

HVI SHORT FIBER CONTENT MEASUREMENT

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Abstract

The USDA, AMS Cotton Program has been evaluating a short fiber (SF) measurement using the Zellweger-Uster HVI. In 1997, over 83,000 samples from our supervisory checklot program were measured for short fiber. Individual HVI lines differed in the short fiber test level. Zellweger-Uster modified the HVI program to include a short fiber calibration routine. The modified program was then evaluated in 1998 in four USDA Classing Offices (Macon, GA; Dumas, AR; Lubbock, TX and Visalia, CA.) along with the Quality Assurance unit located in Memphis, TN. The average reproducibility with a tolerance of 1.0 within office was 58% compared to 57% for between office. The average reproducibility with a tolerance of 1.5 within office was 76% compared to 74% for between office. The encouraging aspect of this year's study is that the level differences observed in the 1997 evaluation appear to have been corrected by the new calibration routine.

Introduction

The manufacturing segment of the cotton industry has long sought a measurement of short fiber content. Short fiber content is defined as the percentage of fibers less than one half inch in length. The allure of this measurement has increased with the developments in textile machinery. Higher textile processing speeds and the need for improved efficiency have placed more demands on cotton fiber. Additional descriptions of fiber quality have the potential to increase the ability of the cotton textile mill to select cotton bales on an individual basis that would perform better in specific applications.

The Cotton Program is continuing with an evaluation of the HVI short fiber measurement in order to offer a meaningful and repeatable measurement in the event that the cotton industry decides to include a short fiber measurement into the classification system. For the past two years, the USDA, Cotton Program has been evaluating a short fiber measurement using the Zellweger-Uster HVI. We reported the results of our 1997 evaluations which involved over 83,000 samples from our supervisory checklot program (Ramey, 1998a). The results indicated a level difference between individual HVI lines. Zellweger-Uster modified the program in an attempt to eliminate this problem. A short fiber calibration routine was added to the HVI software. Also, some modifications were made to improve

the initial short fiber setup on the instrument. My purpose in this report is to describe our findings from the use of the improved short fiber measurement on 1998 crop samples.

HVI Short Fiber Measurement Process

Prior to the 1998 season, four USDA Classing Offices along with the Quality Assurance unit located in Memphis, TN were designated to participate in the study. The classing offices selected were located in Macon, GA; Dumas, AR; Lubbock, TX and Visalia, CA. These offices represent a cross-section of the cotton crop and are the larger classing offices, so that a sizeable number of samples would be assured for inclusion in the study.

Each classing office dedicated five instruments to the study. The instruments were chosen at random and the software was installed. Upon completion of initial short fiber setup, the instruments were calibrated for short fiber along with the usual system calibration routine. The Quality Assurance unit established short fiber standard values for the short/weak and long/strong calibration bales used by each of the offices during the season. These values were established by testing samples from the calibration bales multiple times on the Quality Assurance HVI lines.

The samples used for the 1998 study were the checklot samples from each of the participating offices. Checklot samples are samples that have been classed in the respective classing office and then randomly selected by computer for retest at the Quality Assurance unit in Memphis. Approximately one percent of all samples classed in an office each day are selected as checklot samples. The checklot samples are shipped via overnight express for testing in Quality Assurance. Also, quality data from the classing of the checklot samples is forwarded to Quality Assurance. The samples tested in Quality Assurance each day are representative of the cotton classed in the classing offices the preceding day.

The evaluation is divided into two parts. First, a "within office" analysis was performed followed by a "between office" analysis. Quality Assurance makes HVI measurements on each checklot sample one time on each of two separate HVI's. The QA first run was compared to the QA second run (single test versus single test) for every checklot sample from each of the classing offices. The short fiber average and reproducibility were calculated for each office. Short fiber tolerances were set to 1.0 and 1.5 and the results for the season are illustrated in the figures below. Table 1 illustrates the results of the within office analysis.

Next the Classing Office versus the Quality Assurance Run 2 (between office) was computed for the short fiber average and reproducibility (single test versus single test). Table 2 illustrates the results of the between office study.

HVI Short Fiber Measurement Results

A comparison of the within office and between office reproducibility indicates that within office reproducibility is slightly better. The average reproducibility within office with a tolerance of 1.0 was 58% compared to 57% for between office. The average reproducibility within office with a tolerance of 1.5 was 76% compared to 74% for between office. As illustrated in table 3, the level differences observed in the 1997 evaluation appear to have been corrected by the new calibration routine. The short fiber value establishment process would need to be made part of the standardization process used for setting the other calibration values to ensure a more accurate short fiber value is established for each calibration bale. The short fiber measurement also appears to be capable of distinguishing between differences in short fiber values for cottons with similar length and length uniformity values as illustrated in table 4.

Conclusions

The results of these studies show improvement in the HVI short fiber measurement. The short fiber data collected from the samples tested this year indicates that it is possible to bring multiple HVI lines to a common testing level for short fiber. The results also indicate that the HVI short fiber measurement appears to be capable of distinguishing between different short fiber values for cottons with similar length and length uniformity measurements. It has not been determined if the short fiber differences observed between cottons with similar length and length uniformity values are the result of measurement sensitivity or instrument variability.

The USDA Cotton Program will continue to evaluate the HVI short fiber measurement. It is our opinion that the next phase of this evaluation should consist of a cooperative study with the industry. This study should assess the utility value of this measurement and determine its usefulness as it relates to the marketing and manufacturing of cotton.

References

- Ramey, H. H., Jr., Additional fiber measurements being evaluated. Proceedings of the Tenth Engineered Fiber Selection Conference, pg. 147-152. 1997.
- Ramey, H. H., Jr., HVI measurements of short fiber content. Proceedings of the 1998 Beltwide Cotton conferences. pg. 1513-1514. 1998a.
- Ramey, H. H., Jr., Short fiber content. Proceedings of the Eleventh Engineered Fiber Selection Conference. pg. - . 1998b.

Table 1. *Within Office*

Classing Office	QA Run 1 -vs- QA Run 2			
	Bale Count	Average SF	Tolerance 1.0	Tolerance 1.5
Florence	10344	9.9	58%	75%
Macon	8591	10.8	56%	73%
Birmingham	3887	10.6	55%	73%
Rayville	4455	10.1	56%	73%
Dumas	12548	9.8	59%	77%
Hayti	3192	9.5	60%	78%
Memphis	8219	9.7	60%	78%
Abilene	2772	11.0	54%	70%
Corpus Christi	254	10.2	56%	74%
Lubbock	12065	10.6	57%	75%
Lamesa	2899	10.4	56%	74%
Phoenix	2758	10.3	55%	71%
Visalia	6649	8.6	69%	85%
Totals	78,633	10.1	58%	76%

Table 2. *Between Office*

Classing Office	Classing Office -vs- QA Run 2			
	Bale Count	Average CO SF	Tolerance 1.0	Tolerance 1.5
Macon	1194	11.4	52%	69%
Dumas	435	10.4	51%	68%
Lubbock	1300	10.3	52%	69%
Visalia	1750	8.4	67%	82%
Total	4,679	9.9	57%	74%

NOTE: There are considerably more samples in table 1 than table 2. The samples reported in table 1 represent all checklots from each classing office.

Table 3. *Level Differences between Offices*

Classing Office	Bale Count	CO Short Fiber Avg.	QA Short Fiber Avg.
Macon	1194	11.4	11.0
Dumas	435	10.4	10.3
Lubbock	1300	10.3	10.7
Visalia	1750	8.4	8.6

Table 4. *Cottons with Identical Length and Length Uniformity Readings*

Length	Length Uniformity	Bale Count	Avg. HVI SF	Min. HVI SF	Max. HVI SF
1.03	81.0	577	10.71	8.5	13.4
1.08	81.0	961	10.18	8.1	12.3
1.10	81.0	444	9.96	8.5	12.6
1.13	82.0	338	9.09	7.6	10.7