

INVESTIGATION OF DEFORMATIONAL CHARACTERISTICS OF NATURAL LEATHER

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Leather is a natural anisotropic, layered material. Its physical-mechanical characteristics depend on the quality of a raw material and technology of its currying. The existing practices of evaluation of leather quality are based both on objective and subjective testing methods. One of the major parameters of natural leather is its elasticity ("softness"), which an expert evaluates by touch. The results of such examination depend on experience of the expert and his subjective sensations.

The purpose of this investigation is to develop an objective technique for evaluation of natural leather based on its deformative characteristics determined experimentally, and to compare the results obtained with the subjective examinations. The cattle halfskins treated according to the classical technology of chrome tanning under production conditions were the object of the experimental researches. The experimental basis for developing an objective technique is the stress-strain curves obtained from the uniaxial tensile tests of leather specimens cut out from the cattle halfskins in two mutually orthogonal directions. Derivation of these nonlinear stress-strain curves allows one to obtain the dependencies of the tangential elastic moduli of leather (in longitudinal and transversal directions) on the applied strain, and also some integrated stiffness characteristics used in the technique developed. The scientific interest of the investigation represents the analysis of nonlinearity of the elastic properties of natural leather and the degree of its elastic anisotropy.

Twelve stiffness characteristics determined at five different levels of the applied strain from the uniaxial tensile tests of leather specimens cut out from forty cattle halfskins of a various thickness were used in the objective examination. The garment (0.6–0.9 mm), haberdashery (0.9–1.2 mm), and footwear (1.2–1.5 mm) leathers were investigated. The results of these examination based on the values of transversal and average moduli of elasticity in the field of small strains correlated best with the results of the subjective evaluations by a group of experts. The information obtained enabled us to offer an engineering method for the evaluation of natural leather elasticity based on the tests in uniaxial tension carried out with a simplest equipment at industrial conditions.