

Desizing processes on cotton and cotton / blends woven fabric

by Dr. S.M. Imtiazuddin, AVM Chemical Industries.

Desizing particular emphasis is to be placed on the complete removal of the size during the first processes step, so that the size is not fixed on the fabric by singeing or heat setting. With mixtures of disperse and reactive dyes the desizing processes is especially important. The reactive dye can react with the residual size resulting in lose of fixation yield and brilliancy of the shade.

Equally the presence of such size can reduce the fastness of the disperse dye to heat treatments applied subsequent to fixation, due to the thermo-migration from the polyester fiber to the size phase on the fiber to the size phase on the fiber surface. The dyestuffs migrate from the fiber and accumulate as a product on its surface. Traditionally starches along with additives that enhance lubricity and smoothness to the yarn like tallow and selected gums are used.

In recent time starches and tallows have been replaced by modified starches and synthetic water soluble waxes like polyethelene glycols/polyvinyl alcohols and such other ingredients that are increasingly developed, while such an application benefits the weaving performance it is negative factor for procesesing. These additives unless removed would interfere with the chemical processes that the fabric undergoes during wet procesesing.

Unless the procesesor knows what ingredients have gone into the size mix used on the fabric supplied, he cannot prescribe a recipe proceses sequence to effectively remove the size.

If starch is used it has to be removed by hydrolyzing with appropriate reagents like an enzyme or an acid or even with alkali under appropriate conditions partially hydrolyzed poly vinyl alcohol (PVA) and polyethelene glycol would wash off in cold water.

Fully hydrolyzed PVA would require hot water treatment, some of the other ingredients like tallows would require emulsifying agents.

Thus the procesesor requires the desizing information to design his procesesing parameters not only to get a satisfactory base fabric but also to optimize on the cost and productivity.

Enzyme desizing: is the most preferred one. It is safe not only for handling but also for the fabric, since it is an enzymatic reaction (hydrolysis), it is target specific it will hydrolyze only the starch and not the cellulose but being an organic reaction it is slow taking up to 6 to 8 hours.

With the development of alfe-amy-lase that have been acclimatized to higher temperatures like 90 to 100c, they offer very short dwell time, thus making the processes compliant to continuous preparation system.

Acid desizing: (Mineral Acid 20g/l) requires comparatively shorter dwell time of about 1 to 3 hours. The desize performance shall be almost perfect but vulnerable to fabric tendering if the controls are not meticulous.

Mineral Acid like Hydrochloric acid or sulphuric acid at 15 to 20 g/l at room temperature could be safe as long as the fabric is not allowed to dry, but if the fabric during the dwell time is exposed to air and starts drying the concentration of acid at those portions as the dry would rise and tender the fabric.

Under dyehouse operating condition the temperature also would be higher and therefore the processes is fraught with danger of fabric damages.

Acid desize can be practiced where the control systems can be very effective. Acid desize with mineral acid could help dissolve the heavy metals in fabric thus help in avoiding tendering during peroxide bleaching.

A separate scouring sequence in the procesesing cycle could be avoided. Care need to be taken to ensure that fabric is washed thoroughly before the scouring processes not only to get rid of the starch degradation products and the other size ingredients but also to wash off minimize the residual mineral acid and where there could be a delay in scouring processes the fabric needs to be neutralized with soda ash 1 to 2 g/l.

Oxidative desizing: Per Acids and per-salts, per sulphate, per acetic acid. Hydrogen peroxide ect, (derivatives of hydrogen peroxide), as in $\text{CH}_3\text{C}(=\text{O})\text{OOH}$ release readily (O) that oxidizes the starch to its degradation products belong to this category of desizing agents.

Per acids and per-salts of organic acids can break down starch and at elevated temperature can desize very short duration of the order of a few minutes.

however the hazards are that higher than recommended concentrations and or longer dwell times could tender the fabric. Unlike enzymes that are target specific, these chemicals would degrade cellulose as well.

Other sizes removing. Partially hydrolyzed Poly Vinyl Alcohol and Poly Ethylene Glycol are water soluble and hence can be easily removed by a good moderate temperature wash followed by hot water wash.

Fully hydrolyzed PVA is difficult to wash off and would require repeated high temperature washing cycles. Other modified starches and Poly Ethylene Glycol chosen for sizing are water soluble.

Mostly polyester blends with cotton are sized with such synthetic sizing agents and in such case a more hot wash with non-ionic wetting and emulsifying agent in carbonate alkalinity can give an effective removal of size.

Assessment of desizing can be done into two ways:

By weight: Generally 8% - 12% weight of the fabric is reduced after desizing. In our practical the weight reduces 9.28% o.w.f.

By Tagewa Scale (violet scale): By dropping the iodine S solution on to the fabric, the starch rating is noted from the tagewa scale. Tagewa scale reading is ranged from 1 – 9 (as under).

Tagewa scale rating	Amount of starch present
1	>2.5%
2	1.5%
3	0.6%
4	0.35%
5	0.21%
6	0.12%
7	0.085%
8	0.06%
9	0.04%