Commercial Standardization of Instrument Testing of Cotton

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Abstract

The International Cotton Advisory Committee (ICAC) recently formed an Expert Panel on Commercial Standardization of Instrument Testing of Cotton (CSITC) devoted to improving international acceptance of instrument-based cotton classification. The United States (U.S.) began evaluating instrument testing in the 1970s and transitioned from manual classing to nearly full instrument classing in 1991. Since that time, the U.S. has led in the development of operating procedures and calibration cottons for instrument-based classification. Presently, other countries have either implemented or are evaluating varying levels of instrument classification. This paper provides background on the USDA’s Universal Cotton Standards Program, the Expert Panel’s current progress relating to working toward internationally accepted classification standards, USDA’s perspective on international standards, and additional actions USDA is taking to provide leadership in instrument classing of cotton.

Background

Beginning in the early 1970s, the USDA Cotton Program, with the support of the U.S. cotton industry, began to conduct research and fund efforts to develop an instrument-based cotton classification system that was accurate, unbiased, objective, and reliable. As a result of these efforts, instrument testing of cotton was implemented for 100% of the United States crop in 1991. Beginning in 1923, the U.S. established a Universal Cotton Standards Agreement (UCSA) with foreign countries which only covered physical color and leaf grade cotton standards for upland cotton. These standards were established by the U.S. and approved by the foreign signatories to the UCSA and the U.S. cotton industry on a triennial basis. In signing the agreement the signatories agreed to arbitrate the sale of U.S. Upland cotton based on these standards. After the U.S. transitioned to nearly full instrument testing, the 23 Universal Cotton Standards Signatory Associations and the U.S. cotton industry were asked to begin adopting standards for instrument classification. In 1995, Universal HVI calibration cotton standards for strength, length and uniformity index along with laboratory moisture conditioning standards were adopted into the Universal Standards Agreement. In 2002, the USDA publication “Guidelines to HVI Testing” as well as Universal micronaire calibration cotton standards were adopted into the agreement. The publication “Guidelines to HVI Testing” gives procedures and practices that the USDA has implemented in its classification program based on 30 years of research and testing of cotton. The UCSA standards and procedures are available to any country desiring to implement a formal standardization program based on the Universal Cotton Standards. Since 2002, Universal Cotton Standards have been used in 44 countries.

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In 1994, the USDA initiated an HVI Level Assessment Program in response to the worldwide proliferation in the use of HVI measurements in trading cotton in the world markets. The program is designed to ensure a standard level of HVI® testing on an international level. Currently the enrollment includes international organizations from Europe, South America and Asia. The program runs year round and provides for participating organizations to send their own test samples to the USDA for comparison. The samples are tested in the Cotton Program Quality Assurance Lab in Memphis, Tennessee, and the comparison results are returned to the participants.

USDA also provides an HVI Check Test Program to ensure a standard level of testing among participants. Two samples are sent by USDA to participants each month for testing. The participant’s tested data is summarized and each participant receives a report comparing their results to the average of all participants and to the established values for the samples.

As the international understanding of the value of instrument-based cotton quality measurements grows, cotton producing countries are recognizing that internationally-accepted quality standards for instrument testing must become the norm for trading cotton worldwide. Instrument classing has brought the spinning industry forward in terms of information about the respective fiber characteristics, optimizing the spinning and blending of cotton, but the exchange and repeatability of test results worldwide remains problematic. There are currently over 1,500 Uster High Volume Instrument (HVI®) systems in the world for measuring cotton quality. These instruments are located in North and South America, Europe, Australia, Asia, Africa, and The Middle East. Other manufacturers such as Schaffner Technologies, Lintronics, and Premier Polytronics also provide cotton quality testing instruments to companies throughout the world. Most of these testing instruments are utilized in small independent testing laboratories. It is estimated that approximately 90% of the cotton is tested by some type of cotton testing instrument in the marketing chain. In 2002/03, however, only 29% of world cotton production was instrument-evaluated at origin. With China (Mainland) adopting a classing system similar to the U.S. on a trail basis in April 2005, and a fully implemented system in 2006, we can anticipate that this percentage will greatly increase.

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In September 2003, at the Plenary Meeting of the ICAC, the Liverpool Cotton Association President expressed concern about problems caused in the international cotton trade by insufficient knowledge about cotton quality. He pointed out that the U.S. had converted its entire crop to instrument classification with other countries catching up in varying degrees. He also recognized that spinning technology adapted to instrument tested quality measurements allowed the spinners to know what the end result would be if the instrument-tested quality measurements were known before the cotton is used. He also pointed out that many origin markets cannot provide bale-by-bale instrument tested quality information and the purchaser of the cotton has to provide their own testing equipment. As a result of these issues, he stated that the world needed an international agreement that defined universal quality parameters and agreed differentials for quality differences in instrument testing of cotton.
ICAC responded to this challenge and established an Expert Panel on Commercial Standardization of Instrument Testing of Cotton (CSITC). The Panel is charged with improving the commercial acceptance of instrument testing for the purpose of trading cotton, and consists of representatives from across the cotton chain, including producers, merchants, researchers and spinners. The panel reflects the geographic diversity of cotton production, consuming countries and organizations with practical experience in cotton classification or those that provide technical research and scientific information on the subject of instrument-based cotton classification. A list of Panel members is shown in Appendix I to this paper.

Most of the work of the Panel has been accomplished through electronic mail with one meeting held at the 27th International Cotton Conference in Bremen in March, 2004. The report from the Panel at the Bremen conference recommended the following:

1. Replacing manual quality descriptions of cotton with quality information provided by instruments.
2. Introducing international standardization of measurements for Rd & +b, length, strength, micronaire, and length uniformity as a first stage.
3. Introducing standardized measurements in future stages that include trash, neps, stickiness, maturity, fineness, short fiber, and any other measurements the industry deems necessary.
4. Ensuring conformity with international standards recommended by CSITC through laboratories participation in the Bremen Round Tests.
5. Implementing international commercial tolerances for the principle measurements based on the Bremen Round test results.
7. Adopting procedures and guidelines recommended by ITMF for CSITC.
8. Confirming quality measurements with buyers’ instruments and providing arbitration in case of disagreement.
9. Using Rd & +b readings from CSITC universally. Color grades are the result of measuring the Rd & +b of cotton, mathematically evaluating and converting the four measurements to a color grade from a Rd & +b color chart lookup table. Each country could establish a look up color chart that converts the Rd & +b to its own color grades. Standardization could be established in the Rd & +b measurement but marketing of cotton would continue to be sold on color grade thus eliminating any disruption in the market.
10. Providing research and development for newer and more economical quality testing equipment through capital contributed from all countries that buy, sell or utilize cotton.

The panel also recommended that cotton testing instrument suppliers provide:

1. Regional training centers for instrument testing of operators,
2. Maintenance that is reliable and economical,
3. Calibration cottons, and
4. An algorithm within the software of each instrument based on the humidity of the samples being tested, as well as the atmosphere in which they are tested.
In addition the panel requested that the USDA:

1. Make available to the Panelample drawing procedures used in the U.S.
2. Offer expertise in establishing a reliable cotton classing system.
3. Conduct training programs for achieving standardization that include:
   a) Calibration procedures,
   b) Quality assurance procedures,
   c) Instrument maintenance,
   d) Proper moisture conditioning practices.

**USDA Perspective On International Standardization Of Instrument Classing**

The USDA would like to see the provisions in the Universal Cotton Standards Agreement and its HVI Level Assessment and Check Test Programs used by the Panel as the basis for standardization of classification. Mr. Atsushi Hamai of the Japan Spinners’ Association voiced a similar opinion at the ICAC Plenary Meeting in September 2003. He stated that the spinners would welcome a single, unified classification system and agreed that HVI® was the best option. He said, “For spinners this would make for easier fiber comparison between cottons of different countries. I believe the U.S. system is time-tested and could be used as the sole international standard.”

There are others that have voiced concerns that the Universal Cotton Standards are made from U.S. cotton and, therefore, do not represent all cottons of the world. Some have also indicated that the USDA standards and procedures are so stringent that other countries can never comply with them. The USDA believes that concerns voiced about the worldwide application of the Universal Cotton Standards is not a critique of the standards but rather a critique of the idea that there cannot be a standard established that can be used to measure all cotton.

The USDA is responding to this concern by assessing the applicability of USDA produced Universal Cotton Standards to various world growths of cotton. This assessment will: 1) ensure that no cottons are outside the range of values represented by the Universal Standards (new standards will be proposed if necessary, and 2) determine whether it is possible, as the USDA and most of the textile industry believe, to establish a single set of standards for instrument classification of cotton by demonstrating that any cotton from around the world can be accurately measured using HVI’s calibrated to the Universal Cotton Standards. The Cotton Program is working with the USDA’s Agricultural Research Service (ARS) to obtain and test cottons from around the world in order to compare its results with those obtained in other labs.

The area of greatest concern raised about establishing a single international standard is related to the U.S. color grades. Many countries, for example, have different color descriptions for cotton than the Good Middling (11), Strict Middling (21), Middling (31), etc. used by the United States. In the U.S. color grades are defined by Rd (reflectance) and +b (yellowness) as represented in the Hunter-Nickerson color chart. Rd & +b is measured on the HVI® and the Hunter-Nickerson color chart is referenced to assign the color grades. Other countries that have different color descriptions can use this same process by converting the measurement of Rd & +b to their own individual color grades or descriptions. This would eliminate disruption in how cotton is marketed while at the same time providing a standardized measurement for cotton color that the mills can use for determining laydown mixes.
AMS is also working with ARS and Cotton Incorporated on the following projects to address in greater detail the concerns that a single international standard for instrument testing cannot be established:

- Establishing traceability of the cotton color classification measurements of Rd & +b to the color standards maintained by the National Institute of Standards and Technology (NIST).
- Improving color measurements on color spotted cotton. Current HVI colorimeter technology is unable to identify color spots.
- Researching the development of accurate, fast and automated moisture measurement for checking moisture of samples prior to testing.
- Evaluating the Uster HVI moisture measurement and strength correction algorithm.

In addition to several U.S. based organizations, the USDA Cotton Program is working with Centre de cooperation internationale en recherché agronomique pour le developpement (CIRAD) of Montpellier, France and the Bremen Fiber Institute of Bremen, Germany to investigate the concerns raised at the 2004 International Bremen Meeting on the stability of the Universal Cotton Standards strength level.

**Conclusion**

The Cotton Program believes that its cotton classification system has been tested and it works. The wide range of varieties and conditions in which cotton is grown in the United States provided an ideal situation for developing the USDA’s classing system. The standards have proven, since their implementation, to provide a sound base for establishing market value. The Panel should give strong consideration to recognizing the Universal Cotton Standards as the basis upon which to build an international system for instrument testing. If we are to preserve and enlarge cotton’s market share, every cotton producing country must work in harmony to increase cotton usage by providing better quality information on its likely performance in manufacturing and final products. The best way to do this is through a standardization of instrument testing of cotton.
Appendix 1

Expert Panel on Commercial Standardization of Instrument Testing of Cotton (CSITC)

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