# Desizing

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## Objects.....

- The object is to **remove from the grey fabric the size** that has been applied during weaving and thus to make the fabric ready for further processes.
- The main **ingredient in size** that *is not* water-soluble is usually starch.
- Chemically starch is poly-glucopyranose in which straight chain and branched chain polymers are present.
- Both the constituents of starch are insoluble in water but they can be made soluble by hydrolysis of these long chain compounds to shorter ones.

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- Grey cotton fabric contains both natural impurities as well as 'added matter'.
- The added matter is called 'size'. It is added by man in a process called 'sizing', as it facilitates weaving.
- The size contains substances such as starch, thin boiling starch, CMC, PVA, vegetable oil, mutton tallow, etc.

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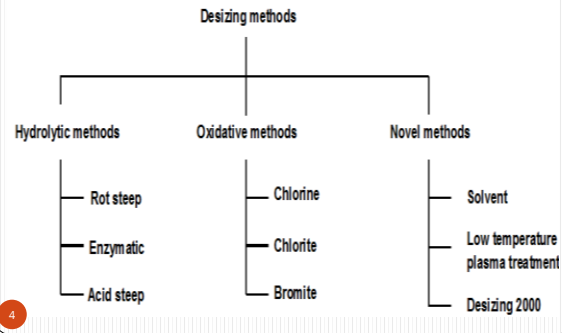
## Methods Of Desizing

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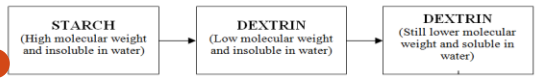
## Mechanism

- The main ingredient in size that is not water-soluble is usually starch.
- Chemically starch is poly-glucopyranose in which straight chain and branched chain polymers are present.
- Both the constituents of starch are insoluble in water but they can be made soluble by hydrolysis of these long chain compounds to shorter ones.
- Thus, under suitable conditions, the following steps show the progressive hydrolysis of starch.
- However, in desizing, the hydrolysis of starch is carried out only up to the soluble dextrin stage, as this can be removed off the desized fabric by means of an aqueous wash.

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## Rot Steep..

- This is the oldest and cheapest method of desizing.
- Here no special chemical is used.
- The cloth is first passed through warm water at 40C in a padding mangle where the cloth is squeezed to about 100% expression.
- The cloth is then allowed to stand for 24 hours.
- The microorganisms, naturally present in water, multiply and secrete starch-liquefying (hydrolysing) enzymes, which break down the starch present in the size to water-soluble products.
- The cloth is then washed to remove these products.

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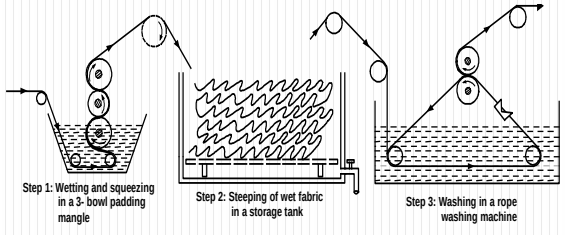
## Rot steeping

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### Advantages

- 1. Rot steeping is the cheapest of all the desizing methods.
- 2. No chemicals are required.

### Disadvantages

- A large floor space is required for this process.
- The process is slow, so desizing time is long.
- Mildew may attack the cloth during steeping and cause stains on the fabric.

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## Acid Desizing

- Dilute sulphuric acid or hydrochloric acid may be used to hydrolyse the starch from the sized fabric.
- A 0.25% - 0.5 % solution of the acid at room temperature (30° C) is suitable for this process.
- The cloth is impregnated with the dilute acid solution in a two-bowl or three-bowl padding mangle and then stored for 8-12 hours in a closed concrete pit.

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### Advantages of acid desizing

- Acid desizing is an economical process.
- The process is effective and gives fairly uniform desizing, as it is a chemical-based process. It does not require specific conditions of pH and can be done at room temperature.
- It is a much quicker process than rot steep desizing.

### Disadvantage of acid desizing

- The main disadvantage of the process is that mineral acid is harmful to cellulose fibres if proper care is not taken.
- Especially during the storage stage, the acid-wet fabric must not be allowed to dry.
- This would cause the formation of hydrocellulose, which will weaken the fibre.

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## Enzyme Desizing

- In enzyme desizing, specific enzymes are used to liquefy the starch in the fabric and make them soluble.
- Enzyme desizing is a very rapid and thorough method of desizing provided that the proper conditions of temperature and pH are maintained. The optimum temperature and pH of the different enzymes are given below.

| Enzyme | Concentration (g/l) | Temperature (°C) | pH |
|---|---|---|---|
| Malt Extract | 3-20 | 50-60 | 6-7.5 |
| Pancreatic | 1-3 | 50-60 | 6.5-7.5 |
| Bacterial | 0.5-1 | 60-70 | 5.5-7.5 |

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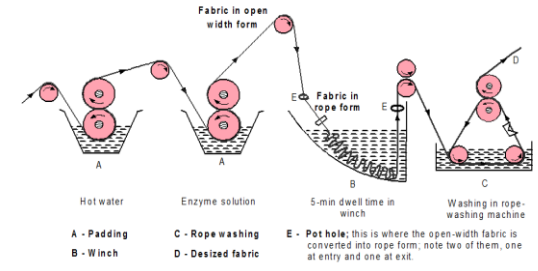
## Continuous Desizing

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**Advantages of enzyme desizing**

- Time required for the desizing process is less.
- It is continuous process, so greater production can be achieved.
- Closely constructed fabric can be easily desized, due to the effective enzyme action.
- There is no chance for the cellulose to get hydrolysed, as in acid desizing.

**Disadvantages**

- If the conditions of temperature, pH and time are not properly maintained, the desizing activity of the enzymes is destroyed.

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Comparison of Process Conditions for Desizing

| Process | Concentration (g/l) | Time (hour)/pH | Temperature (°C) |
|---|---|---|---|
| Rot-steeping | – | 10-16 h | 30-40 |
| $H_2SO_4$-steeping | 5-10 | 3-4 h (pH) | 40 |
| Malt Diastase | 3-20 | 4.5-5.5 | 50-60 |
| Pancreative Diastase | 1-3 | 6.8-7.5 | 50-60 |
| Bacterial Diastase | 0.5-1 | 6.5-7.5 | 60-70 |

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## Desizing with Oxidizing agents

- Though the use of oxidants for desizing of cotton fabric is widely accepted but their large scale industrial application is yet to be exploited.
- The most important aspects of oxidizing agents are that they can be applicable to wide range of fabrics, the size content of which is often not known.

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- Table summarizes the necessary conditions for desizing starch in presence of some important oxidizing agents.

Desizing Conditions with Oxidising Agents

| Oxidising agent | Process | Additives (pad-bath) | pH | Time (min) | Temp. (°C) |
|---|---|---|---|---|---|
| Hydrogen peroxide | Pad-steam | 1-2 vol. $H_2O_2$, 7-15 g/l NaOH. | 8-9 | 1-5 | 90 |
| Sodium bromite | Pad-batch (cold) | 1-3 g/l active $Br_2$, 20-30 g/l Caustic soda, 5-10 g/l Wetting agent. | 7.5-8.5 | 15 | 20-40 |
| Persulphate | Pad-steam | 3-6 g/l Na-persulphate 8-10 g/l Caustic soda, 5-10 g/l Wetting agent. | 10-10.5 | 1-3 | 95-100 |
| Persulphate + $H_2O_2$ | Cold-batch | 40 ml/l $H_2O_2$ (25%) 10 g/l Persulphate, 10 ml/l Water glass, 10 ml/l NaOH 5 g/l Stabiliser, 5 g/l Wetting agent. | 10-10.5 | 6-20 | 20-40 |

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