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# **Stepwise Fattening of Natural Leather and Research of Their Properties**

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**ABSTRACT:** The process of fattening of leathers research using an ester synthesized based on oleic acid and isoamyl alcohol. Graduated fattening of experimental leather was carried out. Research the technological properties of the ester.

**KEY WORDS:** stepwise fattening, ester, secondary products, fatty substances, collagen fiber.

## **I. INTRODUCTION**

Introduction of significant interest to the leather industry are new oiling preparations of various nature created by the synthesis of the etherification reaction based on secondary products of industrial enterprises [1].

For the fattening of the leather, a composition based on the etherification reaction based on secondary products, prepared on the basis of fatty acids of oil-fat enterprises and alcohols of hydrolysis enterprises, was developed [2]. Fattening leather with this preparation is characterized by a relatively high content of bound fat and good fullness.

Production tests have shown the feasibility of using etherification for the fattening of various types of chrome tanned leathers.

When using the ester, it is possible to obtain aqueous emulsions that are resistant to the action of electrolytes (including tanning salts of chromium) in a wide range of pH values (3.0–8.0) [3].

This property of the preparations allows them to be used in the process of stepwise fattening (including at the stages of chrome tanning and retanning), as a result of which there is a uniform distribution of fattening substances and chromium salts, which helps to improve the quality of leathers, as well as saving chemical materials.

Graduated fattening makes it possible to adjust the properties of leathers in the direction of rational preparation for finishing, avoiding excessive absorption of impregnating soil and dressings in the manufacture of leathers with a refined front surface.

Experimental research: In this paper, we studied the process of fattening of leathers using a ester synthesized in various initial ratios.

In the course of research, the technological properties of the ester preparations synthesized in various initial ratios were studied with their combined use in the method of stepwise fattening: Stage I - tanning, Stage II - retanning, Stage III - fattening.

Semi - production batches of leathers developed from half-leather raw materials were processed according to 18 options.

The results of various options for the introduction of esters at the stage of fattening, depending on the initial ratio of the components of the ester are given in table 1.

Table 1  
Various options for the introduction of ester at the stage of fattening, depending on the initial ratio of the components of the ester

| №  | The initial ratio of the components of the ester<br>(acid: alcohol: catalyst) | Ester consumption, %, at the stage of fattening |                |                 |
|----|---|---|----------------|-----------------|
|    |   | I (tanning)                                     | II (retanning) | III (fattening) |
| 1  | 1:1:0,5   | -   | -              | 8               |
| 2  | 1:1:0,5   | -   | 2              | 6               |
| 3  | 1:1:0,5   | 1   | 2              | 5               |
| 4  | 1:2:0,5   | -   | -              | 8               |
| 5  | 1:2:0,5   | -   | 2              | 6               |
| 6  | 1:2:0,5   | 1   | 2              | 5               |
| 7  | 1:3:0,5   | -   | -              | 8               |
| 8  | 1:3:0,5   | -   | 2              | 6               |
| 9  | 1:3:0,5   | 1   | 2              | 5               |
| 10 | 1:4:0,5   | -   | -              | 8               |
| 11 | 1:4:0,5   | -   | 2              | 6               |
| 12 | 1:4:0,5   | 1   | 2              | 5               |
| 13 | 2:1:0,5   | -   | -              | 8               |
| 14 | 2:1:0,5   | -   | 2              | 6               |
| 15 | 2:1:0,5   | 1   | 2              | 5               |
| 16 | 3:1:0,5   | -   | -              | 8               |
| 17 | 3:1:0,5   | -   | 2              | 6               |
| 18 | 3:1:0,5   | 1   | 2              | 5               |

Note. The consumption of ester from the mass of the glue (when tanning) and from the mass of planed semi-finished product (during retanning and fattening).

### II. ANALYSIS OF THE RESULTS

During the first and second stages of the esters of the preliminary adjustment, the pH was dosed into the drum simultaneously with the chrome tanning agent. The processes of tanning and retanning took place without difficulty. When working according to option 1, the ester was prepared at a temperature of 55-60 °C and poured into the drum after cooling to a temperature of 20 °C. In all cases, almost complete development of the ester was observed. After the first fattening phase according to option 1, 4, 7, 10, 13, 16, moderate fattiness of the bakhtarmyan surface of the semi-finished product was observed, after processing at all other stages according to the 2, 5, 8, 11, 14, 17 variants the semi-finished product was organoleptically of normal quality .

The process of planning the leathers treated according to option 9 went fine, the solution was completely worked out, and the weight of the ester was adsorbed by the semi-finished product.

In their finished form, half-leathers of all variants corresponded to the requirements of normative and technical documentation, were soft, elastic. It was found that according to organoleptic evaluation, the best leather were developed according to option 9, then the leather of options 3, 6, 12, 15 and 18.

To ensure the effect of fat loss, the binding strength and distribution of fatty substances in the leather are important. The esters of fatty acids are best associated with the skin [4]. They form in the water not true, but micellar, colloidal solutions, which provide a deeper penetration of fattening substances into the skin fibers.

When assessing the quality of half-leathers, physical and mechanical tests, a chemical analysis were carried out, the content of fattening substances (esterificate) in the semi-finished product after tanning and by layers in the finished skin was determined before finishing, the water resistance of the skin by the time a drop of water was absorbed by the front surface and the filling ability of the fatliquoring preparations were estimated according to the options on

the output of the thicknesses of the semi-finished product after drying. In this case, the thicknesses were measured at four points of half-skin, namely: in the rump, the collar, and at two points of the near-sea part.

The fullness of the leather was determined as a percentage of the thickness of the semi-finished product after drying to the thickness of the planed skin expressed as a percentage.

The fullness of the leather was determined as a percentage of the thickness of the semi-finished product after drying to the thickness of the planed skin expressed as a percentage.

The test results are given in table. 2.

Table 2  
Chemical, physic-chemical and mechanical indicators of experimental variants of stepwise fattening with esters

| № | Indicators  |                 | Options |      |      |      |      |      |
|---|---|-----------------|---------|------|------|------|------|------|
|   |   |                 | 3       | 6    | 9    | 12   | 15   | 18   |
| 1 | Content, %  | moisture        | 13,0    | 13,1 | 13,2 | 13,0 | 13,2 | 13,1 |
| 2 |   | chromium oxide  | 5,8     | 6,1  | 6,5  | 6,2  | 6,0  | 5,6  |
| 3 | Fat content extracted with organic solvent,% after tanning Fat content extracted with organic solvent,% | after tanning   | 3,2     | 1,5  | 0,7  | 0,8  | 2,5  | 3,5  |
| 4 |   | after fattening | 7,2     | 7,1  | 7    | 7,3  | 7,5  | 7,6  |
| 5 | Tensile strength 9.8 MPa  |                 | 2,0     | 2,0  | 2,2  | 2,1  | 2,0  | 1,8  |
| 6 | Stress extension 9.8 MPa,%  |                 | 21      | 21,2 | 21,4 | 20,8 | 20,2 | 20,1 |
| 7 | The time of absorption of a drop of water with the front surface, minutes                               |                 | 1       | 2    | 5    | 4    | 2    | 1    |
| 8 | Weight gain, by thickness,%   |                 | 0,5     | 0,8  | 1,2  | 1,1  | 0,8  | 0,6  |

As can be seen from the data table 2, the leather, developed according to option 9, have the best fullness (Table 1). According to the indicator characterizing the hydrophobic properties of the front surface, the leather of all options did not practically differ from each other, no finishes were observed when finishing the “dips”. With the introduction of ester in the processes of tanning and retanning, together with chromium salts, the uniformity and depth of penetration of fattening substances into the structure of the dermis increases, which helps to increase the softness and elasticity of the semi-finished product. At the same time, planning is facilitated, and the performance of dye-fat processes is improved.

Finished leathers worked out according to the given scheme were distinguished by softness, elasticity, were well-filled, non-fragrant.

The grade of leather during extensive production testing of this technology amounted to 85.6% of first-class units (at 84.1%). As a result of better working fluid handling, material efficiency is increased.

Dyeing was performed in a spent fat bath. All further processes and operations - according to current technology. The leathers developed by this method were characterized by increased softness and ductility.



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