COMBINING THE USE OF OVERSPRAY AND BLENDING FOR SUCCESSFUL PROCESSING OF VERY STICKY COTTON

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Introduction

Issues related to stickiness in cotton may be divided into three categories: prevention, measurement, and treatment. This paper focuses primarily on the treatment of sticky cotton at the textile mill. When honeydew (insect secretions) is the cause of significant stickiness, achieving acceptable processing through the spinning mill requires blending the sticky cotton with non-sticky cotton, applying an overspray to the raw fiber, reducing humidity, or a combination of these treatments.

In the ongoing work with organically grown cotton at the International Textile Center (ITC), severe stickiness is a recurring problem. To help alleviate the problem, an organically approved overspray was developed and has been tested over the past two seasons for use in textile mills. So far all the field testing has been done at harvest and ginning; however, the overspray was developed for use in textile mills and tests will be conducted in a commercial U.S. mill during the next few months.

The ITC has long used full-sized carding machines to categorize the degree of stickiness in cotton. By utilizing the crush-roll, an experienced operator may effectively observe whether a sample of cotton fibers will process in a sticky manner. The following ordinal ranking system for stickiness has been developed:

■ 0 - NOT STICKY
This rating applies to samples that exhibit no stickiness. The card web passes cleanly through the crush-roll, is delivered to the trumpet, and forms into an even sliver.

■ 0.5 - VERY SLIGHTLY STICKY
This rating is given when one may observe periodic picks in the card web, but no tears occur and an adequate sliver is formed without interruption of the carding process. (Experience has shown that seed-coat fragments are highly correlated with this degree of stickiness, while it is rare for honeydew stickiness to get this rating.)

■ 1 - SLIGHTLY STICKY
This rating means that the sticky tears in the card web occur periodically, requiring remedial steps by the card operator, causing delays in production, and resulting in a sliver that is uneven in both weight and diameter.

■ 2 - MODERATELY STICKY
This rating applies when the cotton web tears and wraps around the crush-roll; the fibers may be removed from the roll by the operator, but there is no success in consistently forming a card sliver.

■ 3 - VERY STICKY
This rating denotes a threshold where not only does the fiber stick to the crush-roll, it cannot be removed by the operator except with a tedious picking process. Production of a sliver is not possible.

It should be noted that these categories and the ordinal rankings assigned to them do not enable the predictive power needed for control ex ante of stickiness problems. This requires an objective, cardinal quantification of stickiness that correlates with fiber behavior in textile processing. This need has lead to the ITC becoming a beta site to help develop procedures for using the new Lintronics FCT instrument in the prediction and management of sticky cotton. Our FCT instrument was made operational in February, 1996, and our early efforts are necessarily focused on basic operational and calibration issues. The intention is to develop procedures for using the FCT not only to predict sticky behavior in the processing of cotton fiber, but to predict the effectiveness of steps to alleviate the stickiness before the cotton is taken to the opening line of a textile mill.

Objective and Procedures

The objective of this study was to develop a prescriptive framework for determining the combinations of overspray and blending that effectively alleviate severe stickiness in the processing of 100% cotton. To do this, a bale of cotton was selected that was known to have substantial honeydew contamination caused by the whitefly and which met the ITC criteria for a rating of "very sticky." It seemed that a good beginning was with a cotton sample (1) contaminated by a known insect and (2) in the worst category of the ITC stickiness rating.

The experiment was designed to generate a matrix of stickiness results from 7 levels of overspray and 7 blend percentages; therefore, there were 49 distinct "cells", or observations on stickiness ratings. The test was replicated 3 times, for a total of 147 observations, and the average of the resulting 3 cell values were used to derive the stickiness ratings.

The levels of overspray and blending were as follows:

Overspray % (by weight)	% of Non-stickyCotton in Blend
0.0	0
0.5	10
1.0	25
1.5	50
2.0	75
2.5	90
3.0	95

The actual percentages of oversprays used in the industry are probably near the high end of the percentages used in this study. (Our impression is that 2.5% is common.) Also, the actual percentages of non-sticky cotton used in blends are probably near the high end of those shown here. Nevertheless, interest naturally focuses on how low each of these levels may be taken and still alleviate stickiness.

Results

Experimental results are summarized graphically in Exhibit 1, where the alternative overspray levels are on the horizontal axis, the bars show results at alternative blend levels, and the line shows the average impact (over all blend levels) of each level of overspray. The line is included to clearly show that there is a strong tendency for the effectiveness of the overspray to improve until the 1.5% level of concentration, but there is very little impact on the average at higher concentrations. This is an interesting result, because it indicates that the common practice of using 2.5% concentrations of overspray may frequently be unnecessary—especially if the cotton tests somewhere below the "very sticky" rating.

An examination of the bars in Exhibit 1 leads to the conclusion that the cotton stays very sticky when overspray concentrations of 0.5 or less are combined with non-sticky cotton blend levels of 50% or less. Experience has shown that as the stickiness rating falls below 0.5 the cotton generally can be processed; therefore, results in Exhibit 1 indicate that the cotton stickiness problems are substantially alleviated when overspray concentrations of 1.5% or more are combined with blend levels of 25% or more.

A somewhat more prescriptive presentation of the results is given in Exhibit 2, with a matrix of stickiness results shown for each combination of overspray and blend levels. Using the (fairly conservative) decision rule that a card stickiness rating averaging 0.3 or less will process adequately, the double-lined boundary that traces diagonally across the table separates the various combinations that meet this criterion. For example, the threshold rating of 0.3 may be achieved with a 3% concentration of overspray and a 10% blend of non-sticky cotton; it may also be achieved with a 1% concentration of overspray and a 95% blend of non-sticky cotton.

There is a smaller area of Exhibit 2 that is also separated by a double-lined boundary; this shows those cells that give an average stickiness rating of 0.1—a very conservative criterion to apply in a textile mill. This was achieved, for example, with a 2% overspray concentration and a 90% blend of non-sticky cotton. If the non-sticky cotton blend is raised to 95%, a 1.5% overspray concentration may be used to meet this more difficult criterion.

Conclusions

These results, while useful for demonstrating an appropriate prescriptive framework for managing sticky cotton, are limited in their application to specific textile mills. The reasons include diverse ambient conditions in mills, diverse sources of honeydew deposits, diverse opening, cleaning and carding lines, etc. Furthermore, as mentioned previously, the card rating used by the ITC, while useful and reliable in our research environment, is too subjective and too slow for application in a commercial environment. This limitation may be overcome, however, with commercialization of the stickiness measurement made possible by the Lintronics FCT. The ITC will be focused on bringing this new tool to bear on the management of stickiness in cotton.

Exhibit 1: Rating of Stickiness in the Processing of "Very Sticky" Cotton

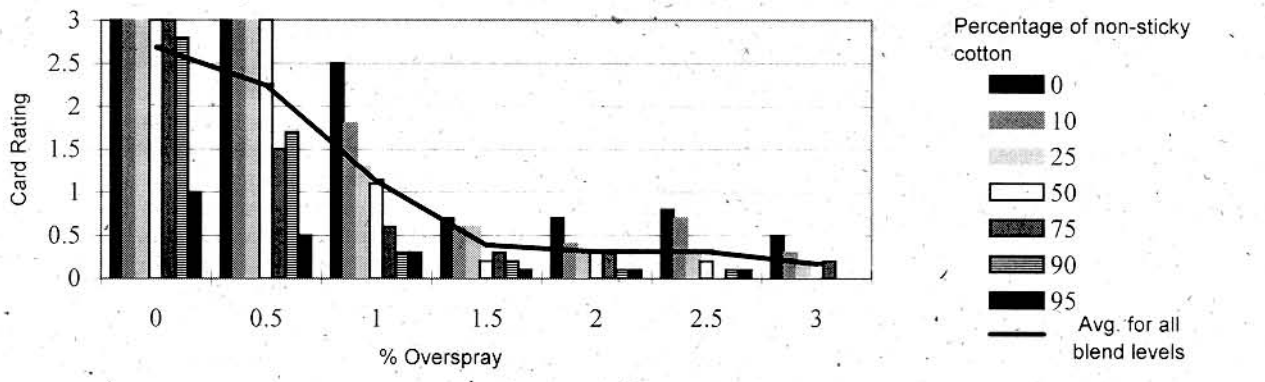


Exhibit 2: Identifying Overspray/Blend Combinations for *Acceptable Processing of "Very Sticky" Cotton*

Concentration of Overspray	Blend of Non-sticky Cotton						
	0%	10%	25%	50%	75%	90%	95%
0.0%	3.0	3.0	3.0	3.0	3.0	3.0	1.0
0.5%	3.0	3.0	3.0	3.0	1.8	1.7	0.5
1.0%	2.5	1.8	1.3	1.1	0.6	0.3	0.3
1.5%	0.7	0.6	0.6	0.2	0.3	0.2	0.1
2.0%	0.7	0.4	0.3	0.3	0.3	0.1	0.1
2.5%	1.0	0.7	0.3	0.2	0.0	0.1	0.1
3.0%	0.5	0.3	0.2	0.0	0.2	0.0	0.0

NEW CLIENT-SERVER TECHNOLOGY AUTOMATES ITC

Billing, test results, and other paperwork that makes a business run is now automated at the ITC, thanks to Shridhar Chikkodi, research associate.

The staff of ITC typically conducts about 75 major projects each year and responds to more than 1000 requests for testing, evaluation, specialty processing, and manufacturing. With each department carrying out many projects simultaneously, it was critical to develop an information system for the center that could combine order processing and management reporting capabilities into a single system.

Over the past year, Shridhar has developed a customized client-server based information system to suit the needs of a textile research facility.

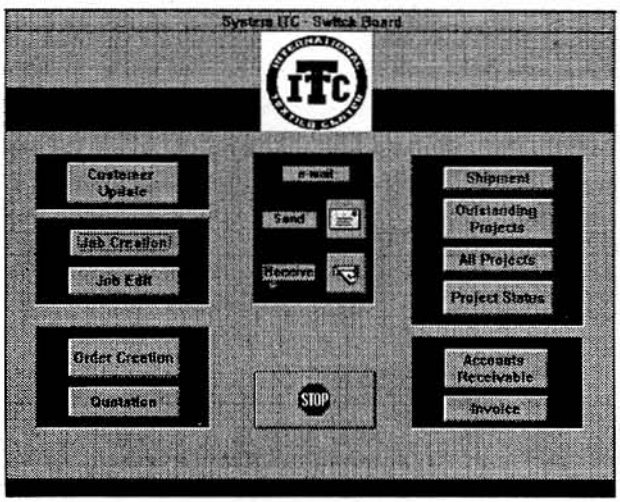
This Windows-based system has been built around a multi-dimensional relational database and uses Novell's Local Area Network to integrate networking on client workstations. The relational database acts as a container for all sorts of information and links the data electronically so that timely accessibility of the information is achieved with a few clicks of a mouse.

With the new system, it is easy to access up-to-the-minute information regarding status of an order, shipments, payments, and so on. The system is also used to generate invoices, quotations and several innovative reports. In the months to come, ITC intends to eliminate paper-based files and documentation.

The ITC has also developed a data reporting system exclusively for the Materials Evaluation Lab. This software has a built-in capability to import data directly from High Volume Instruments and to enter data for other manual instruments. The data is then processed to produce standardized reports for clients.

Over the summer, new material will be added to our Web page, so visit us electronically:
http://www.ttu.edu/~itc

The main screen for the ITC information system.



MAILING LISTS UPDATED

The spring edition of Textile Topics included mailing list update sheets for our foreign and campus friends to let us know if they would like to continue receiving our quarterly newsletter. With this issue we will be including mailing list updates for our domestic friends. Please send or fax those update sheets back to us. We are required by the postal service to periodically update our mailing lists. Postage costs are considerable so we want to know if you want to receive Textile Topics. Thanks for helping us.