage that most of these fall into the category of decentralized sector. Due to improper infrastructure and poor technical know-how these processing units lack knowledge of eco-standards and proper effluent management.

As per random survey the total fabric production in the powerloom sector is 20000 million meters per month and this does not include knitted and dyed yarn. Of the total, 70 – 80 % of the production is from the wet processing units. Most of the processors make use of conventional and rudimentary techniques leading to heavy effluent load which varies from 5000 – 30000 lit/1000 kg fabric depending upon the process sequence adopted and the type of fabric. Rough estimates suggest that, out of the total water consumed by the wet process houses, about 70 % of it becomes waste and if this is discharged into water bodies without treatment then it affects marine life. It has deleterious effect on sewage handling system and the agricultural land.

The industry exists in two forms, the organised and the unorganised sector. The organized sector gets potable water and has a common waste disposal and treatment facilities with proper power supply. These units have proper structure and the proper flow

of goods. The daily production figures and export volumes are very high. The effluents discharged from these units have to meet the pollution control norms that are to be strictly monitored and adhered. Whereas the other counter part i.e., the unorganised sector a.k.a. the decentralised sector varies drastically from the organised sector. Mostly these units are involved in job work wherein the fabric is manufactured at one source and subsequently processed at a different unit and the co-ordination between the procurement and production is poor leading to inferior quality of the end goods.

Thus, SASMIRA has propagated the concept of pollution control to the decentralised sector by a) creating awareness, b) by modifying chemical processing techniques for minimum effluent load leading to efficient production, c) implementing cost effective effluent treatment model.

The awareness survey resulted in the following findings:

- There is no access to municipal water
- Exhaust method for dyeing is most commonly employed
- There is inadequate effluent management
- Process Control is carried out by Trial and Error Method
- Non standardized dyes and auxiliaries are used
- There are frequent power cuts
- There is lack of appropriate testing facilities
- Employs more labour

The crunch of modern technologies is, therefore, severely felt by the decentralised sector. Thus the decentralised units can be termed as 'necessary evils' because of the flexibility and the higher profit margin involved in job work.

The general effluent treatment approach consists of following three stages of treatment:

1. Primary Screening

Equalization ⟶ Neutralization ⟶ Coagulation ⟶ Floatation

2. Secondary Treatment

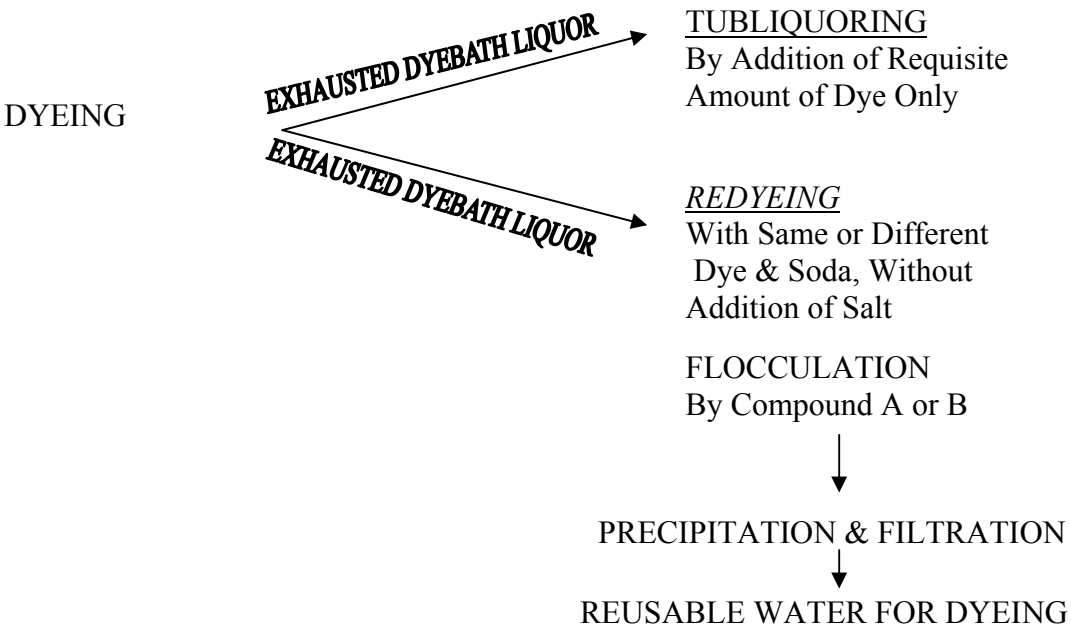
- Aerated Lagoons
- Trickling Filtration
- Activated sludge
- Multimedia filtration

3. Tertiary Treatment

- Chemical coagulation
- Chemical precipitation
- Dialysis
- Activated carbon adsorption

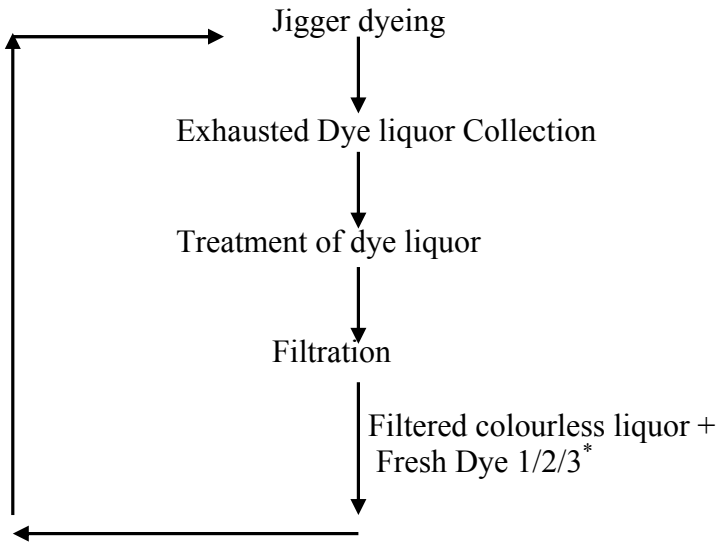
In practice, however, the organised sector chiefly follows the CETP i.e., the common effluent treatment approach wherein the effluent from various industries is collected in a common tank and treated with chemicals, filtered and then relatively harmless effluent is let in the water stream. This approach is to an extent unfavourable for the decentralised sector, where high investments are not encouraged due to lower profit margins. Moreover the other disadvantages of CETP are a) heavy seed capital requirement, b) suitable land requirement, c) mixed effluent is generated and most importantly d) the water obtained is not reusable for any process.

Against this background, SASMIRA carried out an in-depth study and concluded that the reuse technique is more appropriate and economically suitable approach of effluent treatment and effluent control for the decentralised sector. It encompasses the concepts of tubliquoring and re-dyeing. Below is a broad outline of the reuse approach:



SASMIRA adopted the following strategy during Industrial trial at a reputed Wet processing unit in Bhiwandi:

Dyeing of Cotton/Viscose and Recycling the exhausted bath



- The re-dyeing can be of the same or different shade

The findings suggest that it is possible to carry out recycling of the dye bath liquor, both for cotton as well as polyester dyeings by using appropriate flocculating agents. The same dye bath liquor may be flocculated with a very small amount of a specific flocculant. On settling of the flocculated solution, the supernatant clear colourless solution may be used for re-dyeing of fresh cotton fabric. The findings suggest that four or more than four re-dyeings may be possible in the same liquor.

COST ECONOMICS

The cost economics of the case study revealed **54 % savings per batch of dyeing cotton with reactive dyes and 40 % savings per jigger per day**. For example the cost of reactive dyeing on cotton (inclusive of water, auxiliaries) is @ Rs. 77/- per batch by the conventional method. Then the total cost of four batches is Rs. 310/-, whereas, when the recycling process is employed, the cost of second, third and fourth batch reduces to Rs. 36/- per batch (the cost of first batch being the same as Rs. 77/-). Thus the total cost of four batches by the recycling method is Rs. 185/- leading to savings per batch of about 54 %. Needless to say, there is a reduction in the effluent load by four folds as the same liquor is circulated four times.

During re-dyeing, it is possible to dye the fresh fabric with any shade (light or dark) as the supernatant solution is absolutely clear and does not lead to any residual dyeing tint during fresh dyeing. The re-dyeings may be carried out without the addition of salt and exhausting agent, as the flocculation process chiefly precipitates the dye by forming big molecular aggregates, which settle down due to gravitational forces. The resultant bath, therefore, retains the salt and also required pH for dyeing.

The dyed samples show satisfactory fastness ratings thereby implying that the re-dyeing process or the presence of flocculant does no hamper the subsequent dyeing process. The dyed samples when tested for their strength showed no variation. This again confirms the finding that the fabric is not affected by the action of residual flocculating agent in the dye bath.

Thus, the findings of the present study gives a simple yet effective technique for conservation of water, time, auxiliaries which is the need of the hour specially for the decentralised sector which was targeted. The saving in the amount of water definitely leads to lesser load on the effluent. The effluent load is virtually nearly reduced by nearly **300 % as the same dye bath is used four times**.

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