

# PRODUCT UPDATE

## Cotton pre-treatment — a smart step to quality

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ON analysis, it is found that 70% of all problems in textile wet processing can be solved if attention is given during the pretreatment stage. However, in practice it is found that the required importance is usually not given at this stage. Corrections are attempted during the Dyeing/Printing and finishing stages which end up not being satisfactory.

Globally 70% of Pretreatment Auxiliaries are used for cotton goods while the remaining is used on synthetic material. The major component in the Pretreatment package is the wetting agent/detergent followed by boil-off and bleaching agents. Right selection of these auxiliaries more or less determines the quality of pretreatment.

Currently 50% of pretreatment chemicals, globally are used to treat woven goods, 40% for knits and the remaining 10% for yarn/flocks.

There is an old saying 'Work well begun is work half done'.

This rings true for pretreatment process too. 70% of all faults in wet processing originate at the pretreatment stage. The common faults encountered are:

1. Stains
2. Catalytic damage
3. Poor absorbency
4. Poor whiteness
5. High fiber damage (Low degree of polymerization - DP)

Requirements in a good pretreated fabric are as follows:

1. Size free for woven goods
2. Impurities free
3. Good absorbency
4. Good Whiteness; high DP
5. Optimum swelling of fibers
6. Good dimensional stability
7. No variations in pH
8. Uniform residual moisture content

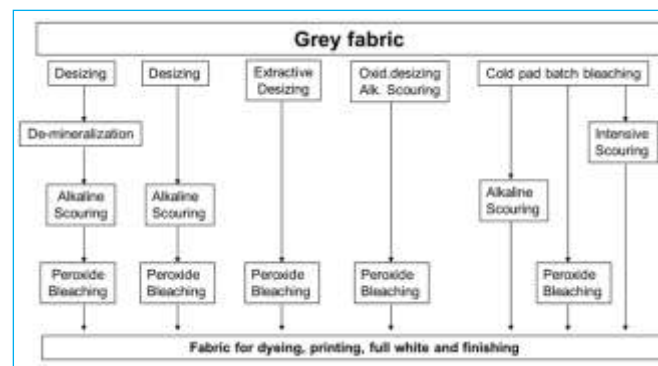
Cotton contains anywhere between 15 to 25% impurities both natural and man-made. Various mechanisms are

Mechanism	Cotton Contaminants that are Removed
Solving in water	Inorganic salts, acids, sugars, proteins, special sizes
Solving in alkali	Pectins, hemi-cellulose, proteins, waxes, fats, sizes
Solving in acid	Alkaline earth metals, heavy metals
Swelling	Dead and unripe cotton, husks, sizes
Emulsifying	Waxes, fats and oils
Dispersing	Alkaline earth metals, proteins, dust
Complexing	Alkaline earth metals, heavy metals
Oxidation	Husk, natural colored pigments, sizes
Reduction	Natural colored pigments, rust, metals
Enzymatic	Starch based sizes
Wetting /detergency	Fiber wetting and washing

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employed to rid cotton of these impurities :

Various methods of pretreatment for cotton goods are employed to achieve the objectives mentioned above. They are:



### Steps in cotton pretreatment :

#### 1. Enzymatic de-sizing

The purpose of desizing is to eliminate sizes in order to ensure the success in scour boiling and bleaching to subsequently produce faultless dyeing. Enzymatic desizing using Alpha-amylase enzymes bio-converts the insoluble starch sizes to water soluble glucose.

Inadequate desizing of textile goods is the most common problem in pretreatment. The desizing auxiliaries should help in deaerating and wetting the substrate so that optimum water is available to solvate and swell the hydrophobic polymer size. Only then the enzymes can penetrate the size film to break it down completely. There are two types of desizing enzymes usually employed; Low temperature enzyme that works in the 40 to 70°C range and the other one that works at a higher temperature range between 70 to 100°C. The efficiency of desizing is measured using a TEGEWA Violet scale developed in 1951 with a range from 1 to 9 where rating of 9 indicates complete removal of starch size. TEGEWA agent is a diluted solution of Iodine in water and alcohol. When this solution is applied on desized fabric it reacts with residual starch in the fabric if any and forms starch iodide which is blue in color. The lesser of color, higher is the amount of starch removed and higher is the TEGEWA rating, the best being a rating of 9.

Leomine Organics has a range of robust high performance desizing enzymes like **Leomine Desize DSE** and **Leomine Desize DHP** along with rapid wetting agents like **Leomine Wet WRA/WRM/RDM** that provide excellent TEGEWA results

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### 2. Pre-extraction

This process combines reduction and extraction. There are various processes employed. Pre-extraction can be combined with enzymatic desizing, in a bath before peroxide bleach or separately as extraction scouring.

Pre-extraction followed by peroxide bleach ensures:

- Higher degree of whiteness
- Uniform whiteness
- Extraction of metals like Iron in contaminated cotton qualities
- Optimum husk removal
- Good absorbency

Leomine Organics offers a complete range of extracting agents that work in the entire pH range viz. **Leomine Chelant CSA/CSC/CSM** and Leomine Extract CPE/CSE/DKE/SDE. They have the ability to selectively extract metals and stubborn impurities.

### 3. Scouring or Alkaline boil-off

The purpose of the alkaline boil-off and the subsequent washing process is to extract impurities and size degraded residues, pectins, lignins, waxes, greases, soil and dust. The main factors for success in this step depends on the concentration of caustic soda used, temperature and duration employed and avoidance of exposure to air to prevent formation of oxycellulose. Optimum concentration of caustic soda and corresponding reaction time is important to arrest the drop in DP. Auxiliaries employed in this process perform the following important functions:

- Oils and fats are saponified into water soluble glycerols and soaps
- Detergents used emulsifies the waxes
- Chelating and dispersing agents bind the heavy metals and disperse the polyvalent cations like calcium and magnesium which if not dispersed will form insoluble soap and deposit on the fabric

Leomine Organics provides powerful wetting, low foaming and emulsifying detergents like **Leomine Wash WSL/XDJ/DFB/DCP/DNC/JET DBJ/Jet DNB** for both exhaust and continuous processes.

### 4. Mercerizing

Mercerizing can be carried out at various stages e.g. on greige goods, after desizing, after combined desizing and scouring, after bleaching and after dyeing. There are various methods of mercerizing like hot mercerizing, cold mercerizing, tension mercerizing, slack mercerizing. Mercerizing is treatment of cotton goods with a concentrated solution of caustic soda. The objectives of mercerization are:

- To improve the lustre of cotton goods
- To improve dyeability
- To reduce damages due to neps on fabric
- To remove crease marks
- To improve physical properties like tensile & tear strength and abrasion resistance

### f. To improve handle

Factors that affect mercerizing are concentration of caustic soda employed, temperature, tension deployed and time of contact. A concentration of 300 g/l of caustic soda at 20°C with a rapid wetting agent is used for mercerizing the fabric held under tension to achieve the best results. The time of contact depends on the concentration of caustic soda but is usually between 45 to 60 seconds. To measure the level of mercerizing achieved, various methods are employed, the most common among them is Barium Activity Number method. A result of 130 is required to indicate optimum mercerizing.

Two products from Leomine Organics viz. **Leomine Mercerizer MCW/MCS** provide a balanced effect of low foaming/stability in high doses of caustic soda and instant wetting to ensure optimum mercerizing.

### 5. Oxidative hot bleaching

This is the final step in cotton pretreatment and the most visible in its effects. There are various methods of bleaching which can be broadly classified as Oxidative bleaching using peroxy compounds or chlorine based compounds and reductive bleaching. The most popularly used bleaching agent these days is Hydrogen peroxide for its various advantages the main one being, it can be combined with scouring. After bleaching, the yellowish and brownish tinge imparted by natural pigments in cotton are broken down and de-coloration takes place which makes the bleached goods look whiter and brighter.

Organic peroxide stabilizers from Leomine Organics like **Leomine Stabilizer PSD/PSL/PSE** ensure optimum stabilization of peroxide and along with Leomine Detergents and extracting agents result in brilliant whiteness. Peroxide quenchers like **Leomine Antiperox APX/CPK Conc.** ensure peroxide free fabric for subsequent dyeing.

The final results for pretreated cotton goods should be as follows to indicate optimum pretreatment:

Tests	Optimum Results
TEGEWA rating (woven fabric)	8-9
Degree of Polymerisation (DP)	1800
Degradation factor	0.21-0.30
Ethanol content after petroleum ether extraction	0.3-0.5%
Degree of Whiteness - Berger - for whites	75-80
Degree of Whiteness - Berger - for dyeing	65-75
Absorbency (drop test)	Instant
Mercerizing (Barium Activity Number)	130

Each step in the pretreatment process has its own importance and requires equal attention. More of one step cannot compensate for the deficiencies in others. With modern machinery with high speeds and precision, the role of auxiliaries for pretreatment are of utmost importance to reach perfection in pretreatment. **Leomine Organics Pvt. Ltd.** is fully aware of the power of these auxiliaries. It is continuously involved in intense R&D to provide the textile wet processing industry with sustainable solutions to 'generate brilliance out of the ordinary'. ■