

Green Edge of Blue Denim



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Introduction

The spread of denim culture, all over the world brought with it a trend of fast changing fashions and manufacturing technology. Nowadays, when it comes to eco-friendly treatments within the denim industry, there seems to be no shortage of innovative views, technological progression or the investments. Instead, the difficulty lies in the power to implement the green solutions into the apparel market. Naturally, no long-lasting change happens over night. Reasons vary throughout the supply chain: from short term pricing issues to lack of education concerning the production methods and or simple reluctance of companies as well as consumers to embrace a breath of fresh air in the way they conduct their business and or lead their lives.



Three main issues identified which put resistance on green edge movement ¹

1. There is an enormous need for an interdisciplinary consideration, education and open dialogue regarding the methods and technologies involved from the beginning phase of raw material sourcing through design, production and the consumer use stages.
2. The fresh ideas to fully materialize, one should not disregard the importance of the collaboration between the ground-breaking developments and the capital intensive apparel manufacturers.
3. The retail is saturated with insincere “green” claims, which cause mass confusion. To deliver honest products into the market manufacturers must adhere to the existing laws, employ appropriate testing policies and allow for transparency throughout the value chain. Putting the same into practice seems to be the most problematic as it requires additional research, time and advanced education.

Denim Garment Processing: Green Way

The domestic readymade garment sector is booming, and garment processing has emerged as one of the important production routes towards meeting quick changing demands of the fashion market. The new denim fabrics are manufactured from different type of eco-friendly fibre like Bamboo fiber denim fabrics, Organic cotton fabric, Cotton/Bamboo fiber

blended fabrics, Hemp/cotton blended denim fabrics, Hemp/Bamboo/wool/cotton blended denim fabrics, Cotton/organic cotton, Cotton/Rayon are labeled under green. But to impart unique looks and finishes that cannot be achieved in fabric form. One after another, several washes were introduced such as stone wash, acid wash, moon wash, monkey wash, show wash, frosted wash, white wash, mud wash, etc. Over the last 6-8 years, India has probably seen the most dramatic and exciting changes in the washing of denim garments. Some of the advantages of new processing techniques are explained².

- **Desizing**

Desizing is performed by using acid or oxidative desizing agents traditionally which is associated with many drawbacks and limitations. Due to uncontrolled and non-specific reaction, the cellulose material gets damaged and loses strength can be overcome by enzymatic desizing process is performed by using alpha amylase enzyme. The main advantages of enzymatic desizing over traditional desizing are like better strength retention, saving of water, process time can be reduced, saving of energy as desizing takes place at moderate temperature. Also feel of fabric is much softer and less hairiness on the fabric and no adverse effect on Lycra or polyester containing fabric. Handling of chemical is safe and easy. No adverse effect on material and machinery.

- **Stonewash Effect**

Stone wash effect is one of the oldest but highly demanded washing effects. Stone wash process gives “used” look or “vintage” on the garments, because of varying degree of abrasion in the area such as waistband, pocket, seam and body. The degree of colour fading depends on the garment to stone ratio, washing time, size of stones, material to liquor ratio and load of garments. Normally after desizing, stone wash process starts with pumice stone addition in rotary drum type garment washer. There are many limitations and drawbacks associated with stone washing process, which can be overcome by using new enzyme based washing technology. This technology also helps to conserve water, time, energy and environment.

Cellulase enzymes are natural proteins which are used in denim garment processing to get stone wash look on to the denim garments without using stones or by reducing the use of pumice stone. Cellulase attacks primarily on the surface of the cellulose fibre, leaving the interior of the fibre as it is, by removing the indigo present in the surface layer of fibre, Which give soft handle, luster and attractive clean appearance is obtained without severe damage to the surface of yarn and give top quality product by the removal of hairiness fluff and pills, etc. Fancy colour-fenced surface can be obtained without or a partial use of stone. It allows more loading of the garment into machines. Environmental friendly treatment, simple process handling and minimum effluent problem. Garments with less damage to seam edges and badges, homogenous abrasion of the garments. Problem of pumice powder contamination on garment is not there.

- **Denim bleaching**

In this process, a strong oxidative bleaching agent such as sodium hypochlorite or KMnO_4 is added during the washing with or without stone addition. Discoloration is usually more apparent depending on the strength of the bleach liquor quantity, temperature and treatment time. Due to harshness of chemical, it may cause damage to cellulose resulting in severe strength losses and/or breaks or pinholes at the seam, pocket, etc. This process is

harmful to human health and chlorinated organic substances occur as abundant products in bleaching, and pass into the effluent where they cause severe environmental pollution.

3-E Bleaching concept for denim the intensive research is underway for the development of sodium hypochlorite bleaching alternative e.g, glucose bleaching, bleaching with sulphinic acid derivatives, and recently with laccase⁵ (enzyme). Laccase enzyme belongs to the oxidoreductase group. Laccase's oxidative effect is complex, it does not work independently. A mediator is necessary and a chemical mediator is employed between enzyme and indigo. New Laccase based bleaching technique only affects the indigo and natural raw white of weft yarn is retained, giving the woven fabric a darker shade, which is not implicitly achieved with hypochlorite bleaching. This product is so specialised on indigo that it does not attack any other dyes. Laccases open up the door to bleach Lycra containing denim without losing the strength of the fabric. Finally the process is based on enzyme so no risk of environmental pollution and harmful effluent discharge.

The only limitation of this method expensive and heavy faded look is difficult to achieve.

The use of an engineered oxidatively stable alkaline protease that can tolerate a range of operating temperature and pH conditions offers flexible and alternative processes for backstaining clean-up, improved contrast of denim finishes, and reduced residual cellulase of fabric.

New Developments in Ecological Denim Processing ³



- **Laser Technology**

It is a computer controlled process for denim fading. This technique enables patterns to be created such as lines and/or dots, images, text or even pictures. In one version of this concept, a mask is used to give the desired shape that is to be applied on the fabric. The laser projects through a lens system, which expands the beam. This beam is passed through the shaped mask that comprises an aperture of the desired shape and is then deflected by a mirror to strike the textile substrate. The duration of exposure determines the final effect on the fabric. The novelty of this system that its water free, ecological and economical process for fading of denim. The machine is very simple and compact, therefore requires very low maintenance and cleaning, extremely safe and reliable.

- **Sand blasting**

Sand blasting technique is based on blasting an abrasive material in granular, powdered or other form through a nozzle at very high speed and pressure onto specific areas of the garment surface to be treated to give the desired distressed/ abraded/used look. This is purely mechanical process, not using any chemicals and water free process therefore no drying required. Any number of designs could be created by special techniques.

- **Mechanical abrasion**

To give worn out effect, abraded look or used look, some mechanical processes have been developed. These are based on mechanical abrasion by which the indigo can be removed. Some of these processes are sueding, raising, emerasing, peaching and brushing. Control on the abrasion so possible to get different look on the garment. All are dry process. Economical, ecological and environmental friendly.

- **Ozone fading**

By using this technique, the garment can be bleached. Bleaching of denim garment is done in washing machine with ozone dissolved in water. Denim garments can also be bleached or faded by using ozone gas in closed chamber. The colour removal is possible without losing strength. This method is very simple and environmentally friendly because after laundering, ozonized water can easily be deozonized by UV radiation.

Process Precaution with Spandex Denim⁴

- Keep a low and consistent temperature wash procedure.
- Standardize the time and M:L ratio.
- Try to remove maximum colour in de-sizing and enzyme procedures to avoid extended bleaching time.
- Carefully control the pH in bleaching. Should be kept in between 9.5-10 and temperature not more than 47°C.
- Give heavy extraction for removing maximum water- so as to reduce the beating action in tumbler.
- Remove complete chlorine residue by using proper antichlor.

Denim Brands on Mission to Go Green Way



1. The “Holy Grail” of denim the Levi’s ® brand-did research regarding a life cycle assessment of pair of their Levi’s ® 501 jeans. They found 58% of climate change impact happens at the consumer-use phase. Together with Goodwill International, Levis Strauss & Co. launched the “Care Tag for Our Planet” campaign.
2. The Advanced Denim by Clariant of Diresul RDT® range of dyes and the PAD-OX® Process. Their new low sulphide content dyestuff can achieve various indigo shades without the actual use of synthetic indigo. The Pad-OX® process manages to condense the typical 10-12 step indigo dyeing procedure into 4, consequently reducing water consumption and water clean up by 60%.
3. Genencor- line of enzymes called PrimaGreen ® which can achieve a collection of stone washed, vintage and bleached looks. The biodegradable nature of enzymes serves as a great substitute to other harmful agents such as bleach or potassium permanganate, which are habitually used by laundries in attaining the above-mentioned aesthetics. In addition, PrimaGreen® products provide substantial savings in overall water process and energy consumption.
4. Perhaps the most remarkable and technologically sophisticated was the “0” Means “0” by Jeanologia™. Their collection, which included 3d resin, vintage fading, whickering, bleaching, handsanding, blasting; pretty much any denim effect one can imagine. Instead of chemicals they used laser technology to mark the wash details. After the laser has mapped-out the garment, it undergoes a short hot wash and or stone wash-depending on the look one wishes to achieve.

Moreover, Jeanologia™ also introduced another ground breaking device called e-Soft. e-Soft is a garment softening technique which operates based on electro-flow technology. It uses a continuous electricity flow and wet air to create positively charged microscopic air bombs. When the air bombs hit the fabric, they change its surface tension yielding a very soft hand feel without weakened tensile strength. It is truly extraordinary what a bit of water, pumice stone, sand paper, grinder combined with Laser, e-Soft technologies can achieve. Thanks to Jeanologia™, brands now have an opportunity to process their garments with zero chemical contamination, save water and energy while maintaining same or even better cost margins.

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