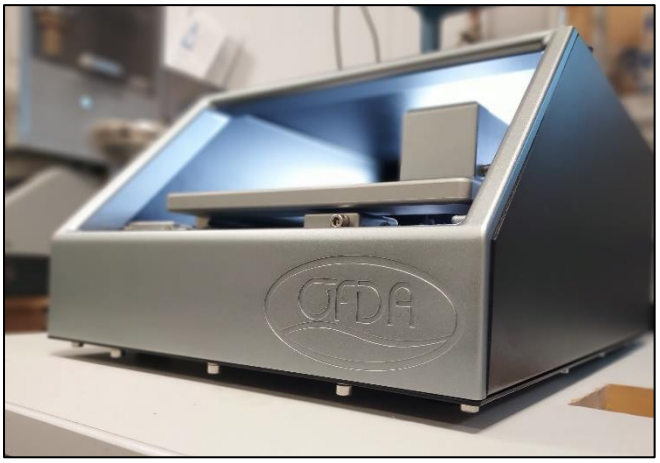
Fleece Testing Using OFDA 2000

Introduction to Mean Fibre Diameter Testing.



Fibre fineness is one of the most important parameters of any animal fibre. It determines how the fibre will be used and affects the handle and visual appearance of the overall product. Clear price differentials exist for different fibre diameters, and in almost all the price increases as the diameter decreases.

The measurement unit of fineness is the micron. A micron is one millionth of a meter and is represented with the symbol; µm.

There are a multitude of methods for determining the diameter of a fibre. Before the advent of the current technologies, fibre diameter was assessed by simply examining the fibre and making a subjective assessment. By today's standard this seems a rather primitive method, however these assessments could be surprisingly accurate. Today, three main methods are in use; airflow, Optical Fibre Diameter Analysis (OFDA), and laserscan. WTAE Ltd issue test results for all three methods but the focus of this leaflet will be on OFDA 2000.

OFDA 100 vs OFDA 2000.

The OFDA 2000 is the successor to the OFDA 100. It can measure mean fibre diameter using 2 methods.

The first involves taking snippets from a scoured sample and spreading across a glass slide and reading the mean fibre diameter over many thousands of these snippets to give an average measurement for fibre diameter along with a histogram. Standard deviation and comfort factor are also determined. This is analogous to how the OFDA 100 would measure mean fibre diameter. OFDA 2000 is an approved machine by the IWTO but it must be used in "100-mode". A point of note; despite being obsolete, the OFDA-100 is still a perfectly valid machine for the measurement of mean fibre diameter, and it is an approved machine by the IWTO.

The second method and also importantly the most valuable for fleece testing, is the ability to read the fibre diameter along the length of a greasy staple. Reading fibre diameter in "100-mode" is a perfectly good and accurate method for measuring fleece samples but the sample preparation is time consuming. Samples must be stripped of their grease content (scoured), dried and then to gain the most accurate result, conditioned according to the IWTO conditioning requirements. OFDA-2000 fleece measurement removes this tedious sample preparation and a staple coming into our laboratory can be analysed within 1 minute of coming through our door. Investing in this piece of kit really has been a game changer when it comes to high throughput fleece testing. Compared to using OFDA-100 (and laserscan) we have increased our throughput from approximately 50 tests per day to in theory 100's of fleece tests per day. There is also the benefit of being able to pass the decreased processing costs onto our customers.

The OFDA 2000 is calibrated using wool tops approved for use by the IWTO.

What Does a WTAE Test Report Show?

Mean Fibre Diameter (MFD)

Mean fibre diameter is the average fibre diameter across the entire sample, expressed in microns or µm.

Histogram

A histogram shows the distribution of fibre diameter across the sample. Micron is plotted along the horizontal axis and the number of fibres which are found to measure each micron value are counted and represented as a bar sitting vertical.

Standard Deviation (SD)

Standard deviation is a statistical term for the computed measure of variability indicating the spread of data set around the mean. The calculation for standard deviation is quite involved and is taken care of with the OFDA 2000 software.

The standard deviation provides a measure of the dispersion, or variation, within the data set. In a normal frequency distribution, 68% of all values fall within 1 standard deviation from the mean, 95% of all values fall within 2 standard deviations from the mean, and 99% of all values fall with 3 standard deviations from the mean.

The Standard Deviation (SD) is related to the coefficient of variation as follows:

$$SD = (CV \times \text{average MFD}) / 100$$

$$19.7 \times 30.9\mu m / 100 = 6.10\ \mu m$$

Therefore; 68 % of the data falls within ± 6.10 µm of 30.9 µm. As with coefficient of variation, the smaller the value the more uniform the MFD of the sample.

Coefficient of Variation (CV)

This is an expression of the variation in the diameter of the sample. The smaller this value the more uniform the diameter. In short, the smaller the better. The following test is used as an example for the CV calculation.

The calculation for Coefficient of Variation is as follows:

$$\text{Coefficient of Variation (CV)} = (SD / MFD) \times 100$$

$$(6.10\ \mu m / 30.9\ \mu m) \times 100 = 19.7\ \%$$

Comfort Factor (CF)

Comfort Factor is simply the number of fibres that measure less than 30.0 µm. Research has shown that the critical level of comfort in wool is 30.0 µm. Typically, if more than 5 % of the fibres are greater than 30.0 µm the wool will be “prickly” against the skin.

For a test sample that measures 51.5 % of fibres greater than 30.0 µm, Comfort Factor (CF) is calculated as follows:

$$CF = 100 - (\%\ \text{fibres} > 30.0\ \mu m)$$

$$100 - 51.5\%$$
$$CF = 48.50\%$$

Coarse Edge Measurement (CEM)

Coarse edge measurement tells you the difference between the top 5 % of fibres in the histogram and the mean fibre diameter. For example, if the sample has an average MFD of 26.2 µm and the CEM is measured at 11.03 µm, the coarsest 5 % of the fibres would be found after 37.23 µm.

< 15 %

The percentage of fibres in the sample that measure less than 15 µm.

Spinning Fineness

Spinning fineness tells you an estimated micron that sample should achieve when the fibres are spun into yarn. The calculation uses the measured fibre diameter and the standard deviation:

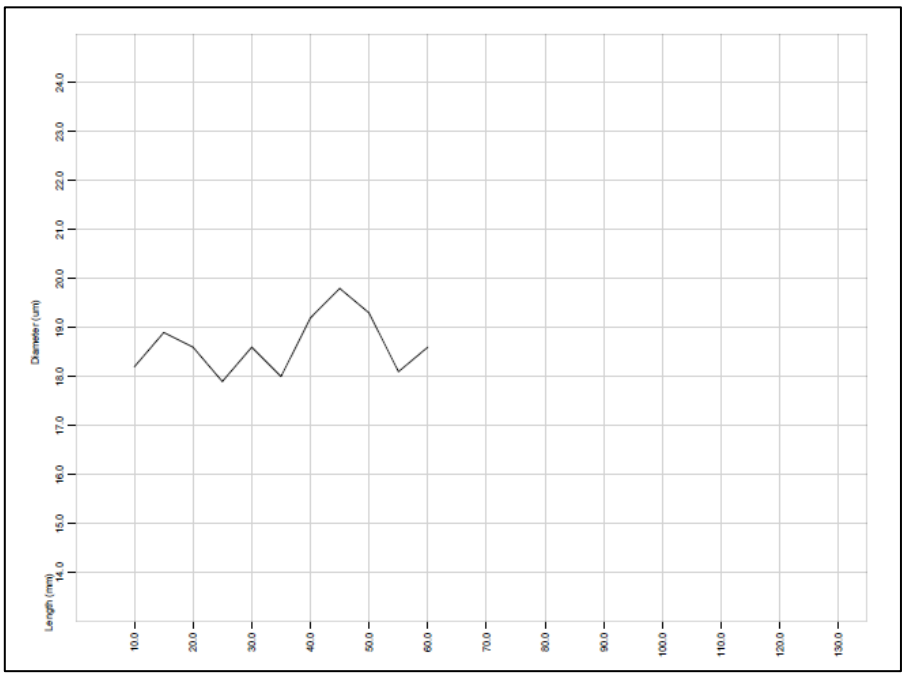
$$\mathrm{SF} = 0.881\mathrm{D}\sqrt{1 + 5\left(\frac{\mathrm{CV}}{100}\right)^2}$$

Where:
SF – spinning fineness, µm
D – mean fibre diameter, µm
CV – Coefficient of Variation, %

Fibre Diameter Along Length Profile

A series of measurements are taken along the length of the staple to produce a profile which shows the variation on fibre diameter throughout the growing season. An example of such a profile is shown below.

The staple measurement also gives the staple length, the minimum and maximum fibre diameter along the staple and the break point of the staple.



This can provide a wealth of information to breeders, such as looking for indications of nutritional deficiencies and other stressors, building a profile of their herd or flock and monitoring the natural variations throughout the season and information on processing performance especially in identifying the position of weakness in the staple.

Staple Length

Staple length tells you the length of the staple measured from the tip to the base, expressed in mm.

Break Point

Break point tells you the distance in the staple from the tip where it would have a tendency to break or where the diameter is at its finest. This can be useful information for processors as it can give an indication of machine settings and fibre performance during processing.

Minimum Diameter

The minimum fibre diameter measured in the staple.

Maximum Diameter

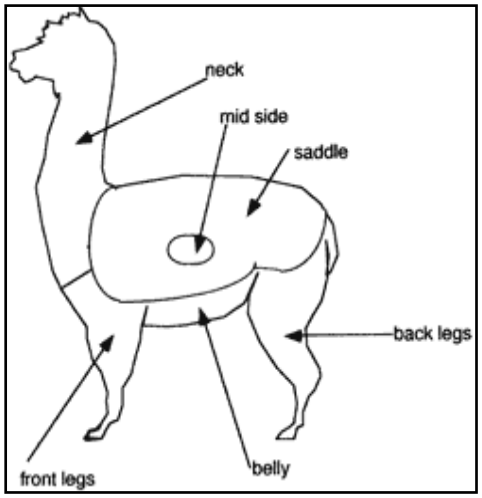
The maximum diameter measured in the staple.

Finest from Tip

The position in the staple where the finest fibre diameter occurs. Finest from tip can be regarded as the same as **Break Point**.

Sampling.

Research has shown that the most representative area of the animal for fleece testing is the mid-side. A hand full of staples is enough for staple measurement (ideally more than 10 staples should be provided) with the sample cut as close to the skin as possible. Samples can be taken at any time but are more commonly taken just before shearing.



Please ensure that all individual samples are clearly labelled.

For more information and to obtain prices, please visit our website or contact the laboratory.

FURTHER INFORMATION

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