COTTON GIN TECHNOLOGY AND CONSOLIDATED

Russell M. Sutton
Vice President/General Manager
Consolidated Cotton Gin Co. Inc.
Lubbock, TX

Introduction

Cotton gin machinery manufacturers and ginners are constantly challenged. To say that both are caught between a rock and a hard place may be putting it too mildly. Some of these challenges include, processing multiple varieties of cotton with some areas having both stripper and picker harvested varieties, varying moisture levels, and crops harvested with varying degrees of maturity under every harvesting condition imaginable. In order for ginners to satisfy producers and remain profitable this product must be processed at high speeds, operate 24 hours a day, seven days a week, and run trouble free, with a minimum of labor and supervision. Also the gin must operate at lower power and fuel requirements than ever before, process the entire crop within a 3-month period, and need virtually no repairs when the season is complete. To top this off the textile mills would like the gins to take this widely varying product and produce a nice, homogeneous product. This allows the mills to operate at faster and faster spinning speeds with less labor, higher accuracy and dependability to successfully compete with synthetic fibers and foreign markets.

All of these challenges may seem impossible to some or common place to others but one thing is for sure, gin manufacturers are under constant fire from the textile industry to change. To quote one author from a previous Beltwide Conference, "The fact is that ginning technology has not changed over the last fifty years or more, only the machines run faster and produce more bales per hour but the approach has not changed." When in fact, over the last fifty years ginning technology has evolved into much more than just faster equipment. Advancements have been realized in every area of production, harvesting, storage, materials handling, drying, seed cotton cleaning, ginning, lint cleaning, moisture restoration, and bale packaging. Not to mention major advancements in fiber measurement devices, marketing techniques, and information distribution all enhancing cotton and cotton ginning techniques. All of these advancements have enabled manufacturers to deliver a more homogeneous and desirable product to textile mills for processing on more advanced textile machinery. Consolidated Cotton Gin Co. Inc. is proud to have been a part of these advancements and will continue to contribute to the ongoing transfer of technology, which has brought this industry to where it is today. Following is a list of areas in which Consolidated has made recent advancements in machinery development and design.

Reprinted from the *Proceedings of the Beltwide Cotton Conference*
Volume 1:409-410 (1999)
National Cotton Council, Memphis TN

Discussion

Drying

In the area of seed cotton cleaning, drying has always been and remains a very important, controversial area in ginning. The absence of a quality drying system can be very detrimental to the process and to fiber quality. Consolidated has chosen a system called the Even Heat Dryer that introduces hot air along three points within the dryer. This will keep the temperature constant throughout and allows the use of lower temperatures at the mix point. This drying system has proven to be very effective on high moisture cotton while having the flexibility of operating with lower temperatures when practical. Improvements in moisture monitoring equipment have enabled drying systems such as the Even Heat to react quickly as cotton conditions change. These characteristics are important in a drying system in order to minimize the amount of heat required and maximize the fiber properties.

Seed Cotton Cleaning

Consolidated has a history of developing equipment designed to operate in the harsh environment of stripper harvested cotton. Naturally when the USDA Laboratory in Lubbock, Texas developed the multistage stick machine, Consolidated jumped at the opportunity to license this product. This concept incorporates three stages of primary saw cylinders within one machine to enhance the effectiveness and performance of a stick machine to remove bark and reduce overall trash content. Consolidated adopted this concept when designing the Rescuer 5000. This machine has shown superior performance over conventional combination burr and stick machines. Originally designed for stripper cotton, the use has spread to picker areas where Ultra Narrow Row production has gained popularity and the need for additional seed cotton cleaning has increased.

Gin Stand Development

Consolidated was the first manufacturer to incorporate a narrow spaced rib design to increase the number of saws within a given width gin stand. This change allows for more efficient removal of lint leaving fewer fibers on the ginned seed while having minimal effects on fiber quality. This also enables the gin to operate more efficiently with higher production with less power requirements. Every domestic gin manufacturer has adopted this concept with the same or similar spacing.

Incorporating a removable wear plate and a stainless steel rib design reduces maintenance cost and prolongs rib life. Research for the ultimate materials to further enhance rib life will continue. Replacement ribs for all makes and models of gin stands are now available by other manufacturers. There is ongoing research of gin rib design

to enhance gin stand performance for all conditions and to target specific areas of cotton production around the world as cotton characteristics may change.

Consolidated was the first to manufacture a wider model of gin stand to address the always-present pursuit for higher production. This move appears to have been successful in obtaining high production rates while offering no adverse effects on fiber quality. The results of this is a 198 saw gin stand, ten feet wide, which can process in excess of 20 bales per hour for extended periods of time.

Lint Cleaning

In order to keep up the pace with the 198-gin stand, the need quickly arose in our product line for a high capacity lint cleaner. The design criteria for our Engineering staff became rather lengthy, taking into consideration every aspect of lint cleaner efficiency. Research of established data on lint cleaner performance revealed that most lint cleaners today were operating outside the ranges of optimum operational curves of batt density, and combing ratios. This appears to be the result of gin stands processing at higher capacities than lint cleaners were originally designed for. Consolidated set out to design a lint cleaner that could operate at capacities of modern gin stands and maintain desired batt density and combing ratios. Also this will allow the gin to single lint clean on cotton with higher trash content more often than ever before. The result was the Super 120 lint cleaner, a 24-inch diameter saw lint cleaner incorporating the latest technology in controls, safety interlocks, and grid bar design. Superior batt control within the cleaner was the result of a break through in airflow control and condenser design. This allows operation at production rates as low as 8 bales per hour and as high as 24 bales per hour, targeting the 18-21 range for optimum batt density and combing ratios.

Bale Packaging

Ginners have recognized the need to add moisture to fiber after the gin stand, prior to the bale press. Several methods are available to apply this moisture into the fiber. Consolidated and other manufacturers have chosen the moisture condenser method which forces moisture through the batt in the battery condenser. This has caused problems in condenser operation in the past. Consolidated completely re-designed its moisture condenser in order to overcome the problems previously encountered by other moisture condensers. This design allows ginners to add a wide range of moisture into the lint trouble free.

Demand for a high performance down-packing press prompted Consolidated to utilize variable displacement hydraulic pumps to enhance efficiency and speed, resulting in the first 45 bale per hour down packing press. This gain in efficiency from the design change in the pumps carries over in the design of other presses within the product line. Another major change is the use of a double acting main cylinder incorporated into the design of an up-packing press. This gives full control of the cylinder speed and positioning while not having to rely upon gravity to lower the cylinder. Most recent designs within the industry still incorporate the use of a ram and casing which has to rely upon weight to lower the ram to the down position.

Total System Design

Consolidated not only utilizes the latest in machinery technology but incorporates a system approach to enhance gin plant performance. This approach begins with a good drying system early in the process. With modern moisture controls and the Even Heat dryer, reduction of high moisture early enables the seed cotton cleaners to do their job. Our approach is to use the Rescuer 5000 stick machine to remove heavy trash early in the process and allow the second stage of pre-cleaning to remove pin trash and leaf trash prior to ginning. This approach will result in less trash particles remaining in the fiber for the lint cleaners to remove. Air jet type centrifugal lint cleaners have been shown to reduce leaf grades from ½ to 1 full leaf grade, and when used prior to the first stage of a Super 120 lint cleaning system, may result in requiring only one stage of saw type lint cleaning. Finishing out the process with a moisture condenser to add back lost moisture rounds out the system that will deliver to the mills a uniform, high quality product, which will provide optimum value to the producer at a low cost to the ginner.

Summary

There will always be room for improvement in gin machinery technology. Current machinery cannot improve the actual fiber quality. It is often stated that ginning cotton is a compromise. Balancing the value of the finished product with fiber quality, and maximizing producer's profits. Consolidated as well as others have developed machinery and a total system design to help reduce the amount of compromise necessary. Ideally future development will eliminate the compromise totally and be able to enhance fiber quality. A clear understanding of the objectives, good quality people, and experience are the keys to Consolidated's ability to continue to make major breakthroughs and advancements. Communication between the textile industry and the ginning industry is imperative to maintain a clear set of goals and objectives. Communication has improved drastically as is evident with the signing of a memorandum of agreement in early 1997 here in Orlando at the National Cotton Council Meeting. This concentrated effort will bring more understanding between both industries and help bridge the gap.