

Master Training Program on Water (Water Supply, In-house Processing, End-of-Pipe) in Textile and Garment factories

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



Day 5 Presentation 5

Some other best practices

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Benefits

- To protect Environment
- To reduce carbon emission
- To ensure health and safety in production area
- To reduce or eliminate the use or generation of hazardous substances
- Prevents formation of hazardous waste
- Ensuring acceptable quality of the final product
- Longevity of the final product
- Overall Cost Benefit (by saving time, water, energy and increasing production).

Application

- Bio-scouring process
- Multifunctional detergent
- Dye bath neutral enzyme
- Salt substitute
- Polyfunctional reactive dyes
- Soda substitute
- Core neutralizing soaping agent

Application

- Dyeing without alkali (Shade dyes) for avoiding topping
- Low temperature soaping agent
- Low temperature scouring agent (using bleach activator)
- Elimination of caustic and hydroses for reduction cleaning
- PFC free water repellent chemical
- Using green acid
 - ✓ Natural dye (washing)
 - ✓ Ozone wash(washing)
 - ✓ Nebu dye (washing)
 - ✓ Laser wash (washing)
 - ✓ PP alternative(washing)
 - ✓ PP alternative neutralizer (washing)

Multifunctional Detergent

ADVANTAGES

With this kind of detergent, can do scouring and bleaching with less dosing about 50% of caustic and peroxide. However, caustic and peroxide is hazardous and they produce very toxic effluent discharge. Using less hazardous chemical strongly support green textile.

LIMITATIONS

Cannot dye all kind of colour by using multifunctional detergent. Some critical color dyeing is limited .

Soaping and scouring agent

Low temperature soaping agent

Using low temperature soaping agent by which wash-off can be done at 65°C temperature. Normally the wash-off temperature is 80°- 90°C. It saves power and energy and helps to go through sustainability but costing becomes high.

Core neutralizing soaping agent

Using core neutralizer soaping agent, which has reduced the use of acid. It eliminates the neutralizing step from dyeing process. It saves water and time than before. It also produces less toxic effluent discharge. It is more costly than other soaping agents.

Soaping agent and green acid

Low temperature scouring agent

Using low temperature scouring agent (bleach activator) by which scouring and bleaching can be done at 80°C. Conventional scouring temperature is 98°C. It also saves power and energy and helps to go through sustainability but costing becomes high.

Using green acid

Green acid is used for neutralizing and PH control. It is an eco-friendly Chemical and less hazardous than acetic acid. But it needs more dosing and overpriced than acetic acid.

Reducing agent

Elimination of caustic and hydrosulfite for reduction

In conventional reduction after polyester dyeing, caustic and hydrosulfite are used. Now it can be replaced by a substitute chemical that eliminates caustic and hydrosulfite. It produces less hazardous discharge.

Green Chemistry?

Natural Dye

Natural dyes or colorants derived from plants , invertebrates or minerals .

ADVANTAGES

- Natural dyes are biodegradable
- Non-Toxic
- Non- Allergenic
- Water and power consumption are low

LIMITATIONS

- Cost is higher than regular dyes stuff
- Color fastness is comparatively lower than regular dyes stuff.
- We have to choose color from the supplier's shade card as these colors can not be mixed with others moreover supplier's have limited colors in the shade card.

Green Chemistry?

Alternative of Potassium Permanganate

ADVANTAGES

- Non-hazardous chemical
- Non-allergenic
- Low impact on E.T.P.

LIMITATIONS

- Cost is higher than KMnO_4 .
- Produce Less whiteness than KMnO_4



Alternative of Potassium Neutraliser

ADVANTAGES

- Non-hazardous chemical.
- Non-allergenic .
- Color wash out is less.
- Low effect on E.T.P.

LIMITATIONS

- Cost is higher .
- Produce less whiteness than Sodium meta bi-sulphite .



Green Chemistry?

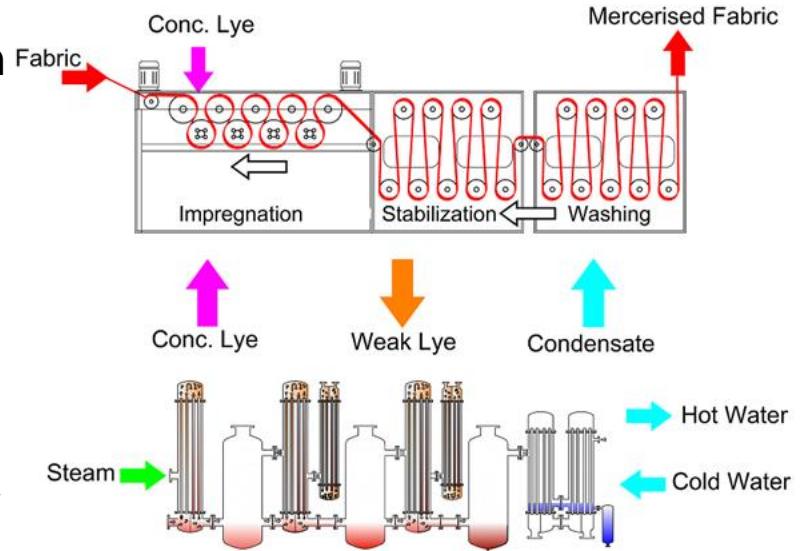
Challenges

While environmentally friendly living is a positive ideal, there are several possible challenges of Green processes and technology such as:

- High product costs
- High implementing costs,
- Uncertainty about achieving acceptable final product quality
- Chance of losing work order due to high production cost
- Lack of information about green chemicals
- Still alternative green chemicals are not available for many hazardous chemicals

Reuse of water/alkaline water from Caustic Recovery plant (CRP)

During the mercerisation process, cotton yarn or fabric is treated under tension in a solution of concentrated caustic soda (270-300 g NaOH/l) for about 40-50 seconds, which improves strength and increases whiteness. After mercerisation, fabric is rinsed, and the alkaline water can be recovered and concentrated to add into original caustic soda solution.

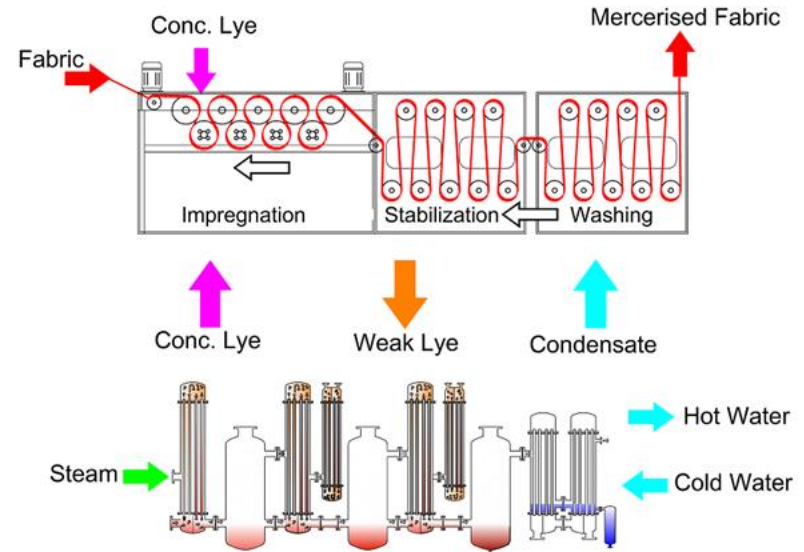


Caustic recovery plant, source: from <https://www.unitopaquacare.com/caustic-recovery-plants-crp/>

Reuse of water/alkaline water from Caustic Recovery plant (CRP)

Advantage

- Recycled alkaline water reduces water consumption in the process
- The alkaline load of the wastewater is reduced drastically and
- the acid required for wastewater neutralisation is minimised.



Caustic recovery plant, source: from <https://www.unitopaquacare.com/caustic-recovery-plants-crp/>

Reuse of Vapor Condensate of CRP

- The evaporated water vapors are condensed and discharged as wastewater
- This hot water (70 – 80°C) can be collected and reused as:
 - ✓ Washing water for post mercerization washes
 - ✓ Pre and post washes of continuous textile pretreatment machines (desizing, scouring and bleaching)
 - ✓ Dilution water for caustic soda solution from 50 °Bé to 25 °Bé
- Its quantity is in the range of 30 – 75 m³/d



Reuse of Vapor Condensate of CRP

Economics

Capital cost = Rs. 300,000 – 500,000

Annual saving = Rs. 1.6 to 4 million

Annual O&M cost = Rs. 200,000 - 400,000

Simple payback period = 2 - 3 months



Moisture management in weaving

Humidifier is crucial in work environmental areas with low humidity levels; often without auto cutoff system constantly supplying steam in turn resulting in significant water consumption

Improved approach

- Use moisture management device with auto cutoff system when desired humidity level reached
 - ✓ Water savings in range of 0.1 to 0.5% can be achieved



Photo: Mohammad Abbas Uddin 2022

Reuse of RO Plant's Concentrate

- Raw water treated in RO plant produces 70% permeate and 30% concentrate
- This 30% concentrate (150 – 1,100 m³/d) can be collected and reused at following:
 - ✓ At color kitchen for washing the floors and chemical drums
 - ✓ Showering water at solid fuel fired boilers wet scrubbers
 - ✓ Toilets
 - ✓ Printing machine screens washing
 - ✓ Showering water in the cooling rooms
 - ✓ Vehicular washing
 - ✓ Coal moisturizing for boilers
 - ✓ Water injection at water ejectors of caustic recovery plant (CRP)
 - ✓ Showering water at fluff scrubber at singeing machines.



Reuse of RO Plant's Concentrate

Economics

Capital cost = Rs. 300,000 -1,000,000

Annual saving = Rs. 0.23 – 1.65 million

Annual O&M cost = Rs. 100,000 – 700,000

Simple payback period = 1 – 2.3 year



For further reading

- Water Efficiency in Textile Industry (WETI) in Pakistan
- Clean By Design: <https://www.nrdc.org/resources/green-textile-redux-clean-designs-10-best-practices-offer-even-greater-pollution-reduction>
- Reducing the Water Footprint of the Global Cotton-Textile Industry towards the UN Sustainable Development Goals. Final Report of the Joint Research Project InoCottonGROW, BMBFG Grant Number 02WGR1422A-M. FiW e.V., Aachen, Germany <https://www.inocottongrow.net/>
- Best Available Techniques (BAT) Reference Document for the Textiles Industry, European IPPC Bureau, https://eippcb.jrc.ec.europa.eu/sites/default/files/2020-01/TXT_bref_D1_1.pdf
- IFC Partnership of Cleaner Textiles <https://www.textilepact.net/>

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