

Mechanical stretching of leather for area yield: Determination of the influence on quality

G.E. Attenburrow¹, C. Boote², X. Lui¹, K.M. Meek², M.J. Otunga¹, E.J. Sturrock²

¹British School of Leather Technology, University of Northampton
Boughton Green Road, Northampton NN2 7AL, United Kingdom

²Cardiff University
Cardiff, United Kingdom

Introduction

Because hides are purchased by weight but leather is sold by area it is common practice to stretch leather during manufacture. Some area increase may be achieved in mechanical operations such as samming or setting but may be lost due to subsequent recovery. It has been shown that more permanent increases in area can be achieved by drying leather whilst it is maintained in a stretched condition as may be achieved using a split toggle frame. However there is concern that in-process stretching of leather may affect important aspects of quality such as stiffness and strength. In this paper the effect of drying under various degrees of applied biaxial strain on the stiffness and strength of chrome tanned bovine leather will be reported.

Methods

Wet blue leather was cut into squares and stretched equally in two directions by various amounts up to 25% on a specially constructed biaxial stretching device. After drying for 24 hours it was found that the imposed stretch was effectively maintained by the leather and area increases up to 56% could be obtained. Stiffness was measured in tension, bending and compression using an Instron 1122 testing machine.

Results and Discussion

It was found that tensile stiffness increased by up to seven times as the biaxial stretch applied during drying increased up to 15%. Similar changes occurred in bending stiffness. Stretching beyond 15% biaxial strains caused the stiffness to decrease. Although staking resulted in a considerable reduction in stiffness the effects of biaxial stretching were still apparent. The influence of biaxial stretching on compressive stiffness was less marked.

Grain crack resistance was measured using a work of fracture approach and it was found that biaxial stretching during drying only caused a relatively small reduction in this parameter up to a biaxial strain of 15%. However at greater applied strains there was a marked reduction in crack resistance. X-ray diffraction was used to examine the fibre structure before and after stretching. This indicated marked changes in fibre orientation occurred during stretching.

Conclusion

It is concluded that drying leather under an imposed biaxial stretch can lead to very significant increases in area which can cause increased stiffness and loss of grain crack resistance. The tanner needs to be aware of the way these important aspects of quality depend on the stretch imposed during drying.

E mail: geoff.attenburrow@northampton.ac.uk