

## **Objective measurement of wool**

Lisa Surber, PhD

LM Livestock Services



Although subjective measurements of wool to determine its quality and value (i.e. grade) has been practiced within the sheep industry for decades, the way the industry measures fiber diameter has been modified and changed with advances in wool technology. When utilized properly, objective fiber testing can be a powerful marketing and selection tool. It allows breeder to make selections and track improvements in breeding programs. Both commercial and seedstock producers can find value in testing wool samples from individual animals. An objective measure of fiber diameter is important from a buyer's perspective because it gives them an actual micron and not one person's opinion of grade.

All agree that fiber diameter is important value determining factor of wool and thus should be included in selection programs. Finer is not always better but for any particular type of sheep, depending on breed standards or marketing opportunities, there is wool fiber diameter that maybe is too fine or too coarse. Those values vary by the type of sheep and the breeding objectives of the producer. Know what your flock is in terms of micron and whether test results merit a change.

Fiber diameter is a function of both genetics and environmental conditions such as nutrition of the animal. Nutrition can play a huge role. As the plane of nutrition increases wool micron will get coarser. When a buyers look at potential seedstock replacements, they should really examine the condition of that individual. Rams or ewes that have been fed up and are in really good condition (maybe even fat) for sales will be the coarsest they will ever be in their life and under range conditions will get finer. A buyer must also ask the seller if the micron reported is a first shear (lamb) micron or where the sample was taken within the last month or two prior to the sale. Lamb microns will likely be much finer (maybe as much as 3-4 microns) than a more recent micron. A more recent micron will reflect the genetics but also the feed program that the ram has been developed under. Another indication of fiber diameter is the micron estimated breeding value (EBV). A ram with a fiber diameter EBV of 0 is average for the Targhee breed and equates to a clip micron of around 22 microns. Negative fiber diameter EBV will producer offspring that are finer, positive micron EPV will produce offspring that are coarser. Although yearling fiber diameter may be different than adult fiber diameter, an evaluation conducted several years ago by the Montana Wool Lab and Dr. Dave Notter at Virginia Tech. showed that in genetic evaluation this measurement was accurate and sufficient for selection purposes.

**Taking a representative sample:** For selection purposes, micron testing can be run on samples taken from individual sheep. The most common and most representative sampling location is on the side of the animal, at the mid-side (behind the shoulder and in front of the hip) of the animal (See Figure 1). Research has shown that this sample will best reflect the average fiber diameter of the animal. Some people take a sample at the britch as well as the side, just above the flank level and halfway between the flack and the rear of the sheep, to get a better idea of the variability of the fleece. However, recent research has shown that most of the variability

within a fleece is within the staple itself. Previous research at Montana State University (MSU) and other universities suggest that a measurement taken on the side of the animal is the best indicator of the average micron of the entire fleece. Extreme variability between the britch and the side can usually be assessed visually. A research project conducted at MSU with Targhee fleeces indicated that removal of britches from fleeces prior to processing had no effect on wool top fiber diameter variability.

Figure 1. Sampling location

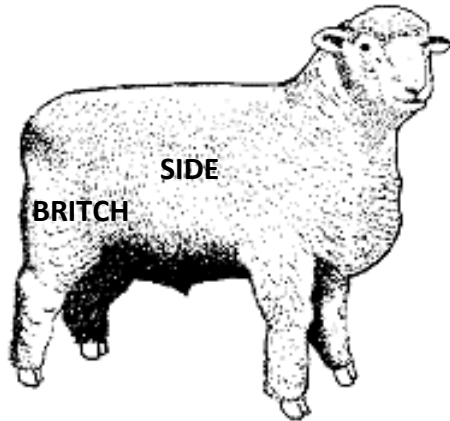
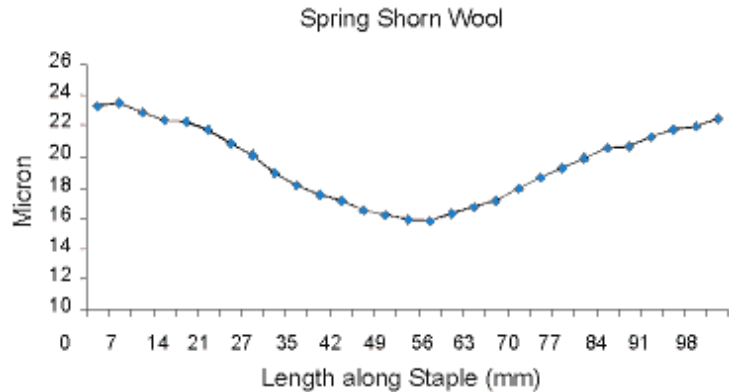


Figure 2. Example of a Micron Profile



**OFDA2000:** The OFDA2000 is the world's first instrument to measure greasy wool and diameter profile along the staple. The OFDA2000 is fully portable unit and can be easily used the barn, chute side or at shearing time. The technology is used at all stages of the wool-processing pipeline, from greasy fleece through to yarn and fabric. It is also used to measure synthetic fibers, cashmere, mohair and alpaca. The OFDA2000 is recognized by the IWTO test method (TM 47) for measuring wool fiber snippets.

The OFDA is a video microscope set above a moving sample of fibers. The instrument magnifies and captures images of the individual fibers using a video camera and then identifies and measures each fiber. Each fiber diameter is measured to a resolution of 1 micron (um) and the combined mean diameter and standard deviation are calculated to a resolution of 0.01 um.

OFDA's histogram data include the mean fiber diameter, standard deviation (SD), coefficient of variation (CV), comfort factor, curvature and spinning fineness. The comfort factor is vital to sheep breeders and wool buyers to identify those coarse fiber in a sample that can cause a "prickly" feel in some woolen garments. The sample size needed for OFDA2000 testing is a lock of wool about the diameter of your index finger. OFDA2000 is the robust, lightweight, fully portable for general-purpose fiber measurement. OFDA2000 can provide rapid (<30 seconds), accurate and precise diameter measurement along the length of greasy wool staples. Fibers in greasy staples are coated with a varying thickness of grease, dirt and sweat. The OFDA2000 automatically corrects for the grease factor, utilizing a formula established after exhaustive analysis of Australian and New Zealand flocks. However, because average grease levels vary slightly from flock to flock, it is recommended to determine a grease correction factor for each

group of samples to be measured at the beginning of testing or to test samples on a clean (degreased) basis.

The OFDA2000 has the ability to generate a considerable amount of data relating to the wool sample tested. Measurements include:

**Average Fiber Diameter (Micron):** The average fiber diameter of the tested sample expressed in microns. It is the average of a large number individual fiber measurements. It is the major factor that determines the wools end-use.

Spin Count	Micron
Finer than 80s	Under 17.70
80s	17.70 – 19.14
70s	19.15 – 20.59
64s	20.60 – 22.04
62s	22.05 – 23.49
60s	23.50 – 24.94
58s	24.95 – 26.39
56s	26.40 – 27.84

**Distribution of Fiber Diameter**

The terms standard deviation (SD) and coefficient of variation (CVD) are used to describe variability of fiber diameter of wool. They are different ways of looking at the same thing. Although the average fiber diameter is the major price determinant for wool, the degree of fiber diameter variation in a clip or individual fleeces has an effect on wool processing. Wools with higher average fiber diameters and lower CVD’s have been found to produce yarns with properties similar to wools with lower average fiber diameters and higher CVD’s.

**Standard Deviation** is a statistic which measures the distribution of measurements around the average fiber diameter. The smaller the SD, the more uniform the diameters of the individual fibers measured. About 2/3 of all fibers measured, fall within the average fiber diameter plus or minus one SD. Generally, the finer the average fiber diameter the smaller the SD.

**Coefficient of Variation** of fiber diameter is a measure of the variation in fiber diameter within a fleece sample, relative to the average (or mean) fiber diameter. The higher the CVD, the more variable the sample. This statistic is useful when comparing the variances between two lots of wool with differing means.

CVD	Standard Of Uniformity
Under 21%	Excellent
21% - 27 %	Average
Over 27%	Poor

Percentage of fibers less than 30 micron (comfort factor): The percentage of fiber greater than 30 microns (**%>30**) is the prickle factor. This data is of interest because it shows the coarse edge that determines the final use of the fiber. Fabric from wool with 98% or more of the fibers 30 microns or less will not be scratchy.

My business, LM Livestock Services, provides on-site OFDA2000 wool testing. Let the OFDA technology help you make a better wool clip and a more uniform flock. Please contact me with questions and pricing at [lmsurber@gmail.com](mailto:lmsurber@gmail.com) or 406-581-7772