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Contamination: An Industrywide Issue

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Over the last year, Cotton Physiology Today has covered many topics relating to plant growth and management. Economic health requires more than just efficient production; it also requires efficient and profitable marketing. Because of the threat from contamination to U.S. cotton's reputation and recent gains in market share both at home and abroad, this issue focuses on contamination, why it should be avoided and how.

History of Cotton Pricing

Historically, the price of cotton has been based largely on reputation. Before government classing, each growing region had a reputation for producing certain fiber types (S.E. coastal region = Sea Island Cotton, Mississippi Delta and tributaries = long and strong fiber, Southwest desert = short and coarse). With establishment of the Universal Quality Standards in 1914, more of the price could be based on bale quality because a common language for grade and length could be used to describe what qualities were available at what price. No longer did a cotton broker have to look at each bale sample. As more measurements of quality are added, micronaire in 1966 and strength, color, trash and elongation in 1991, the price of a bale can be determined more by its measured quality and less by its reputation. But even under HVI, many important quality features are not measured and, as is natural, price will continue to be determined in part by reputation. The one unmeasured factor that places the greatest blemish on cotton's quality reputation is contamination from unnatural sources.

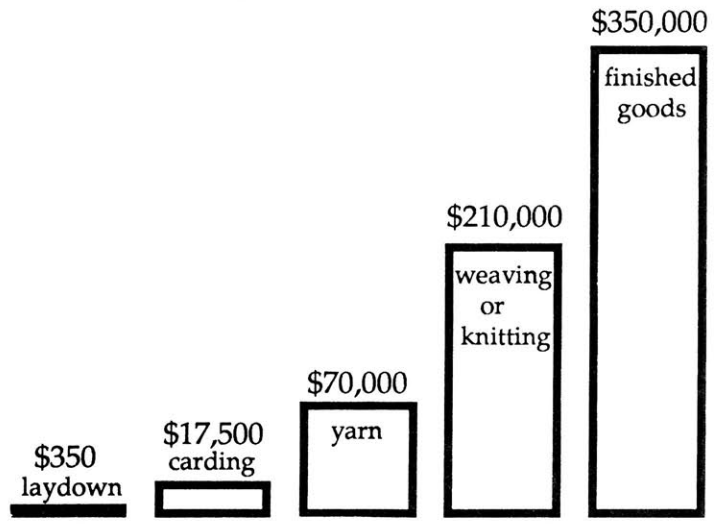
Contamination and Modern Spinning Equipment

Contaminants are an increasing problem as gins and mills utilize more sophisticated equipment and remove the human element. In the "old days" of ginning and textile manufacturing, an army of workers monitored the conversion of seed cotton to fabric. In older gins, watchful eyes handled suck pipes, whereas today's modern gins employ automatic module feeders. In the opening room, where bales are laid down and fed into the blending and cleaning machines, the work used to be done by hand, with an employee picking lint from 3 to 5 bales and feeding it into the blending and carding machines. If a piece of twine or cloth appeared in the bale, he would pull it out.

Modern machinery has replaced these workers, with robotics and automated systems now doing the work. The modern opening and blending process automatically feeds multiple bale laydowns. If contaminants exist, this automated, large-scale system can blend them from one bale with lint from many other bales. Take, for example, one contaminated bale that goes undetected and is blended with 29 contamination-free bales in a laydown. When three of these laydowns are then blended together, the potential exists for 45,000 pounds of contaminated cotton. Again if undetected, yarns manufactured from these contaminated cottons may be blended with contamination-free yarns to produce a fabric — thus creating the potential for many thousands of square yards of contaminated fabric from one contaminated bale.

Although fabrics are periodically checked, if undetected the contaminated fabrics may be sewn into finished goods resulting in the highest losses. Sewn and finished goods are the most costly place to locate contaminants because so many processing steps have occurred and the value added to the raw product is greater. The bar chart below illustrates the increased loss during each stage of mill processing. Losses in finished goods are at least 1,000 times more expensive than when a contaminant is found in the bale prior to blending in the opening room.

Dollar Loss From Contaminants



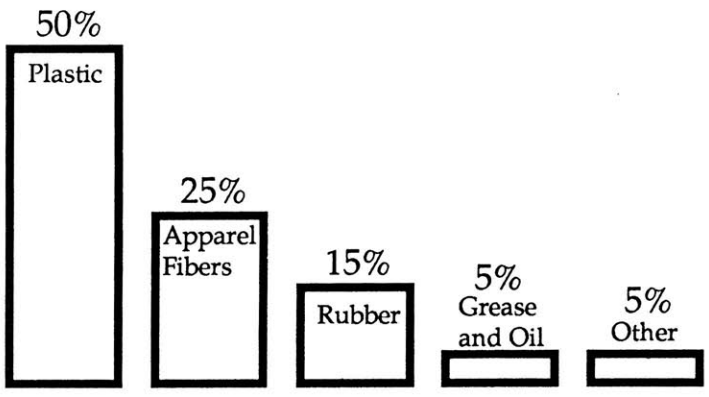
Lint cleaning, whether in the gin or mill, relies upon physical differences between the fiber and the contaminant for the basis of separation. If the contaminant is heavier or larger or even shaped differently, engineers have been able to design separation machines. however, when the contaminant is of similar size, shape and weight as lint (as are our major contaminant problems), then it is virtually impossible to remove them prior to the irate shopper returning the defective goods. Polypropylene twine is the No. 1 contaminant problem, partially because of its similarity in size, shape and weight to cotton lint.

Contaminants Have Changed over the Years

Contamination has always been a concern for textile mill processors. However, over the years contaminants have changed. In the late 1970's approximately 25% of all contaminants originated from plastic materials, 25% originated from rubber materials, and about 50% from grease and oil. Grease and oil contaminants were coming primarily from the bale surfaces, where exposed cotton had come in contact with grease and oil in storage and transportation. Bale packaging programs that promoted improvements in packaging materials and fully covered bales have helped to eliminate these problems. In 1970, 100% of the U.S. bales had exposed sides, while in 1990 all of the bales are fully covered except for the sample holes. Additionally, an industry push led to the establishment of standards for bale conditions which help to assure that bales arriving at textile mills are in satisfactory condition.

Contamination continues to be a problem in the textile industry, but again, the contaminants have changed. Reports received within the last year indicate that contamination from grease and oil makes up only about 5% of the total problem. Rubber now accounts for approximately 15% of the problems. Plastic accounts for about 50% and apparel fibers 25% of the problems. The remaining 5% comes from other materials such as paint and metal.

Distribution of Contaminants



Grease and Oil

Grease and oil account for about 5% of the problems reported. Most grease and oil contamination now appears to be coming from within the bale itself. Possible sources include excess lubrication in harvesters or ginning machinery. Grease build-up from over-lubrication of spindles is a problem that can be reduced by steam cleaning picker heads at the start or end of each day. In addition, leaks in hydraulic lines or worn seals on module builders or bale presses can lead to oil contamination of seed cotton and lint.

Rubber

Rubber continues to be a major contaminant, accounting for about 15% of the problems identified. One possible source is rubber doffers on cotton pickers. If adjusted too tight, spindles can grind doffers and create thousands of small pieces of rubber material which are mixed in with seed cotton. Because these rubber pieces created by over tightened spindles are similar in size and shape to cotton lint, they cannot be removed during seed cotton or lint cleaning processes.

If spindle twist is occurring, moistener systems should be checked instead of tightening down on spindles. An alternative is to use non-contaminating doffer materials. If adjusted too tight, these materials break off in chunks rather than small slivers. These chunks, similar in size to sand and dirt, can be removed in normal cleaning procedures. The National Cotton Council's Committee on Quality Assurance and Education has set a date of 1993 for release of alternate doffer materials. Both Case I.H. and John Deere have indicated they are currently researching alternate materials.

Bunge cords when used to hold down module covers can also get into the seed cotton and be ground into black strings in the gin stand's seed roll. The gin stand is where lint is pulled from the seed. Unfortunately this is also the place where hats, shirts, rope etc. can get recycled and ground into lint size particles, turning high quality lint into "newspaper grade" contaminated cotton.

Plastic

Almost 50% of all contamination problems are caused by plastic. Plastic fibers found in cotton fabric include every possible color: black, red, blue, orange, purple and lavender. However, rarely do these contaminants originate from bale packaging materials. So where do they come from? In today's disposable society, plastic trash on the roadside becomes man-made tumbleweeds, spreading the seed of con tamination into cotton fields near population centers. These materials can be picked up by harvesters

and incorporated in seed cotton. Producers should checks fields as they are being picked — especially those near traveled roadways — to insure that trash has not blown in during the night.

Polypropylene or other twine used to hold down covers on modules or trailers accounts for a large percentage of the plastic contamination in bales. Cords may be left on modules and become entangled with seed cotton and be pulled into a gin's suction pipe or module feeder. The twine can become broken up by gin equipment and contaminate several bales of lint. To avoid problems from module tie downs, it is best to use cotton rope to secure covers. In addition, ropes should be fully removed from the seed cotton prior to ginning. Ropes or twines should also be removed because they can cause damage to gin equipment if they become entangled in shafts or other pieces of equipment.

Plastic irrigation tubes also can become contaminants. If these materials are left in the field, they may be picked up by harvesting equipment and contaminate seed cotton. To avoid problems from these materials, producers should be certain that all such materials are properly removed prior to harvest. Plastics and other materials on gin floors, around gin machinery and in other areas can cause contamination. These materials can become incorporated with seed cotton, be ginned and contaminate baled lint. Be sure that all areas around the gin are clean of foreign materials.

Tarps or covers used on seed cotton modules or trailers also may be a potential source of contamination. If covers become torn or frayed, loose materials may enter the gin with seed cotton and contaminate baled lint. The best way to avoid potential contamination from module or trailer covers is to use cotton duck module covers. It is less likely that these cotton materials will contaminate the lint. If covers made from other materials are used, be sure they are in good condition before use, with no torn or frayed areas. Periodically check covers to assure that they are not torn or frayed.

Apparel Fibers

Many of the contamination problems we see — about 25% — are caused by apparel fibers, such as polyester, rayon and nylon. Possible sources of these materials include pieces of clothing from gin employees or farm workers. This may be the result of a worker who gets hot and removes a shirt, jacket, gloves or cap and sets it in the wrong place. The material then becomes hidden in the seed cotton in a module or trailer, or is picked up by a gin's suction pipe. Even a 100% cotton garment can be a contaminant if it is colored and the cotton is going into a white fabric.

Metal

Other materials which are sometimes a problem, although rarely, are large foreign objects in bales. When cotton was hand picked, this kind of contamination in seed cotton was not always accidental. Materials such as metal flashing, wire and tools have been found inside bales. If not caught in time, materials such as these can cause equipment damage, fire and possible injury.

Spray Paint

Another item which is a potential contaminant is spray paint used to mark seed cotton modules or bales of lint. Regular spray paints cannot be removed during normal textile processing and can stain lint, contaminating finished goods. The use of BRAND-A-BALE, developed by Cotton Incorporated, for marking modules and bales eliminates the problem. BRAND-A-BALE can be removed during normal textile processing.

Education and Research Efforts

The cotton industry is trying to solve the lint contamination problem from several directions. The textile industry is developing a bale tracking system to identify the bales used in each lot of garments, ostensibly to guide future purchases or recoup damages from contamination.

Through photographic analysis with sophisticated laboratory equipment such as the Scanning Electron Microscope and Fourier Transform Infrared Spectroscopy, contaminants can be accurately identified, possibly even to the manufacturer. Numerous national and local cotton organizations and co-ops are developing contamination education programs. But the most important step to reduce contamination comes from the producer and ginner as he instructs his employees. Unless the farm hands and gin workers hear about contamination from the man who signs the checks, the problem will continue to drag down cotton's value and reputation.

The United States cotton industry has a reputation for providing a quality product and quality service. This is an industrywide problem, and all segments must work together to assure cotton's high quality is not harmed because of contaminants. Each segment must assist in the educational effort of its particular group, as well as that of others, to assure all possible steps are taken to avoid contamination. Brochures and posters which discuss many of the issues, are available from the National Cotton Council.

About the Authors

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The National Cotton Council (NCC) is the central organization representing all seven sectors of the U.S. cotton industry: producers, ginners, warehousemen, merchants, cottonseed crushers, cooperatives and manufactures. A majority of elected delegates from each sector must approve all NCC policies, thus assuring unity of purpose and action.
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