econfidence® from DyStar®

DyStar®

Whitepaper

Sera® ECO WASH process

Advanced wash-off process for reactive dyeing in exhaust process

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Introduction

An increasing world population will demand 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 procedure.

A typical wash-off process of reactive dyeing needs approx. 5-6 rinsing and soaping baths and, if the dye selection is not optimal or 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, hydrolyzed reactive dye. So-called soaping agents can help in cases of poor rinsing conditions – e.g. water hardness, electrolyte content or inadequate temperature – to reach the required fastness level, but they are not able to shorten the process.

This long wash-off procedure with temperatures at boiling point is necessary because of limited fixation yield and poor wash-off behavior of many of the reactive dyes.

Reducing the water and energy consumption

When selecting high performance reactive ***Levafix***® and ***Remazol***® dyes from DyStar®, which possess high fixation yield and improved wash-off behavior properties, and using a special washing accelerator, the consumption of water can be reduced by up to 25% ; and the consumption of energy by up to 50%.

The washing accelerator is called ***Sera***® ***Fast C-RD*** and because of its special chemistry, it is able to remove more hydrolyzed dyestuff from the fiber and prevents it from re-exhaustion. It is not impaired by electrolyte carried over from the dye bath or water hardness.

Following pictures show the comparison between a conventional dyeing and rinsing/soaping process with the new Sera® ECO WASH process:

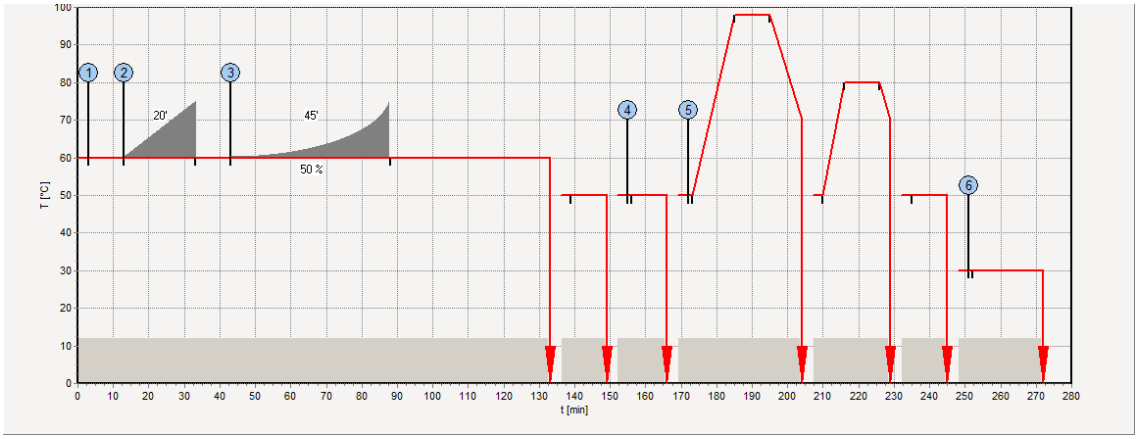

Figure 1: Conventional dyeing and rinsing/soaping process

1. Salt and auxiliaries **2. Reactive dyes** **3. Alkali** **4. Acetic acid**
5. Soaping agent **6. Softener**

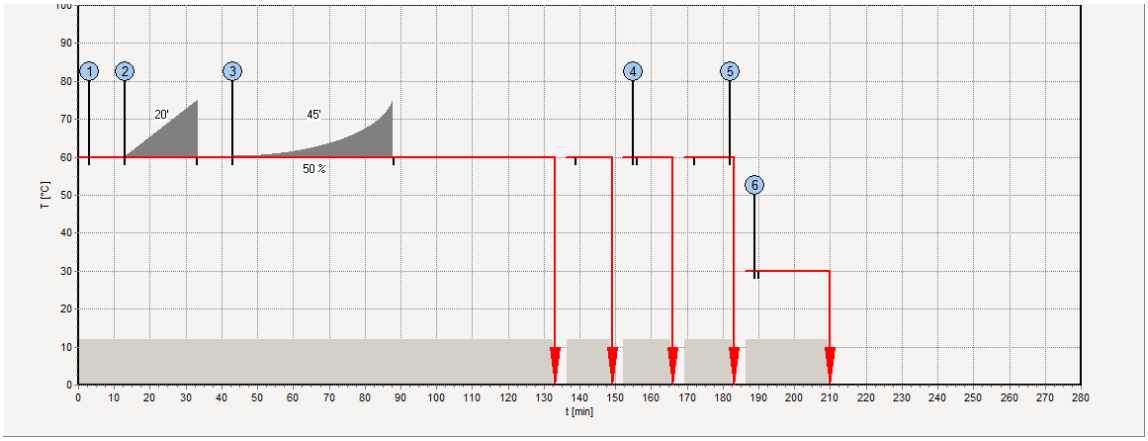

Figure 2: New Sera® Eco Wash process

1. Salt and auxiliaries **2. Levafix®/Remazol® dyes** **3. Alkali** **4. Sera® Fast C-RD**
5. Acetic acid **6. Softener**

When dyeing a medium Brown shade with in total 2.5% Remazol® Ultra RGB dyes, using Sera® ECO WASH process, and checking fastness to water severe (ISO 105-E01) and Fastness to washing 60°C (ISO 105-C06-C2S) you'll reach a perfect result (Figure 3):

ISO 105-E01
Dyeing **Multifiber**

ISO 105-C06 C2S
Dyeing **Multifiber**

Figure 3: Fastness test to water severe (ISO 105-E01) and fastness to washing by 60°C (ISO 105-C06 C2S)

Referring to Figure 1 and 2, it becomes immediately visible that Sera® ECO WASH process (Figure 2) is much shorter than the conventional process (Figure 1). It is also visible, that Sera® ECO WASH process needs 2 rinsing bathes less than the conventional process and that all bathes with Sera® ECO WASH are carried out at 60°C only.

Comparisons under bulk condition at various customers show the following resource savings:

- Time - 30%
  Water - 25%
  Electricity - 60%
  Steam - 60%

Saving of 30% in time can also mean an increase of 30% productivity if the saved time can be used for additional production.

Saving 25% of water, is not only cost-efficient, but also contributes to protecting our environment.

Both the production of electricity and steam are based in most cases on the combustion of fossil fuels. If the production of energy is based on combustion of coal we can do following calculation.

The thermal energy content of coal is 6.67 kWh/kg. Although coal fired power generators are very efficient, they are still limited by the laws of thermodynamics. Only approx. 30 percent of the thermal energy in coal is converted to electricity. So the electricity generated per kg of coal is 0.3 x 6,67 kWh or 2.00 kWh/kg.

When assuming a 600 kg dyeing on a modern Jet machine, a saving of 5 kWh per Sera® ECO WASH dyeing sounds realistic.

When using Sera® ECO WASH process for only 5 batches per day and a yearly working time of 300 days, the saving in electricity is around 7500 kWh. That will also be a saving of 3750 kg coal per year.

As the combustion of 1 kg coal generates 2.94 kg CO_2 (1 kWh ≈ 1.47 kg CO_2) [1)], the 7500 kWh electricity which can be saved corresponds a saving of 22 ton of CO_2.

These potential savings make Sera® ECO WASH process a highly recommended integral part of sustainable textile production.

Additional information about Sera® ECO WASH process and recommended Levafix® and Remazol® dyes can be found on our home page (www.DyStar.com).

References

1) http://en.wikipedia.org/wiki/Coal