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Wool Testing Services Info-bulletin

Fibre length-diameter profiles

Introduction

During the course of a year, sheep eat differing amounts and quality of feed, and some sheep convert feed to fibre more efficiently than others. Fibre output (both in length and diameter) varies seasonally in most cases, but may also be influenced by events such as lambing. Wool fibres therefore vary in diameter along their length, largely influenced by feed and environmental conditions. Some sheep in some climates may have fibres that vary in diameter by as much as 10 µm along the length.

Why is length-diameter profile important?

During processing, wool fibres are more likely to break at the point where the profile changes most rapidly - this may be the point of minimum diameter, but not necessarily. If a fibre has both reduced diameter and rapid variation in diameter in the middle of its length, it is quite probable that the fibre will break near the middle, and may also have relatively low strength. Staple strength is likely to be reduced and a high percentage of middle breaks will lead to more shorter fibres in processing, and higher waste. Both of these effects will result in the wool having lower value (i.e. discounted).

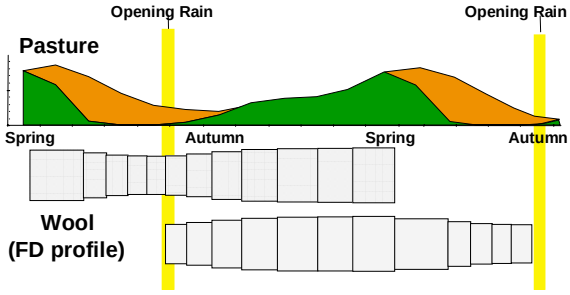
Fibres which have reduced diameter at their ends, rather than in the middle, not only tend to be sounder, but also will have improved fibre-ends characteristics when processed. It has been shown that wools with fibre end diameters less than the average fibre diameter will give better next-to-skin comfort. In effect, a manufacturer of next-to-skin garments can save money on raw material if he were able to buy wools with improved fibre ends, since he would be able to source wools with higher mean fibre diameter than normal for the same comfort. (However, fabric handle would remain the same as an equivalent wool with the same mean fibre diameter, but maybe poorer ends characteristics.)

Measuring length-diameter profiles

The conventional method of measuring length-diameter profiles is to cut a cleaned staple into sequential 2mm snippets, and to then measure the mean fibre diameter of each set of snippets and from this data re-assemble the profile. This is a relatively expensive and time-consuming method, since it involves careful handling and multiple measurements. Some simplification has been introduced by reducing the number of snippet segments required to establish the main parameters of the profile.

In the mid-1990's BSC Electronics introduced a high-resolution single fibre profile measuring instrument, the Sifan, but it was intended for use by researchers and was not practical for routine measurements.

Typical patterns of pasture supply and wool growth for wool sold in Fremantle shorn in spring or autumn



Effects of feed and time of shearing on profiles
courtesy A. Peterson, Dept. Agriculture, West Australia

The OFDA2000 instrument (see Info-bulletins 3.4 and 3.7) allows length-diameter profiles to be measured on greasy staples sampled directly from a fleece or animal, and therefore allows the data to be obtained in a very cost-effective manner. Each measurement takes approximately 30 seconds and consequently whole flocks can be measured.

Relationship between greasy wool and tops

Another instrument, the OFDA4000, allows length-diameter profiles to be rapidly measured on top samples, thereby opening the door to utilising the data along the processing pipeline. Researchers in Australia have shown that profiles measured on greasy wool survive through to topmaking, and that fibre ends characteristics in the top can be predicted from greasy wool measurements.

A further linkage between greasy wool and tops is currently being refined. Research is demonstrating that the Hauteur of tops can be predicted from the greasy length-diameter profile, without having to go through the expensive step of performing staple length and strength measurements. A prediction algorithm has been incorporated in the OFDA2000 software.

Managing length-diameter profiles

With the knowledge of how his sheep performed last year, a grower is able to start managing the profile. Whilst this option may not suit every grower, it has the potential to allow use of the profile to increase staple strength, reduce overall fibre diameter, and to optimise shearing patterns to reduce fibre end diameters. However, it might be some time before the latter option gets taken up to a significant extent, since IWTO has so far only agreed a draft test method for measuring the fibre ends characteristics of tops (DTM 60), and as yet there are no premiums to encourage this management option.

However, by monitoring fibre diameter next to skin on a regular basis, growers with suitable management resources can already use restricted feed options to reduce diameter "blowout" and to increase staple strength.

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