

Wash Away Your Soaping Problems with Itawash

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THE HUMAN POPULATION is growing fast, and our water use is growing even faster. Fresh water is becoming scarcer and more expensive. Many people today are short of drinking water, but textile processing still uses a huge amount of this precious resource. In textile wet processing, water is used mainly for two purposes: firstly, as a solvent for processing chemicals; and secondly, as a washing and rinsing medium.

Reactive dyestuff belongs to the group of dyestuffs widely used for dyeing/printing of cellulosic fibre. A number of reactive dyestuffs are sold and their product lines are diversified, from conventional ones to high-tech products by discharge and resist printing processes. Reactive dyeing of cellulosic substrates takes place under alkaline conditions, but this alkaline condition also facilitates the reaction of reactive groups with the dye liquor (water), resulting in hydrolysis of the dye. Approximately $\frac{3}{4}$ of the dye gets fixed while remaining $\frac{1}{4}$ gets hydrolysed. After dyeing, the substrate contains unfixed hydrolysed dyes and usually some residual unfixed dyes. This hydrolysed dye adheres on to the substrate and keeps on getting removed during washing treatments, causing poor wash fastness.

Removal of hydrolysed and unreacted dye from the goods is a vital step after dyeing. Unlike other dye classes, as much as 50% of the total cost of a reactive dyeing

process is attributed to the washing-off stages to remove unfixed or hydrolysed dye and treatment of the resulting effluent. The hydrolysed dye must be removed by rinsing and using an appropriate washing-off agent in order to retain the fastness properties. Effective washing after reactive dyeing is crucially important.

The washing process, as far as reactive dyes are concerned, contains more complex factors than the washing process used with other groups of dyestuffs. Normally, a washing process includes first rinsing, washing, second rinsing, and a drying step. Typically, soaps, such as phosphate-based detergents, are added during the washing step to assist in removal of unreacted reactive dyes. However, the liquid alkalis used during fixing have not been considered for use during soaping since they would not be expected to assist in excess dye removal. In addition, if the reaction mixture is too hot or alkaline, such as is seen with pure sodium hydroxide, the sensitive-type reactive dyes will hydrolyse with the water in the rinse bath and form a nonreactive pigment that has no effect on the fabric colour. Furthermore, phosphate and silicate based soaping agents are not accepted by European countries due to their biodegradability issues.

Traditional washing methods cannot achieve the purpose

of complete elimination of the unfixed dyes because of the substantivity between dyes and fibres. Some surfactants used in the traditional washing agents are forbidden because of their environmental pollution and toxicity. It is necessary to develop new washing agents that accord with environmental protection demands and that can strike a balance between the removal of unfixed dyestuff and prevention of re-deposition

Role of washing-off agents in reactive dyeing:

- Washing-off agents are necessary to remove the unfixed hydrolysed dye from the dyed material.
- Washing-off agents disperse hydrolysed dyestuff and keep them in the water bath, preventing their re-deposition on the substrate.
- Washing-off efficiency of dyes would depend upon the amount of unfixed dye and ease of removal of unfixed dye.
- Washing-off agent should facilitate the diffusion of unfixed dye molecules from the fibre into the water.

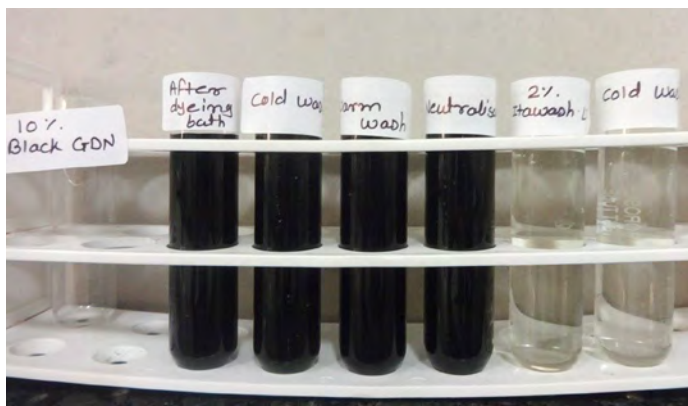


Fig 1: Exhausted bath after each washing-off steps

Washing fastness : ISO 105 C10	
Blank	
2% Itawash-LT	
Water Contact Test : ISO 105 E01	
Blank	
2% Itawash-LT	

Table 1: Fastness testing

Need of Low Temperature Washing-off Agents

A growing world population demands an increasing amount of fresh water and energy, therefore reducing the usage of these resources has been a hot topic lately. In the process of reactive dyeing of cellulosic fibres, there is a huge potential for saving energy and water in the wash-off process. A typical wash-off process of reactive dyeing needs approx. 5-6 rinsing and soaping baths, and for darker shades even more baths may be necessary to reach the required wet fastness level. All this effort is required to remove the unfixed, hydrolysed reactive dye. So-called washing-off agents can help in cases of poor rinsing to reach the required fastness level, but they are not able to shorten the process. Setting of a high temperature seems preferable for removal, however, washed-off dyestuff often diffuses and penetrates into the yarn, resulting in re-adsorption and staining. The use of a special washing-off agent, capable of producing maximum effects in a quick, strong soaping at a small bath ratio, while preventing re-deposition and staining of white ground regardless of rinsing temperature or any difference in process conditions, is considered most rational.

Keeping in mind the need of the dyer, Sarex has developed one such product, Itawash-LT, which is a low temperature washing-off agent. Itawash-LT shortens and reduces the washing-off process during reactive dyeing to achieve good fastness, ultimately reducing the time, energy and water against conventionally used washing-off agents.

Unqie features:

- Saves energy: operates at lower temperatures of 40-60°C
- Saves water - minimum of 3 baths can be reduced

- Saves time: Improves productivity
- Reduction in effluent load
- APEO/NPEO free
- Single bath washing for dark shades
- Double bath washing may require for shades such as orange, turquoise blue and royal blue dyes
- Effectively removes unfixed and hydrolysed dyes
- Excellent dispersibility, which prevents re-deposition
- Washing fastness is comparable to conventional washing-off agents

Materials and Methods

Materials: 100% Cotton knits (RFD) Single jersey

Chemicals: Itawash-LT

Reactive Dyestuff: Reactive Black GDN (10% shade)

Experimental

Reactive dyeing was carried out as per the standard recipes. After the completion of dyeing, the washing-off procedure was followed as given below:

1. Drain the dye bath
2. Cold wash for 10 min and drain
3. Warm wash at 50°C for 15 min and drain
4. Neutralize with acetic acid, make bath pH 5.0-6.0, run for 10 min, check pH 5.0-6.0 and then raise temp to 60oC for 20 min and drain
5. Make bath pH 5.0-6.0 using acetic acid, then add 2% Itawash-LT, run at 40oC for 30min and drain
6. Cold wash for 10 min and drain

Evaluation

The washing-off efficiency of Itawash-LT was evaluated by performing washing fastness and water contact test with below standard test methods.

- Washing fastness test : ISO 105 C10
- Water contact test : ISO 105 E01

Results & Discussion

Fig.1 shows the drain baths of the washing-off process with Itawash-LT. It can be clearly seen that up to the neutralisation step, there is considerable bleeding of unfixed dye. However, after washing the fabric with Itawash-LT, the drain baths are almost colourless.

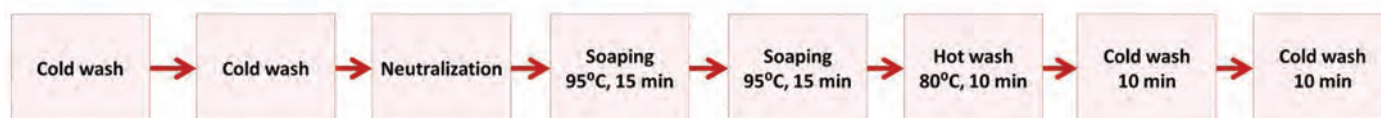
The fastness results, as can be seen from Table 1, indicate that Itawash-LT is an effective washing-off agent. Moreover, washing with Itawash-LT is carried out at 40°C for 20 min, unlike the conventional process where washing is carried out at 90-100°C. The lower temperature results in the saving of energy.

The conventional process is a lengthy process of about 7-8 steps, as shown in Fig. 2. Itawash-LT process needs a minimum of 3 rinsing baths less than the conventional process and soaping with Itawash-LT is carried out at 40°C, which clearly indicates that washing-off process with Itawash-LT is an economical, ecological and energy conserving process. Under bulk conditions, Itawash-LT shows about 20% saving in time, water and energy as compare to the conventional process, making the process ecological and economical.

Conclusion

- Itawash-LT is a low temperature washing-off agent which effectively reduces the washing-off process during reactive dyeing to achieve good fastness properties
- It shows 20% saving in time, thereby increasing productivity, and saving in water, hence contributing in protecting the environment
- These potential savings make Itawash-LT process a highly recommended integral part of sustainable textile production

Conventional washing-off process for very dark shades



ITAWASH-LT washing-off process for very dark shades



Fig.2 : Washing-off steps followed conventionally and with Itawash-LT