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THE EFFECTS OF LINT CLEANING ON FIBER AND YARN QUALITY: Conclusion

The last two issues of *Textile Topics* have included two portions of a report on the influence of the lint cleaning of stripper-harvested cotton at the gin. Part 1, given in the December 1991 issue (Vol. XX, No. 4), provided an overview of the study and commented upon the dilemma within the industry in that the grading system rewards cleanliness even though the necessary cleaning processes result in fiber damage. This is most frequently identified as an increase in short fiber content or reduction in uniformity ratio. The second part presented data from determinations of fiber properties, waste levels at various cleaning points, yarn properties and spinning performance, to show the general effect of increasing the number of lint cleaning treatments from zero to two. The trends observed offered no surprises; as the number of lint cleaners increased so the upper length statics decreased (2.5% span length, upper quartile length), and uniformity and short fiber content increased.

Also expected was a reduction in the trash content of the cotton as the number of lint cleaners was increased. This was confirmed by a lowering of the non-lint content determined by the Shirley Analyzer and also of the wastes extracted in the blowroom and at the card. Differences between lint cleaning treatments in terms of rotor-spinning performance and yarn quality were not significant. These were our major findings from the work performed in Segment 1.

Within the cotton gin, lint cleaners are located after the gin stand, the machine whose function it is to separate fiber from seed. For the ginning of Upland cotton, it is normal to use two lint cleaners despite the fact that many studies (including this one) have demonstrated the incidence of significant fiber shortening when a second lint cleaner is incorporated. One thought has been to increase the intensity of seed cotton cleaning which is performed in the sequence of machinery before the gin stand. A more effective removal of trash before ginning, it was felt, could reduce the quantity of sticks, burrs, etc. which may be shattered at that point to such a size that lint cleaners could not efficiently remove them. Less trash in the ginned lint would provide an opportunity to reduce the number of lint cleaners used and, therefore, the risk of fiber damage.

When the study into the effects of lint cleaning was designed, it was fortuitous that a new, more effective seed cotton cleaning machine (the Multistage Extractor) was being developed by Roy V. Baker, director of the USDA Ginning Research Laboratory in Lubbock. Consequently, the second segment of the study was planned with the intent of assessing the ability of this concept, particularly in terms of cotton processing performance.

For stripper-harvested cottons such as those in West Texas, ginners may increase their ability to remove sticks by using a third extractor-type machine in the seed cotton cleaning system in addition to the extractor feeder supplying the gin stand. The new development by the USDA, however, combines three stages of extraction into a single machine by using five saw cylinders working together with five doffing brushes. (Since this study was begun, the rights to produce the machine have been obtained by a ginning machine manufacturer.)

Figure 3 on the following page shows the different sequences of machinery used to gin the seed cotton remaining in modules after satisfying the needs for raw material in Segment 1 of this study. The flow chart shows that the Multistage Extractor was used in place of at least two conventional seed cotton cleaning machines. After ginning, the ginned lint was subjected to either zero, one or two lint cleaning treatments. For comparison, seed cotton was also ginned through the conventional system which involved the use of two lint cleaners. To provide an extreme, cotton was processed through a minimum of three seed cotton cleaning treatments (one of which was the Multistage Extractor) and received no lint cleaning treatment after ginning.

Table V (next page) shows the influence of cleaning treatments in the gin on the characteristics of the resultant cotton. Comparing the first two columns, the data suggest that the influence of additional seed cotton cleaning had little effect on fiber properties but did reduce the non-lint content significantly.

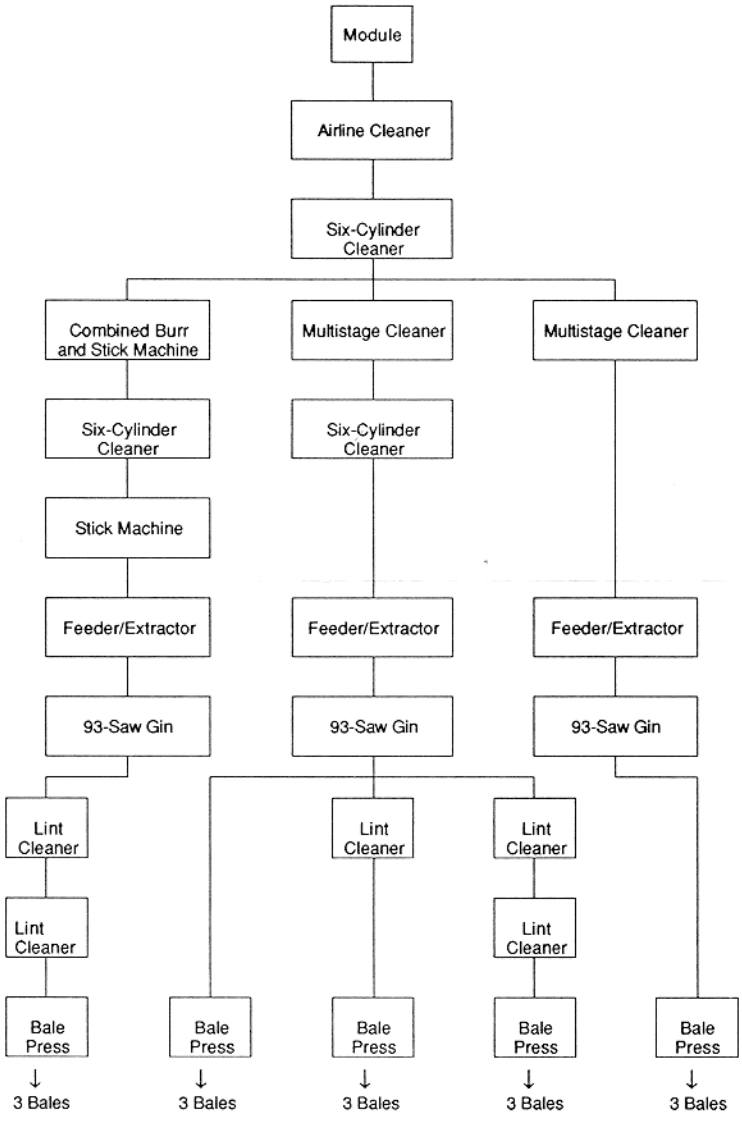

FIGURE 3: MATERIAL FLOW THROUGH GIN

TABLE V

INFLUENCE OF GINNING PROCESS ON VARIOUS COTTON ATTRIBUTES

SEED COTTON CLEANING	M.E.*	M.E. & CYLINDER CLEANERS			NORMAL
LINT CLEANERS	0	0	1	2	2
Shirley Analyzer					
Non-lint Content	8.20	6.56	2.79	1.81	2.38
Digitial Fibrograph					
2.5% Span Length (in)	1.047	1.053	1.041	1.033	1.038
Uniformity Ratio (%)	48.7	48.5	48.1	47.7	47.4
Uniformity Ratio (%)	1.3	1.2	1.8	2.7	2.5
Micronaire Value	3.94	3.87	3.76	3.75	3.72

TABLE VI

INFLUENCE OF GINNING PROCESS ON BLOWROOM & CARDROOM WASTE (%)

SEED COTTON CLEANING	M.E.*	M.E. & CYLINDER CLEANERS			NORMAL
LINT CLEANERS	0	0	1	2	2
Opening Line	6.5	5.7	2.4	1.7	2.0
Card	5.5	5.1	3.7	3.4	3.6

*M.E. = Multistage Extractor

The effect of lint cleaning treatments was much more profound. The addition of each lint cleaner caused a proportionately greater reduction in non-lint content than the stick machine in the seed cotton cleaning system. There was also evidence of fiber damage as the number of lint cleaners was increased, revealed as a reduction in the upper length statistic and the uniformity ratio as well as an increase in short fiber content. The act of utilizing a lint cleaner appeared to reduce the micronaire value slightly.

The last two columns of Table V permit a comparison of the modified seed cotton cleaning system and the normal process when two lint cleaners were used. The results suggest that the conventionally-ginned cotton may have slightly better length characteristics while retaining a higher trash content.

The trends in trash content are substantiated by the wastes produced during opening and carding, as shown in Table VI. There is a very close association between the amount of trash extracted and the measured non-lint content.

Table VII shows the effect of the various ginning treatments on yarn properties measured both at the beginning of spinning and also after more than eight hours running. Yarn strength tended to be highest when one lint cleaning treatment was used, while the weakest yarn was given by the cotton ginned normally.

The spinning performance data are given in Table VIII. Despite the fact that there were more trash-related breaks when spinning from the cottons which had received the least cleaning at the gin, the total number of ends down was the lowest of all. There was no difference in spinning performance between the other four treatments of cotton. It will be interesting to see if this trend is repeated in the two subsequent studies to be conducted.

This research was sponsored jointly by the Texas Food and Fibers Commission and the Agricultural Research Service of the United States Department of Agriculture. The report was prepared by John B. Price, assistant director of the International Center.

A report on the final portion of this series of studies will be presented in a future issue of *Textile Topics*. The subject will be the influence of blowroom and cardroom machinery upon processing and rotor spinning performance.

TABLE VII

INFLUENCE OF GIN CLEANING TREATMENTS ON YARN PROPERTIES

SEED COTTON CLEANING		M.E.*	M.E. AND CYLINDER CLEANERS			NORMAL
LINT CLEANERS		0	0	1	2	2
Count-Strength-Product	Initial	1984	1976	1994	1978	1954
	Final	1915	1937	1958	1922	1909
Yarn Tenacity (%)	Initial	12.25	12.23	12.12	12.15	12.06
	Final	11.85	11.86	11.88	11.80	11.81
Elongation (%)	Initial	6.05	6.14	6.11	6.12	6.15
	Final	6.08	6.01	6.03	6.00	6.08
Non-Uniformity (%)	Initial	14.41	14.40	14.47	14.43	14.51
	Final	14.80	14.88	14.90	14.87	14.92
Total Imperfections (Per 1000 yds)	Initial	126	124	134	127	138
	Final	162	164	168	164	170
Hair Count	Initial	541	528	545	533	538
	Final	1391	1362	1280	1317	1341

*M.E. = Multistage Extractor

TABLE VIII

INFLUENCE OF GIN CLEANING TREATMENTS ON SPINNING PERFORMANCE

SEED COTTON CLEANING	M.E.*	M.E. AND CYLINDER CLEANERS			NORMAL
LINT CLEANERS	0	0	1	2	2
Breakage Rate (per 10^3 rotor hours)	125	145	144	139	138
% Trash Related Breaks	16.1	7.0	6.2	7.6	9.7
% Entanglement Related Breaks	77.2	82.8	86.5	86.1	84.9
% Unknown	6.7	10.3	7.3	6.2	5.4

* M.E. = Multistage Extractor

HELP NEEDED

The time has come for updating our mailing list, and we ask your help with this once again. We need to know if there has been a change in the address of your organization or a change of personnel, or if you know someone who would like to receive *Textile Topics* but is not on our current mailing list.

Likewise, we need to know if you want to continue receiving *Textile Topics* or if you would like for your name to be removed from the list.

We need this information by September 1992, which is the beginning of a new fiscal year for us. If we have not heard from you by that time, your name will be automatically removed from our *Textile Topics* mailing list.

INTENSIVE SHORT COURSE FOR EGYPTIANS

The International Center was pleased to have Dr. Mostafa Mohamed Kamal and Dr. Sami Mohamed Abou-Fadl of the Giza Cotton Research Institute, Giza, Egypt, with us for a three-week course in cotton production, fiber testing and fiber processing. This special training course was sponsored by the Agricultural International Development program through the Egyptian National Agricultural Research Project of San Diego State University, San Diego, California. As part of their course, Drs. Kamal and Abou-Fadl visited the USDA Cotton Ginning Research Laboratory, the Texas A&M Research Station and the USDA Cotton Classing Office in Lubbock. The remainder of the time was spent studying and observing research being conducted at the Center.

We enjoyed meeting and visiting with these gentlemen, and learned much from them. We hope there will be an opportunity for Drs. Kamal and Abou-Fadl or others from their organization to visit with again in the future.

We would like to remind our readers that the Center offers special training programs for various groups with classes tailored to the needs and desires of the participants. We welcome inquiries from anyone interested in discussing such a program.

EQUIPMENT DONATION

Some time ago, Lorenzo Textile Mills of Lorenzo, Texas donated an A.M.H. Feed-O-Matic chute to the International Center. This enabled a fourth card to be added to the line of cards in our cardroom, bringing the total number of operational cards at our facility to five. We believe that it is very important to have this increased versatility in our cardroom, particularly in regard to our heavy involvement in cleaning research.

We are grateful to Lorenzo Textile Mills for their generosity.

MR. SMITH GOES TO SEVILLE

We are occasionally asked to provide experts to participate in seminars and meetings in other countries and, in the past, members of our staff have gone to various parts of the globe to deliver papers and lectures on many different subjects.

The week of February 16, Harvin R. Smith, head of our materials evaluation laboratory, travelled to Seville, Spain to lecture at a Cotton Fiber Technology Course sponsored jointly by the Agricultural Department of Andalusia and The Mediterranian Institute of Agronomy. Smith lectured on the development of high volume instrument (HVI) technology and its usage in the international cotton textile industry.

VISITORS

In contrast to previous months, February brought few visitors to the International Center. We hope those who did defy the February doldrums found the time spent here worthwhile.

Those visiting included Bill Robinson, ICI Fiberite, Tempe, AZ; Steve Clarke, ICI Fiberite, Greenville, TX; twelve textile students from Lubbock Christian University accompanied by Linda Cash, their instructor; and a class of forty Agricultural Economics students from Texas Tech University with their instructor, Dr. James Graves.