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OPEN-END SPINNING: THE INFLUENCE OF SPINNING CONDITIONS ON ROTOR DUST ACCUMULATION – PART I In the early days of open-end spinning, it was realized that cotton should be cleaned as thoroughly as possible to avoid the accumulation of dust and trash in the rotor. Particles lodging in the rotor were found to interfere with the laying of fibers in the groove and to result in the production of uneven yarn. It was learned that as dust particles accumulate, the groove profile changes from narrow to wide and the yarn properties vary accordingly. Research at the Textile Research Center has shown that a sharp-grooved rotor produces a high-strength, low-elongation yarn which tends to be uneven. Rotors having wider, less acute grooves tend to provide yarns of lower strength yet greater elongation and better evenness. Finer dust is less troublesome in this regard, forming small spots around the groove which gradually join into a continuous band.

Briefly stated, it has been learned that the accumulation of dust in a rotor groove has a direct effect on yarn quality and possibly on subsequent products. Depending on the particle size, yarn quality irregularity was sometimes found severe enough to produce effects even in fabrics woven from the yarn. The range of accumulation is affected by a number of functions, beginning with ginning performance and continuing through textile processing. However, particle accumulation can be altered by spinning conditions. Examples of the effects of certain functions and conditions are given in this report and in a second part which will appear in the next issue of *Textile Topics*.

As a result of TRC's early investigations, a test procedure was developed to precisely measure dust particle accumulation. This procedure employs the first commercial design of rotor spinning machine, namely the Czechoslovakian Elitex BD200M. In this design, airflow to transport fibers from the opening (combing) roller to the rotor is generated by the pumping holes located in the back wall of the rotor. Unlike today's rotor spinning machinery, there is no trash extraction system. All material present in the sliver entering the spinning machine will be forwarded to the rotor to be removed in the yarn, exhausted through the pumping holes, or remain in the rotor groove as a deposit.

The procedure involves spinning a fairly coarse yarn at a high twist level for a fixed period of time, typically four hours. The relatively coarse yarn and high twist were chosen to reduce the likelihood of yarn breaks which could disturb the accumulated deposit. After the allotted time, the machine is stopped, the spinning chambers opened, and the deposit carefully removed. The deposit is collected from the so-called ledge, upon which the pumping holes are located, as well as from the rotor groove. The collected deposits are weighed in milligrams, while the amount of yarn spun is measured in kilograms. The quantities of deposit are then expressed in terms of milligrams per kilogram of yarn.

The deposit collected from the ledge is always more compact, lighter in color and contains fewer particles which can be identified by the naked eye as fragmented stalk, seed coat, etc. Such deposits are believed to be composed of fiber fragments generated not only by the opening roller but by preceding processes. The dust may also contain the remains of trash particles which have been pulverized. Groove deposits contain particles of similar origin to those found in ledge deposits but larger, heavier particles can be identified. Despite the incorporation of trash removal systems in the opening boxes of modern rotor machines, some of the more massive particles are likely to remain in the rotor groove. The groove deposit of the BD200M is most useful, therefore, in describing the propensity for dust accu-

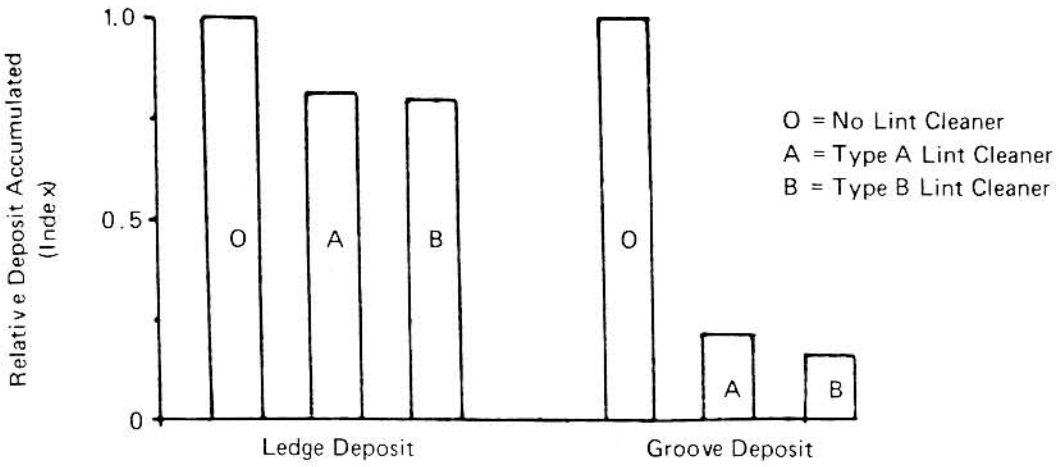
mulation in contemporary machinery. The lighter ledge deposit is more likely to indicate the quantity of airborne material which would be expelled from modern machines.

Dust studies are regularly performed at the Textile Research Center for a number of U.S. textile companies. In some cases, mills appear to be using the test as a means of checking the level of cleanliness of their material. In other instances, the dust studies are requested to assess changes made in the preparatory equipment, particularly the opening line and card. More than 200 dust studies have been conducted at TRC on industrially-produced slivers over the past five years. The information which was shared by the various companies concerning the preparation of these slivers has shed some light on the influence of processing on the propensity for rotor dust accumulation. Some of the findings are presented in the following section, supplemented by information obtained in some of the Center's own trials.

1. Influence of Ginning Treatment:

   The inclusion of a lint cleaner into the ginning process produced a reduction in both ledge and groove deposit, as shown in Figure 1. The textile processing machinery was unaltered for all ginnings.

Figure 1: Influence of Gin Lint Cleaner



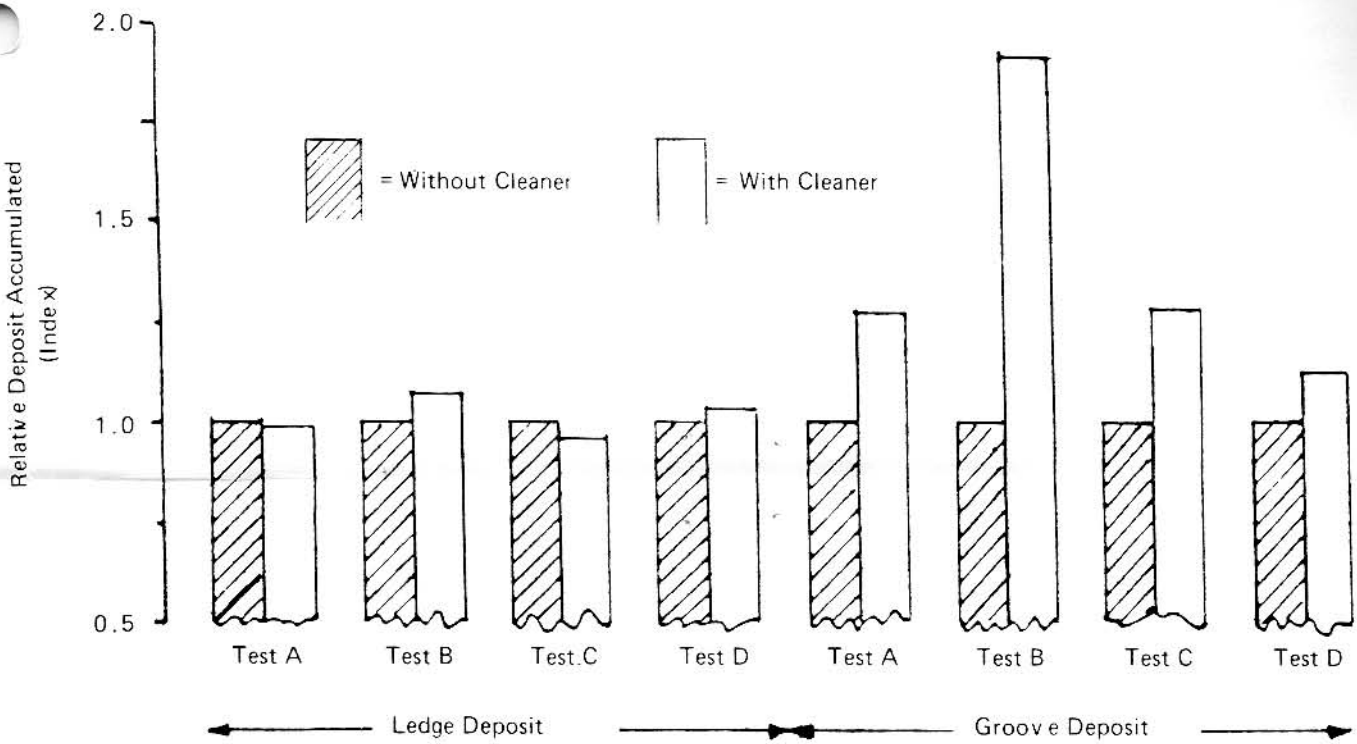
2. Influence of Cleaning Machinery:

   Four different trials were made using a machine purported to clean cotton in the opening process in a textile plant. In all cases, the groove deposit was actually increased by its use, yet the ledge deposit remained largely unaffected (see Figure 2). Introduction of the cleaning machine was detrimental to the cotton cleaning process as a whole, a somewhat surprising conclusion. This qualifies the results of other researchers who have shown that the efficiency of a cleaning machine is determined by the equipment preceding it.

   In another instance, the wire of a roller in a cleaning machine was altered to become more aggressive in action. The ledge deposit was found to increase less than 10%, but the groove deposit was reduced to about 60% of the original.

As mentioned previously, further information will be presented in the next issue of *Textile Topics*. This study has been conducted at the Textile Research Center under the supervision of John B. Price with the assistance of William D. Cole and Albert Esquibel.

Figure 2: Influence of Textile Cleaning Machine



COTTON BOARD/COTTON INCORPORATED VISIT TRC On August 12, thirteen members of the Cotton Board and Cotton Incorporated visited the Center for a tour of the facilities and a discussion of research on cotton. Don Kerr of the Cotton Board and Nelson Gibson of Cotton Incorporated led the group through a review of the research conducted by Cotton Incorporated. Cotton Incorporated staff members present were Hal Brockmann and Wolfgang Strahl.

We were pleased to have these visitors with us. We hope they will return for another visit whenever there is an opportunity.

VISITORS Other visitors to the Textile Research Center during August included Roger Bolick and Linley Jones, Allied Plastics & Fibers, Hopewell, VA; Bob Alexander, Allied Plastics & Fibers, Columbia, SC; Kurt W. Masurat, George A. Goulston Co., Monroe, NC; Carl Cox, Natural Fibers & Food Protein Commission of Texas, Dallas, TX; John E. Eckert, The Wool Bureau, Inc., Woodbury, NY; Dan Stokes, Rieter Corporation, Spartanburg, SC; Merill Q. Garvin, Western Electric Products, Norcross, GA; Denise Hannah, Hohenberg Bros. Cotton Co., Memphis, TN; Steve Clark and Bob Sallavanti, Gentex Corporation, Carbondale, PA; Harvey Campbell, Campbell, West & Associates, Bakersfield, CA; Kater D. Hake, University of California Cooperative Extension Service, Bakersfield, CA; Stephanie R. Johnson, University of California Cooperative Extension Service, Visalia, CA; H. B. Cooper, California Planting Cotton Seed Distributors, Shafter, CA; Ted Tashian, CPCSD, Bakersfield, CA; Douglas Fain, Cotton Incorporated, Raleigh, NC; and Butch Johnson, Milliken Company, Spartanburg, SC.

Also visiting were Johan Gillen, South African Cotton Board, Pretoria, South Africa; Faisal Jalil Chowdhury, A.J.C. Group of Enterprises, Chittagong, Bangladesh; and David Haywood, Cotton Council International, London, England.

In addition, members of the Las Aranas Spinners and Weavers Guild of New Mexico attended an intensive short course in textiles offered by the Textile Research Center. Those participating were Dottie Smith,

Hobbs, NM; Nancy Coleclasser, Maryll Dauphinee, Suzette Lindemuth, Marty Mitchell, and Frances and Peter Szeman, all of Albuquerque, NM.

Correction. In the July issue of *Textile Topics*, visitor Michel Antuszewics, Filatures de la Madelaine, was incorrectly listed as being from Rerimont, France. This should read Remiremont, France. We regret this error and extend our apologies to Mr. Antuszewics.