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New Approaches to Reduce Water Consumption in Textile Wet Processing (Sponsored by Ministry of Textiles, Govt. of India)

(i) **Project title** :

Objectives :

- To conduct preliminary trials to test suitability for various dyes, used for textile material
- Designing and fabrication of equipment for dyeing and standardization
- Conducting dyeing trial on various types of textile materials
- To compare dyed material out of new approach and conventional dyeing method in terms of quality and consumption of water

Progress of work :

- Water conservation/consumption study has been carried out in various mills
- Various approaches of dyeing are being tested to conserve water
- Brief of approaches adopted are given below:

Approach-1: Exploring Possibilities of Dyeing Cotton Hank Using Soft Flow Dyeing Machine

Cotton dyeing is one of the most water consuming processes in dyeing industry; major load on ETP is only due to cotton treatment. Conventional cabinet Hank dyeing machine consume water in the range of 1:15 to 1:20 MLR. The salt, soda and other chemicals auxiliaries are used as per the MLR of machine. If MLR is high, the consumption of chemicals will also on higher side. It was thought to use soft flow dyeing machine for dyeing cotton hank so the MLR can be reduce to 1:6 to 1:10. It will not only reduce consumption of water but also reduce chemical auxiliaries consumption and load on ETP. Also provide an option to the dyer having soft flow dyeing machine to dye yarn in hank form. Some of the dyeing trials taken using soft flow dyeing machine to dye cotton yarn in hank form are given below in the Table-1:

Table 1 : Results of some of the Dyeing trials

Trial	Material to liquor ratio	Total water consumption (liter/kg)	Observation
Trial 1	1:15	161	Even shade, high entanglement
Trial 2	1:10	107	Even shade, high entanglement
Trial 3	1:8	88.5	Achieved even dyeing
Trial 4	1:7	77.5	Due to poor liquor circulation dyeing was uneven, entanglement

This study shows (Trial 3) that cotton hank can be dyed in soft flow dyeing machine using 1:8 MLR as shown in Fig.5 and Fig.6 below:.



Fig.5: Soft flow dyeing machine used for

hanks dyeing



Fig.6 : Dyed Cotton cotton hank

Approach-2: Dyeing Cotton Fabric in Solid Shade Using Disperse Dye

To dye cotton fabric, reactive dye is one of the best suitable methods. It also gives good fastness properties as required. For cotton dyeing with reactive dye requires 5 to 6 washes after dyeing to remove the unfixed dye. Due to high colour discharge and chemical in effluent it increases the load on ETP and cost of treatment. In this approach we have tried to develop a solid shade using disperse dye on cotton fabric.

In disperse dyeing the amount of color and chemical in effluent is comparatively less than reactive dye. It also saves time during dyeing and required less number of washes to remove unfixed dye. The lab trials results are shown below in Fig.7 below:



Fig.7 : Cotton Fabrics dyed in solid shades using disperse dye

Approach-3: Creating Denim Effect using Disperse Dye on Cotton Fabric

Denim industry is one of the most water consuming industry. Mostly vat and sulphur dyes are used to produce denim fabric. It has a limitation to produce different shades. In this approach we use **Pad-Cure-Dyeing** method to produce denim effect using **Disperse dye** on different twill fabric. Result are shown in Fig.8 below:



Fig.8 : Cotton Fabrics having denim effect created by using dispersedye

Approach-4: Fabrication of Hank Dyeing machine working in low material to liquor ratio

Under this approach a pilot model hank dyeing machine is fabricated. With this machine, yarn in hank form can be dyed in 1:8 MLR. The trials on this machine are still going on (see Fig.9).



Fig.9 : Pilot model Hank Dyeing Machine