Information sheet 01-25

'Genetic Focussed' fibre testing

Most breeders of animal fibres would be well aware of the influence that fibre diameter has on the eventual end-product created from their fleeces.

While fibre diameter is regarded as the most influential aspect affecting the softness of the eventual end-product, the product softness is in turn highly influential in the price achieved and its levels of demand.

Too often however, when we talk of fibre diameter, we talk in terms of the average diameter. For example, we focus on the midside test's average microns when we describe the fleeces of breeding stock. The average diameter, however, is only half the equation. The other half is the range in diameter – that is, how much difference there is between the finest fibres and the coarsest fibres.

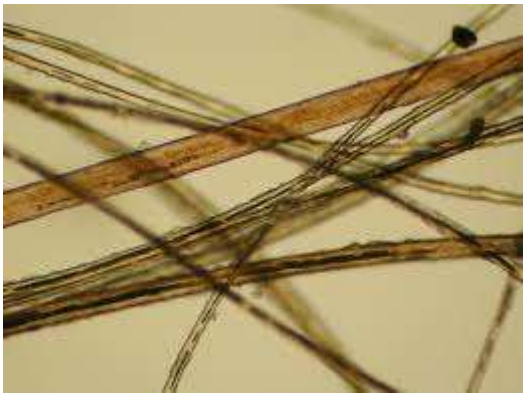
To make the point, lets imagine two fleeces both with midside tests showing an average diameter of 20 microns. One fleece might have fibres from 15 microns to 30 microns, while the other might have fibres from 10 microns right up to 40 microns. The issue here is that the first fleece will be suitable for 'next to skin' wear, while the 40 micron fibres in the second fleece will relegate it to average outer-wear such as jumpers. Hence, we have two fleeces with the same average diameter, but suitable for two different markets due to the difference in the range of diameter.

The range in diameter not only has an impact on processing/spinning performance and end-product, but it also has an impact on breeding outcomes in that the higher the variation in fibre diameter of a breeding animal, the lower the predictability of the fleece quality of the progeny.

When we describe a fleece or an animal in terms of its average diameter, we refer to that measurement as its 'micron', although technically, this is not really a suitable term, but I'm happy to 'run with the flow'.

When we describe the range in diameter of fibres, we refer to its 'standard deviation of fibre diameter' or 'SD' for short. SD is a generic statistical calculation that measures variation. Put simply, one standard deviation is how far either side of the mean or average you need to go to capture two thirds of the total variation. For instance, if the average diameter is 20.0 microns, and the SD is 5.0 microns, then two thirds of the total variation or range in fibre diameter would be between 15.0 and 25.0 microns.

At this point, I'll mention that when we measure fibre samples, the testing device, which is normally OFDA2000 equipment, takes a series of measurements across the sample at every 5 millimetre interval. In other words, it measures across and along the sample. Normally, this results in about 2000 to 3000 measurements, with the average diameter and the SD being calculated from those measurements.



Fibre testing devices (OFDA2000) takes a series of measurements across the fibres at each 5 millimetre interval along the sample. Normally, 2000 to 3000 measurements in total are taken from which the average diameter and the SD are calculated

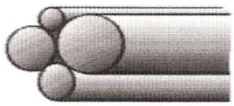
Before we venture further into the realms of SD, we need to be reminded that variation in diameter, or SD, is not only crucial for revealing the incidence of problematic coarse fibres, but also the relative genetic superiority, or otherwise, of the subject animal.

In saying that, measuring for SD of animal fleeces has had its limitations.

Most variation in a fibre test is normally the variation in diameter between fibres. This generally accounts for about three quarters of the variation in a sample. Importantly, it is this form of variation that we aim to focus on with breeding as variation between fibres is genetically influenced. In fact this trait is highly heritable and therefore perfect as a breeding objective.

On the other hand, the variation in diameter along the fibres, is environmentally influenced, in that it is impacted by factors external to the animals' genetics, such as season, feed and health.

Along fibre variation is caused by environmental factors



Across fibre variation is caused by genetics

As we have mentioned above, when the testing device is measuring samples, the range in diameter or SD which we see in our reports is relating to the overall variation in the sample, that being between the fibres as well as along the fibres. In other words, the all-important, genetically influenced variation in diameter between fibres, is being affected by the excess baggage of the 'along fibre' variation which is caused by factors external to the genetics of the animal (this is not entirely the case, but we will deal with that another day…)

This factor has a resounding impact if, for instance, the animal has had a highly varied level of nutrition over the season, and consequently has a highly varied diameter along the fibres. The SD being reported in this case is being substantially pumped up by factors that are inconsequential to breeding. In other words, a high SD might be due to highly varied diameter along the fibres, and could well disguise a superior breeding animal. I hasten to add that this sort of thing does not happen often, but it does happen.

In the past, attempts to isolate the genetically influenced 'across fibre' variation from the environmentally influenced 'along fibre' variation have used the unfortunately termed, 'butt test' whereby only a 5 millimetre snippet from the sample was tested. The problem with this is that it did not effectively provide the full range of data given it was merely a 5 millimetre snippet.

Modern advances in the OFDA technology now enable us to measure the full length of the fibre sample, while being able to report on 'across fibre' variation without the baggage of the 'along fibre' variation. The OFDA device does this by collecting the SD at each measurement interval, and then calculating an average for all the 'across sample' SD measurements to give an overall 'SD Across' figure for the sample. The figure is not affected by 'along fibre' variation

This seemed to be perfect news, however, when Art of Fibre looked at a number of 'SD Across' figures for a range of samples, we found the results did not produce a satisfactory degree of repeatability (precision).

Given the high value we place on an SD figure that confines its attention to genetics, we decided to carry out trials aimed at improving the repeatability of the test to acceptable levels. These trials looked at perfecting means for fibre alignment. In the end, a specially devised method for conditioning and preparing the fibre samples before testing for SD Across was established. The results of this work are evident in the below table. This table reveals relevant measurements from testing four identical sub-samples drawn from seven different fibre samples. We believe the Across SD figures have a reasonable degree of repeatability, however, we are doing some fine-tuning to narrow things down a bit more.

Sample	*Average*	*SD*	*Along SD*	*Across SD*	*length*
1.1	19.93	4.19	1.22	4.69	90
1.2	19.92	4.23	1.18	4.57	90
1.3	20.07	4.28	1.25	4.46	90
1.4	19.89	4.18	1.25	4.55	90
2.1	20.12	4.2	1.09	4.67	85
2.2	19.98	4.11	1.1	4.52	85
2.3	20.01	4.29	1.15	4.77	85
2.4	20.14	4.28	1.1	4.67	85
3.1	28.99	5.69	0.68	6.39	70
3.2	28.56	5.69	0.58	6	70
3.3	28.9	5.58	1.33	6.13	65
3.4	28.97	5.62	0.83	5.77	65
4.1	19.36	4.43	0.88	5.08	85
4.2	19.26	4.29	0.5	4.84	85
4.3	19.17	4.35	0.5	4.93	85
4.4	18.95	4.12	0.74	4.88	85
5.1	21.15	4.46	0.75	4.74	80
5.2	21.35	4.55	0.79	4.86	80
5.3	21.16	4.43	0.86	4.87	80
5.4	21.4	4.51	0.67	4.83	80
6.1	24.84	4.55	1.19	5.39	85
6.2	24.86	4.61	1.02	5.06	85
6.3	24.94	4.78	1.06	5.07	85
6.4	24.91	4.92	1.27	5.33	85
7.1	16.55	3.95	0.9	4.98	90
7.2	16.53	3.88	0.93	5.15	90
7.3	16.46	3.85	1.09	5.26	90
7.4	16.38	3.91	0.98	5.36	90

Table showing results of testing four identical alpaca sub-samples from each of seven samples.

Art of Fibre are now in a position to offer the 'Across fibre SD' testing using the devised method of sample conditioning and preparation. Further, as the 'Across SD' figures mean little to breeders until a high degree of familiarity develops as with overall SD figures, Art of Fibre will collate SD Across measurements so as to provide customers with a guide as to the relative ranking of their results compared to all other SD Across testing.

This package we are calling 'Genetic Focussed Testing', and will be provided as an adjunct to our normal testing service, although the extra labour costs will be recouped through a nominal fee charged for each such test. This fee will include access to the SD Across benchmark database.

Customers may elect to have the 'Genetic Focussed' test carried out by selecting this option when ordering/ paying for testing on our website www.artoffibre.com

Customers should be aware that 'SD Across' figures are also available on some test reports even though 'Genetic Focussed' testing option is not selected. In these cases, samples are not conditioned and prepared to allow an advanced level of fibre alignment. It is therefore up to the respective customer if they wish to rely on generic 'SD Across' data or rely on the more specialised 'Genetic Focussed' testing. Art of Fibre can provide both forms of measurement.

I might also mention that 'Along SD' and the more commonly used overall SD are provided with all testing.

For more information, contact Paul Vallely, info@artoffibre.com