

## APPLICATION OF METHODS FOR OPTIMIZING THE WASHING PROCESS OF COARSE LOCAL WOOL

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**Abstract:** The washing process of wool is a crucial stage that determines its quality, and incorrect methods can damage the fibers, cause loss of elasticity, and reduce the quality of the product. To preserve the natural properties of wool, it is necessary to optimize the washing process.

In our country, the production of products from silk and cotton fibers has been widely implemented, and modern scientific research is being conducted in this field, resulting in improvements in product quality. However, the demand for fabrics made from wool fibers, which are among natural fibers, remains significantly unmet. Such products are largely imported using foreign currency. At present, our country has considerable potential for producing wool fibers.

There is insufficient capacity at enterprises for the complete processing of locally produced wool raw materials. At existing enterprises, the cost of finished products increases because the main raw materials are imported. One of the pressing issues facing textile industry specialists is to expand the range of marketable products made from natural fibers. Wool and silk fibers can be used for this purpose. To obtain high-quality wool, attention must be paid to processes such as sorting, cleaning, and washing.

Wool fibers are washed to remove grease, sweat, and residues of plant and mineral materials. The essence of washing is that the washing solution must pass through the layers of dirty wool and over the surface of the fibers, thereby wetting them.

Unwashed wool fibers contain grease, sweat, moisture, and various contaminants. The amount of contaminants ranges from 40% to 70% and depends on the age, sex, and breed of the sheep, as well as the soil and climatic conditions and the feeding regime and conditions. Therefore, the processing regime differs for different types of wool fibers. The higher the degree of contamination, the more difficult it is to clean the wool.

The washing regime is determined by the number of washing baths required, the amounts of soap, soda, and other chemical agents added to each bath, the direction of liquid flow and the procedure for supplying the solution to the baths, the pressure of the squeezing rollers, and the frequency of cleaning.

Table 1

Recommended alternative wool-washing regime

| Order number of washing bath |      |      | pH of solution |
|------------------------------|------|------|----------------|
|                              | Soap | Soda |                |



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|   |     |     |     |
|---|-----|-----|-----|
| 1 | 0.5 | 2.0 | 9.3 |
| 2 | 0.6 | 2.0 | 9   |
| 3 | 0.6 | 1.0 | 9   |
| 4 | 0.8 | 0.7 | 8.7 |
| 5 |     |     | 8   |

Wool fibers are washed in hot-water solutions using soap-and-soda solutions or synthetic detergents.

Washing of wool fibers is carried out in wool-washing machines that form part of a wool-washing unit.

The wool-washing unit (Fig. 1) is a continuously operating system consisting of an automatic feeder 1 for unwashed wool fibers, a beating machine 2, several washing baths 3, 5, and 6, squeezing rollers 4 installed after each bath, and a drying machine 8 equipped with an automatic feeder 7.

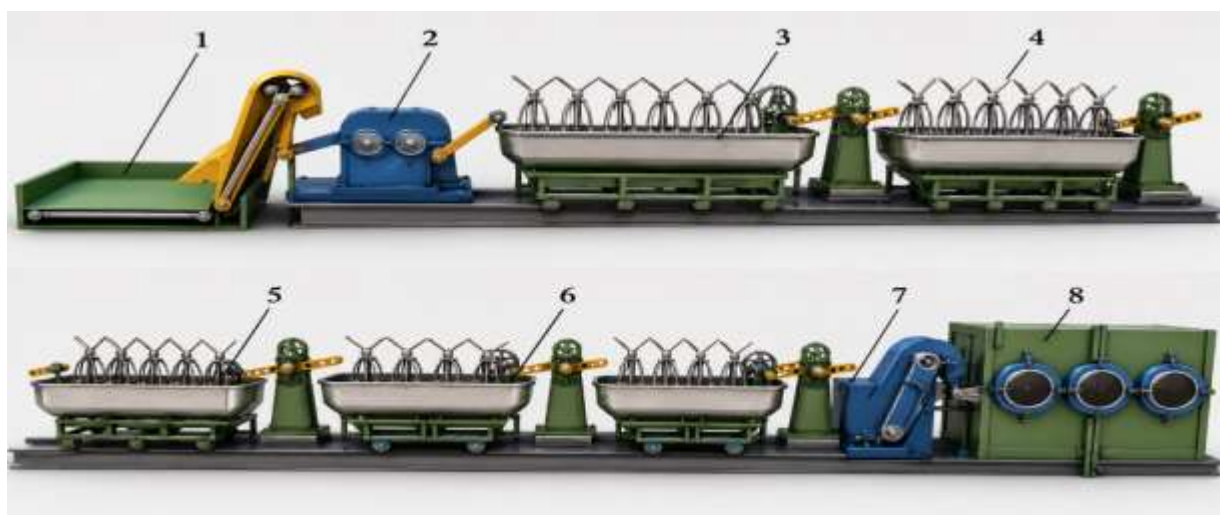


**Fig. 1. Wool-washing unit.**

The unit has a processing capacity of 750–1000 kg/h. The yield of wool fiber is 40–65%.

The most common problems in the washing process are fiber brittleness caused by excessive temperature and inappropriate chemicals, hardening of the wool and loss of its natural lanolin layer due to excessive detergent use, fibers sticking together, and changes in the natural structure of wool caused by improper washing methods. Several key factors should be considered to eliminate these problems.

First, selecting the optimum washing temperature is very important. Wool fibers are sensitive, and washing them at 30–40°C is recommended. Very hot water can cause the wool to harden and damage the fiber structure. The use of suitable detergents also helps preserve fiber quality. To prevent the loss of natural lanolin, environmentally friendly and biodegradable detergents with a pH of 6–9 should be used. Reducing the amount of sulfates and phosphates helps preserve the natural properties of wool.



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The use of softening agents is also recommended to prevent the loss of elasticity in wool fibers. Oil-based softeners help maintain the elasticity of wool and prevent fiber brittleness.

Controlling mechanical action is also an important factor. Excessive mechanical movement can damage wool; therefore, washing with an optimum rotational speed and stable movement is recommended. The use of low-pressure water-spraying systems in washing machines prevents the fibers from being subjected to excessive mechanical action.

Water quality also plays an important role in the washing process. Hard water can cause wool to harden and become damaged; therefore, special filtration systems are recommended to reduce the mineral content of the water. The use of recycled water is beneficial from both environmental and economic perspectives.

Optimizing the washing process makes it possible to improve wool quality, reduce fiber damage, and introduce environmentally friendly technologies. By using an optimum temperature, mild detergents, reduced mechanical action, and water-quality control, the natural elasticity and softness of wool can be preserved. This approach increases the efficiency of the washing process and expands the possibility of obtaining high-quality products.

### **Conclusion**

Optimizing the washing process makes it possible to improve wool quality, reduce fiber damage, and introduce environmentally friendly technologies. By using the correct temperature, mild detergents, reduced mechanical action, and water-quality control, the natural elasticity and softness of wool can be preserved. This approach increases the efficiency of the washing process and makes it possible to obtain high-quality products.

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