

KIMBELL BELT DRYER
Dale D. Gray
Kimbell Gin Machinery Company
Lubbock, TX

Abstract

First new technology low temperature belt dryer installed in a picker cotton gin located in a high humidity region near Chesapeake Bay has a successful 40,000 bale year after converting from a tower drying system. A smaller single stream Texas stripper gin completes a 14,000 bale year in record time after converting from pipe drying to a belt dryer. These performances demonstrate value of the belt dryer over other systems.

Introduction

Thank you for the opportunity to visit with you today about the new belt conveyor dryer. We want to take a few minutes to report on the first commercial belt dryer installation in a high humidity picker gin. This installation was at the Commonwealth Gin in Windsor, Virginia; less than 30 miles from Chesapeake Bay and Norfolk, Virginia. The gin processes 40,000 bales annually at a 25 - 30 bale per hour flow through the split stream overhead system. Each gin stand is backed by tandem lint cleaners with the capability to run single or tandem cleaning. The gin receives all cotton through a telescoping suction system. They are processing about half of the crop from modules through the same unloading system since they don't have a module feeder. They market most of their cotton directly to mills with custom condition and quality specifications. They have their own in-house classifying office to assure compliance with special request from the mills. Quality conditioning and processing for early season green cotton to meet demand from the mills is very important.

The 1994 crop was processed through a first stage tower drying system with two 3-million BTU burners and a second stage pipe drying system with two 3-million BTU burners. A considerable amount of down time was experienced due to chokeup at the gin stand, lint cleaners, and inclines caused by inadequate drying of damp green cotton.

In August of 1995, the existing drying system was replaced with a Kimbell belt dryer and a single new 5-million BTU burner, to provide drying for the 95 season crop. A waste heat recovery system was provided to claim radiant heat from burner pipes and provide heat to the incline cleaner pull systems. The 40,000 bale 1995 crop was processed in one month less time than 1994 with only single stage lint cleaning resulting in better grades, better strength, more

consistency in fiber length, and lower trash content. The pin trash and dirt removed by the belt dryer precleaning and consistent drying, which also eliminated stickiness of green cotton, allowed the improved performance while using less fuel. The single stage lint cleaning would probably not been possible without pin trash removal prior to the agitation by the inclines and stick machines. A noticeable absence of static in the cotton emerging from the belt dryer eliminated the need for static control chemicals. These results were obtained on a 1995 crop which was lesser in quality at the time of field harvest than the outstanding 94 crop

At the same time a similar belt dryer was install in the Inadale Coop Gin located at Inadale, Texas. This gin is a single stream stripper gin located in Scurry County Texas in an area between the High Plains and the Rolling Plains which can be prone to have considerable moisture during harvest. This gin installed the dryer as a gravity flow system discharging directly into the first stage incline cleaner. The absence of static and the ability to gin green sticky cotton at maximum capacity allowed them to complete 14,000 bale year faster than any gin in the area.

Proven technology aside, the gin manager wants to know why I should be interested in the belt-conveyor dryer, what can it do that I can't do with the system I have now, and what does it cost? We wish to briefly address these questions in the few minutes we have.

We believe the belt-conveyor dryer offers the best drying technology available today as a result of eight years of development and testing by the USDA-ARS ginning and research lab at Lubbock and sponsored by Cotton Incorporated. Most gins should be able to install and operate this unit with their existing burners, fans, and controls. In fact, most of the gins we have looked at will be able to eliminate several burners and fans in their existing drying operation.

This machine comes to the gin plant today with a proven pedigree having been in development and production operation a combined eight years. This machine has run a quarter of a million bales in the production gin with prior gin lab testing spanning four seasons. The historical and technical support for this machine make it unique in gin machinery development. Not only are we at Kimbell prepared to come to your gin and provide custom installation design and drawings for your gin, but; the USDA-ARS engineers have pledged technical support available to any gin that desires quality assurance data on performance. They can answers any questions which may arise about application as well as provide economic impact assessment if needed.

Dryer Comparisons

The belt dryer is the fourth and newest technique for cotton gin drying being used today. The four types of dryers are... pipe, shelf tower, fountain, and belt dryer. The pipe, shelf tower, and fountain dryers are actually variations of the same concept. They basically allow the gin to control two of the three controllable factors which create drying. These three factors are temperature, air volume, and time. The belt dryer is the only approach which allows effective control of the time. The pipe, tower, and fountain system connected by 100 feet of pipe can only retain the cotton in the drying stream for approximately 5 to 6 seconds maximum which means the drying must happen very fast. There is not much time for the moisture to warm inside the cotton lock and migrate toward the surface where it can be absorbed by the air. Therefore the usual method to increase drying with these dryers is to install a bigger burner and turn up the heat with mix point temperatures often being as high as 600 degrees. If the fan and motor is large enough, the air volume is often increased which may not help. If the pipe size remains the same, putting more air in the pipe will increase the air speed thereby reducing the exposure time for the cotton to hot air.

The belt dryer adds time control to the drying system by employing a variable speed control conveyor belt which allows slowing the flow of cotton and increasing the exposure time without changing the speed or volume of the air. Since we can control exposure time, we do not need temperatures higher than 200 to 250 degrees for effective drying. We can easily slow the flow to allow 60 to 90 seconds drying exposure without affecting the ginning rate in bales per hour. The gin capacity in bales per hour is maintained at the slower flow by running the cotton deeper on the belt which does not affect the drying process.

Should you decide to build a pipe drying system to retain the cotton for 60 seconds, the average gin would need one mile of pipe. You might just run the pipe out the back of the gin to the farmer's house, tell him to dump in his cotton, and when it gets back to the gin in the pipe; it will be dry and ready for ginning. The static in the cotton might be a little high and the fan and motor to run the system might require a new power plant down the road. A tower dryer system for 60 second retention would require about 40 to 50 towers and probably an addition to the building.

Additional benefits obtained by belt drying is an absence of static in the cotton which helps ginning and cleaning machinery. We also remove a considerable amount of fine pin trash which sifts through the belt before the rotating machinery in the cleaning system thrashes the trash into the lint. This plus the low heat drying has consistently brought better grades and longer fiber.

Summary

In general summary the belt dryer is the best technology available for cotton drying and is proven by eight years of development, testing, and production drying under careful monitoring of USDA-ARS and Cotton Incorporated. The average gin can dry 14% moisture cotton down to 6.5% at the rate of 40 bales per hour, on a six foot wide belt dryer 35 to 50 foot long, using one 5 million BTU burner at 250 to 300 degrees and a 30 HP push fan, and 30 HP pull fan. It also can be operated efficiently using an existing trash fan as the pull fan. This will add the high moisture air to the trash line which will make the dust easier to collect and control. The belt dryer is the only technology available today for drying high moisture cotton in high volumes thoroughly enough to eliminate green sticky residues which enhances processing rates. It is the only system with documented seed coat drying of 2%.

Acknowledgments

We wish to give special thanks to Tom Alpin, Jr., owner and manager, of the Commonwealth Gin and David Server, manager of the Inadale Coop Gin. Their help, cooperation, and patience during installation and observation has been invaluable.