

STATUS REPORT ON GIN WIZARD

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Abstract

GinWizard process monitoring enabled Rabbit Ridge to take immediate process control actions. These actions increased the economic value to their customers and provided more “useable” and higher quality fiber to the mill.

Background

During 1998 (Figure 1), the principal author, Fred Couch, manager of Rabbit Ridge Gin, received a phone call from National Textiles to allow them to test Rabbit Ridge’s cotton for neps and short fiber content. Not knowing how neps and short fiber content impacted the mills, Fred decided he could do a better job if he and his producers knew better what their customers, the mills, needed. He ventured out to learn more about the fiber quality needs of the mills. One of the more dramatic mill visits was with Al Propst with Frontier Spinning. He asked Mr. Propst, “What is Rabbit Ridge’s average neps/gram?” Mr. Propst reached into his desk and removed a list of gins ranked by neps/gram. He told Fred, “Rabbit Ridge is below the neps/gram threshold, but at some point in time, if your name is not on the list, we will not buy cotton from that gin, and we will not tell you that we are not going to buy cotton produced at your gin.” The shock of being omitted from sales possibilities or worse, “black listed” started Fred on his quest to improve the quality of his cotton according to the needs of the mills. He quickly came to appreciate that traditional classing results are limited in what they tell the mill customers.

To learn more about neps and short fiber content, he met with Jack Crooks and Todd Attaway with Milliken & Company. During the past three years, Jack and Todd visited with Rabbit Ridge and tested samples to verify that the quality of cotton he produced met the mill requirements. By 1999, Fred realized that by-passing lint cleaners increased the leaf but decreased neps and short fiber content. This describes the difficult and sometimes painful trade-off between clean cotton, with low leaf, and cotton which is damaged, i.e. high neps and short fiber content, as a consequence of more cleaning.

In order to manage this trade-off, Rabbit Ridge decided its staff needed to know more about cotton quality, particularly leaf. Before the ginning season started in 2000, Rabbit Ridge educated its staff on making leaf calls by comparing their samples with USDA leaf standards. They were trained how to adjust lint cleaners, grid bars, stick machines, through-put, and temperature to increase or decrease the leaf. Rabbit Ridge was able to maintain its average leaf grade at 3.3 in 2000. Rabbit Ridge was not satisfied. Their objective was to achieve an average of 3.8 leaf, without frequently producing 5 or higher leaf grades, where penalties can destroy profits.

Fred read an article about the RapidTester in Cotton Digest written by Donald Smith from Jones County Cotton Gin and contacted Schaffner Technologies. His initial interest was neps, but after several telephone conversations, he elected to purchase the trash and color module initially.

In August 2001, Schaffner Technologies installed the RapidTester next to the bale press. Within hours, Fred was classing cotton. This allowed Fred to know immediately his leaf and color grades for each bale produced. We adjusted the leaf thresholds to match the classer’s call in Memphis. He did not adjust the thresholds again during the entire 2001 season.

Two weeks later, Schaffner Technologies installed the GinWizard next to the gin console and connected it to the RapidTester. The ginners were able to see the sample under test in comparison to the digital leaf standards. By viewing control charts, the ginning staff quickly understood their objective to maintain the leaf between the upper and lower limits.

They were able to increase the leaf amount by turning off the lint cleaners, by-passing the stick machine, increasing throughput, and operating the dryers at lower temperatures.

Introduction

GinWizard is a process monitoring software program that acquires and presents RapidTester data to better enable the ginner to make immediate decisions and to take process control actions to increase the economic value for the producer and provide more "useable" fiber to the mill. Figure 2 is an image of the GinWizard console and the RapidTester platform.

The operation of the RapidTester is very simple for color and trash operation, as reported here. After the samples are cut from the bale, the operator places the left and right "classers" samples in the scanning window, closes the top, and slides the barcode through the reader. In less than 30 seconds, the results are presented to the RapidTester operator and images are automatically transferred to GinWizard, where these high quality images are presented to the ginner.

GinWizard has the following tools to enable the ginner to make immediate and effective decisions.

- Statistical Process Control Charts: leaf, color, micronaire, etc.
- Image Comparison with USDA Digital Standards, side by side
- Premium and Discount CCC Calculator
- Cleaning Efficiency: i.e. # of lint cleaners
- Management Reporting

Results

Rabbit Ridge's production figures from 1998 to 2001 are presented in Figure 3. Rabbit Ridge typically processes less than 18,000 bales per year, except for 2001. Production increased by 10,000 bales in 2001.

If one examines the number of mote bales produced, compared to production figures, the results are impressive. By 2001, Rabbit Ridge produced 1 mote bale for every 70 bales produced, which increased their turnout from 1999 to 2001 by 1.6%! Figure 4: Lint Cleaning Trends show that in 1999 and 2000, the majority of the cotton ginned went through 2 stages of lint cleaning. After installing the RapidTester in 2001, the majority of his cotton went through less than 1 stage of lint cleaning! 23.4 % of the cotton processed by-passed both stages of lint cleaning. Fred was able to achieve the economic benefits for his producers by adding more leaf into the bale and providing more useable fiber to the mill, especially improving neps and short fiber content.

Figure 5 shows the impacts of optimizing leaf with respect to short fiber content and nep content from 1999 to 2001. Rabbit Ridge sent samples to Milliken to test for neps and short fiber content. Rabbit Ridge's experimental controls for each year were, PM-1218 for variety, maintain 5% bale moisture, and process at a rate of 22 bales/hour (3 – 14 Continental Gin Stands). In 1998, samples were processed using 2 stages of lint cleaning, in 2000 samples were processed using 1 stage of lint cleaning, and in 2001 samples were processed using 0 lint cleaners. The fiber quality results heuristically make sense. The less aggressive the mechanical process, the short fiber content will decrease and the neps/gram will decrease; however, the penalty is severe if the leaf call is a 5 or worse. They also observed that the color grades shift with less lint cleaning based on the USDA results; however, the economic gain from leaf and length, warrants a minor color shift. Schaffner Technologies has observed the same trends in Arizona, Texas, and North Carolina.

To achieve the above results, the following figures are screen images as presented to the ginner to monitor the ginning process. Figure 6: GinWizard's Analysis Screen presents the image scanned in comparison to USDA digital leaf standards. The leaf call and associated sample under test is located at the bottom center of the screen. The program automatically selects and displays the USDA digital standards to the left and right of the sample under test. The data above the images shows the last 10 bales produced with the associated fiber properties and relative discount points. If the operator needs to recall an image from the day before, he/she can quickly search for the PBI under the Find button.

Figure 7 demonstrates the simplicity and power behind the software. This scenario occurred during the 2001 ginning season. If one examines the x-axis, at 180 (Bale Identification), a module change occurs. The next bale (200), the micronaire increased to 5.2, the color remained at a 41, and the leaf content increased to a 5 leaf. Two penalties needed to be avoided in this above scenario: 5 leaf call and 5.0 or worse micronaire measurement. By engaging the lint cleaners, the discount decreased by 400 points. The gin can not change the micronaire value; however, the producer may have been able to avoid this significant discount by monitoring the micronaire in the field.

In 2002, Rabbit Ridge will add micronaire, moisture content, and mini-gin module from Schaffner Technologies for the 2002 season to provide a value-added service to their producers to help them avoid a \$30 to \$40 micronaire discount. The producers will collect samples from the field and bring them to Rabbit Ridge to test. Based on the test results and applying Dr. Lewis' research, the producer will be able to make informed decisions on when to defoliate and harvest.

Rabbit Ridge was able to document and collect all process changes for each bale from 1999 to present. This helped STI to go back and analyze the results. This also allows Rabbit Ridge to explain to their customers "how" Rabbit Ridge ginned their cotton. When a producer comes into Fred's office and inquires about his cotton, Fred not only provides him a recap, but can show him images of his cotton, fiber quality data, under what conditions he ginned the cotton, and why he ginned the cotton that way (Figure 8).

Conclusion

GinWizard enabled Rabbit Ridge to experiment with various ginning control points to maximize turnout while minimizing fiber damage and to take process control actions to minimize the financial penalties based on the CCC loan chart for the producer.

Rabbit Ridge was able to achieve their objective by providing more "useable" fiber to the mill through a reduction in neps/gram and short fiber content by monitoring and controlling the amount of leaf retained in the bale.



Figure 2. Gin Wizard & Rapid Tester Images.

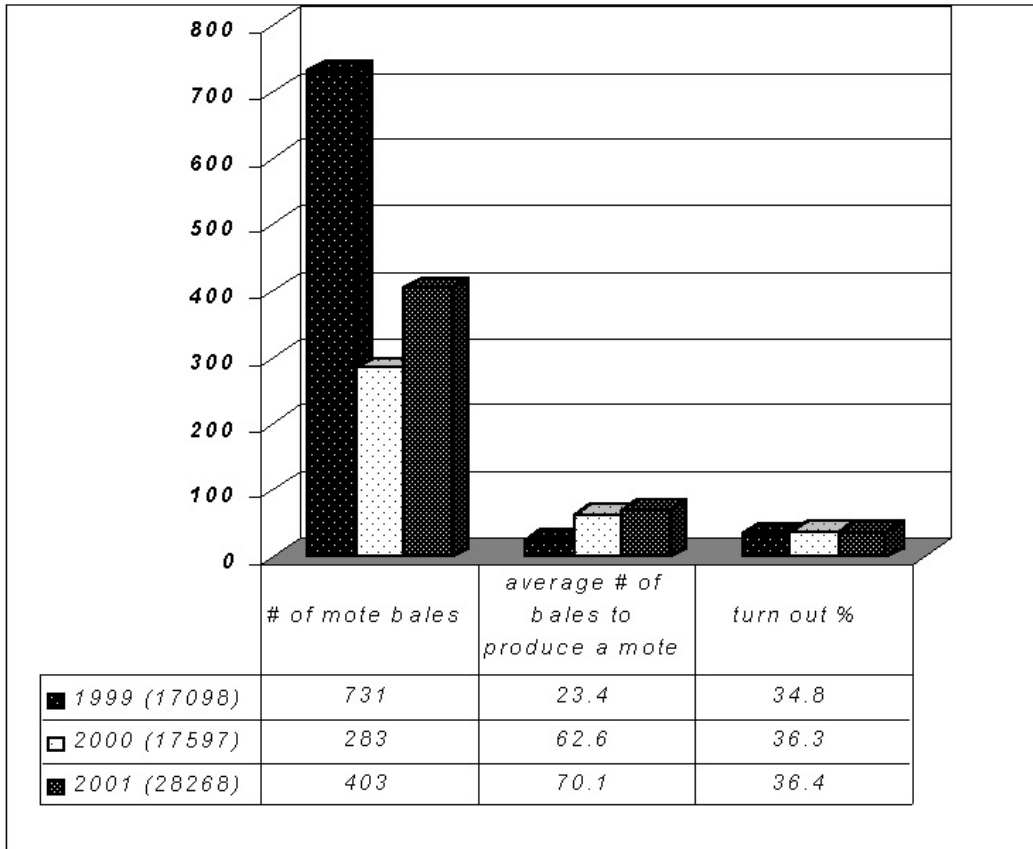


Figure 3. Rabbit Ridge's Production Figures.

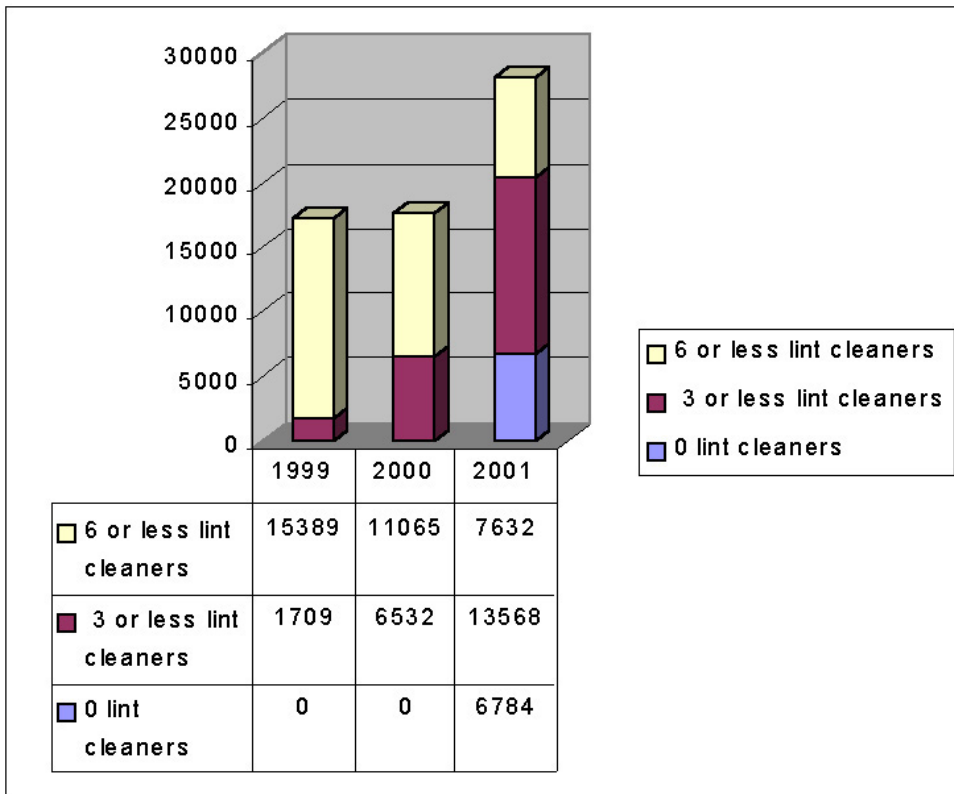


Figure 4. Lint Cleaning Trends.

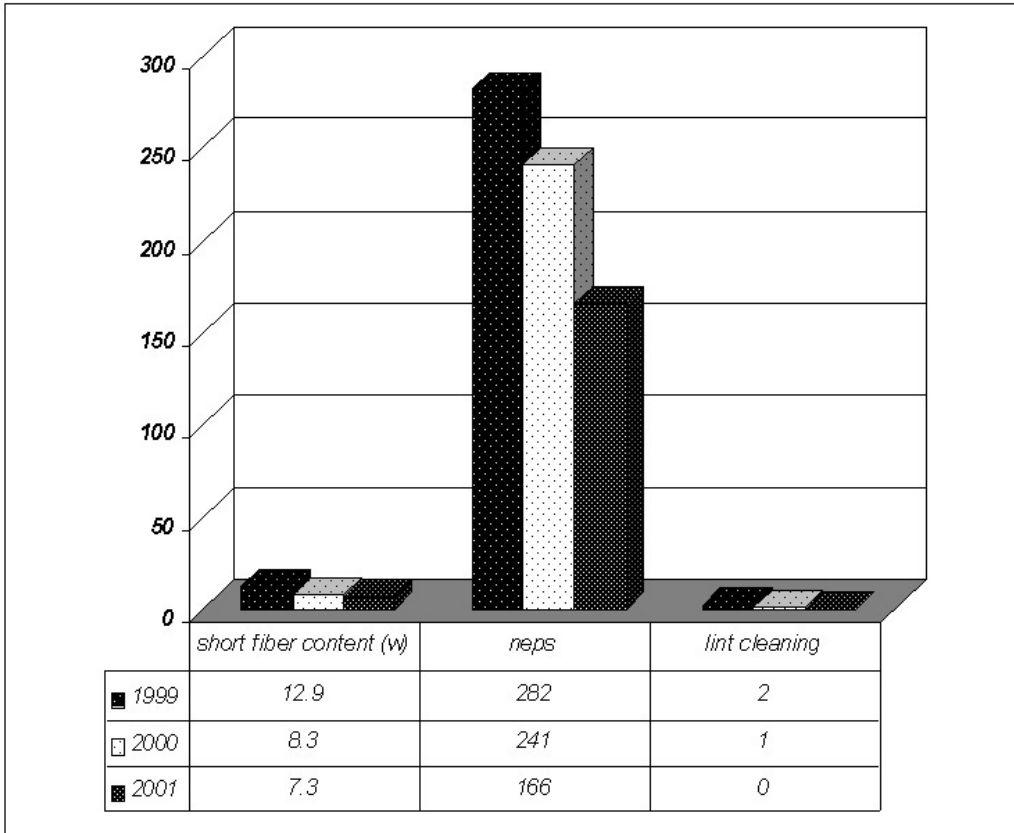


Figure 5. Fiber Quality Trends.

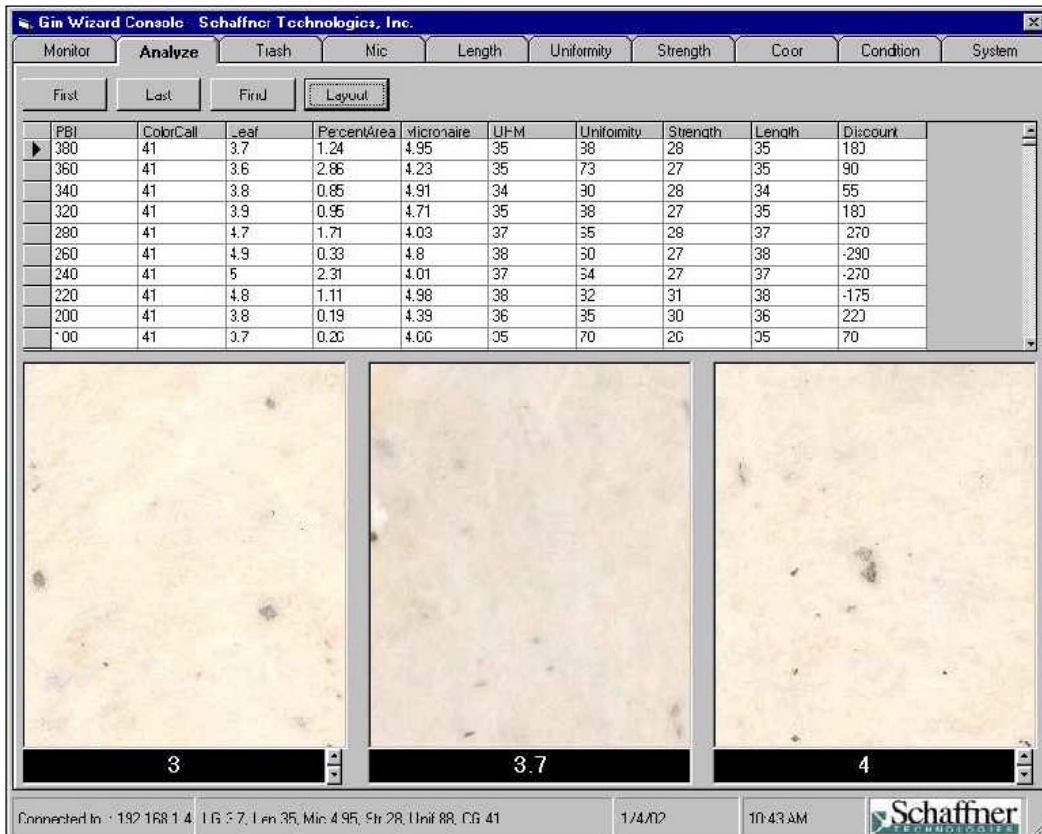


Figure 6. Gin Wizard Analysis Screen.

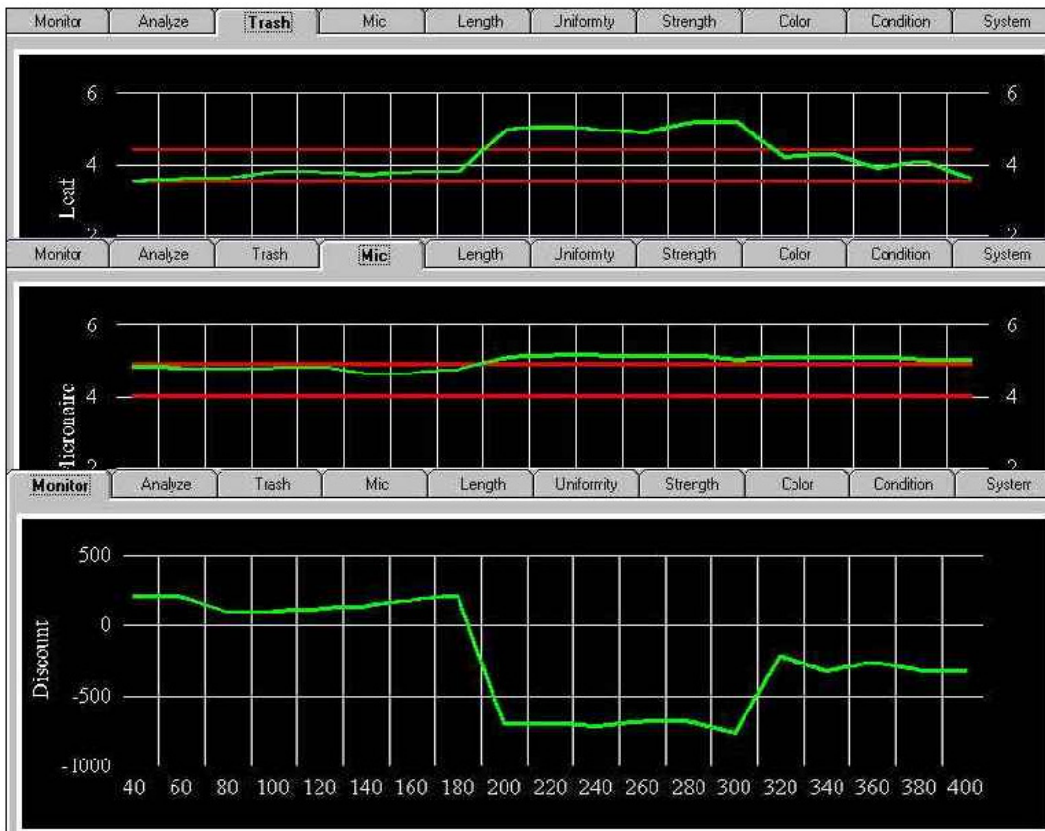


Figure 7. Statistical Process Monitoring Chart.

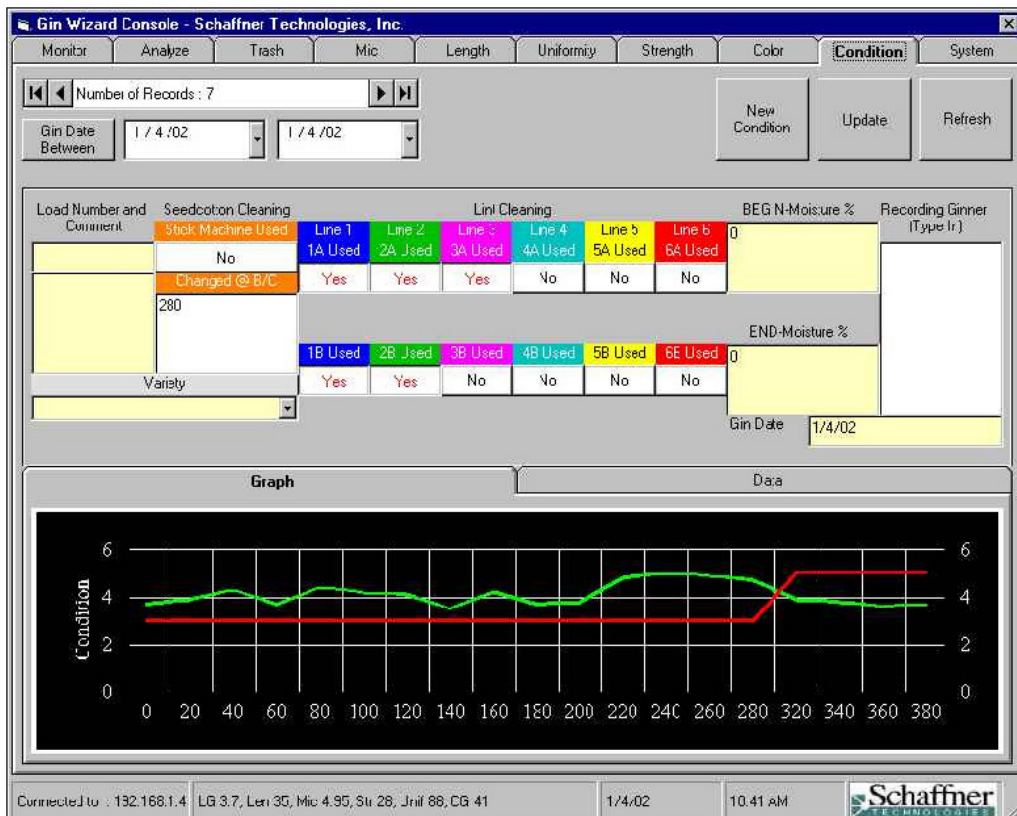


Figure 8. Seed Cotton Conditioning Program.