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GENSTOCK FLEECE TESTING SERVICE

FIBRE DIAMETER DISTRIBUTION is an integral part of the Merino Wool Industry and effects all participants from the commercial grower to the end user who wears the finished garment. Its effect ranges from management problems such as fleece rot and fly strike, through sale price due to dust penetration, tip weathering and doggy wool, to prickle in the finished garment.

Selection for heavier wool cuts tends to increase fibre diameter variation.

FIBRE DIAMETER DISTRIBUTION is directly related to:-
Staple structure and Style (arrangement of fibres within the staple).
Fleece tip (dust and water penetration, tip weathering, top/noil ratio).
Fleece rot.
Fly strike.
Micron control.

FIBRE DIAMETER DISTRIBUTION is the distribution, or number, of fibres of each diameter in any given wool sample. When measured, it enables the degree of fibre diameter variation, or uniformity, to be assessed.

Good staple structure requires *fibre diameter uniformity.* Evenly sized fibres grow and crimp in unison to give an even, distinct crimping pattern. This gives wool true style and character.

Poor staple structure has considerable *fibre diameter variation.* Unevenly sized fibres produce crimps of uneven length and depth, which give rise to a disrupted crimping pattern and feathery tip.

Resistance to fleece rot and fly strike is very dependent on *good staple structure*, which naturally facilitates the rapid draining and evaporating of moisture, which may enter the staple.

A blocky tip *does not* necessarily indicate evenly sized fibres!! It is often formed after shearing when copious wax cements the tips of the wool fibres together which creates the blocky surface and *disguises* any naturally feathery tip.

Feathery tips allow substantial dust penetration. They also weather and tend to break and become noil during processing.

Handle is very dependent on fibre diameter distribution.

Poor Handle is largely attributable to *fibre diameter variation* (these wool's deteriorate in appearance and become stronger micron).

FIBRE DIAMETER DISTRIBUTION HISTOGRAM

The Histograms and measurements are provided as a guide to assessing the comparative wool quality and average micron of this group of sheep.

1. *Standard Deviation (SD MIC)* - indicates the micron "spread" or distribution of the majority of the fibres.

2. *C of V (CV MIC)* - is the coefficient of variation which indicates the micron "spread" relative to the average micron. It allows the "spread" of micron of sheep of different average micron to be compared. Uniformity of fibre diameter is the basis of wool quality and is characterised by well-defined and evenly spaced crimps (better known and "style").

C of V can also be used as an efficient indicator of staple strength. Low C of V of fibre diameter, lead to a high staple strength.

3. *Coarse Edge Micron (CEM) Threshold* - is the micron at which the broadest 5% of fibres are found on the frequency histogram. It is useful as an indicator of garment comfort and would be more useful than comfort factor for wools under 19 microns. The lower the CEM Threshold, the more comfortable will be the wool. These fibres disrupt the internal staple structure and are the framework for feathery tips. In severe cases, they can be pre-emptive of the future increase in the average micron of that sheep.

4. *Comfort Factor or % Fibres < 30 micron (CF %)* - Indicates the proportion of fibres, which are, less than 30 micron. When there are less than 95 % of fibres, prickliness becomes apparent thus indicates the degree of prickliness that a finished product is likely to have.

5. *% Fibres < 15 micron* - Indicates the proportion of fibres which are less than 15 micron. This is helpful in determining those animals with a left-hand shift on their histograms.

6. *Spinning Fineness (SF MIC)* - is a numeric calculation that relates C of V to the actual micron in terms of spinning ability. The spinning qualities of wool are enhanced by a low coefficient of variation, which enables the wool to be processed at standards less than the given micron. For e.g. a 20 micron wool with an 18% C of V, has the spinning qualities (or fineness) of a 19 micron wool. The same 20 micron wool with a 29% C of V, would have a spinning quality (or fineness) of 21 micron.

7. *Fibre Curvature (CRV °/mm)* - is a new approach to measuring "crimp" in wool, and recent evidence shows that curvature is probably the third most important fibre specification after diameter and length. *SDC °/mm* is the standard deviation for fibre curvature.

What use is curvature?

Curvature relates strongly to staple crimp characteristics, particularly crimp frequency - for as frequency increases, the fibres are increasingly curved. But curvature is not the same as character (staple crimp definition), which is a measure of how well aligned fibres are. Fibre alignment and thus staple crimp definition does however relate to the CV of curvature, since it is physically hard to align fibres differing in curvature. Figure 1 illustrates these points:

Recent scientific evidence confirms that wool fibre curvature influences processing efficiency, particularly during topmaking and spinning operations, yarn thickness and evenness and fabric thickness, handle and quality.

Topmaking: Wools of high crimp curvature tend to show increased fibre breakage during carding, relative to wools of low crimp curvature. Wools of poor crimp definition (high CV of curvature) tend to show increased fibre breakage in processing, in comparison to wools of good character.

Spinning: As fibre curvature increases, yarns become progressively more uneven, thicker, and show a progressively increasing frequency of faults.

Fabric:As fibre curvature increases, fabrics become increasingly thick and rigid.

Handle: As fibre curvature increases (at a constant diameter), wool becomes increasingly hard to compress, displays increasing bulkiness, develops an increasingly noticeable texture, a dry feel, and generally feels increasingly harsh. By comparison, cashmere (renowned for its silky softness) represents the combination of low average fibre diameter and low average fibre curvature.

Measurements of fibre curvature have the potential to have a major positive impact on the ability of our wool to deliver to consumers the soft, lightweight and easy care fabrics consumers increasingly demand.

Interpreting Results

In raw wool, OFDA measurements of curvature commonly range from 60 °/mm, for wools of low crimp frequency, up to around 130 °/mm, for superfine samples.

The standard deviation of curvature on the OFDA commonly ranges from around 40 - 100 °/mm, generally increasing as the average curvature increases, and as staple crimp definition decreases.

Measurements of fibre curvature could therefore be a useful means of identifying and specifying wools of particular style, such as Superfine wools, or the target wool type of the Soft Rolling Skin Sheep selection system. The latter is characterised by a low average curvature relative to the average diameter, as well as low CV's of both diameter and curvature.

IMPORTANT

Higher rainfall areas benefit from lower figures.
Lower rainfall areas will handle both low and higher figures.
Tall histogram profiles with a narrow base indicates better quality wool's.
Squat profiles with a broad base indicate lesser quality wool's.

REMEMBER do not neglect the basic need for wool production - select for productive wool cutters and frame, then fine - tune the wool to suit your own environment.

If you require any further information, please do not hesitate to contact us.