FUNDAMENTALS OF CLASSING

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In my paper on the fundamentals of Classing I would like to outline both the traditional style classing and the modern high volume instrument classing.

CLASSING AUSTRALIAN COTTON

Traditional style cotton classification of upland cotton is the art of describing the quality of cotton in terms of grade, staple and micronaire reading according to the Official Cotton Standards of the United States Department of Agriculture which are accepted world-wide.

For grade, classification is based on appearance and is accomplished chiefly through the sense of sight by integration of the three factors of grade - colour, leaf and preparation in the sample.

Classification for staple length involves both sight and touch and micronaire readings are obtained by an airflow measurement which indicates fibre fineness.

Grade, staple and micronaire of a particular bale indicates the spinning utility and its market value.

Samples for classing are drawn from opposite sides of a bale and consist of two parts.

The temperature and humidity under which samples are stored before they are classed is important. A temperature of 21 degrees and humidity of 65% R.H. is ideal. In this way the cotton is conditioned to its natural form and gives the classer the opportunity to see the sample at its best.

When grade is determined by visual inspection lighting conditions are very important if uniformity of classification is to be maintained. Strict specifications for classing lights are adhered to in most classing rooms. The first thing a classer should do when he enters an unfamiliar classing room is to check the USDA standard boxes under the rooms lighting.

The classification of cotton is broken into many hundreds of grades depending on the following descriptions.

COLOUR

All cotton is white when the bolls open. But as most growers would have experienced in the last three seasons continued exposure in the field to weathering and the action of micro-organisms can cause white cotton to lose its brightness and become a dull greyish colour.

Cotton may also become discoloured or spotted by the action of insects, fungi and soils. Discolouration may also be caused by oil or grease used in picking, green leaves or other parts of the cotton plant which have been crushed by picking machinery.

Regardless of cause, any departure from the bright colour of normally opened cotton indicates a deterioration in quality. To think that colour is not important in the grading of cotton is negative, as the majority of spinners producing high quality yarn, demand middling or better colour and that cotton is sold at a premium.

LEAF AND TRASH

Cotton usually becomes contaminated by leaf in various amounts during defoliation and picking. Even when cotton is carefully harvested under ideal conditions it is difficult not to have some leaf in the sample.

Leaf can be divided into two general groups:

1) Large leaf; and,
2) pin or pepper leaf.

Large leaf particles are generally less objectionable as they are easily removed by modern cleaning equipment in spinning mills. The only other major trash materials in Australian cotton are grass and bark and both lead to discounting by the classer in line with discounts internationally accepted by cotton shippers and spinners.

Cotton which contains the least amount of foreign matter, other conditions being equal, has a higher spinning value. It is because of this quality relationship that graduations of leaf and trash are important in grading cotton.

PREPARATION

Preparation is the term used to describe the degree of smoothness or roughness of a sample after it has been ginned.

Spindle twist or spindle wrap, neps and naps all come under the heading of preparation and cotton can be downgraded as a result. As a rule Australian cotton has very little spindle twist or spindle wrap as a result of good picking methods and/or their removal by ginning.

STAPLE

Staple length is one of the most important factors of cotton quality because both fibre fineness and fibre strength are associated with staple length in the varieties of cotton grown in Australia. The USDA supplies official standards for staple lengths from 13/16" to 1 3/4" in gradation of thirty-seconds of an inch.

Australian irrigated grown varieties produce an average staple length of 1 1/16" (34) to 1 5/32" (37). Rain grown cotton staple is 31/32" to 1 3/32" depending on the growing season.

In classing cotton for length the classer pulls a tuft of fibres from the sample and by a process of lapping, pulling and discarding, he parallels a typical portion of the fibres. The staple length is the average length of these fibres.

New varieties Sicala 33 and Siokra L22, grown in good conditions, have a minimum staple length of 1 1/8" and can be as long as 1 7/32".

MICRONAIRE READINGS

Micronaire readings as determined by airflow instruments are measures of the fineness of individual fibres. This reading is also an indication of maturity of the fibre (but not an accurate maturity test). USDA micronaire standards are in use in all testing facilities. Premium micronaire is 3.5 to 4.9 and readings above or below this range are discounted.

The ability to class cotton is an art in itself. The principal recognised classing schools for upland cotton are the Memphis Cotton Association and Calcot in Bakersfield. At the completion of each of these students sit for the USDA classing exam. Even with the introduction of HVI classing, there will still be a place for the traditional classer.

HIGH VOLUME INSTRUMENT CLASSING

Work on development of High Volume Instrument - HVI - systems began about 1964. The first research and development contracts were approved by the USDA in 1967. In the following ten years several models were developed and evaluated. In 1980 the machines were accepted for use in the official classification of cotton.

About 43% of the 1989 US crop was classed by HVI using 130 instrument systems. All US cotton is expected to be classed by HVI in 1991 - cotton that is not HVI classed wont be eligible for the price support loan.

Today there are approximately 400 HVI machines in the world, 250 in USA, 60 in Europe, and 50 in the Far East. Most of the remainder are located in Australia, South America, Africa and the Middle East.

Micronaire, length uniformity, strength and elongation are all measured by the HVI system, in addition to the traditional colour, trash and length measurements previously performed by the classer.

HVI units were developed by two companies, Spinlab and Motion Control. All units in Australia are the highly sophisticated Spinlab models. The following is a breakdown of how cotton is tested on the Spinlab HVI.

COLOUR - The colour test is expressed as percent reflectance plus yellowness, combined to give the equivalent three digit USDA colour grade.

LEAF - A high resolution video camera in conjunction with a micro processor produces leaf or trash test results which consist of trash count or the number of individual trash particles in a sample; the percent of the sample occupied by trash; and a trash code number.

MICRONAIRE - A fineness or micronaire measurement is produced by passing a metered air stream through a known mass of fibres in a chamber of known volume and noting the pressure differential.

STRENGTH AND ELONGATION - A strength measurement indicated on either Pressley or Stelometer level on a 1/8" gauge basis is obtained by measuring the force required to break a sample of known mass. Total elongation or the length to which the sample can be extended before breaking is also calculated.

LENGTH AND LENGTH UNIFORMITY - Span or mean lengths of a fibre are determined optically by the Fibrograph, length uniformity is also calculated.

All these results are displayed on a screen in front of the operator as well as being transferred to a computer printout. It should be possible to do 1000 tests on a HVI in a 12 hour shift.

Meanwhile research continues to improve the instruments, to increase their speed and reliability and to add more measurements such as fineness and maturity as these tests are perfected.

After the development of open-end spinning in the 1970's the demand for better fibre strength began to come through loud and clear from the mills.

In the tendency to overgin or over clean cotton, by means of extra speed and heat, for maximum premiums for grade, a great deal of damage is being done to the cotton fibres. At the same time penalties for micronaire lower than 3.5 are especially harsh for growers. Numerous experiments have proved that for efficient manufacturing of yarns on modern spinning machinery fibre properties such as strength, fineness, maturity and elongation, length and uniformity all contribute directly to the end product quality.

Therefore, it has become essential that premiums and discounts for all these fibre properties be established at different levels to ensure that breeders, grower and ginners produce cotton not only possessing the desired range of these fibre properties, but also fulfilling the requirements of the spinner.

HVI testing is now utilised by every facet of the cotton industry from the seed breeder to the grower to the buyer and the mill.

In addition most spinning and ancillary machinery manufacturers throughout the world are now equipped with HVI testing equipment because of the ever increasing demands being made for high production through increased speeds of the machinery and the need for scientific measurements.

Mechanical test evaluation of raw cotton is here to stay, and a change from evaluation of raw quality based on physical classification to mechanical test evaluation is inevitable.