ILE DS-65 EVENNESS TESTER CONVERSION: A DIGITAL MODERNIZATION WITH REVOLUTIONARY FEATURES FOR EXISTING TESTERS

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Abstract

Controlled evenness of fiber mass in yarn manufacturing is the requirement for profit. Uncontrolled variation of mass leads to rejected shipments, disgruntled customers, lost revenues and lost opportunities.

Introduction

There are many factors that contribute to yarn mass variations. The simplest and most cost-effective way to reduce variations is to maintain properly adjusted machinery. A production machine that is not fine-tuned for the fiber in process will produce poor product. A production machine with a mechanical problem can be expensive to repair, but if allowed to continue operating, the cost increases exponentially with the ultimate price paid for poor quality yarn is a lost customer.

Discussion

The standard mass variation test instrument in spinning mills for the past 40 years has been the Zellweger Uster® Evenness Tester. This marvel of engineering and mathematics, developed following World War II, has made possible the use of high-speed yarn production. Without the ability to monitor evenness in all stages of production it would be impossible to utilize today's high-speed equipment.

A few years ago we were told that on-line testing would make the Quality Control (Q.C.) laboratory obsolete. On the contrary, on-line testing has made the Q.C. lab indispensable for maintaining product integrity. High-speed equipment can bankrupt a mill in a short amount time if on-line control and testing is inaccurate.

In 1989 Industrial Laboratory Equipment Co., Inc. (ILE) began servicing GGP evenness testers following the decision by Zellweger to discontinue service on this model. With the introduction of the new high-speed Pentium® microprocessors, we realized that much of the evenness tester could be evaluated via software, thereby eliminating maintenance problems. A project was funded to develop a digital system with new features, including data storage, and yet maintain affordability to the yarn manufacturer.

ILE introduced the DS-65 at ITMA-95 in Milan, Italy. The original plan was to provide mills an opportunity to use existing equipment while saving tens of thousands of dollars in maintenance costs. Since that time the system has been continuously upgraded and expanded. Today,
DS-65 models are available for the GGP, UT-I, UT-II and UT-III.

The ILE system consists of a high-speed Pentium® computer, interface box, monitor and special color printer. No modification of existing equipment is necessary when connecting to the GGP or UT-I. When the DS-65 is connected to the UT-II a simple jumper wire is installed inside the evenness tester sensor unit to activate the automatic feature.

Set up of the DS-65 only requires connecting the original Uster® output cable from the Uster® sensor unit to the ILE-A2 interface box. Note: The only part of the customer's evenness tester used is the sensor unit. High maintenance components of the instrument, including the spectograph, integrator, IPI, and recorders, are no longer needed.

The specially modified computer is connected to the interface box and the system is ready for operation. Anyone even slightly familiar with PC computers will have the system unpacked, setup and operating in 15 to 25 minutes. The software operates under Microsoft® Windows 98® and is selected via a standard icon. Unlike other evenness testers, the computer can be used for any other PC function when not testing evenness.

Technicians find the operation of the system extremely simple, being very similar to the instrument they were already using. Operators can be self-taught in less than 30 minutes. All commands and testing procedures are on-screen selectable. Commands are either entered via the mouse or keyboard.

Set Up
The operator selects a setup screen (Figure 1) if necessary to measure in English or Metric and CV or U%. Automatic data storage, Beeper, and Print settings are noted.

Test Parameters
Information on Speed, Times, Range of Scale, as well as Thick, Thin and Neps are a mouse click away (Figure 2). Information on test identifiers, CV of cut length and fiber properties are typed in if needed.

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Test Results
The DS-65 program provides all of the standard information currently available with the existing tester along with a number of features never before available. Diagram charts, Spectographs, Imperfection readings of thick, thin and neps and % CV or U % are standard (Figure 3), along with a host of new features. Data from the DS-65 on % variation, imperfections, diagrams and spectograms are exactly the same as operators have observed on their existing tester. There is no need to set new standards or use correcting factors.

Information results are displayed on the computer color monitor and can be output to the color printer. A single page records all of the information from a single test. When multiple samples are tested, the data is displayed on the monitor for individual samples and can be batched on the printout (Figure 4).

ILE has revolutionized the spectograph by increasing the number of channels to 172 (Figure 5). This allows extremely accurate resolution of defect patterns. Repetitive defect patterns that were never observed in the past are now easily detected. The interpretation of the exact location of a defect pattern from the standard spectrograph has always been difficult for technicians and mill mechanics. The operator however simply slides the mouse pointer to any peak and clicks. A line is drawn to the defect peak and a window displays the exact location (Figure 6).

Density Chart and IPI
An exclusive feature of the DS-65 shows the mass and length of defects as a total picture (Figure 7). Not only does the system provide a numeric listing of the total defects selected, but also the thickness and length of IPI defects can now be seen at a glance. Prior to this feature, only the count of the number of thick and thin places could be recorded. The density chart also reveals dot patterns in the thick and thin plot that refer directly to machinery or fiber problems.

Variance-Length Chart
This window shows the %CV or % U plot over the test period showing all possible test lengths in the sample (Figure 8), the optimum being displayed as a straight line. Fiber or production problems can be seen at a glance in deviations from this optimum plot.

When the cotton fiber fineness, micronaire and staple length are entered, the computer will calculate the optimum theoretical CV% or U% at all possible sample lengths and superimpose this plot on the same chart, allowing for comparison.

Selectable Cut Length
CV% or U% at five pre-selected cut length can also be displayed (Figure 9). The Institute of Textile Technology has developed extensive data for use with % variations at cut lengths of 1, 3, 10 and 50 yards. These lengths can be inserted and the variation noted. The DS-65 is not limited to these lengths however, and other cut lengths can be entered. This is of particular importance to mills when looking for problems in various machinery locations. Machinery manufacturers have found this feature exciting and important for analyzing each part of their equipment. For the first time is possible to dissect the entire mechanical process.

Data Storage
All test results except the diagram are stored in an ASCII file. Individual test data and multiple tests can be batched for data recall. Standard spreadsheets and databases such as Excel® and Access® can be used to prepare almost any conceivable report. Data recall allows historical reports on cards, draw frames, roving frames and spinning frames. Maintenance or production reports for daily, weekly, monthly or other periods are commonly produced.

Optional Slub Program
Manufacturers of specialty yarns where slubs are intentionally introduced for special fabrics must insure random location of slubs along with a specific size and quantity per unit length to meet designer requirements. Traditional methods of counting and calculating the random placement and size of slubs requires the detuning of current evenness testers and the manual measurement of distance and counting of the peaks. Calculations of this data follow, requiring nearly an hour to arrive at test results.

The SA-100 program provides data on slub interval, CV of interval, slub length and slub height. Complete tests are performed in less than 30 seconds.

Optional Visual Yarn And Fabric System
The Ciros Visual System allows viewing of a computer-generated display of yarns and defects, as well as yarn boards, simulated woven and knitted fabrics. The system also interfaces to the Amsler Slub Vision and PK4 Matrix.

Over 40 of the top mills in the United States are using the DS-65 system. It has been chosen by the U.S. Department of Agriculture and Cotton Incorporated and leading manufacturers such as Rieter. Other installations are located across Mexico, Central and South America, and Europe.

Summary

The simplest and most economical method for eliminating undesired variation in yarn mass is to properly maintain the manufacturing equipment. Instruments to monitor the evenness of yarn mass are crucial for such maintenance. The DS-65 by ILE minimizes tester downtime and maintenance costs, and provides revolutionary analysis tools, all at a fraction of the cost of replacing existing testers.

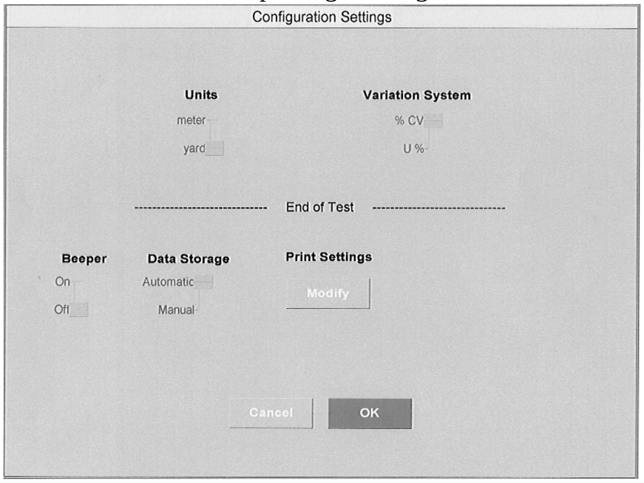

Figure 1. Configuration Settings

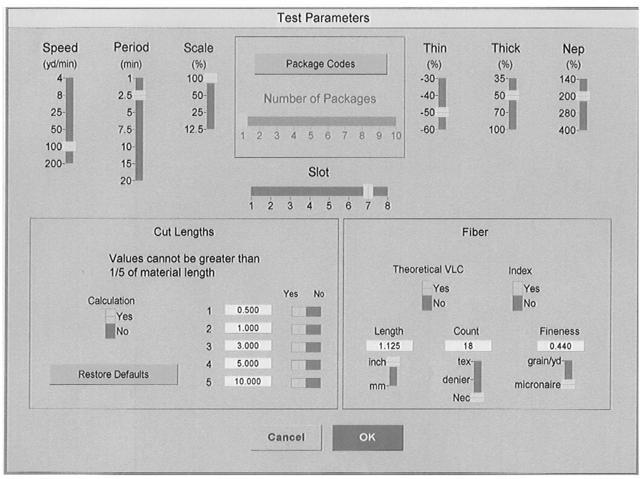

Figure 2. Test Parameter Settings

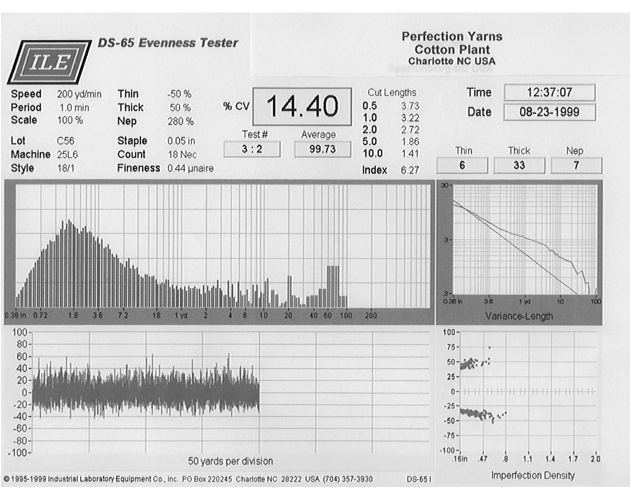

Figure 3. Test Results Report

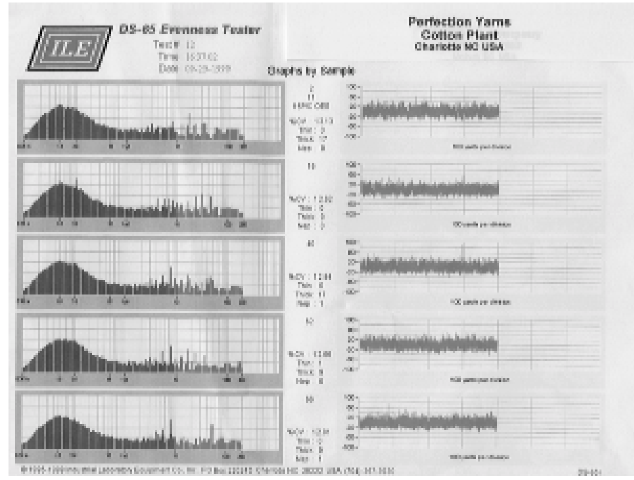

Figure 4. Group Results.

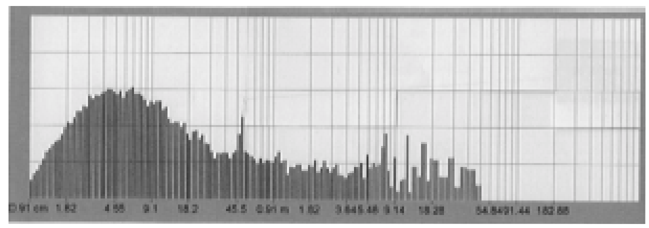

Figure 5. 172 Channel Spectrograph.

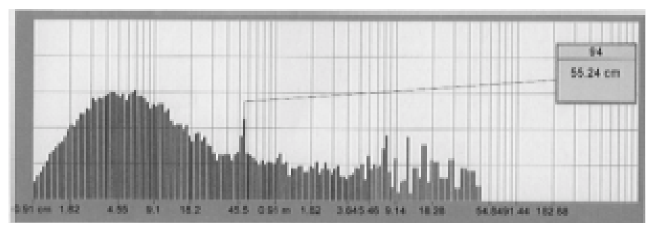

Figure 6. 172 Channel Spectrograph with Defect Wavelength.

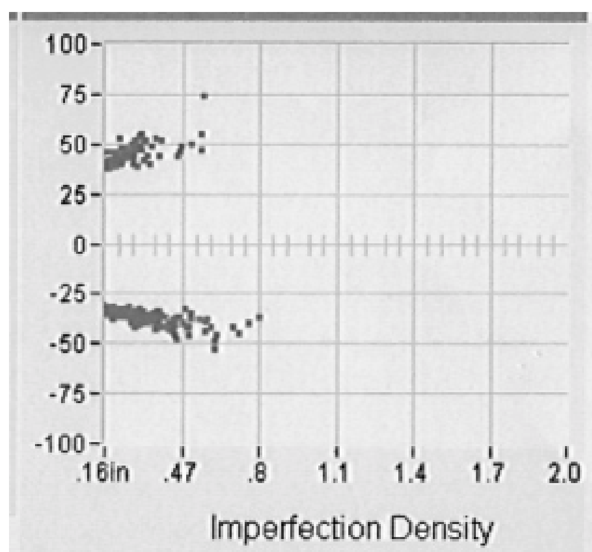

Figure 7. Relative Mass vs. Length of Imperfections.

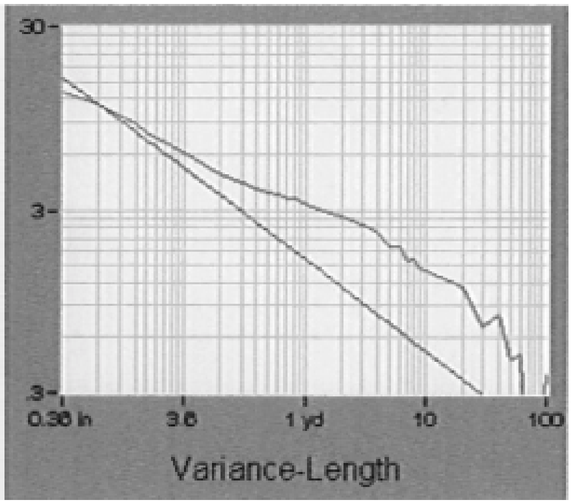

Figure 8. Variance-Length, Theoretical and Actual.

Cut Lengths	
0.5	5.85
1.0	3.63
3.0	2.26
5.0	1.76
10.0	1.32
Index	6.83

Figure 9. Operator-determined Cut lengths.