

Wool Testing Services Info-bulletin

What do staple length & strength data mean?

Introduction

Info-bulletin 1.1 describes staple length & strength measurements in a very general manner, and briefly mentions the use of these measurements. This bulletin addresses more specific questions concerning the relationship between the raw results of the iWTO-30 test method and the processing performance of the wool.

Typical results in New Zealand

New Zealand only produces approximately 10,000 tons of merino wool each year, of which still only a relatively small proportion is tested for length & strength. However, most of this is high quality, with good staple length, high strength, low VM and good style.

Typical results for NZ merino wool are staple lengths of 60 to 95 mm, strengths varying from 25 to 55 N/ktex, and VMB levels of 0 to 1.3 %, but how does one judge these results? On their own, this is fairly difficult, because the primary parameters that the end user is interested in are hauteur (H), CvH and noil (expressed as romaine), although, as discussed in Info-bulletin 1.6, staple strength has now become very important on its own.

Assessing SL, CvL, SS and PoB

Staple length is directly related to combing length, and this therefore is one of the primary specifications. The coefficient of variation of staple length (CvSL) gives an indication of how uniform a lot of wool is, or, how well prepared. Expected ranges are 10 to 20% for fleece wools and 18 to 30% for skirtings.

Staple strength indicates how a wool will survive the rigours of processing. Weak wools break easily, and consequently during carding may reduce significantly in length. Wools can be loosely classified as follows: very tender less than 15 N/ktex; tender 20 to 30 N/ktex, sound 30 to 40 N/ktex, and very sound 45 N/ktex and above.

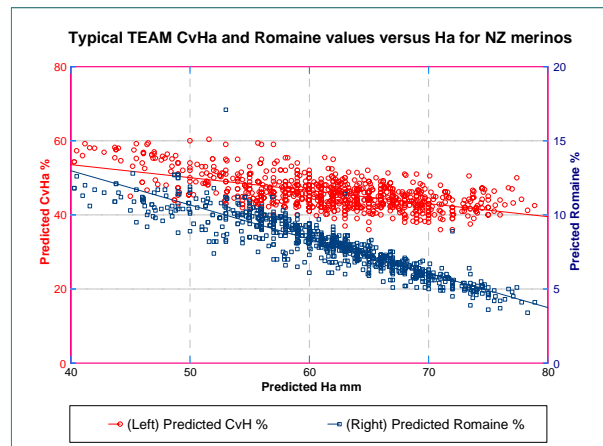
Position of break appears on test certificates as the percentages of staples broken in the tip, middle and base. Wools which have a high middle break % tend to produce more short fibre after carding, since the fibres tend to break in the middle, and it is this figure which is used in calculating the effect on processed length.

The TEAM predictions

Buyers use the TEAM equations to predict the processing performance of combing wools. Under TEAM-3 these are:

$$Ha = 0.43 L + 0.35 S + 1.38 D - 0.15 M - 0.45 V - 0.59 CvD - 0.32 CvL + 21.8 + MA$$

$$CvHa = 0.30 L - 0.37 S - 0.88 D + 0.17 M + 0.38 CvL + 35.6 + MA$$



$$Rom = -0.13 L - 0.18 S - 0.63 D + 0.78 V + 38.6 + MA$$

Ha is the predicted hauteur in the top, which is approximately the average fibre length in the top. *CvHa* is the predicted coefficient of variation of *Ha*. Romaine (*Rom*) is predicted short fibre combed out (noil) expressed as a percentage of total top and noil. *L* is staple length, *S* is staple strength, *D* is mean fibre diameter, *V* is vegetable matter base%, *CvD* is coefficient of variation of fibre diameter, *CvL* is coefficient of variation of staple length, and *M* is % mid breaks. *MA* is a mill-specific correction, which allows for the fact that mills perform differently to each other. The TEAM-3 equation was adopted in 2006 and removes some of the biases which had developed with TEAM-2 due to the improving efficiencies in mills.

From these equations it can be seen that, for example, 10 mm increase in staple length, would predict 4.3 mm increase in hauteur, 3.0% increase in *CvHa*, and 1.3% decrease in romaine; whereas 10 N/ktex lower staple strength would reduce *H* by 3.5 mm, increase *CvHa* by 3.7%, and increase romaine by 1.8%.

Whilst there has been work to show that longer hauteur spins better, most mills prefer to work within a band of *H* values to avoid having to adjust their equipment. Lower *CvH* is desirable from a spinner's perspective, and since noil has a low market value, lower romaines are also very desirable.

Other prediction methods

For carding wools, the LAC method (Info-bulletin 1.2) gives a prediction of processed fibre length (as barbe rather than hauteur) by emulating the semi-worsted process in the laboratory.

Researchers in Australia are also examining ways of predicting both topmaking and next-to-skin wearer performance using the diameter-length profiles of raw wool samples (see Info-bulletin 1.5). It has been suggested that profile data better explains some aspects of processing performance than the TEAM equations, although more work is needed. Research is also under way to predict staple strength from fibre profile data.