



Vol. 14, Issue 50, July 2020

Saraqvest

Exclusive Insight

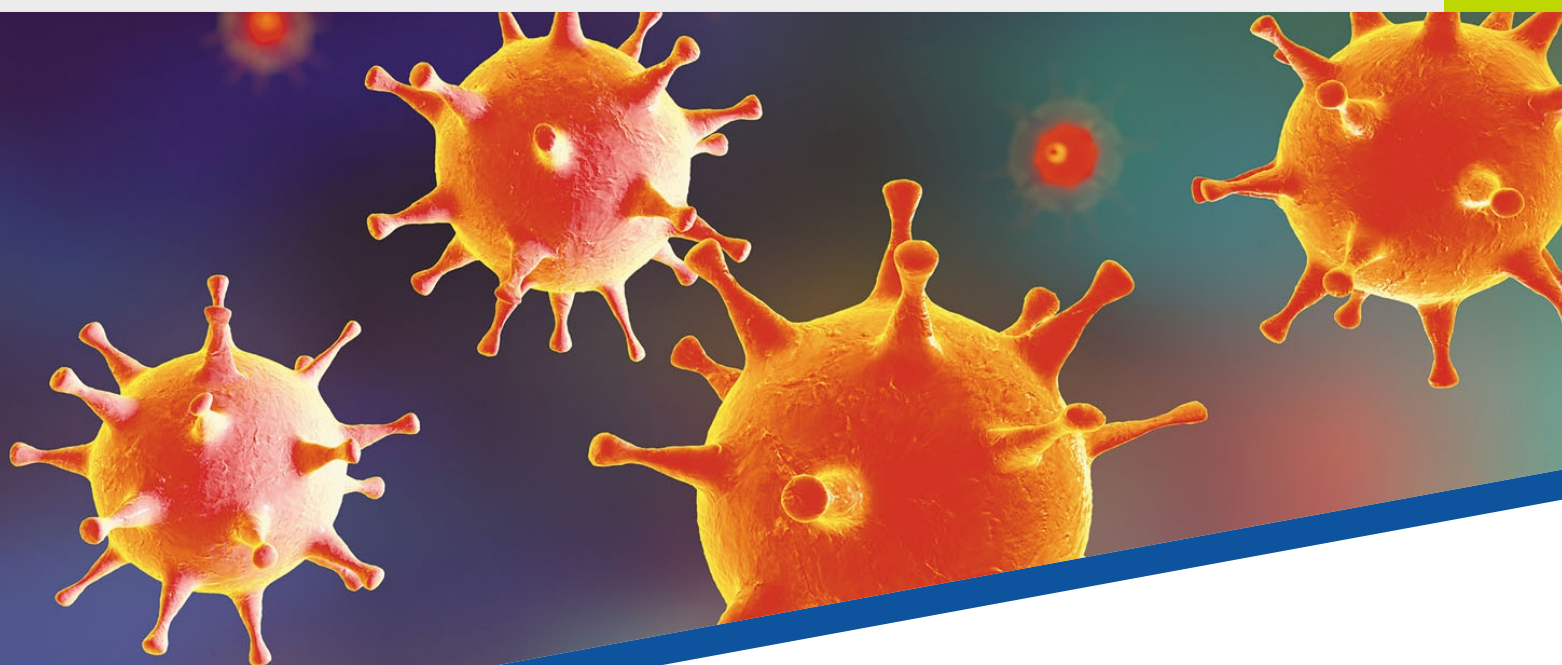
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CHEMISTRY BEHIND, GOOD FEELINGS

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SARAGUARD-5700

Focussing on Antiviral Properties

Textiles are the fabrics of our lives, offering protection from extreme cold, excessive heat and moisture, but in the Covid-19 crises, the urgent need for antiviral fabrics has opened up a whole new chapter for the development of antimicrobial surfaces that now take centre stage in the ongoing armoury of PPE, a term that we are now remarkably all familiar with. What was once a requirement for medical profession predominantly, is now set to cross into the general apparel sector. The challenge right now is not just antibacterial fabrics but having a fabric that is antiviral also. As the country grapples with the Covid-19 pandemic, antiviral fabric seems to have become the buzzword in the textile industry. As the world faces the Covid-19 crisis, there is an urgent need for antiviral fabrics. Research shows that viruses and bacteria can remain active on textile surfaces for up to two days. Realising this scenario, India's textile companies have converted the pandemic-induced economic crisis into an opportunity, by coming out with antiviral textiles.

Technical textiles/specialised fabrics are finding their way in the making of masks and personal protection equipment as well as apparels now. Even though this fresh demand may not nullify the Covid impact on the sector, the antiviral fabrics could prove as a saviour in these testing times, giving room for fresh value-added products.

Textile materials that are being utilized in the hospitals viz., Healthcare workers' (HCWs) uniforms and PPE gets contaminated with bacteria and are conducive to cross infection or transmission of diseases originated by bacteria, fungi, viruses, pathogens. The existence and progression of microorganisms can be a source of health problems, odours and of course the weakening of the fabrics. The outbreak of coronavirus throughout the globe has produced large stress for protecting the personals with functional clothing and materials. Antimicrobial property has thus become an important function to be incorporated in the uniforms and PPE as a means of reducing this contamination.

Sarex has introduced a product **Saraguard-5700** which is highly effective, durable, non leaching antimicrobial and antiviral agent suitable for all substrates and effective against pathogens, viruses and bacteria's. The earlier article on Saraguard-5700 published in Saraquest, January 2020 issue was majorly focused on antibacterial properties. This article will elaborate primarily on the antiviral property of Saraguard-5700.

Unique Features:

- Methanol free, Silane based, Non-leaching Anti-microbial agent.
- Effective against broad spectrum of microbes, pathogens, bacteria, viruses, algae, mold, yeast.
- Applicable on all types of textile substrates including woven, non-woven and composites. It is also applicable on non-textile substrates viz., glass, table top, flooring, cartons etc.

- It is highly suitable in medical textiles, healthcare and hygiene textiles and Personal protective equipments (PPE). PPE refers to protective clothing, helmets, gloves, face shields, goggles, facemasks and/or respirators or other equipment designed to protect the wearer from injury or the spread of infection or illness.
- Can be applied by padding, exhaust, soaking and spraying methods.
- Durable to multiple home launderings.

Effective against following microbes': Bacteria, Fungi, Yeast, Mold, Algae, Viruses

Bacteria		Fungi	Yeast	Algae	Mold	Viruses
Gram positive	Gram negative					
<ul style="list-style-type: none"> • <i>Staphylococcus aureus</i> • <i>Bacillus subtilis</i> • <i>Streptococcus faecalis</i> 	<ul style="list-style-type: none"> • <i>Escherichia coli</i> • <i>Klebsiella pneumonia</i> • <i>Salmonella typhosa</i> • <i>Mycobacterium tuberculosis</i> 	<ul style="list-style-type: none"> • <i>Aspergillus niger</i> • <i>Aspergillus terreus</i> • <i>Aspergillus flares</i> • <i>Chaetomium globosum</i> 	<ul style="list-style-type: none"> • <i>Saccharomyces cerevisiae</i> • <i>Candida albicans</i> 	<ul style="list-style-type: none"> • <i>Cyanophyta oscillatoria</i> • <i>Cyanophyta anabaena</i> • <i>Chlorophyta selenastrum gracile</i> 	<ul style="list-style-type: none"> • <i>Black mold</i> 	<ul style="list-style-type: none"> • <i>Influenza A2</i> • <i>Influenza B</i> • <i>Adenovirus</i>

End application includes

- | | | | |
|---|--|--|---|
| <input checked="" type="checkbox"/> Surgeon Gowns | <input checked="" type="checkbox"/> Bed Linens | <input checked="" type="checkbox"/> Filter Materials | <input checked="" type="checkbox"/> Hospital Uniforms |
| <input checked="" type="checkbox"/> Caps | <input checked="" type="checkbox"/> Patient Drapes | <input checked="" type="checkbox"/> Diapers | <input checked="" type="checkbox"/> Incontinence Diapers |
| <input checked="" type="checkbox"/> Faces Mask | <input checked="" type="checkbox"/> Cover Cloths | <input checked="" type="checkbox"/> Bedding | <input checked="" type="checkbox"/> Wipes |
| <input checked="" type="checkbox"/> Gloves | <input checked="" type="checkbox"/> Ambulance Blankets | <input checked="" type="checkbox"/> Blankets | <input checked="" type="checkbox"/> Surgical Hosiery etc. |
| <input checked="" type="checkbox"/> Bandages | <input checked="" type="checkbox"/> Stretchers | <input checked="" type="checkbox"/> Pillow Cases | |

Application Method

100% Cotton, 100% Polyester and 100% Polyamide fabrics were treated with Saraguard-5700 at required concentrations, with 65% pick-up. The pH of 5.5 was maintained and the fabrics were dried at 150°C for 2 min.

Evaluation

The finished fabrics were taken further to study their antiviral activity. Following test method was followed to study the efficacy of product.

Assessment of antiviral treatment using AATCC 100-2012 (Modified for viruses)

Antiviral property of 100% Polyester fabric treated with 40gpl Saraguard-5700 was also carried out from outside laboratory (Biotech testing services). The antiviral property was determined by AATCC Test Method 100-2012 (modified) using MS2 Bacteriophage (MS2), an RNA virus of the family Leviridae. *Escherichia coli* 15597 are the hosts for bacteriophages. Due to its environmental resistance, MS2 bacteriophages are used as a surrogate virus particularly in place of Picocornaviruses such as Poliovirus and human Norovirus in water quality and antimicrobial studies.

Results & Discussions

Table 1: Antiviral property of treated fabrics - MS2 Bacteriophage

Textile substrate	Samples	% Reduction of Virus	
		At 2 hours	At 24 hours
100% Cotton fabric	Untreated	0.00	0.00
	40 g/l Saraguard-5700 - Initial	>99.99	>99.99
	40 g/l Saraguard-5700 - 5 HL	95.41	90.47

Textile substrate	Samples	% Reduction of Virus	
		At 2 hours	At 24 hours
100% Polyester fabric	Untreated	0.00	0.00
	40 g/l Saraguard-5700 - Initial	>99.98	>99.98
	40 g/l Saraguard-5700 – 5 HL	98.47	99.03
100% Polyamide fabric	Untreated	0.00	0.00
	40 g/l Saraguard-5700 - Initial	>99.99	>99.99
	40 g/l Saraguard-5700 – 5 HL	94.72	81.48

HL : Home Launderings

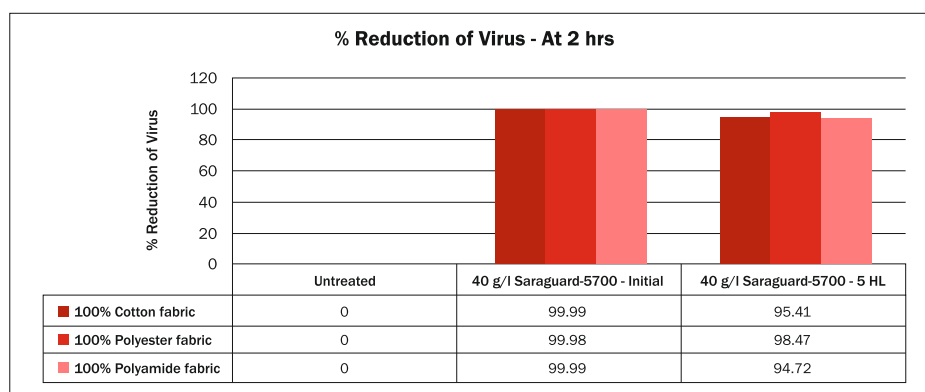


Fig. 1: % Reduction of virus of the treated fabrics – At 2 hrs

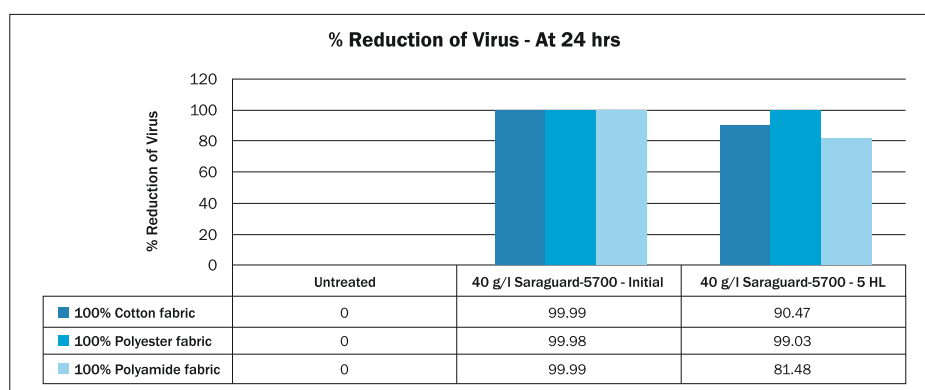


Fig. 2: % Reduction of virus of the treated fabrics – At 24 hrs

The fabrics taken under study, 100% Cotton fabric, 100% Polyester fabric & 100% Polyamide fabric, when treated with 40gpl Saraguard-5700 has shown >99% reduction of Virus in 2hr and 24hr when analyzed as per AATCC 100-2012 test method using MS2 Bacteriophage as surrogate virus. The antiviral property of the treated fabrics is also effective after 5 home launderings as can be observed in Table 1, Fig.1, Fig.2.

Saraguard-5700 proved its efficacy as an effective and durable antimicrobial agent possessing very good antibacterial, antifungal and antiviral properties. The product is highly recommended for application on all types of PPE clothing like gowns, face masks, gloves etc. which will give protection to our Health care personnel's who are at forefront in protecting us in the current fight against Corona virus.



SARABLEACH-BBA

Bleach Bath Activator

The dyeing and finishing of readymade jeans garments has gained increasing prominence in recent years. It has gained a position of ever-increasing importance in the clothing market due to wearing comfort and fashion. Designers learned to make jeans attractive to an ever increasing number of customers through innovative modifications and styling.

Bleaching is a treatment of textiles in order to lighten the fabric for the final shades. Bleaching with sodium hypochlorite is by far the most common bleaching process. Sodium hypochlorite is generally used as a bleaching agent. As on date, 'Chlorine Bleach' is the most effective bleaching agent for indigo since all shades can be obtained from it. It is used when the indigo's colour needs to be lightened as required by fashion, as well as to clean up the pocket linen and the inner face of the jeans (weft). This particular bleaching process is preferably used whenever a strong contrast between blue and white fibres is desired since it gives the bluest cast of all bleaching processes.

Due to its high oxidation potential, hypochlorite bleaching is carried out at low temperatures. The actual bleaching agent in bleaching liquors is not sodium hypochlorite (NaOCl) itself, but the hypochlorous acid (HOCl) which is formed from it in a pH sensitive equilibrium. In order to ensure mild bleaching conditions, a pH range between 9.0-11.5 has been found as optimum range for effective bleaching. Since, under practical conditions, pH levels below 10 are difficult to keep constant, an initial pH range

in 11.0-12.5 is selected, as a rule to take into account the consumption of soda ash or caustic soda.

The drawback with sodium hypochlorite bleaching agent is the fact that hypochlorite consequently reacts relatively unselective; it reacts even with the fibres. In this bleaching, even the fibre is damaged and there is emission of polluted waste water. In order to minimize the fibre damage and thereby its emission in waste water, Sarex has developed a bleach activator/booster/catalyst, **Sarableach-BBA**, which when added in the bleaching bath, catalyzes the bleaching action. The same bleaching effect is obtained by the reducing the sodium hypochlorite dosage to 50%. Below mentioned are its unique key features.

Unique Features:

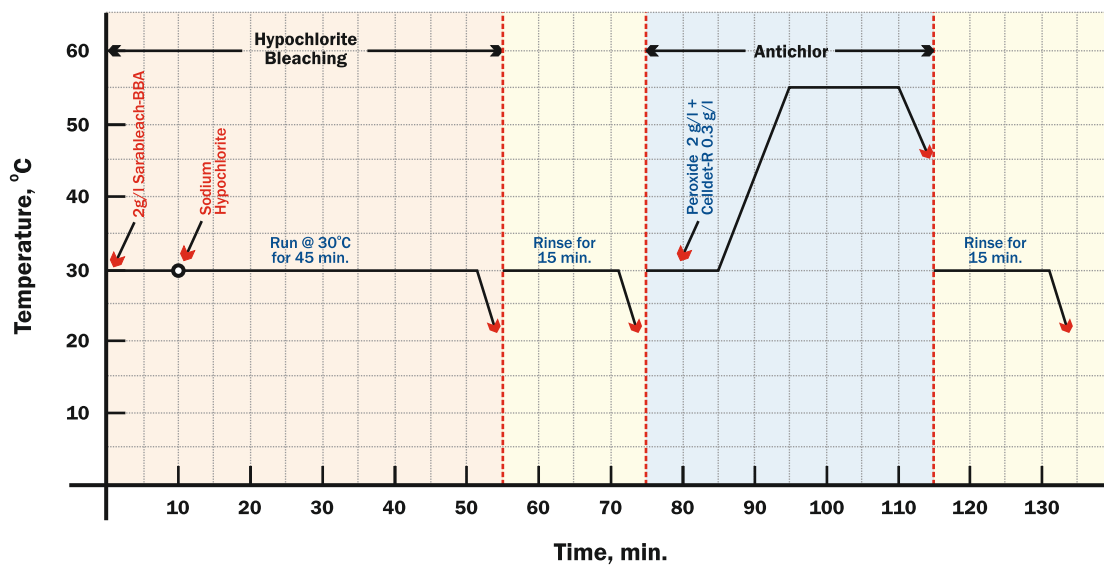
- Sarableach-BBA is a catalyst developed for hypochlorite bleaching of denim garments and its blends.
- With the use of Sarableach-BBA, the concentration of sodium hypochlorite can be reduced to 50% to get the same fading effect.
- Due to low concentration of sodium hypochlorite in bleaching with Sarableach-BBA, degradation of Lycra and Tencel fibre used in blends is prevented.
- Localized pre treatment with Sarableach-BBA can produce various effects like sand blasting on indigo or sulphur dyed fabric.

Mechanism of Action:

Denim garments are subjected to sodium hypochlorite bleaching to get various fading effects in order to achieve this effect, the amount of sodium hypochlorite is varied, and however the high concentration of hypochlorite results into weaker garment. Sarableach-BBA, when used along with sodium hypochlorite acts as a bleach activator and helps to achieve the desired adding effect at lower concentration of sodium hypochlorite.

Application Method of Sarableach-BBA

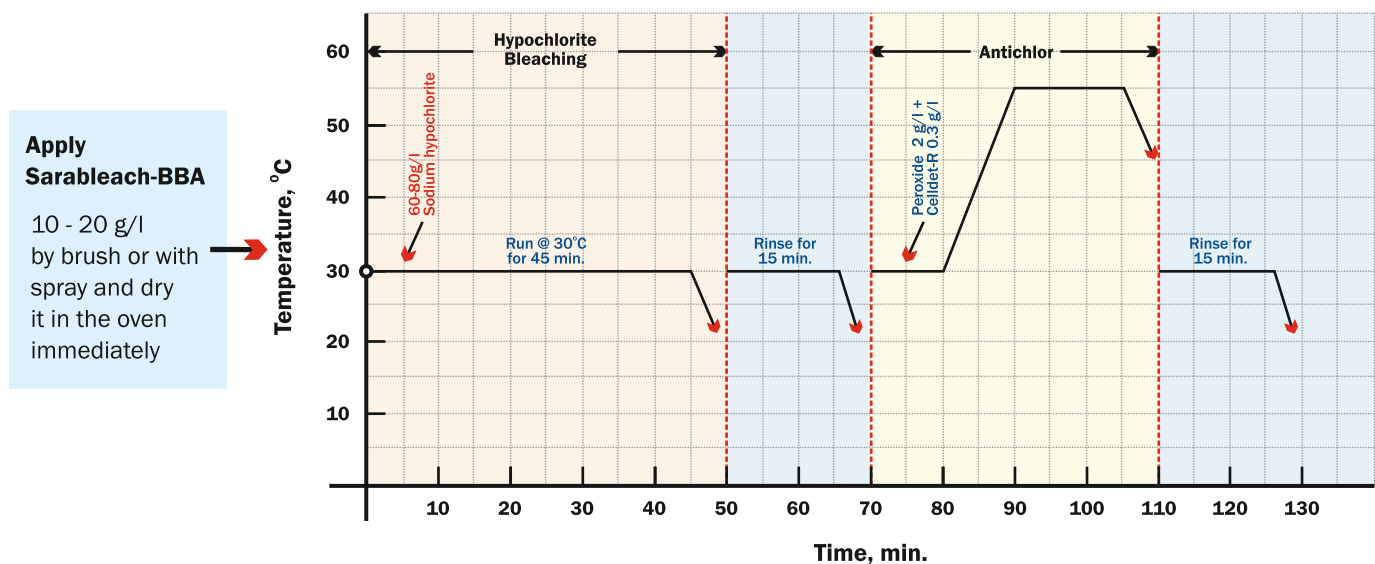
Process flow in drum washer for fading effect on a garment as activator for sodium hypochlorite



Sodium Hypochlorite Concentration:

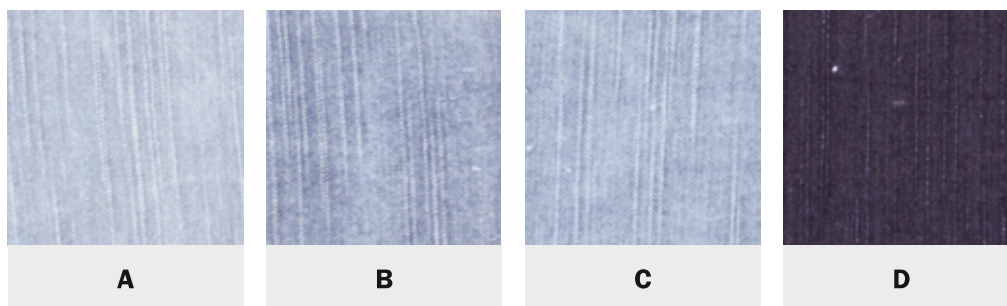
1. Low fading: 25 - 30 g/l
2. High fading: 40 - 60 g/l

Process flow on a garment to get localised fading effect



Apply Sarableach-BBA

10 - 20 g/l by brush or with spray and dry it in the oven immediately

Results:

- A.** 40gpl NaOCl + 1gpl Sarableach-BBA, 30 min.
- B.** 40gpl NaOCl + 0.5gpl Sarableach-BBA, 30 min.
- C.** 80gpl NaOCl, 30 min.
- D.** Desized Denim

Sarableach-BBA is used as an activator to get better fading effect at low concentration of hypochlorite. Above results shows Sarableach-BBA improves the bleach effect with lower concentration of sodium hypochlorite.



SARAQUEST-W (CONC)

Sequestering Agent in Textile Wet Processing

What are Sequestering Agents?

A sequestering agent is a substance that removes ions from a solution system by forming a complex that does not have chemical reactions with the ion which is removed. Sequestering agents are commonly used for removing water hardness. They form molecules in which the ions are held so securely that they can no longer react. Sequestering agents are also known as chelating agents. A chemical sequestering agent surrounds another molecule or atom and holds it "in seclusion". In this process, the chemical sequestering agent hides the molecule or atom and prevents it from interfering into chemical reactions.

Role of Sequestering Agents in Textile Wet processing – In Pre treatment

Sequestering agent is used in textile wet processing for minimizing the negative effect of calcium, magnesium, ferric ions which are present in hard water. Cotton fibre/fabric also contains varying quantities of metal traces (iron, copper), which mainly comes from fertilizers and insecticides. Also, the iron content of caustic soda may exceed to 100 mg/lit. There are many routes through which the metal traces enters in the wet processing operation. Cotton fabric is usually bleached by treatment with hydrogen peroxide under alkaline conditions in order to

achieve a satisfactory level of whiteness through oxidation of coloured impurities. The trapped iron residues in the fabric acts as catalyst in this process and causes H_2O_2 to undergo homolytic fission to two hydroxyl radicals ($OH\bullet$). This metal ions causes abnormal decomposition of H_2O_2 . The rate of decomposition may be so high that cellulose is converted into oxy-cellulose. The oxy-cellulose thus produced becomes visible in form of tiny holes commonly addressed as iron pin-holes in the industry. Fabrics comprising pinholes results into poor mechanical properties and are rejected as waste and are the cause of major concern to textile processing organizations.

Role of Sequestering Agents in Textile Wet processing – In Dyeing

The presence of alkaline earth metals (calcium and magnesium) and other heavy metals has a significant effect on the degree of success which is achieved in the sequence of preparation, dyeing and washing-off during the processing of cotton and its blends. Potential problems include physical and chemical damage (including pin holes) in the cotton during preparation, reduced depth of shade, dulling of colours, unlevel dyeing, and poor colour reproducibility and reduced fastness properties during dyeing. This can give rise to customer complaints and a reduction in the level of right-first-time (RFT) production obtained with an increase in cost for reprocessing resulting in loss of economy, loss of productivity, revenue and profitability.

Calcium and Magnesium ions present in the hard water reacts with natural soaps generated during the alkaline scouring to form waxy substance on the textile material, which creates patchy dyeing and discolouration of the fibre.

This waxy substance also deposits on the machinery surface. This is termed as Lime soap deposits.

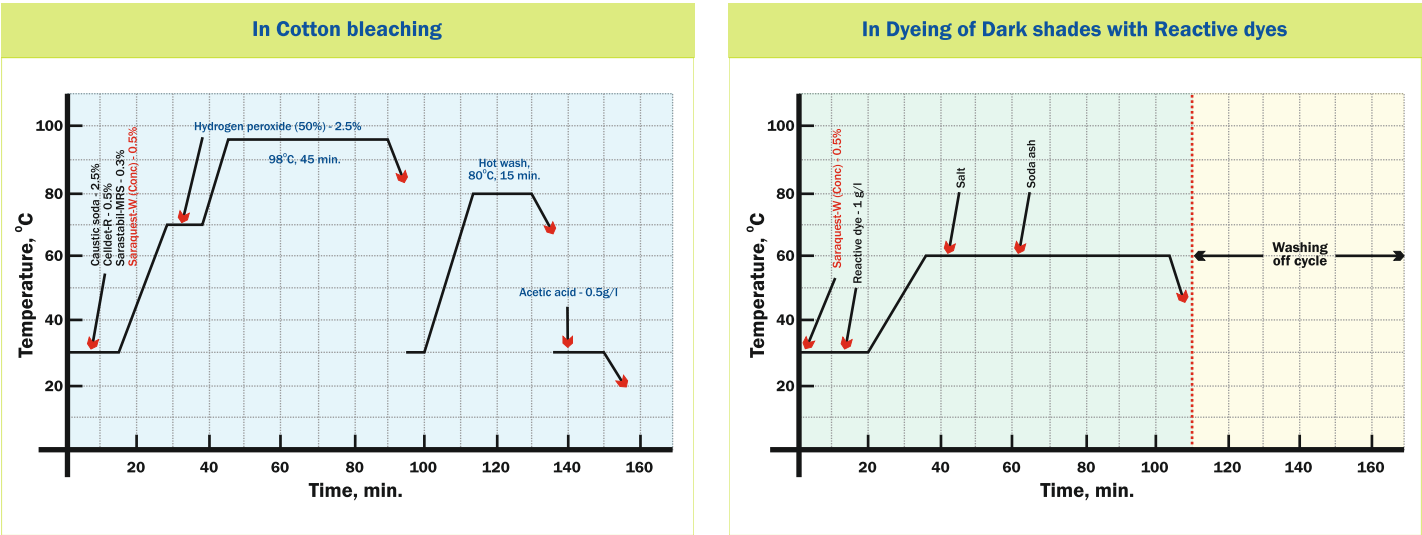
Calcium and magnesium ions also reduce the solubility of anionic dyes, causing reactive dyes to aggregate or even precipitate onto the fibre. Aggregated, and certainly precipitated dyes, cannot migrate or diffuse, usually remaining on the fibre surface as particulate deposits. This causes lower colour yield, unlevel dyeing, spots and stains which are difficult to remove, change of shade and even contamination of machines. Pthalocyanine turquoise dyes and tri-phendioxazine blues and some reactive orange dyes are particularly susceptible in this respect. In Dye-bath, Ca^{++} , Mg^{++} , Fe^{+++} attack the dye molecules and forms aggregates of molecules which deposits on the fabric as dye spots and also they prevent the reaction process.

Dye bath sequestrants should be of different strength than that of the scouring and bleaching baths, because some dyes have metal compounds and if powerful chelating agents are used then it will attack the metal compound of dye. Looking at the overall scenario of the need of sequestering agents to overcome the deleterious effects in the scouring, bleaching and dyeing bath, Sarex has developed a sequestering agent as Saraquest-W (Conc) which is an HEDP based sequestering agent and is suitable for desizing, scouring and bleaching operations.

Unique Features:

- An HEDP (1-hydroxyethane 1,1-diphosphonic acid) based sequestering agent.
- High power sequestering agent in powder form specially developed for scouring and bleaching of cotton and polyester/cellulosic blends.
- High chelating action for calcium, magnesium and iron under alkaline conditions and at high temperature.
- Prevents precipitation of insoluble hydroxides and carbonates which are formed due to alkali used in scouring and bleaching.
- It also chelates iron impurities preventing catalytic damage and pin-hole marks during peroxide bleaching.
- It has neutral pH so can also be used in dyeing.

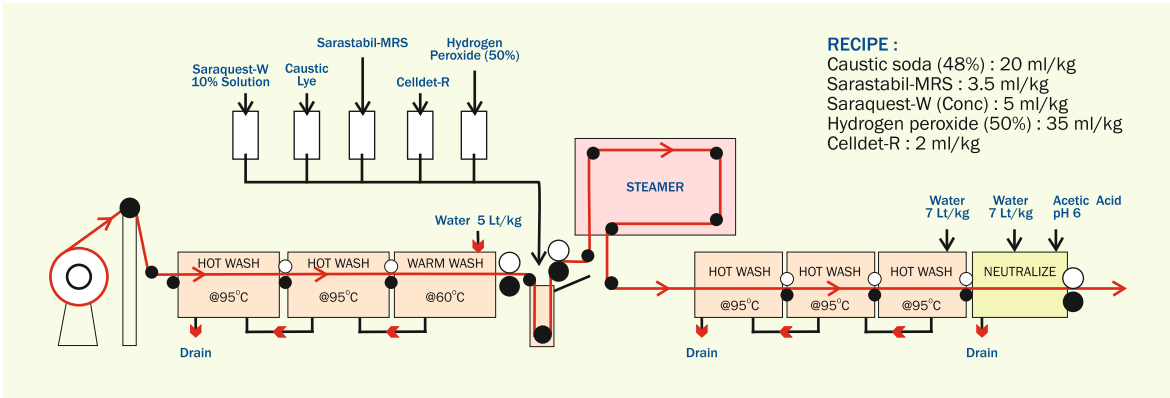
Recommended Application Process for Saraquest-W (Conc)



Method of using Saraquest-W (Conc) in Dyeing

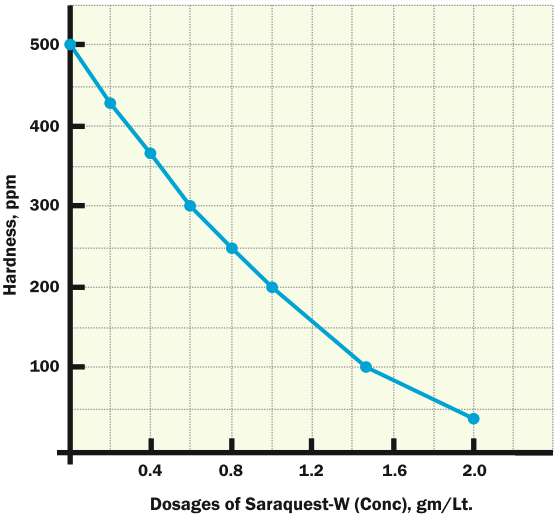
- Step 1:** Pre-dissolve 0.4g/l of Saraquest-W (Conc) in water and use this water to dissolve dyestuff.
- Step 2:** First add 0.4 g/l Saraquest-W (Conc) in the machine. Run it for 5 min till it is absorbed by fabric. Start dosing the dyestuff.

Saraquest-W (Conc) in Continuous Bleaching on CBR



Performance data

Water hardness reduction – Saraquest-W (Conc)



Saraquest-W (Conc) : Solubility of dyestuff in hard water

In the dyeing process, due to the presence of calcium and magnesium impurities in water or salt, Saraquest-W (Conc) will neutralize the impurities and thereby improve the solubility of dye.



Sequestering efficiency of Saraquest-W (Conc)

Products	Description	Ca chelation value (mg CaCO3/gm at pH 12)	Fe chelation value (mg of Fe/gm of sample at pH 11.5-12)
Saraquest-W (Conc)	HEDP based	600-680	1350-1450

Saraquest-W (Conc) : Iron chelation results



- 1
- Precipitation reaction : $\text{FeCl}_3 + 3\text{NaOH} \longrightarrow \text{Fe}(\text{OH})_3 + 3\text{NaCl}$
 $\text{Fe}(\text{OH})_3$ is a brown precipitate as seen on the Whatman filter paper
- 2
- Soluble Fe^{+3} salts dissolve in water to give a solution of hexa aquairon (III) ions, $[\text{Fe}(\text{H}_2\text{O})_6]^{3+}$
HEDP when dissolved in NaOH solution: $\text{HEDP} + 4\text{OH}^- \longrightarrow \text{HEDP}^{4-} + 4\text{H}_2\text{O}$

The following reaction takes place when solutions of $[\text{Fe}(\text{H}_2\text{O})_6]^{3+}$ and HEDP^{4-} are mixed:
$$\text{Fe}(\text{H}_2\text{O})_6]^{3+}_{(\text{aq})} + \text{HEDP}^{4-}_{(\text{aq})} \longrightarrow [\text{Fe}(\text{HEDP})]^{-}_{(\text{aq})} + 6\text{H}_2\text{O}$$

HEDP forms complex with Ferric ion, $\text{Fe}(\text{HEDP})$, which is colourless hence not visible on Whatman filter paper



Sarex

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