The Impact of Short fiber Content
In Textile Processing

What Con We Do About It?

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by

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Good Morning,

It is an honor and a privilege to be invited here to speak to you about a subject that I feel is very important to our industry: the impact of short fiber content in textile processing and what we can do about it. Short fiber contest is, in my opinion, the leaking cause of problems that we face everyday in yarn manufacturing and fabric forming operations. We, as an industry, must fine a way to minimize short fiber content in raw cotton in order to improve our manufacturing competitiveness.

What is short fiber contest? Short fiber contest is defined as the percent of fibers that are less than 1/2" in length. This length distribution can be determined classically by the

Suter Web Array test method or with devices such as the AFIS L&D tester or an AL101 tester. The AFIS L&D is gaining more widespread acceptance in the industry as a rapid and fairly accurate measure of short fiber contest. It is the preferred method of choice at Russell Corporation today. There are three basic sources of short fiber in cotton. The first source is the fiber that is naturally short on the seed itself. Mother Nature does grow a small amount of the fiber on the seed that is less than 1/2" in length. The second source of short fiber is the ginning process. As we mechanically separate the lint from the seed some fibers are broken and damaged which generates short fiber. The third source of short fiber contest is in the sliver preparation processes in the yarn manufacturing plants. If we look at the distribution of short fiber by source we will see that approximately 1.5% short fiber is found on the seed. However, in the ginned lint the total short fiber content on average runs approximately 9%. This seems to indicate that short fiber content produced by ginning is about 7.5%. In the sliver we will see another 1% increase in short fiber content. If we look at this on a percentage basis we see that the ginning process creates 75% of the short fiber in a bale of cotton. In other words, short fiber content is not inherently natural in a bale of cotton. It is introduced into cotton through a mechanical process. What can we do about that?

In surveying the literature there are many documented effects that short fiber content has on textile processing. One effect is increased waste generation. With higher short fiber content there is more white waste in the blow room. Also, higher carding pneumafil and flat strip waste is seen. Drawing pneumafil also increases with higher short fiber content. Pneumafil waste in ring spinning and air jet spinning has also been shown to increase. Short fiber also affects the sliver. Short fiber content also affects the base quality of the raw materials that are running in the plant. Lower short fiber content

increases the effective staple length of the fiber which allows for better drafting and better sliver preparation. It also improves length uniformity. This improves control of fibers in the draft zones of drawing machines and spinning machines. Short fiber tens to improve carding and drawing performance through fewer stops and fewer lint generated sliver defects. Spinning efficiency has also been shown to be improved with lower short fiber contest. Ends down declined and fewer defects have been documented with lower short fiber contest. There have been several studies showing that fabric forming has improved with lower short fiber content. There are fewer interruptions in the fabric forming operation and lower fabric defect level have been documented with decreased levels of short fiber content. Yarn quality has also affected through short fiber content. Lower short fiber content in fiber tests to translate in to better yarn evenness, better strength, reduced variability of yarn quality parameters, and fewer yarn defects. Another area where short fiber has an impact is in housekeeping. With lower short fiber content running in the plant there is less lint generated. This translates in to fewer blowdowns or cleanups necessary for the plant. It also reduces the need for roll picking especially in ring and air jet spinning operation.

What are some of the methods that are available for reducing short fiber content? If we look a5t the first source, seed cotton, I do not know what we con do to reduce this area of short fiber content. Perhaps a geneticist of seed breeder may be able to come up with a way to reduce short fiber on the seed in a few years. In the yarn manufacturing area there are some things that we can do in sliver preparation to minimize fiber damage and decrease short fiber content through proper settings on cleaning machinery and proper carding and drawing settings. Also, we need to make sure that our opening and cleaning equipment and our carding equipment is well maintained and running properly.

This will assure that we are not adding additional short fiber content to our sliver. When we begin to talk about ways to reduce short fiber content in the ginning process several thins come to mind. First, a reduction in short fiber content in raw cotton is going to require a different approach. we must involve producers and ginners to make sure that fiber damage is minimized.

What is the value of less short fiber in the bale to the textile industry? I feel this is a critical issue that we face today. If the information that has been reported in the literature is true, then there should be some economic value for lower short fiber content to us as the consumers of cotton. However, different markets will place different values on short fiber content. In many ways this issue is very similar to the cotton fiber strength issue of several years ago. Back in the mid-late 80's there was a push to increase cotton fiber strength in order to improve performance in rotor spinning. Because of the work of some visionary people in our industry, stronger cottons began to come on the market. Initially there were premiums placed on this cotton. The average fiber strength in the mid-80's was 24-26 grams per tex. Today fiber strengths of 27-29 grams per tex are common. We improved strength through placing a value on it, then paying for it. Today we do not have to pay the premiums we used to pay to get higher strength cottons. We, as an industry, effected a change in cotton fiber strength through placing a value on this property. In order to effect a change in short fiber content we have to do the same thing again today. However, we lack a method to determine what this value for short fiber should be.

Based on the literature findings as well as understanding the need to put a value on short fiber, Russell Corporation conducted a preliminary short fiber "value" study to see if the improvements mentioned in the literature could actually be measured in a

production environments. In order to do this, we selected three mini-laydowns of cotton, with significantly different short fiber contents. These were identified as L1 = 6.66% short fiber, L2 = 7.91% short fiber, and L3 = 10.55% short fiber. Other fiber properties were held as close to each other as possible. These three laydowns were processed through identical machinery into27/1 100% carded rotor yarn and 20/1 50/50 air jet yarn. They were run consecutively with each other in a test facility that operated on a 24 hours/day basis on production machinery and under production conditions During processing , performance and quality data from each laydown were collected and analyzed. I would like to take a few minutes to run through the highlights of this preliminary study.

As demonstrated by this graph, the three levels of short fiber content were maintained in both the card mat and card sliver. One of the most interesting conclusions was to see what happened to processing waste as short fiber content changed. As shown in this slide, you can see that the low short fiber content ran almost 1% lower in waste than the high short fiber content laydown at carding. We also saw the same effect in evidence in MJS spinning.

At rotor spinning we see that there was no significant difference in ends down per 1000 rotor hours between the low and middle short fiber content laydowns. However, the high short fiber content laydown had a significant increase in ends down. The quality of the rotor yarn also showed a significant change at the high short fiber content laydown. Single-end strength dropped over 12% from the other two laydown samples. Uster evenness was not affected by short fiber content in rotor yarn. Uster IPI's also showed in change as short fiber content increased. However, Classimat long thin defects showed a tremendous increase at the high short fiber content laydown.

If we loom at the yarn quality in air jet spinning we saw no changes in strength properties. However, the Uster CV% of the yarn did change in a linear relationship. As short fiber contest increased, Uster CV% also increased. We also saw, as in the rotor yarn, Classimat long thins went up significantly in the high short fiber content laydown.

In summary, this preliminary study showed that lower short fiber content reduces card waste, specifically in flat strips. It provides improved fiber characteristics in the card room. In rotor spinning, lower short fiber provides significant improvements in yarn strength, improved spinnability, and reduced Classimat defects, specifically long thins. In air jet spinning, lower short fiber content improves yarn evenness, reduces Cassimat defects, and reduces spinning waste.

How do we effect change in short fiber content in our cotton bales? The first thing we must do is place a value on short fiber content just like we did on strength several years ago. I believe we can take information like what was generated in this preliminary study and begin t1`1o get on estimate of this value. However, I think if we went into our operations and did some controlled experimentation where the only variable that changes in our laydowns is the short fiber content, then an accurate estimate of how much increased short fiber content costs us in manufacturing performance can be determined. The first thing that we have to do if we are going to effect change is we have to know what short fiber is costing us to start with. Once we know what value short fiber has, we must be willing to pay some portion of the "value" back to the producers to give them an incentive to better control their ginning processes. There are products available to control trash levels and moisture content at the gins which I believe will make some significant improvements in short fiber in bales of cotton. We need to encourage our producers to invest in these gin control technology products. The

third thing that we need to do is to develop partnerships and strengthen communications with producers. We need to have discussions one on one with them and share what problems are caused by short fiber. We need to encourage them to be a world class producer of cotton.

Short fiber content is the single biggest cause of problems in yarn manufacturing We are fast approaching the point where we have to do something about it. It reminds me of the story of the 60 year old man who went to a new doctor for a physical. He had all the testing done and the doctor took him into his office and set him down and said "Sir, you are the most amazing specimen of a 60 year old man I have ever seen in my life. You have the body of a 20 year old. I have never seen someone who was in such good physical shape as you are." The man said, "Why, thank you doctor." If you think that I'm in good shape, you should see my father. He is 80 years old and he is in better shape than me." And the doctor said, "I don't believe that." The man replied, "My grandfather is even in better shape than both of us. He is 100 years old and next week he is getting married to a 25 year old woman." The doctor said, "That is incredible, but why does your grandfather, a 100 year old man, want to marry a 25 year old woman?" The man said, "He doesn't want to, he has to!"

So it is with us, if we want to see less short fiber in our incoming bales of cotton we, as an industry, will have to make it happen.

Thank you.