

Cleaner Production Training for EPD Punjab

Promotion of Sustainability in the Textile and Garment Industry in Asia-FABRIC

4. Best Cleaner Production Option to consider at Planning Stage

13:45 – 14:30

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on behalf of GIZ FABRICS and Espire Consult

Possible Options which can be asked and introduced before construction of textile like

- Segregation of Drains
- Slope for Gravity based flows of Wastewater in production, before and after treatment plant
- Use of Sunlight in Storages, Production, and utility areas
- Proper layouts (Storages, Production, Utilities) like Safe Chemical Storages with additional drain for spills, reducing redundant steam lines, etc.

Cleaner Production



Shifting emphasis to sustainable development

Segregation of streams

In existing mills, investment in new equipment and/or structural modifications (e.g. for the segregation of streams) is likely to be necessary.

Machines are now available with built-in facilities for waste stream segregation and capture. For example, the washing water from a previous load can be recovered and fully used in the bleach bath for the current load, which can then be used to scour the next load. In this way, each bath is used three times.

The internal separation of process liquor from the washing liquor applied to some modern batch dyeing machines (see above) is essential to allow easier bath segregation and reuse, in cases where the characteristics of the liquor make it feasible.

Storage tanks may be needed to store spent baths, washing or rinsing water for reuse.

Segregation of streams

The internal separation of process liquor from the washing liquor applied to some modern batch dyeing machines is essential to allow easier bath segregation and reuse, in cases where the characteristics of the liquor make it feasible.

a) Reuse and/or recycling of washing and rinsing water

- the reuse of washing water from bleaching in caustic washing and scouring make-up and rinsing water;
- the reuse of rinsing water from scouring for desizing or washing printing equipment;
- the reuse of washing water from mercerising to prepare scouring, bleaching, and wetting-out baths;
- the use of water for pre-washing carpets in after-washing.

b) Reuse and/or recycling of cleaning water

Segregation of streams

c) Reuse of process baths

- Spent bleach, dye or finishing baths are reused, after analysis and make-up if needed

d) Reuse and/or recycling of cooling water

Many cooling water systems are operated on a once-through basis. In general, cooling water and condensate water can be pumped to hot water storage tanks for reuse in functions where heated water is required, such as for dye make-up water, bleaching, rinsing and cleaning.

e) Recycling of treated segregated waste waters from dyeing and desizing

Membrane techniques (e.g. ultrafiltration, nanofiltration, reverse osmosis), ion exchange and evaporation are applied in various ways for the treatment of segregated streams from dyeing and desizing to allow water recovery and reuse, closely integrated with these processes

Segregation of streams

Source reduction options and/or special pretreatment considered for hazardous and hardly or non-biodegradable and/or non-bioeliminable substances present in the effluents (wastewater streams) will be selected by considering the options for:

- reduction at the source (e.g. by use of process-integrated techniques, choice of raw materials, auxiliary chemicals, etc.);
- collection (drainage) system (e.g. suitable for segregation and separate pretreatment of different tributary waste water streams);
- treatment methods (e.g. suited to abate a specific pollutant or generic, suitable for abatement of many pollutants).

Segregation of streams

Examples of effluents from textile treatments which may need to be pretreated include :

- Washing water from yarns and/or textiles when preparing dyeing processes.
- Rinsing water from washed, dyed and/or printed textile materials.
- Residues of (concentrated) process baths (e.g. residual baths and residual pastes from dyeing, printing and finishing , responsible for 1-2 % of the total waste water volume). These may also be handled as hazardous liquid wastes, see Section 4.1.7.2).
- Exhausted process baths in discontinuous process (dyeing).
- Rinsing water from cleaning the process baths (e.g. rinsing water from dye baths, responsible for 1-2 % of the total waste water volume).

Segregation of streams

Increased energy and water consumption may also be caused by inappropriate *handling techniques* and/or poorly performing *process control systems*. For example, in some cases displacement spillage may occur during immersion of the fibre in the machine, while the potential for overfilling and spillage exists where the machines are only equipped with manual control valves, which fail to control the liquor level and temperature correctly.

Process Improvement

- Countercurrent washing sequence in the machines (bleaching, mercerization, pad steam dyeing, soaper)
- Water showering at fabric instead of direct water supply at rope washing machines and open jiggers
- Orientation of overflow and drain points at rope washing machines
- Boiler blow down after measuring TDS
- Machine washing of screens instead of manual washing
- Dry disposal of fly ash from boiler



Process Improvement

Caustic soda recovery from mercerization wastewater

4-Polyvinyl alcohol (PVA), polyacrylates, carboxymethylCellulose (CMC) recovery from desizing process through ultrafiltration (20-30 g/l dilution to 150-350 g/l concentration for reuse in sizing, hot concentrate as hot water used in desizing washes)



Chemicals management - Storage



Challenges

- Large stockpiles and insufficient capacities of chemical storage facilities
- Critical condition of storage conditions (e.g. ventilation, cooling, incompatibilities)
- Inefficient warehouse management
- Insufficient preparation for emergencies (e.g. fire, release, exposure of persons)
- Insufficient training of warehouse workers

Chemicals management – Internal distribution and preparation

Great range of good and bad practices



Chemical management - preparation, intermediate storage, dosing - use

Practices

- Internal transport of chemicals (from main store to intermediate store, "dyekitchen" to dosing points) mostly manual
- Preparation and mixing (regular calibration of balances rare)
- Dosing - From manual to automatic dosing systems
- Process controls - depending on the degree of modernization of the production facilities

Challenges

- Limited willingness of production managers to experiment (training?)
- Operational blindness or limited openness to change
- Limited space and time window for implementation of changes

Recovering NPOs – Caustic Recovery Plant

- NaOH is reused in Mercerising
- H₂SO₄ consumption is reduced at Effluent Treatment
- Hot water available to feed into the processes – saving steam
- Return on Investment ~ 3 years

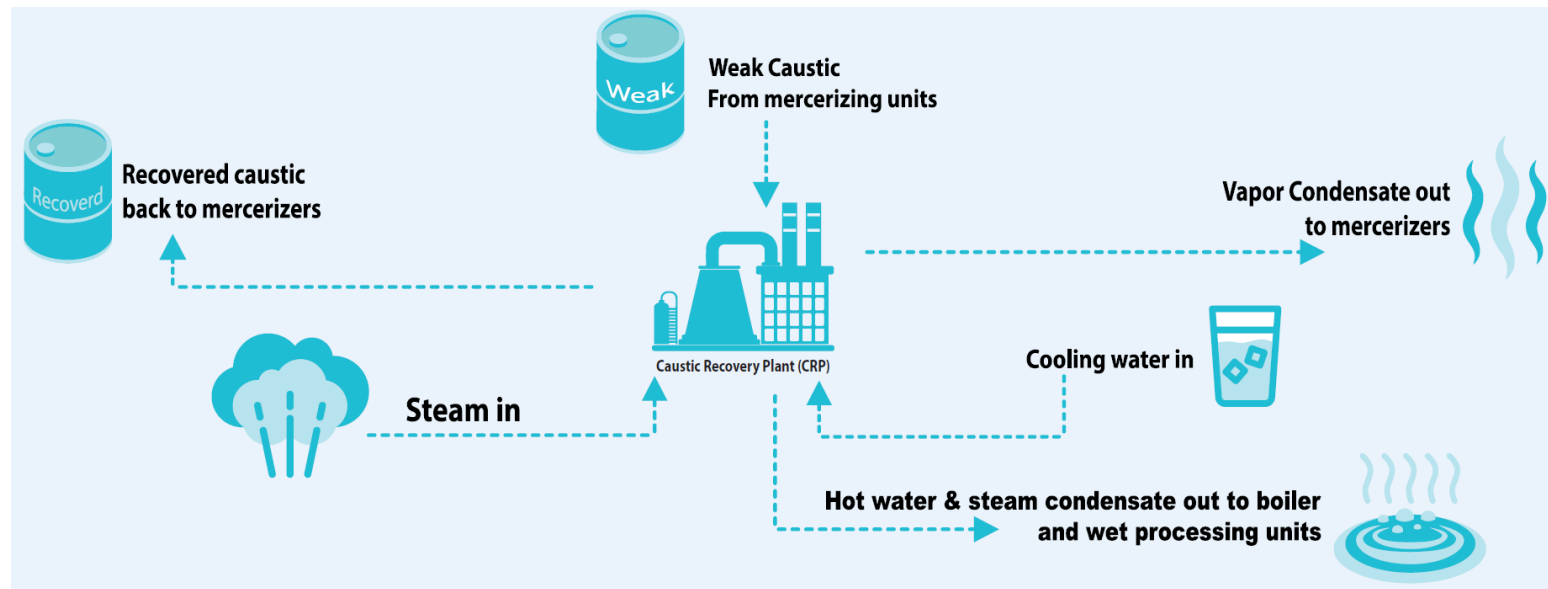


Image source: IFC

Recovering NPOs – Residue Printing Paste

- **Printing paste from Printing Screens and Paste Drums could be recovered**
 - Reusing the Color As it is
 - Use of Color Dedicated Drums
 - Mixing of Residual and Recovered Colors to get black
- **Benefits**
 - Financial savings (without investment)
 - Reduced BOD and COD in Printing Effluent
 - Reduced Water Consumption for washing drums and machine



Cost of Water

- Pumping CostRs. 3 –4/m³
- Transportation CostRs. 3 –5/m³
- Water Treatment Cost (Softener)Rs. 10 –12/m³
- Water Treatment Cost (RO)Rs. 25 -30/m³
- Wastewater Treatment Cost Rs. 30 –40/m³
- Hot Water (80oC) CostRs. 160/m³

Measurement and Monitoring

Water Consumption 80-370 liter/kg

IF YOU DON'T MEASURE, YOU DON'T MANAGE

- 1-Install water flow meters (water turbine, machine inlets, section inlets)**
- 2-Monitor water consumption**
- 3-Record production in kg**
- 4-Analyze specific water consumption (liter/kg)**
- 5-Set benchmarks-keep on improving it**

Source: Shafqat Ullah, Director Projects Cleaner Production Institute



Water Quality

- Good quality water produces good quality fabric, consumes less chemicals and increases machine life
- Water treatment for process water and for boiler feed water
- Reverse Osmosis (RO) and Softener



Piping and Equipment Modification

- Spring operated shut off valves at water hoses
- Automatic motor operated water shut off valves at machines. Blanket wash water keeps on running during stoppage
- Level switches at water storage tanks
- Preventive maintenance and anti corrosion measures

Reuse and Recycling

- Reuse of cooling water (singeing, compressor, drum dryers, thermoil pumps, chiller, yarn dyeing machines, fabric dyeing machines, ID fans).
- Reuse of RO and Softener reject water (toilets, drum washing, floor washing, wet scrubber , singeing fluff showering, desizewash, screen washing area).
- Reuse of process washes
 - Bleaching Wash → Scouring Wash
 - Scouring Wash → Desizing Wash
 - Mercerization Washes → Desizing/Bleaching/Scouring Wash
- Reuse of mercerization wastewater for preparation of mercerization and scouring baths.
- Soaper wastewater for floor and drum washing at color kitchen.
- Reuse of RO reject water (30% of total intake water)
- Reuse of softener regeneration washes (back washes)

Reuse and Recycling

- Recycling of blanket wash water. About 50% of water can be recycled.
- Reuse of steam condensate as boiler feed water
- Reuse of cooling water of condensers and vapor condensate from Caustic recovery plant in mercerization, scouring etc

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