STUDIES OF DUST IN COTTON SLIVER

Since the advent of rotor spinning, textile companies have been concerned with dust particles in the finisher sliver fed to the spinning machine. In the early days, before these machines were equipped with dust removal systems, there was concern about accumulation in the rotors which caused poor spinning efficiency and lowered yarn quality. It was soon realized that some method should be developed to remove the dust particles, and all of today's rotor machines are constructed to accomplish this.

The first open-end machine installed at the International Center was an Elitex BD200M made in Czechoslovakia. This was followed by several others that were equipped with dust removal systems. We retained the BD200M to assist with our overall research effort, and today it is used as an instrument to measure the amount of dust in finisher sliver supplied to rotor machines. It is interesting to note that at one time this particular machine was considered to have a deficiency because it did not remove dust, but today it is very useful in our research as a means of evaluating the amount of dust in sliver.

The evaluation we conduct with this machine was initiated in 1975. Since that time we have performed it for many companies interested in knowing the efficiency of their opening room equipment and cards. The test has developed into a routine procedure, one that has revealed some interesting results. Obviously, the more efficient the cleaning, the less dust will remain in the sliver that goes to spinning.

We are presenting in this issue of Topics a review of the work we have done during the past ten years, which we feel will be of interest to our readers. However, we believe we should first outline the test procedure itself, and this is given below and at right.

FINISHER SLIVER DUST TEST PROCEDURE

1. An Elitex BD200M rotor spinning machine is used to produce Ne10 yarn with a twist multiplier of 5.0 at a rotor speed of 36,000 rpm. Opening rollers of type OK40 are operated at 8000 rpm. Spinboxes are equipped with smooth naves having a radius of curvature of 4.0 mm.

2. Two pounds of sliver are supplied to each of twenty rotors.

3. Sufficient yarn is spun for testing and adjustments in draft are made to assure the required Ne 10 yarn.

4. Before proceeding, all rotors are thoroughly cleaned.

5. Spinning is initiated on all twenty (20) rotors.

6. Spinning is continued for a total of four hours of machine time, piecing any ends down without cleaning the rotors.

7. When the four-hour test period has been completed, machine is stopped.

8. Yarn packages are removed and weighed to determine the total quantity of yarn spun. Weight of yarn is expressed in kilograms.

9. Each spinbox is opened and fibers present in the rotor are carefully removed.

10. A cut-away plastic cup is inserted into the space between the rotor wall and rotor housing. Deposit from the groove is carefully brushed into the cup. This procedure is repeated for all rotors and the total accumulation is placed in a sealable container (zip-lock plastic bag).

11. Using the cut-away cup as before, residue is collected from the ledge (the area of the rotor at which the pumping holes are located) of each of the 20 rotors. Deposits are combined and placed in a second sealable container.

12. Each container is weighed with and without the contents. Weight of deposits is recorded in milligrams.

13. Groove and ledge deposits are expressed in milligrams per kilogram of yarn.

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In 1985 an analysis was made of the results of performing dust studies on 52 slivers prepared and submitted by various manufacturers. The study was performed to permit the test results to be expressed in relative terms to provide some indication of the cleanliness of the material, in comparison with others.

The analysis has been repeated, and in this study
a total of 346 results formed the data set collected over a period of ten years from industrially-prepared sliver. The histograms of the deposits show that the ledge deposits give a Normal distribution whereas the rotor deposits are not so distributed. The logarithms of the rotor deposit data, however, were Normally distributed. Knowledge of the mean and standard deviation permits calculation of various percentage points of the distribution. These values may be used as an assessment of the cleanliness of the sliver. For instance, a groove deposit of less than 0.7 mg/kg was achieved in only five percent of the tests performed.

As would be expected, those companies using the service provided by the International Center have demonstrated that cleaner cottons are being prepared. Since the 1985 analysis was made with 52 slivers, the median of the ledge deposit data has fallen from 37.4 to 36.3 mg/kg, whereas the median of the rotor deposit data has decreased from 68.9 to 16.9 mg/kg of yarn.

A large proportion of the ledge deposit is made up of fiber fragments. Presumably, a significant proportion may be generated by the action of the opening roll. A regression analysis has shown no evidence that ledge deposits vary with rotor deposits.

Rotor deposits contain heavier trash particles and indicate the quantities which arise in production conditions. They appear to reflect changes in cleaning equipment more than ledge deposits. This can be seen in changes in the experience values between analyses. Accompanying the reduction in the median between analyses was a decline from 10.5 to 1.37 mg/kg for the upper limit of the first decile of the distribution. These changes indicate the success that some companies have had in reducing the trash content of sliver supplied to the spinning machine.

**DUST STUDY EXPERIENCE VALUES**

(346 Industrial Samples 1981–1991)

<table>
<thead>
<tr>
<th>Percentage</th>
<th>Ledge Deposit (mg/kg yarn)</th>
<th>Groove Deposit (mg/kg yarn)</th>
</tr>
</thead>
<tbody>
<tr>
<td>&lt; 1.0</td>
<td>≤ 11.4</td>
<td>≤ 0.20</td>
</tr>
<tr>
<td>1.0 – 5.0</td>
<td>11.5 – 18.9</td>
<td>0.21 – 0.70</td>
</tr>
<tr>
<td>5.0 – 10.0</td>
<td>19.0 – 22.9</td>
<td>0.71 – 1.37</td>
</tr>
<tr>
<td>10.0 – 25.0</td>
<td>23.0 – 29.6</td>
<td>1.38 – 4.14</td>
</tr>
<tr>
<td>25.0 – 75.0</td>
<td>29.7 – 44.6</td>
<td>4.15 – 48.50</td>
</tr>
<tr>
<td>75.0 – 90.0</td>
<td>44.7 – 51.3</td>
<td>48.6 – 146.90</td>
</tr>
<tr>
<td>90.0 – 95.0</td>
<td>51.4 – 55.3</td>
<td>147.0 – 285.00</td>
</tr>
<tr>
<td>95.0 – 99.0</td>
<td>55.4 – 62.9</td>
<td>286.0 – 988.00</td>
</tr>
<tr>
<td>&gt; 99.0</td>
<td>≥ 63.0</td>
<td>≥ 989.0</td>
</tr>
<tr>
<td>Median</td>
<td>36.3</td>
<td>16.9</td>
</tr>
</tbody>
</table>

**FIGURE 1: HISTOGRAM OF LEDGE DEPOSITS**

**FIGURE 2: HISTOGRAM OF ROTOR DEPOSITS**
EXCHANGE OF TECHNOLOGY

One of the objectives of publishing Textile Topics is to disseminate technical data generated by the research conducted at the International Center. A number of organizations around the world have written to request permission to reproduce certain of our reports in bulletins printed in various countries, many requiring translation for their readers. Our response has been, "Yes, this may be reproduced, but please give credit to Textile Topics and the International Center for Textile Research and Development."

In June, Harvin Smith, head of our materials evaluation laboratory, spent three weeks in Taiwan, Republic of China, consulting with companies that use cotton produced in Texas. He found that a periodical published by the Taiwan Cotton Spinners Association had reproduced a report carried in our May 1990 issue. We found this interesting, and we are reproducing a page from that article at right, thinking it also may be of interest to our readers.

We are pleased our friends in Taiwan believed one of our reports worthy of reproduction. We appreciate the credit given to Texas Tech University and the Texas Food and Fibers Commission.

MATTERS OF MAGNITUDE

Last month’s Topics included a small trivia section entitled "Did you know . . . (or even care?)". One of our statements of erudition told of the number of different compounds contained in the alcoholic beverage known as Scotch. This information, borrowed from the April 1, 1991 issue of Chemical & Engineering News published by the American Chemical Society in Washington, DC, apparently contained a misspelled word (at least according to tradition in some countries). In any event, we promptly received a letter from a friend with Ralli Brothers & Coney in Liverpool, England, pointing out our limited knowledge of such important matters.

So that our readers can appreciate the full significance of this, we quote the letter in its entirety in the column at right.

Thank you, Mr. Wilde, for your comments.

7th August 1991

Dear Sir/Madam,

With regards to your item on "Did you know (or even care)" please note Scotch is spelt Whisky and not Whiskey. The latter term is used for similar, inferior brews/distillations from countries other than Scotland i.e. USA, Canada, Ireland etc. Whisky is a name unique to Scotch.

Yours sincerely,

G. WILDE
TECHNICAL MANAGER & SERIOUS SCOTCH DRINKER
RALLI BROS & CONEY
VISITORS

Visitors to the International Center during July included Jerry M. Lawson, W. W. Wool, Inc., Pleasanton, TX; Kearny Robert, USDA-SRRC, New Orleans, LA; Roger Bolick, Allied Fibers, Hopewell, VA; John Castro, Odessa, TX; Lawrence Hahn, Midland, TX; Don R. Bradshaw, Eastland, TX; J. C. Mathews, Texas & Midwestern Consultants Company, Woodson, TX; Mr. & Mrs. Jim Crawford, Muleshoe, TX; Linda Shockley and Jennifer Ann Mueller, Little Bear Organic Foods, Pacific Palisades, CA; Sharon Bell, The American College in London, Los Angeles, CA; Wesley Masters, Amarillo, TX; J. Angus Balharry, Halatex, Muirhead by Dundee, Scotland; and Michel Willems, BoWeevil BV, Amsterdam, Holland.

Also, three different groups of 4-H members from Lamesa, TX; Vega, TX; and Arnett, OK, toured the Center at different times during the month.

On July 16, ICI Americas Chemicals brought a group of ten cotton growers from New South Wales, Australia for a tour of the Center. ICI Americas representative Eugene King accompanied the group.

Then, on July 25 more friends from New South Wales visited with us and toured the Center. This group included S. S. O'Brien and P. J. O'Brien, Warren; D. J. O'Brien, Glenanaar, Culargambone; Peter Wilson, Paul Minogue and Hans Woldring, Hassall Associates P/L, Trangie; Alan M. Frost, AFM Developments P/L, Narromine; and M. Egan, Kameron, Warren. They were accompanied by Texas Agricultural Extension Service area cotton specialist James Supak.

MORE TRIVIA AND OBSCURE FACTS

- The rainiest spot in the United States is Mount Waialeale, Hawaii, which receives an average of 460 inches of rainfall per year.

- More than 75 percent of the world's 850 active volcanoes lie within the "Ring of Fire", a zone running along the west coast of the Americas from Chile to Alaska and down the east coast of Asia from Siberia to New Zealand.