



Staple Length & Strength Measurement for Crossbred Wool

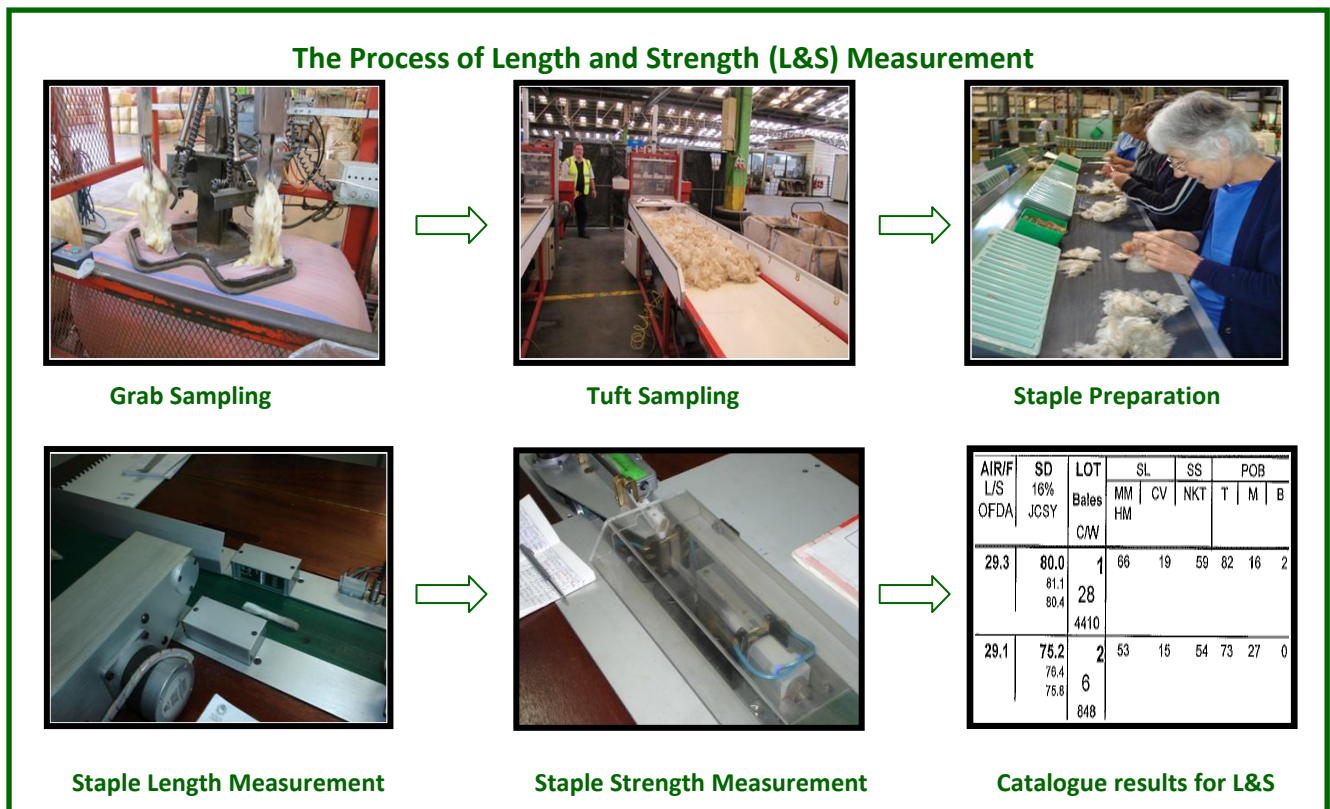
Background

Staple length is a major factor in determining the value of wool due to its importance in processing and product performance. This is the main reason objective testing of staple length and strength is common practice for Merino wool. The same reasons for staple testing are valid for crossbred wool. Independent objective assessment gives all sectors of the industry greater confidence to value wool to its true potential.

Objectives

The industry uses objective information to provide confidence in meeting specifications for trading and assurance that the end-product will meet expectations. Staple characteristics of length and strength in crossbred wool are currently assessed subjectively (visual and touch). This process provides risk in meeting specification, and this risk is often reflected in the valuation. Hence the key objectives of introducing a staple length and strength measurement are:

- to provide an independent and objective basis for the industry which can be used for trading purposes; and
- to reduce risk by providing a better ability to predict the processing outcome of the raw material.



What Measurements are provided?

Characteristic & Abbreviation	Unit	Definition
Staple Length (SL)	mm	The average staple length over all measured staples.
Co-efficient of Variation of Staple Length (CVL)	%	A measure of the uniformity of the length of all measured staples.
Staple Strength (SS)	Newtons/kiloTex	The average staple strength over all measured staples.
Position of Break (POB)	%	The percentage of staples breaking at the Tip, Middle, and Base regions.

What do the Results Mean?

Staple Length - Test results are presented as an average value of approximately 60 individual staples (rather than a broad length range). By using an average length, all appraisers can value it using the same measurements.

Typical Description	2-3"	2-4"	3-4"	3-5"	4-6"
Typical staple lengths fitting description	55mm - 70mm	65mm - 85mm	80mm - 95mm	90mm - 110mm	110mm-135mm

CV Staple Length – This is a measure of the uniformity of the staples. The higher the CVL%, the greater variability in the length of the individual staples measured.

Description	Uniform Length	Typical Length Variation	Mixed Length	Highly Variable
CVL %	< 12%	13 - 21%	22 – 30%	> 30%

Staple Strength – This is a measure of the force required to break the staple and is reported in newtons per kilotex. The staple thickness is standardised by knowing the length and weight of the staples to provide the linear density of the staples. Low staple strength would indicate tenderness in the wool. Tender wool is usually caused by environmental conditions such as poor weather, poor feed, or stress on the animal at some period over the growth of the staple. Weaker wool may lead to fibre breakage and loss during processing.

Description	Very Tender	Partly Tender	Sound	Strong
Staple Strength	< 25 N/ktex	25 - 35 N/ktex	35 - 45 N/ktex	> 45 N/ktex

Position of Break – An indication of where staples/fibres will likely break during processing. This is measured by weighing the broken components of the staple. If the tip is the heaviest then the staple broke at the base. If the tip and base are even then the staple broke in the middle and if the base is heaviest, the staple broke at the tip.

While all staples are broken during the testing process, this is not the case during normal wool processing. Hence Position of Break information becomes less important for high-strength wool.

Benefits of Staple Length & Strength Measurement

The benefits of objective testing of staple characteristics of Crossbred wool are spread throughout the pipeline, ultimately maximising the return to the wool grower.

<p>Benefits to Wool Growers</p> <ul style="list-style-type: none"> • Gives equity in pricing • Provides information for farm management decisions • Captures the real value which can be lost if characteristics are underestimated through subjective assessment • Increases competition from buyers 	<p>Benefits to Processors</p> <ul style="list-style-type: none"> • Allows the specification of the raw material in precise, objective terms • Enables processing performance to be predicted • Enables machinery settings and processing performance to be maximised • Reduces the potential for disputes and claims
<p>Benefits to Brokers and Merchants</p> <ul style="list-style-type: none"> • Provides independent measurement for valuation purposes • Provides sound data for giving shearing and wool handling advice • Enables clear market signals to be established • Ensures maximum value for wool grower customers 	<p>Benefits to Wool Exporters</p> <ul style="list-style-type: none"> • Enables confidence in valuation and bidding • Allows for accurate prediction of processing performance • Likely to speed up valuation process • Reduces the risk of appraisal errors • Reduces the risk of claims

“All subjective assessments produce RISK. These risks are usually mitigated by PRICE”

Crossbred Staple Measurement Trial 2013

NZWTA have undertaken a series of trials in conjunction with Callaghan Innovation and several North Island wool brokers to establish the potential for greasy staple measurement in crossbred wool. The trials covered a number of key aspects:

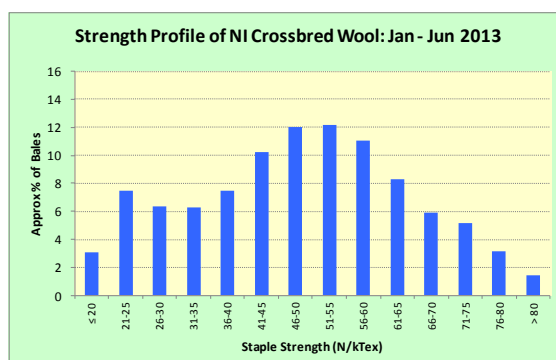
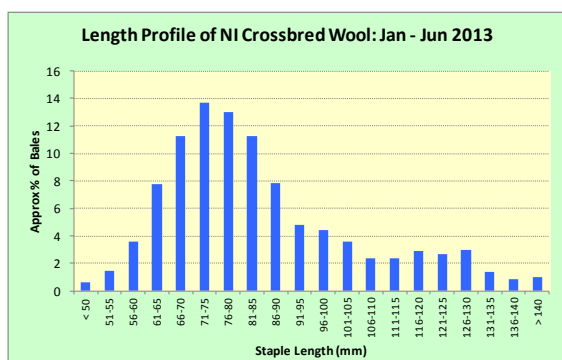
Testing equipment

The sampling and measurement equipment used for L&S testing of Merino wool can be used for staple length and strength measurement of crossbred wool;

Testing Accuracy and Repeatability

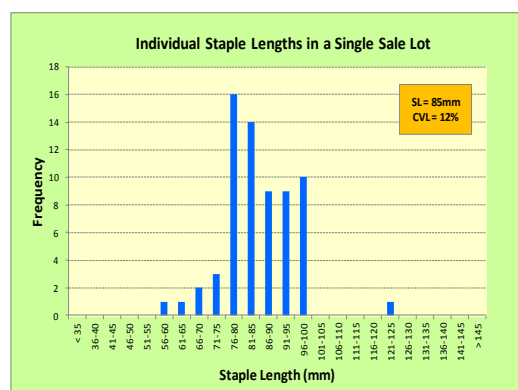
- Each individual staple is tested to within 0.25mm
- The average staple length of crossbred sale lots can be measured with adequate precision (repeatability)
 - Fleece wools <100mm - Repeatability \pm 5mm (comparable with that for Merino wool)
 - Fleece wools >100mm - Repeatability \pm 7mm
 - Oddments <100mm - Repeatability \pm 10mm

North Island Crossbred Wool Profile (Note: January to June only)

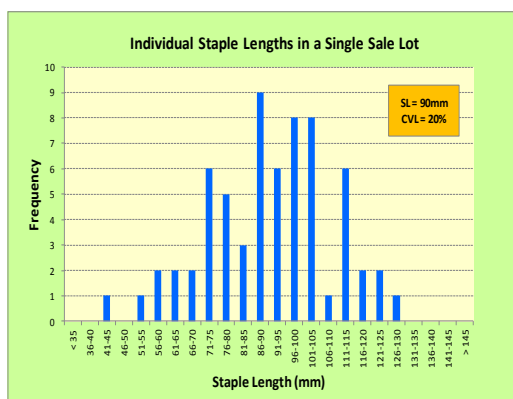


Understanding Length Variation (CVL)

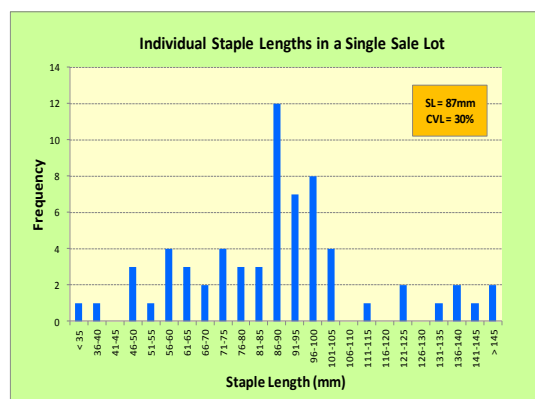
- CVL gives a very good indication of the variation in length within a lot
- Testing of individual staples gives a fair representation of the proportion of short and long staples present in a lot
- This is best illustrated by the examples below
- Examples of three different sale lots - Similar average length but with different staple length variation (CVL)



Low CV Staple Length (12%)



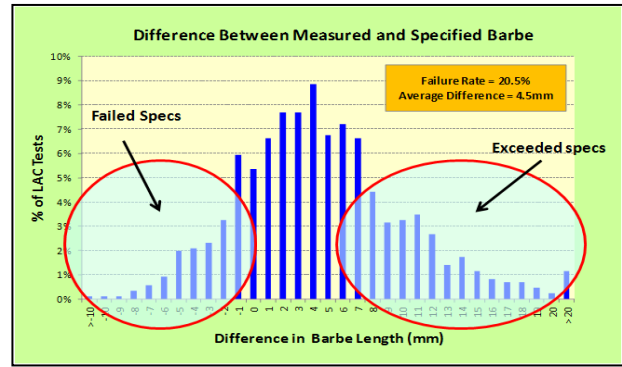
Moderate CV Staple Length (20%)



High CV Staple length (30%)

Current LAC Prediction

- Currently as much as 20% of LAC tests fail to meet specification
- LAC failures are highest in the Autumn (up to 40%);
- Exporters appear to have different approaches to risk with predicting LAC. Some regularly fail to achieve the required specification, while others exceed the specified length by a significant margin.



Can L&S Improve the Prediction of LAC?

NZWTA conducted a pilot-scale trial to develop a model for predicting LAC using greasy test measurements. A number of criteria are known to influence Barbe measurement, including Mean Fibre Diameter (MFD), Staple Length (SL), Staple Strength (SS) and Staple Length Variation (CVSL). The key findings were:

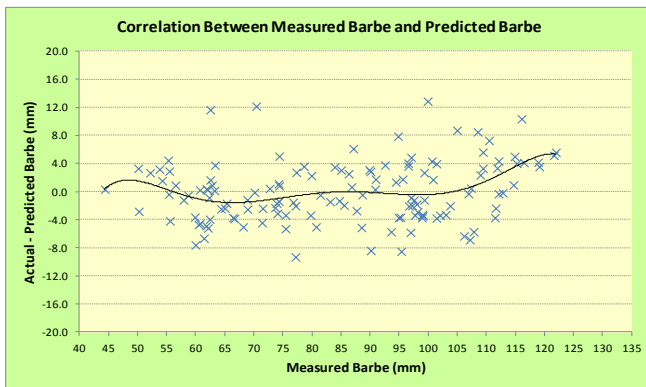
- When applying the prediction model to sale lots, there is a good correlation between measured and predicted Barbe;
- The prediction improves for blends (consignments) when there are more lots measured.
- Predicted Barbe was more repeatable and accurate than visual assessment.

Initial Prediction Model: $\text{Barbe} = 0.35\text{MFD} + 1.76\text{SL} - 0.49\text{SL}^2/100 - 0.39\text{CVL} + 0.47\text{SS}^* - 57.4$

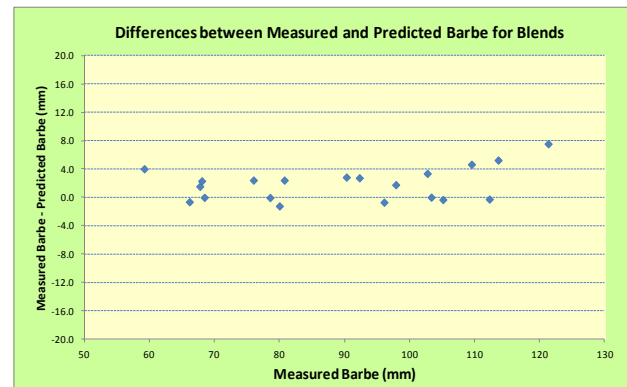
Examples:	2 nd Shear:	MFD = 38.2µm,	SL = 92mm,	CVL = 14%,	SS = 52N/kTex	Predicted Barbe = 90mm
	Ewe Fleece:	MFD = 35.7µm,	SL = 139mm,	CVL = 10%,	SS = 33N/kTex	Predicted Barbe = 117mm
	Lambs:	MFD = 29.3µm,	SL = 71mm,	CVL = 19%,	SS = 42N/kTex	Predicted Barbe = 65mm

SS* is the measured staple strength of the lot if < 40N/kTex and is 40 for all SS measured over 40N/kTex

Note: Provisional model developed from pilot-scale scouring of grab samples. A commercial model is being developed.



Prediction of single sale lots



Prediction of blends (pseudo-scourments)

Future for L&S measurement

Commercial trials are being performed to develop a model for predicting the LAC of commercial scourments using measurements from the component greasy lots. The prediction model is expected to enable exporters to meet LAC specification with greater certainty. This also allows for optimising the allocation of greasy lots into scourments.

Commercial testing for staple length and strength is now available from NZWTA. Test results will be provided as 'additional information'. Further research is being conducted to enable certification of length and strength measurement for crossbred wool in the near future.

For Further Information please contact:

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