
Current Status and Development Trends Slating in the Domestic and Foreign Textile Industry

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Abstract: In the article, the influence of the concentration of dressing components on the physical, mechanical and operational properties of sized yarn is studied. The specificity of the influence of sericin on the physical and mechanical properties of sizing compositions and the main indicators of sizing has been established. The expediency of the development of scientific research and practical developments in the chosen direction is substantiated. The effectiveness of the sizing polymer composition was compared with the base composition, and the practical and economic aspects of the developed technology were determined.

Keywords: Efficiency, polymer composition, practical aspects, physical and mechanical properties, concentration.

In modern conditions of the formation of market relations, improving the quality and competitiveness of products is one of the key tasks in the textile industry, which can be solved by creating effective resource-saving technologies that can significantly reduce the consumption of starch food product and expensive imported chemical materials.

Throughout the history of the development of textile production, starch has played a leading role as the basis of sizing compositions due to its low cost, availability and well-established production. At present, despite the availability of a number of synthetic products for sizing, the situation has not fundamentally changed. The share of starch sizing compositions reaches about 75%. In the context of the economic crisis, a special place is occupied by the issue of creating polymer composite materials and the search for new types of sizing compositions that can reduce starch consumption and meet the technological requirements on the world market.

Currently used traditional sizing components based on starch have a number of disadvantages, so only modified forms of starch are used abroad. Synthetic sizing preparations are devoid of these disadvantages. However, due to the unreliability of the raw material base and the high cost, at present, synthetic sizing agents cannot completely replace starch products in the sizing of the cotton base.

In this regard, the problem of developing a technology for obtaining a polymer composition based on starch and sericin, which improves its adhesive ability, increases the elasticity of the formed films and, accordingly, reduces the consumption of size is of great scientific, theoretical and practical interest.

In the process of sizing, the physical and mechanical properties of the main yarn can change significantly, which affects the breakage of the threads on the loom. To reduce breakage in weaving, it is necessary to carry out the sizing process with high quality.

The essence of the traditional sizing process lies in the fact that the main threads from the warping shafts at a given tension are impregnated with a sizing solution, an excess amount of dressing is removed from the threads when squeezing in the squeezing shafts, the sizing threads are dried in a dryer to a certain humidity, the glued threads are separated and directed on a weaving bow.

In this case, the dressing must meet the following requirements [1-2]:

- be sufficiently sticky and have a certain viscosity to cover the surface of the warp yarn and partially penetrate deep into the thread;
- to create an elastic sheath on the threads, resistant to abrasion, not violating the flexibility of the thread and not making the yarn brittle and stiff, and also not to crumble from the yarn, both in the process of sizing and when processing the yarn on a loom;
- have a good affinity for the fiber, do not destroy the yarn and do not change the color of the thread when sizing colored bases, are easy to remove and do not affect the color and finish of fabrics, do not change their properties during use and storage;
- do not damage shafts and reeds on a loom, do not promote sticking of threads to dryer drums;
- easy to remove from the surface of the yarn when desizing;
- To be cheap enough.

The quality of dressing is determined by a complex of physical and chemical properties, such as: concentration, viscosity, degree and uniformity of dispersion of the adhesive material, wetting ability, adhesive and cohesive properties.

The substances that make up the dressing composition can be divided into the following groups according to their functional purpose: adhesives, splitters, softeners, hygroscopic substances, antiseptics and water.

The main adhesive in the sizing of cotton threads is a natural polymer-starch (potato, maize, corn, rice). To split starch grains into smaller particles that penetrate deep into the thread, splitters are used: caustic soda, sulfuric acid and other acids.

Due to the fact that the textile industry consumes a large amount of a valuable food product - starch for production needs, the issue of partial or complete replacement of it with chemical materials is very relevant. With the development of chemistry and polymer technology, chemical water-soluble adhesive materials have appeared that are not inferior in their properties to starch products. These are mainly modified natural and synthetic polymers - cellulose ethers and some esters, polyvinyl alcohol, polyacrylamide, etc.

The analysis of scientific data indicates that in world practice the following synthetic polymeric compounds are used as sizing agents [3-5]:

- ✓ carbon chain polymers and their derivatives;
- ✓ polyoxy (hydroxy) compounds;
- ✓ polyamides;
- ✓ various copolymers containing in the chain, along with such functional groups as - COOH, -C O O R , -OH, - N H ₂ , etc., aromatic radicals and unsaturated bonds.

Foreign patents are known that describe sizing compositions based on synthetic high molecular weight compounds, in particular, copolymers of styrene and maleic acid, polyvinyl alcohol and its copolymers, polyvinylpyrrolidone, acrylic (methacrylic) polymers and copolymers based on them, as well as many others. Note that they began to be used instead of carboxymethyl cellulose, starch, gelatin, since these synthetic sizing compositions had negative properties - a tendency to peel [6-11].

Currently, polyacrylamide is successfully used for sizing substrates. When sizing cotton yarn, it has long been used as a partial substitute for foodstuffs. The dressing was usually 70% starch and only 30% polyacrylamide, which gave good yarn properties. Subsequently, thanks to the developments carried out, numerous compositions based on polyacrylamide, both 8% and 6%, its alkaline or oxidative degradation products, and its other copolymers were used [12–15]. The use of polyacrylamide made it possible to completely eliminate the use of starch.

Other sources note [13-16] that synthetic and artificial sizing products, in comparison with natural polymers, in particular starch, and have significant advantages, both in terms of equipment productivity and sizing quality. In addition, the conditions for the implementation of the sizing itself will be very simple. In this regard, cellulose ethers are more important.

Among the cellulose ethers with an adhesive effect, the most suitable for the sizing process is carboxymethyl cellulose (CMC) with varying degrees of etherification and polymerization. Indeed, it has a number of advantages over starch. It is easier to prepare a dressing from it, since the addition of other substances (components) is not required. CMC dressing is well retained on the yarn, stable during long-term storage and can be easily removed when washed in hot water.

Ammonium salt of cellulose -glycolic acid also acts similarly to Na -CMC. Its advantage lies in the possibility of plasticization due to organic amines and polyglycols, which makes it preferable to use it in the process of sizing yarn from synthetic fibers [17-19].

Modification of polymers, as a rule, is carried out to improve their properties in the desired direction, which practically makes it possible to obtain polymers with desired properties. The use of modified polymers in sizing technology makes it possible to improve the quality of the sizing and, as a result, reduce warp breakage in weaving, increase the speed of yarn processing, and reduce dustiness. In the domestic and foreign literature, there are a large number of works that consider the issues of obtaining sizing preparations based on modified natural and synthetic polymers.

Of particular interest are drugs obtained from a natural polymer - starch - by modifying it with nitrogen-containing compounds, in particular, low and high molecular weight amides, amines, vinyl cyanides, salts of acrylic acids and their derivatives. At the same time, the modified preparations contain carbamino - O-CO- NH₂, urea - HN CO NH -, amide - CO NH -, nitrile - C N, ammonium and other groups.

The presence of the above chemical groups in the preparations and the change in their structure increases the adhesive ability and improves the technological properties of the sized yarn.

The drugs obtained by modifying various starches with carbamide have found the greatest application [20–24]. Modification is carried out in the process of preparation of dressing. Modified starches contain carbamino groups, which are similar in chemical structure to urethane ones, as a result of which the elastic properties of their macromolecules are significantly increased, which is reflected in the properties of the film formed on the sized yarn. In works [25-27], it is indicated that the properties of the film depend on the number of

hydroxyl glucoside groups linked by modifier groups. Starch modification is carried out as follows: a starch suspension is prepared, and then carbamide pre-dissolved in 5-10 liters of water is introduced and gelatinized according to the modes regulated in weaving industries. The dressing obtained has slightly alkaline properties; its viscosity is somewhat lower than the viscosity of the starch dressing. When using such a modified dressing, the increase in yarn strength increases by 4-5%, and the warp breakage decreases by 8-10%.

Of practical value and theoretical interest in sizing technology are cationic starch compositions containing 0.18-0.20% nitrogen. These drugs are obtained by reacting starch with polyethylene amines [28], polyethylene polyamines, low molecular weight amides, and ammonium salts of acrylic acids.

Chemical modification proceeds by the interaction of starch groups and amino groups of the modifier. Modification products are cationic preparations containing carbamic, amine and other groups, the presence of which also leads to an improvement in sizing ability due to an increase in elasticity and adhesive properties.

An analysis of the literature data shows that a comprehensive study of sizing processes continues to be a topical issue in our country and abroad. Methods for increasing the efficiency of the use of starch continue to attract attention, and not only methods of its chemical or physical modification are proposed, but also the improvement of their properties by changing the components of the sizing composition.

Despite the large amount of research devoted to the issue of sizing the bases, the proposed sizing compositions have certain disadvantages, so the search for new technical solutions seems promising both from a practical and scientific point of view.

The search for new ways to develop sizing technology is dictated by the need to create resource-saving and environmentally friendly technological processes, while improving the quality of products without reducing labor productivity.

A very extensive literature is devoted to sizing compositions based on synthetic polymers. It should be noted that abroad, the composition of the used composition is often hidden behind its trade name, and for patentable compositions, very significant information, as a rule, remains outside the scope of the published patent description.

There are examples of serious theoretical work, in particular, the study of the thermodynamic aspects of the sizing process.

Fundamental studies carried out by the authors of works [29-35] indicate the possibility of targeted synthesis of high - molecular compounds with a set of properties that ensure the technological process of sizing and satisfy almost all requirements for adhesive preparations. A promising direction that allows partially or completely freeing starches used in sizing is the development of compositions based on binary mixtures of natural and synthetic macromolecular compounds. Sizing based on binary mixtures is cost-effective and can significantly reduce the consumption of both starches and synthetic polymers.

A very serious situation in the domestic textile and chemical industry, the lack of funds for the development of environmental programs serve as the basis for the search for compositions for sizing, consisting of starches and synthetic polymers, which are waste products of high -tonnage industries and have adhesive, softening, antibacterial and other properties. Such compounds can be: sodium salts of synthetic fatty acids, polyoxyethylatedalkylphenols, amides, amines, alcohols, alkylarylsulfonates, polyethylene glycols, protein hydrolysates, and other products.

Thus, all sizing agents can be divided into starch products and synthetic materials. The choice

of the sizing agent is due to a complex of adhesive, surface, rheological and viscous properties, which, with minimal application to the threads, provide high physical and mechanical properties of the sized threads. In unmodified form, starch products are inferior to synthetic sizing agents, primarily in terms of film-forming and adhesive properties.

All of the above suggests that sizing compositions based on natural and synthetic macromolecular compounds can be used as effective components of sizing compositions with subsequent involvement of production waste. The present work is devoted to the solution of this problem.

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