

Whitepaper

Sera[®] ECO WASH process

Advanced wash-off process for reactive dyeing in exhaust process

07/2014

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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:

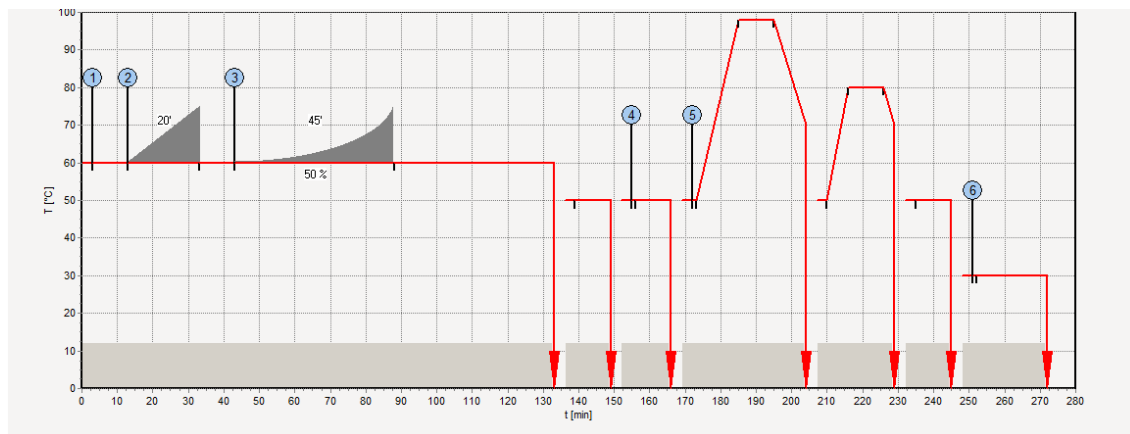


Figure 1: Conventional dyeing and rinsing/soaping process

1. Salt and auxiliaries
5. Soaping agent

2. Reactive dyes
6. Softener

3. Alkali

4. Acetic acid

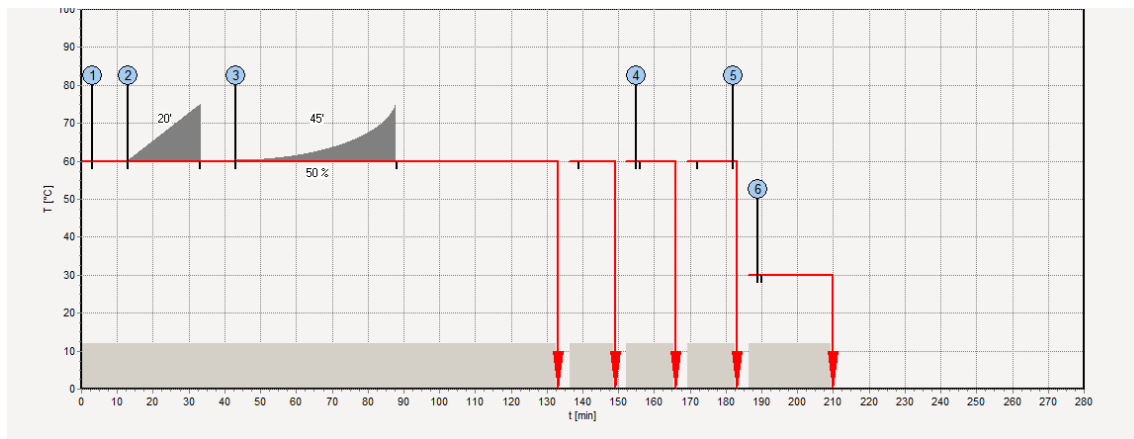


Figure 2: New Sera® Eco Wash process

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|--------------------------------|----------------------------------|------------------|---------------------------|
| 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):



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 CO₂ (1 kWh \approx 1.47 kg CO₂) ¹⁾, the 7500 kWh electricity which can be saved corresponds a saving of 22 ton of CO₂.

These potential savings make Sera ECO WASH process a highly recommended integral part of sustainable textile production. The Sera ECO WASH process works best with selected Levafix® and Remazol® dyes. A list of recommended dyes can be found in Table 1.

LEVAFIX®	%	REMAZOL®	%
Levafix Brilliant Yellow CA	1,90	Remazol Yellow RR	2,50
LevafixYellow CA	1,50	Remazol Red RR	2,60
Levafix Amber CA	1,70	Remazol Blue RR	2,40
Levafix Orange CA	1,90	Remazol Golden Yellow RGB	2,30
Levafix Scarlet CA-N	2,00	Remazol Ultra Yellow RGBN	2,00
Levafix Brilliant Red CA	2,90	Remazol Ultra Orange RGBN	1,10
Levafix Fast Red CA	1,00	Remazol Navy RGB 150%	1,60
Levafix Red CA	2,00	Remazol Ultra Carmine RGB	1,70
Levafix Rubine CA	1,00	Remazol Ultra Red RGB	2,20
Levafix Olive CA100	2,10	Remazol Yellow GR 133%	2,00
Levafix Blue CA	2,00	Remazol Brilliant orange 3R spec	1,50
Levafix Dark Blue CA	2,00	Remazol Orange BN	2,10
Levafix Navy CA	1,30	Remazol Brilliant Red BB 150%	1,00
Levafix Golden Yellow E-G 150%	0,90	Remazol Brilliant Red F3B	1,00
Levafix Yellow E-3RL	0,50	Remazol Red RB 133%	2,80
Levafix Brilliant Red E-6BA	0,75	Remazol Brilliant Violet 5R	1,00
Levafix Brilliant Blue E-FFN 150%	1,50	Remazol Brilliant Blue BB 133%	2,00
Levafix Brilliant Blue E-B	0,50	Remazol Yellow SAM	2,00
Levafix Brilliant Blue E-BRA	0,80	Remazol Red SAM	2,00
Levafix Navy Blue E-BNA	1,60	Remazol Blue SAM	2,00
Levafix Brown E-2R	1,50	Remazol Grey SAM	2,00
		Remazol Gold SAM	1,00
		Remazol Terra Cotta SAM	2,50
		Remazol Maroon SAM	1,00
		Remazol Pacific SAM	2,50
		Remazol Space SAM	4,00

Table 1: Recommended dyes and recommended percentage for Sera® ECO WASH

Additional information about Sera® ECO WASH process are available on our Website (www.DyStar.com).

References

- 1) <http://en.wikipedia.org/wiki/Coal>

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