# OTHER EMERGING GIN TECHNOLOGY

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## Abstract

This report is a brief overview of some of the research activity that is currently going on at the three USDA Ginning Laboratories. The various research projects cover every aspect of the ginning process as well as aspects of variety and raw fiber quality, and textile processing/quality. Projects being worked on include working with cotton breeders on development of new varieties/strains, new cotton cleaning techniques, gin measurement of cotton condition and quality, automatic control of both saw and roller gins, seed handling, better control of particulate emissions, etc. Detailed information about any of the individual projects can be had by contacting the particular laboratory conducting the research.

## Narrative

This overview will be given by laboratory beginning with the eastern most lab and working west. Each laboratory does not necessarily cover all facets of ginning research at any one time with their research program, and each lab is probably working on other projects that are not being reviewed here.

U.S. Cotton Ginning Laboratory, Stoneville, MS:

This laboratory, which serves the Eastern portion of the Cotton Belt, has been developing a computerized process control system that will soon be commercially available. The system provides a means of prescription ginning cotton based on its needs and the desires of the farmer. Six patents that are involved in the system have been issued and three are pending. Automated directional valves for seed cotton cleaners, and seed cotton and lint pipes have been developed. An inexpensive but yet accurate moisture sensor has been developed to measure the moisture of seed cotton and lint. The sensor is available as a portable and an inline sensor. The system is based on optimization software that originally took over an hour to execute but now can be done in less than a second. Software to control the valves and direct the flow of the cotton based on the optimization decisions is also available.

Other components of the control system include a paddle sampler that collects and compresses seed cotton and lint samples for analyses which has been licensed to Samuel Jackson to market. A compression ram, and automated calibration device to ensure that the sensors remain in calibration is used to maintain quality control. Automated directional valves for lint cleaners are also available.

Much of the computerized process control hardware and software has been licensed to Zellweger Uster for manufacture and marketing by 1999.

Work on bale packaging has resulted in three related developments. One development is a device to return a cotton bale with broker ties to its original compressed density and allow installation of new ties. This device is being patented and plans are for it to be available in the summer of 1997. Another device has been developed to reduce the forces involved in packaging cotton bales by 20 to 30%. A third development is a system to estimate fiber moisture at the press. Patents are currently being pursued on all three developments.

The patented paddle sampler and patented moisture sensor have also been incorporated into a spindle harvester and in a module builder. Plans are for commercial versions to be available in the near future.

An automated device has also been developed to predict the stickiness of cotton that is caused by insect sugars. The device can be used as a stand alone or an online system in the gin or laboratory.

Cotton Production and Processing Research Unit, Lubbock, TX:

The Lubbock lab, which primarily serves both stripper and picked cotton areas in Oklahoma and Texas, has been working for a number of years on an alternative seed cotton drying system called the "belt drier". This drier has been licensed to Kimbell Gin Machinery Co., Lubbock, TX, for commercial manufacture. However, scientists at the laboratory are still actively engaged in the technology transfer process that is ongoing. A recent installation monitored by ARS scientists was at the Commonwealth Gin, Windsor, Virginia. This installation was done for the 1995 ginning season and has processed as average of 45,000 bales/yr for the last two ginning seasons. Results have been good for processing efficiency, cotton quality, and fuel costs under the cotton harvest conditions of the Atlantic Coast.

Another project that involves use of the belt drier technology is a cooperative project with Cotton Inc. This project is to develop a technique to commercialize production of "easy-flow" cottonseed. What it involves is a method of wet application of 5% corn starch by weight to fuzzy seed and then immediately drying the mixture for further seed handling and storage for use as a dairy ration. A belt drier is used to dry the seed once the corn starch has been applied by a mixing auger that feeds the belt drier. The relatively long drying time of the belt drier is sufficient

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to thoroughly dry the wet mixture. Once the corn starch mixture is dried on the seed surface, the linters are bonded together and form a hard slick coating on the seed. This coating changes the handling characteristics of the cottonseed. It enables the seed to be processed by grain handling equipment which can't be done when the seed is in its untreated or fuzzy state. Feeding trials of the treated seed are currently underway.

Research is also being conducted at Lubbock on evaluating the particulate collection efficiency of several experimental cyclone designs. The designs being tested are full size models of cyclones that showed improved collection efficiency as small scale models. Preliminary indications are that significant improvement in collection efficiency over the standard 1D3D cyclone is possible.

Other work at the Lubbock Ginning Lab include work to reduce seed cotton fires in cotton strippers, effects of defoliation and desiccation treatments on seedcotton storage, cottonseed moisture transfer rates, and various other cleaning and ginning studies.

Southwestern Cotton Ginning Research Laboratory, Mesilla Park, NM:

The Mesilla Park Lab serves the Western Cotton Belt states of Arizona, California, and New Mexico. This laboratory conducts roller ginning research on Pima cottons as well as well as ginning and processing research on the normally saw ginned upland cottons.

A current technology transfer project involves the automatic computer control of the roller gin stand. This technology has been utilized in New Mexico and Arizona roller gins and has just been installed in a new California roller gin for the 1996 season. Previous experience has shown that the computer control increases gin throughput rate by 10 to 15% over the normal manual controls with much less downtime due to chockages. This holds true also for the Semi-Tropic Roller Gin in California this year. The control system performed well under very adverse harvest and ginning conditions due to continued heavy rains and resulting high moisture cotton.

An ongoing cooperative project with Lummus Corp. on commercial development of the coupled lint cleaner has made significant progress recently. Redesigning the lint cleaning saw cylinders has greatly improved the air flow path through the machine and maintained the fiber quality advantage of the experimental cleaner. All of the length, trash, and nep measurements of cotton fiber processed through the coupled lint cleaner are either statistically significantly superior or tend better than the standard two saw lint cleaner control. The work remaining to be done involves developing the design to accommodate retro-fitting of the lint cleaner behind existing gins in a commercial gin plant.

Another project involves development of an experimental system using air temperature and air and cotton flow measurements to determine initial seed-cotton moisture levels. Laboratory tests show promise of being able to make a reasonable moisture measurement without having to use sensor plates or interrupt the flow of cotton in any way. Field tests will yet remain to be done to further validate the process.

Testing of model cyclone designs continues with the goal of better understanding the important design considerations of cyclone collectors. Several important design considerations such as the formation of the trash inlet as well as several new designs have shown to significantly increase cyclone collection efficiency. This is a cooperative project with promising improvements being tested full scale at the Lubbock Ginning Lab.

Other research projects ongoing include a new Pima lint cleaner, measurement of true fiber color and video differentiation of trash types in the ginned lint, cooperative work with New Mexico State University on improving the processing quality of newly developed cotton strains etc.

Information on these and other work being conducted at the ginning laboratories can be had by contacting Stanley Anthony, Research Leader, Stoneville Lab, phone 601-686-3093; Roy Baker, Research Leader, Lubbock Lab, phone 806-746-5353; or Ed Hughs, Research Leader, Mesilla Park Lab, phone 505-526-6381.