



Technology of Denim

Production:

Part-VI

**(Washing Techniques of
Denim)**

By:

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Technology of Denim Production: Part-VI (Washing Techniques of Denim)

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Denim has been used as clothing material for centuries due to its high durability. But today's fashion arena likes denim jeans due to its attractive shades, designs, attractive styles and various types of wash appeal, rather than for its robustness. Denim jeans in the past were worn in a raw, rigid and starch-finished form. But today's fashion requires various types of washing treatments, such as desizing, enzymatic washing with or without stones, decolorization, neutralization, brightening and finishing.



Normally denim washing is carried out in sewn garments. The denim jeans are subjected with different washing techniques, such as rinsewash, bleach, enzyme wash, acid wash, stonewash, moonwash, sandwash, sun wash, overdyed/ tinted look, whiskering, damaged, used look. In denim washing, enzymes played an important role to get clean, smooth, fuzz free fabric surface with reduced tendency of pill formation and improved fabric handle.

Traditionally, indigo denim fabric is deep blue in shade. Denim finish may be of two types, such as raw denim and pre-washed denim. In raw denim, the denim is not washed after weaving.



Raw denim jeans shows natural shade of indigo which is faded during wear and subsequent washes at home. However in some cases it is believed that, raw denim is not practical as it creates some problems of rubs off on other materials which come into contact with it. The unfixed dye on the surface of the fabric may

cause stains to other fabric.

In order to overcome this problems, denim jeans is washed after sewn. The main plus point of pre-washing of denim jeans is that the colour is not transferred to other fabrics or surfaces during wear.

DENIM WASHING

Washing treatment on denim garments offers an aesthetic finish, enhanced the appeal and increases the fabric strength. Different types of denim washing is available in order the meet the requirements of today's denim fashion trend. However each of the washing techniques having their own advantages and limitations.

Denim washing are of two different types, such as: mechanical and chemical.

Chemical washes of denim fabric may be of different types, such as:

- Denim Bleaching,
- Enzyme washing, and
- Acid washing.

Other chemical washes are:

- Rinse wash,
- Cellulase wash,
- Ozone fading,
- Snow wash,
- Salt water denim,
- Flat finish,
- Over dye,
- Sun washing
- Super dark stone

Denim bleaching treatment discolors the denim garments in specific places and exhibited a unique look to the garments. The degree of severity of the bleaching depends upon several factors, such as strength of the bleaching agent, temperature, and duration of the treatment.



Mechanical denim washes are stone washing and micro sanding. During stone washing, stones are used in order to achieve typical wash down effect. There are three types of micro sanding, such as:

- sandblasting,
- machine sanding, and
- hand sanding

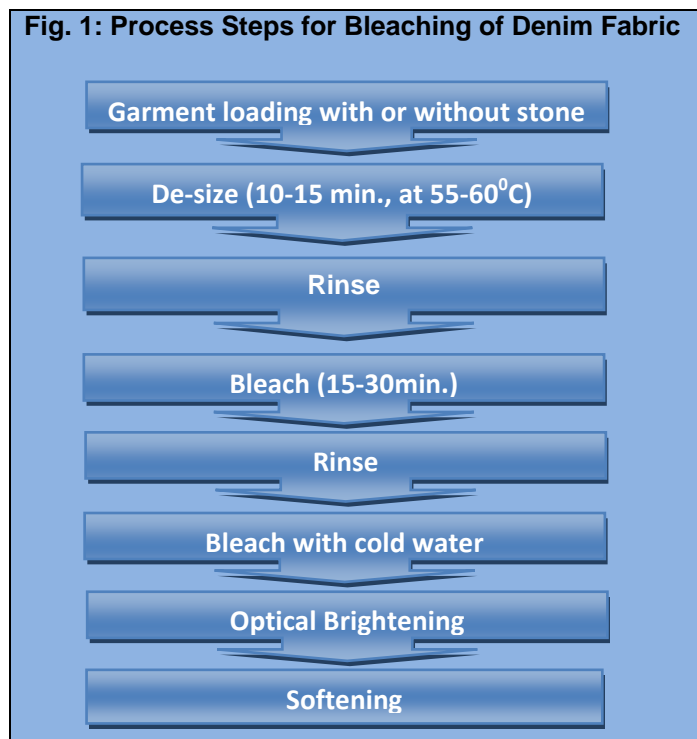
Other Mechanical washes are:

Whiskering
Shot gun denim
Water jet fading
Super stone wash
Ice wash
Thermo denim
Laser technology finish

Some basic denim washing techniques are as below:

Denim Bleaching

Denim bleaching normally carried out with a strong oxidative bleaching agent such as sodium hypochlorite or $KMnO_4$. Bleaching may be carried out with or without the addition of stone. The bleaching washing effect and de-coloration usually depends on strength of the bleach liquor, liquor quantity, temperature and treatment time. The bleached fabric materials should be properly antichlored or after washed with peroxide to reduced the subsequent yellowing or tendering of the bleached denim fabric. The basic steps of denim bleaching are shown in **Fig.1**.





Bleached Denim

NaOCl Bleach

Typical Sodium Hypochloride bleaching for denim is as below:

- The bath material to liquor ratio is set at 10:1 and temp. at 140°F.
- Add 0.5% owg of Soda Ash
- Add 20 - 30 g/l. of Sodium Hypochlorite 12%
- Bleaching to be carried out for 10 - 20 minutes with comparing to the wet standard,
- Drop and rinse

Antichloring

Antichloring treatment is required as traces of NaOCl left on the fabric which will form hypochlorous acid. This may consequently yellow and weakens the fabric.

Antichloring with hydrogen peroxide brightens undyed cotton, increase the fabric contrast, has no significant odor. Typical steps include the following:

- Set the bath temp. at 140°F.
- pH of the bath to be adjusted at 9 with soda ash,
- Add 1 g/l hydrogen peroxide 50%, and run for 10 min.
- Drop and rinse

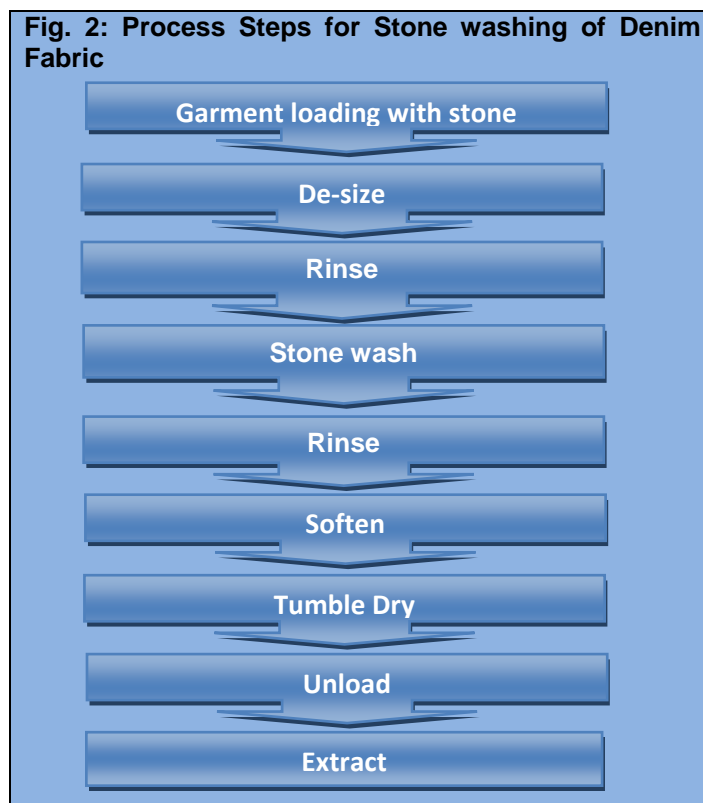
Limitations of bleaching:

There are some limitations of bleaching, such as:

- The same level of bleaching is very difficult to achieve in repeated runs.
- Bleaching treatment sometimes damage to cellulose resulting in strength losses and or pinholes at the seam, pocket, etc.
- Bleaching liquor is harmful to human health. This may also causes corrosion to the machine parts.
- Bleaching treatment needs antichlor treatment in order to eliminate the subsequent yellowness to the fabric.

Stone wash

Stone washing of denim fabric gives “Used” or “Vintage” look on the garments. This is due to the varying degree of abrasion in the garment. The traditional stone washing of denim garments normally carried out with pumice stones to achieve a soft hand and desirable look. The pumice stones having oval and round shape with a rough surface, work as an abradant in washing cycle. The variations in shape, composition, hardness and porosity gives different washing effect in the denim fabric. During washing, these stones scrap off dye particles from the surface of the yarn of the denim fabric which shows a faded, worn out and brilliance effect in the denim fabric. Due to ring dyeing of denim fabric and heavy abrasion during stone washing, the fading is more apparent but less uniform. Stone washing makes the denim garments more supple so that it fits comfortably. The basic steps of denim stone washing are shown in **Fig.2**.



In order to get the desired washed effect, the stone should be of proper hardness, shape, and size. For heavy weight denim fabric large and hard stones are suitable and also last longer. Similarly, smaller and softer stones are suitable for light weight denim fabrics.



Fitted denim dress (acid/stone-washed)

The degree of colour fading during stone washing depends on several factors, such as, garment to stone ratio, washing time, size of stones, material to liquor ratio and load of garments. The washing time may vary from 60 - 120 min. Stones may be reused until they disintegrate completely.

Pumice is a natural volcanic stone used for stone washing garments. It is crystallized with substantive pores. Pumice is mostly used for stone washing due to its durability to chemical treatment, its strength and light weight.



Pumice stones

Limitations of pumice stone usage:

Stone washing of denim fabric with pumice stones has some disadvantages and limitations, such as:

- Stones may cause wear and tear of the fabric and may damage to washing machine due to abrasion of the stone with fabric or machinery parts.
- It may also create the problem of environmental disposition of waste of the grit produced by the stones.
- Increase the labor cost to remove stone dusts from finished garments. The denim garments are required to be washed several times for complete removal of the stones.

- The stone washing process may cause back staining and re-deposition.
- The process is non-selective.
- Metal buttons and rivets in the denim garments as well as the drum of the washing machine sometimes get abraded which substantially reduces the quality of the garment and the life of the equipment.

Alternative to Pumice Stone

In order to find an alternate to pumice stone synthetic stones have been introduced. These synthetic stones are produced from abrasive material such as silicate, plastic, rubber or Portland cement.

The advantages of synthetic stones in stone washing are:

- The major problem faced by using the pumice stone has been overcome.
- Synthetic stones are more durable than pumice stone and can be repeatedly used from 50-300 cycle.
- By using the synthetic stones the washing effect may be manageably reproducible.
- The synthetic stones cause less damage to machines and garments.

Perlite stonewash

Perlite stonewash is a new stonewashing process. Perlite is a naturally occurring silicon rock, contains 2-6% of water content in it. Due to this reasons, when heated at a particular temperature, perlite expanded 4 to 20 times of its initial volume. These properties of perlite make it suitable for stonewashing process. Perlite offers less damage to washing machine than pumice stones and gives better supple and softer finish to denim garments.

Enzyme wash

In order to minimize the adverse effect of stone-washing, the denim garments is washed with enzymes. The enzyme breaks the surface cellulose fibers of the denim fabric and removes during washing. During enzyme washing certain amount of indigo dye and cellulose fibers from the surface of the fabric are removed.



Enzyme Wash Denim

Enzymes are proteins, found in all living organisms, plants, as well as animals and microorganism. All organisms produce a wide range of enzymes. Enzyme washing is ecologically friendly due to the natural origins of enzymes. Enzymes basically catalyse specific chemical reactions and are known as 'bio-catalysts'. Enzymes act on living cells and can be work at atmospheric pressure and in mild temp and pH.

Mechanism of Enzyme Action

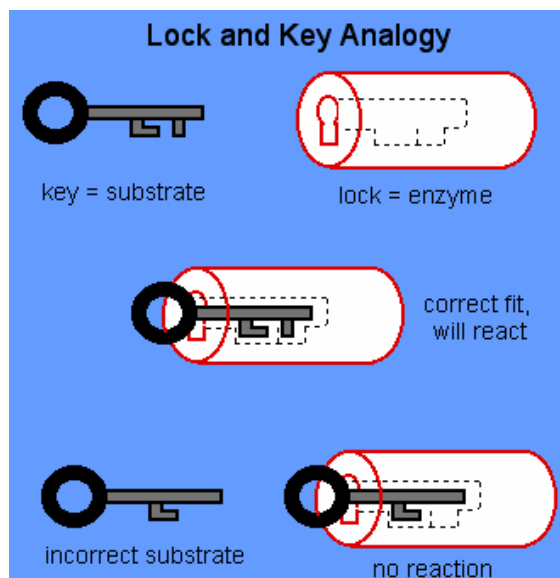


Fig.3: Lock and Key

The basic mechanism of enzyme reaction consists of binding of the substrate to the active site on the enzyme which causes changes in the distribution of electrons in the chemical bonds of the substrate. This ultimately causes the reactions which lead to the formation of products. The products are removed from the enzyme surface which regenerates the enzyme for another reaction cycle.

The active site of enzyme has a unique geometric shape which is complementary to the geometric shape of a substrate molecule. Due to this reasons enzymes specifically react with only one or a very few similar compounds. Enzymes are highly specific and the specific action of an enzyme with a single substrate can be explained by the “lock-key theory”.

Lock and Key Theory:

The Lock and Key analogy first postulated in 1894 by Emil Fischer. Here the lock is the enzyme and the key is the substrate. Only the correctly sized key (substrate) fits into the key hole (active site) of the lock (enzyme) (**Fig. 3**).

Larger keys, smaller keys, or incorrectly positioned teeth on keys (incorrectly shaped or sized substrate molecules) do not fit into the lock (enzyme). Particular lock can only be open by correctly shaped key. Key fits lock-turns, it thus opening the door for reaction to proceed. Enzymes reject dissimilar substance and accept substrate -reaction proceed.

Enzyme Reactions

Enzyme molecule has formed a complex with the substrate to catalyse a reaction. The binding sites of the enzyme recognize the corresponding domain of the substrate. After proper orientation of the molecules, the reactive site of the enzyme molecules have access to the appropriate part of the substrate molecule. When the reaction is over, the product formed quickly detach from the complex. The model of enzyme substrate elementary reactions is explained by the Michaelis-Menten mechanism. The Michaelis-Menten mechanism shows the reactions involving an intermediate which is explained in **Fig. 4**.

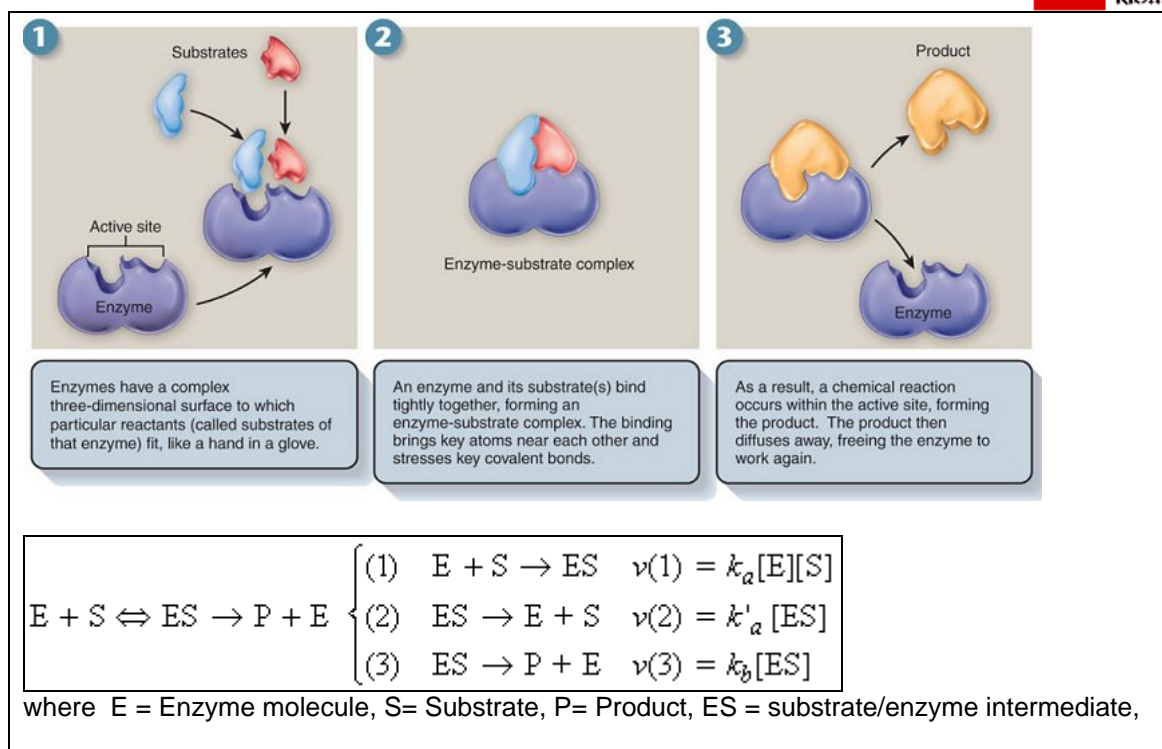


Fig. 4: The basis of the Michaelis-Menten mechanism of enzyme action. Only a fragment of the large enzyme molecule E is shown

Different types of enzymes are used for different purposes. However in all the cases, the enzyme breaks the stain into smaller molecules which can be removed with in subsequent washing with water or conventional soap.

Usage of Enzymes in Textile Industry

- Amylases** : Used for desizing.
- Cellulase** : Used for bio-polishing and denim finishing.
- Protease** : Used for wool finishing.
- Catalase** : Used for bleach cleanup.
- Laccase** : Used for discoloration of indigo dyes.

Amylase is a type of enzyme which converts starch into sugar. Amylase is available in human saliva. Amylase also produce by plants and some bacteria.

Cellulase Basics

The enzyme washing also known as “Bio-stoning” was first developed in Europe in 1990’s and quickly became popular in rest of the world. The enzymes remove the starch and wax residues from the denim fabric and give a uniform finish to the garment. The enzymes used in bio-stoning are “cellulases.” Cellulase acts mainly on the surface of the fiber, but it leaves the inner intact. Cellulase removed by partially hydrolyzing the surface of the indigo dyed fiber of denim fabric.

Cellulases are blends of selective enzymes that break down cellulose into glucose.

Cellulase enzyme can be classified according to pH range in which they are more effective, such as acid, neutral and alkaline stable cellulases. However, the first two types are commonly used. The working pH range of the first two types of cellulose are a below:

Acid Cellulase : pH range of 4.5 - 5.5 , temp. 50°C.
Neutral cellulase : pH 6 – 7.0, temp. 55° C.

Generally, neutral cellulase is preferred to acid cellulase due to little or no back staining, less loss of strength and weight. However, acid cellulase are lower in costs and shorter enzyme cycle time as compared to neutral cellulase.

Cellulases are used under biological conditions of temperature 40 – 60°C and pH. These are critical for required for required wash-down and surface appearance of smoother and less pilling. Cellulase enzymes are used in stone washing process. With cellulases, less stones are required and it causes less damage to the machinery and fabrics. Cellulase treatment on fabric reduce fuzz and pills, increased smoothness, softness, luster and brightness, improve fabric handle and drapeability and increase the wash down effects.

Advantages of cellulase treatment

Usage of cellulases having some distinct advantages, such as:

- 1) Cellulase is economical and environmentally friendly as compared to stone washing using pumice stones. The percentage of fabric damages has been reduced with cellulase treatment. The enzymatic treatment of denim fabric ensures the same result by consuming less water and time, resulting less waste and damage to machines. The pollution, quality variability, and imperfections also reduced in enzymatic treatment.
- 2) The enzymes can be recycled.
- 3) The productivity of washing is increased due to the space formerly taken up by the pumice stones in the washing machines can now be filled with more jeans.
- 4) The time consumption for removing stone fragments from the denim garments has been eliminated in cellulase treatment.
- 5) The duration or number of rinse washing after enzymes treatment is less than pumice stone-washing.
- 6) A small quantity of enzyme can replace several kilograms of pumice stones during washing, which ultimately leads to less damage to garment, machine and less pumice dust.
- 7) Washed garment with soft handle and better appearance is achieved in cellulase treatment.

Cellulase treatment of denim fabric having some disadvantages. There may be chances of back-staining in cellulase treatment. In order to remove the back stating, the garments are rigorously washed. However, this is added usage of water for the washing.

Stonewashing of denim jeans generally consists of few distinct steps, such as:

Desizing

The sized denim fabric consist of cellulose fiber coated with a film of starch. Cellulose and starch are chemically related. During weaving the warp yarns are subjected to considerable stress and strain due to fast moving reed and other machine parts. In order to prevent the end breakages, the warp yarns are sized. Although several other substances have been developed, still sizing is still based upon starch. The starch makes the cloth less absorbent which impairs the uptake of bleaches, dyes, and other chemicals. Hence complete removal of the size is extremely essential.

There are various methods of desizing. Traditional desizing is carried out with acid, alkali or oxidative desizing agents. However, these chemicals having some limitations and disadvantages. The cellulose material may be damaged and loses strength with these chemical treatment.

With the introduction of desizing with enzymes (amylases), the limitation and drawbacks of traditional desizing process has been removed. The enzymatic desizing is considered to be the best and safest. Conventional desizing degrade the cellulose which is not occur in case of enzymatic desizing. Enzymes are very specific in their action and act only on the starch without reacting on cellulose.

The enzymatic desizing process is performed by using alpha amylase enzyme which hydrolyses the cellulose. The enzyme desizing process offers high efficiency and specific action. Amylases completely remove the size. These enzymes are harmless to the fabric and are environment friendly.

Advantages of enzymatic desizing are:

1. There is no adverse effect of enzyme on cellulose, on machinery and on other bath auxiliaries. Hence loss of strength in desized fabric is minimum.
2. In enzymatic desizing, multiple washing is not required to remove the residual chemicals and hence there is saving of water in enzymatic desizing.
3. Enzymatic desizing is carried out in moderate temperature, and the process time is also reduced. This ultimately leads to increase in productivity and saving in energy.
4. Neutralization is not required in enzymatic desizing.
5. Enzymatic desizing offers softer feel and less hairiness on the fabric.

During enzymatic desizing, the starch in the fabric is hydrolyzed by an alpha -amylase enzyme and converted into soluble dextrin.

The enzymatic desizing consists of the following steps:

i) Impregnation / Pre-wetting

Impregnation is carried out in the desize bath liquor. This leads to absorption of enzyme solution by the fabric and gelatinize the starch present in the fabric. Better results can be obtained by preparing the desizing liquor with alpha-amylase enzyme, a good lubricant and wetting agent, a higher liquor ratio and maintaining the recommended condition of temperature, pH, concentration of Ca^{2+} ions which helps to speed up the activity of alpha amylase. The fabric should soak in the liquor for sufficient time.

ii) Incubation (Hydrolysis of starch)

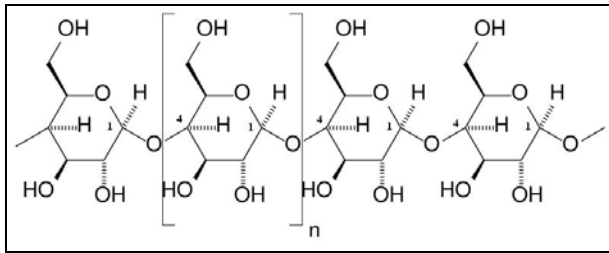
The fabric is incubated for a definite period of time in the desizing liquor at a given temperature. In impregnated fabric is incubated at $60-70^{\circ}\text{C}$, in which the enzymes act on the starch and breaks it down into water soluble dextrin and sugar.

iii) After wash

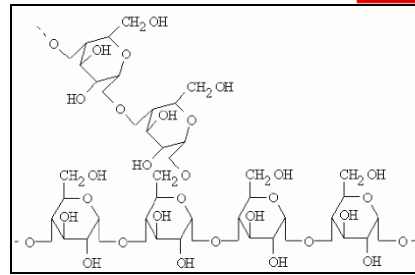
Elimination of enzyme is essential for next process. After washes were performed with hot water at around $80 - 90^{\circ}\text{C}$ with a good detergent. For heavy fabric, after wash is carried out in addition of caustic soda followed by cold wash.

Reaction of Alpha-Amylase with Starch

Chemically starch is poly-alpha-glucopyranose which consists of straight chain (amylose) and branched chain (amylopectin) polymers. Starch is usually insoluble in cold water. The amylose and amylopectin are insoluble in water. However it can be solubilized through hydrolysis.

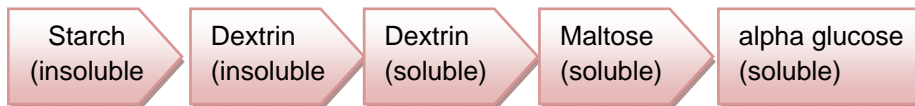


Amylose



Amylopectin

Under suitable conditions starch can be gradually degraded as follows:



Alpha-amylase hydrolyzes the bonds between glucose repeats which breaks down the starch by hydrolysis to maltose. The reaction involved is shown in **Fig. 5**.

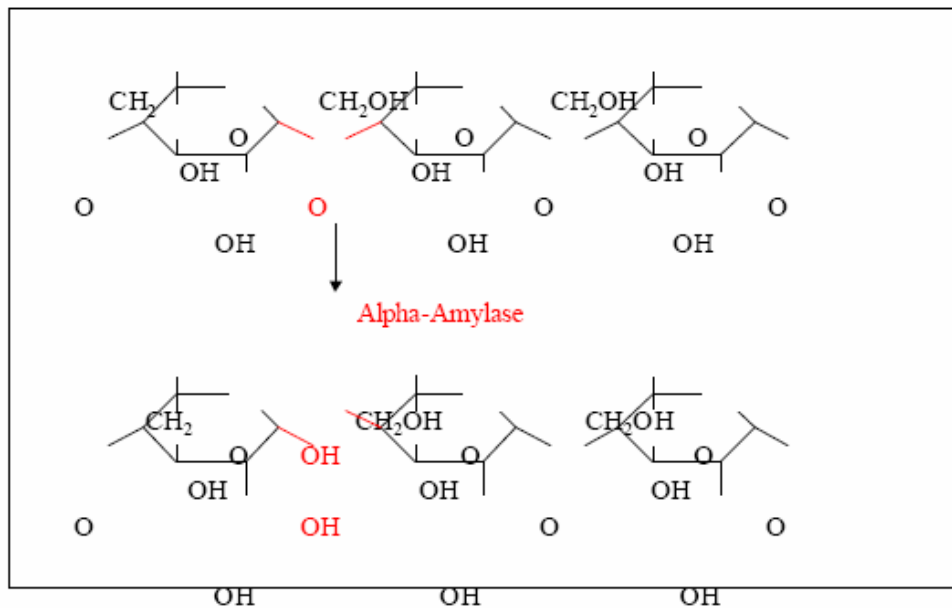


Fig 5: Reaction of Alpha-Amylase with Starch

Cellulase for Bio-Polishing

The appearance of natural cellulosic material, such as cotton can be improved through an enzymatic treatment. This is known as Bio-Polishing. The bio-polishing treatment remove the fuzz and pilling from the fabric surface and gives the fabric a softer and smoother handle, and superior colour brightness and glossier appearance.

In Bio-polishing process cellulase enzyme which is a protein which has a specific catalytic action upon the 1,4-b-glycosidic bonds of cellulose. The cellulase enzyme molecule is too large to penetrate the interior of a cotton fiber. Hence it only act on the surface 1,4-b-glycosidic bonds. Cellulase is a complex multi-enzymatic system and it acts on cellulose in two different ways (**Fig. 6**).

Endocellulases hydrolyze the cellulose by converting it from crystalline cellulose to amorphous cellulose. The β -1,4 link inside of the cellulose polymer is cut randomly. Extremities of the polymer is cut by Exocellulases. Cellobiohydrolases exocellulases detach two units of glucose leaving cellobiose.

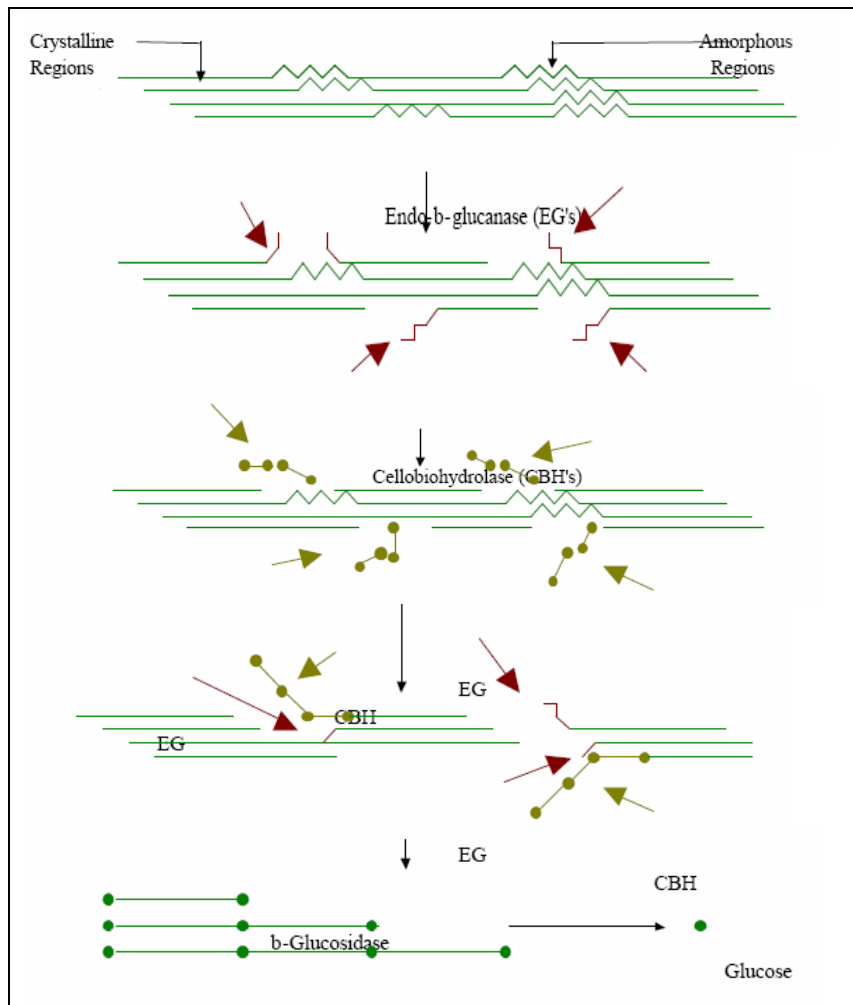


Fig. 6: Schematic Representation of Synergistic Action of Enzymes on Cellulose

Bio-polishing can be carried out on cotton as well as viscose, jute, flax, ramie etc. It can be applied at any wet processing stage or in other processes. Typical process conditions is as below:

Enzyme : 0.5% to 2.0% on wt. of fabric
pH : 5 to 5.5
Temperature : 50 – 55°C
Time : 30 to 60 min.

SAND BLASTING

Sand blasting is a mechanical process in which localized abrasion or colour change on the denim garment is created. The process involves blasting an abrasive material in granular, powdered form at a very high speed and pressure through a nozzle onto certain areas of the garment such as knees and elbows. The garment treated surface shows distressed/abraded/used look. The common blasting materials used are sand and metal granules.



During sand blasting process the garment are first subjected to stone wash to the desired degree of washing. It is then sand blasted.

A solution of sodium hypochlorite or potassium permanganate often sprayed in desired area of the garment in order to obtain the same look. The garment is then neutralized, rinsed softened and dried.

The sand blasting is a water free process therefore no drying required.



Sand blasted Denim

Acid wash

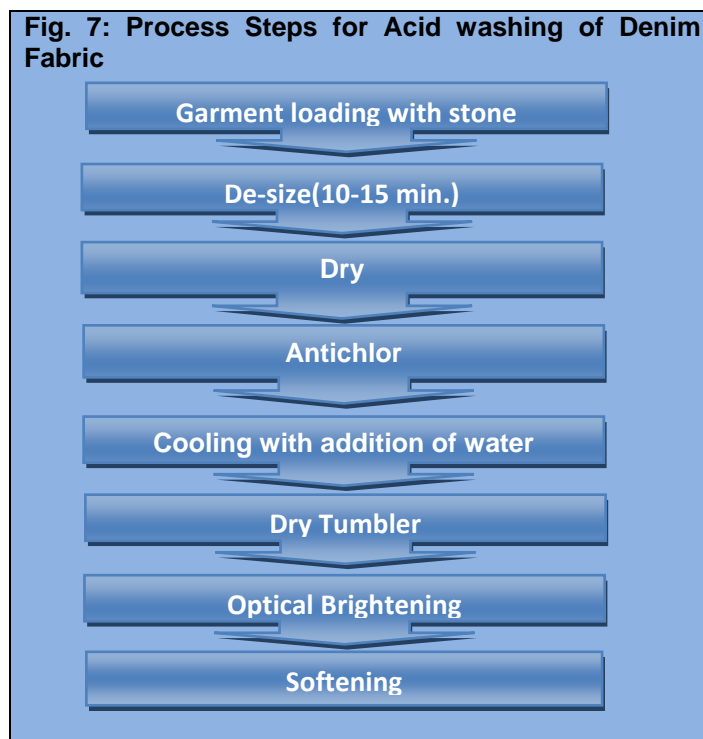
Acid wash on denim jeans is becoming very popular due to its significant contrasts and attractive appearance in color. Acid wash can be carried on Indigo & Sulphur base fabric garments. Acid wash was a chemical wash process on denim which stripped the top layer of color and make a white surface while the color remained in the lower layers of the material, giving it a faded look. Acid was first launched in 1980's as a new innovative finish on denim garments. This wash was being carried out by soaking stones in bleach and then followed by neutralization.

Acid wash of denim garment normally carried out by tumbling the garments with pumice stones presoaked in a solution which contains sodium hypochlorite (5 to 10%) or potassium permanganate (3 to 6%). This causes localized bleaching which produces non-uniform sharp blue/white contrast.



Acid Wash Denim

In this wash addition of water is not required. The color contrast can be increased by optical brightening treatment.



Acid washed denim fabric sometimes becomes yellowish after washing. This is due to incomplete neutralization, washing or rinsing, so that manganese is not removed from the garment. However, the manganese can be removed by washing with addition of ethylenediamine-tetra-acetic acid as a chelating agent.

The process of acid washing jeans involves soaking of porous pumice stones and chlorine or potassium permanganate (PP) bleach. Sodium-bisulfate is used for neutralization. It is recommended to use two separate washing machines for Acid Washing & Neutralization etc.

Acid Washing Process on Denim Jeans




Porous pumice stones is soaked in chlorine or PP bleach solution for about 20 – 60 minutes. After complete soaking of the stones in bleaching agent, the excess water is removed from the stones. Then the stones and the denim garments are put in a washing machine for about 20 minutes. In this process there should not be any single drop of water. The drain should be open during complete process.

When the required look is achieved, then transferred the fabric into another washing machine for a regular washing process for neutralization. After neutralization, the garments is dried.

Precautions

During acid washing, the workers should wear mask & aprons. The operator should use protective rubber gloves and safety glasses.

Most Common Denim Washes:

Washing Type & Features	Application
<p>Fraying</p> <p>It is a type of finish in which some selected area of denim jeans have been sanded to create a “worn” effect. In others words fraying is the destruction of denim fibers in a selected areas, such as waistbands, pockets or hem of the jeans.</p>	
<p>Sand wash</p> <p>Denim sand wash is carried out with pumice stones, enzymes and sand in combination. This gives a aged look in denim jeans.</p>	
<p>Rinse wash</p> <p>Rinse wash denim is washed at about 50°C in a hot bath. Sometimes softener are used to soften the fabric.</p>	

Blue rinse wash denim

Over-dyed / tinted Denim

Over-dyeing / tinting of denim is an additional dyeing treatment which is normally carried out on jeans after sewn. This add another tone of color to the jeans. Normally denim garments is over-dyed with yellowish dye for appearing dirty look. Tinted / over-dyed denim garments shows a used / vintage & muddy look to the garments.

Tinting of denim garment normally carried out after the stone wash process. During tinting, a little amount of tint or color is added to the garment in order to change the hue/cast/tone of indigo shade. However, when the quantity of tint color increases, it cover up indigo.

There are various types of dyes used for over-dyeing / tinting purpose, such as:

- Direct Dyes
- Reactive Dyes
- Pigment Dyes
- Sulphur Dyes

Tinting process normally taken 5 to 15 minutes. This is followed by dye fixing & clean up of superficial dye.

Tinting of denim garment normally carried out after stone wash process. However this process consumes more water and chemical. An alternative methods has been developed, in which novel colour based enzymes have been used. This process allows tinting and stone washing to be carried out in a single bath. The advantages of the new technique are:

- Consumes less water, energy and takes less process time to achieve tinted look.
- No extra chemical used in this process.
- Chances of patches or unevenness in the garment is almost nil.



Tinted Denim



Tinting

Torn Jeans:

Some jeans is teared at some places in order to get natural tearing look. The fabric have actual rips, holes, tears and/or lacerations.



Destroyed/damaged/used/whiskers

Whiskering , also known as 'Cat's Whiskers', are the crease lines around the crotch. Whiskering can be done on the sides of knee and crease marks on the back of the knee. During natural wear, in the portion of a crease, Pigment is removed.

Denim garments can be made of old, worn and /or used look by several different ways, such as with the help of laser, sandblasting, machine sanding, hand sanding or abrading by some kind of power tool. With the help of a grinder, whiskering can be produced around the hip to crotch area of the pant. Damaged look of a denim pant can be made by cutting the edges at different areas before washing, such as at bottom, (back-) pockets, fly and knee area.



Creating whiskers



Natural Crease Lines



Whiskers



Soft feel denim:

Soft feel denim can be made with the addition of softener at the garment stage.

Laser marking/Spray painting

Laser marking/Spray painting is a computer controlled technique through which different patterns or designs, such pictures, images, lines, text etc., can be developed on denim garments.

It is also called spray painting in denims. In this technique chemicals or pigments is sprayed on the fabric in order to get different pattern on the garments. This is followed by curing of the garment.

The advantages of the systems is:

- It is a water free process. Hence it is an ecological and economical process. There is zero effluent discharge
- As this process in computer controlled, the chances of human error is negligible.
- This system having excellent reproducibility and higher productivity.
- The machine requires less maintenance and cleaning.
- Consuming less time.
- This technique having no adverse effect on fabric strength.



Laser etched logo on denim.

Vintage Denim

It is a type of denim washing in which the denim garments is subjected to heavy stonewashing or a cellulose enzyme wash, with or without bleach for showing an old and worn out look.



Super Stone wash

It is type of wash treatment of denim garments in which the denim garments is subjected to prolonged stonewash treatment for more than six hours.

Soda ash and soap are used for hard wash. Steam is used up to 60-80°C for one hour to finish the washing process. It is followed by acetic acid wash treatment, then the garments are neutralized and rinsed.



Shirt in Super Stonewash

Sun Washing

Sub washing of denim fabric imparts a sun faded appearance to denim garments. It is carried out by bleaching and stoning of the denim garments.

Super Dark Stone Wash

This type of denim wash offers an extra dark indigo color which is obtained from a double-dyeing technique



Snow Wash

This type of washing treatment for denim is a variation of acid wash. It gives bright white highlights.

Advantages of quick wash denim

1. Quick wash denim requires less indigo dye. The washing treatment also requires less enzymes and oxidizing agent. Hence it is an economical and environment friendly process.
2. The development of streaks in garments after washing has been avoided by using a modified alkali-ph controlled system giving uniformity of shade.
3. The washing time is 20-30% less than conventional denim.



Flat Finish

Flat finish of denim fabric involves mercerization plus calendaring processes to achieve the flat surface. It impart an even wash down effect and clean surface. The mercerization process swells up the cotton fibers which is pressed in calendaring to achieved a flat surface.



Flat Finish / Mercerized Denim Fabric

Dirty wash

In this washing process, after stone-washing treatment, the denim garments are dyed with special chemicals. This shows a dirty looks to the garments.



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