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PRECISE BALE MOISTURE MANAGEMENT STARTS WITH PRECISE HEAT MANAGEMENT

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Abstract

Gas provides energy to reduce the percentage of moisture in seed cotton entering the gin stream to levels compatible with the design and efficient function of the gin's various components.

Since moisture content is not uniform in incoming cotton, gin managers must constantly adjust heat inputs. Up to now, this management responsibility has been burdensome and imprecise, primarily because the capability to rapidly monitor two variables crucial to real-time maintenance of an optimal ratio of heat input and moisture was not available. These variables are (1) the volume of seed cotton entering the gin stream, and (2) fluctuating seed cotton moisture levels.

A totally new concept conceived and patented by Cotton Moisture, LLC, and marketed as the Precision Drying Control System, monitors these two variable in half-second intervals, determines the precise number of BTU's needed to dry seed cotton to the ginner's desired level, rapidly matches heat and targeted cotton, and when compared to conventional systems, reduces gas consumption by at least forty percent.

Introduction

Despite the many new technologies that have vastly improved cotton ginning over the years, a serious problem — over-drying — still persists. Since seed cotton arrives at gins with anything but uniform moisture content, gin managers have little choice but to maintain heat inputs that are often above an optimal level for a large portion of incoming cotton.

I know this from personal experience. For 20 years, I managed a small gin way out in the boondocks of the Mississippi Delta. Since it only served one customer — my father — it was definitely not a high-tech plant, and probably wouldn't even have impressed Eli Whitney. Its only claim to fame was that it had in it the world's first "Swinging Single" press.

As far as heat was concerned, I learned early on that I stood a better chance of not having to dig cotton out of choked-up machinery if I kept the heat set at a high level all the time.

My method for determining the heat setting wasn't all that complicated…or technologically sound. As long as pipes in the engine room were hot enough to keep the crew's lunch warm, as well as my grandmother's tray of cathead biscuits, I figured the heat was high enough. Whenever static electricity caused a man's hair to stand out on end, I knew the heat had gotten a little too high.

While such an unorthodox, but more often than not conventional, practice helps assure uninterrupted passage of cotton through gin equipment, it reduces overall economic efficiency due to increased gas consumption and reduced turnout, and it compromises fiber qualities mills desire by creating short fibers and neps and by rendering fibers more susceptible to breakage — not only in the gin stream, but also in the mill's rigorous carding process. And of course, over-drying hurts the producer's bottom line by reducing his commodity's value.

Gas provides energy to regulate seed cotton moisture. For efficient ginning and optimal fiber preservation, the cubic feet of gas must constantly be synchronized with:

- The volume of seed cotton entering the gin stream
- Fluctuating moisture levels of the seed cotton

Our Precision Drying System monitors these two variables in half-second intervals, determines the precise number of BTU's needed to dry the cotton to the ginner's desired level and instantly matches heat and the targeted cotton.

The Precision Drying Control System, one of two state-of-the-art, computerized moisture management systems our company manufactures for cotton gins, is a totally new and patented concept in gin drying control that precisely delivers the exact number of BTU's needed to assure all cotton reaches the gin feeder apron with a moisture content within one-half percentage point of that desired by the gin manager. Furthermore, when incoming cotton is sufficiently dry and no BTU's are needed, the system prevents gas from being consumed.

As mentioned earlier, moisture content is not uniform in incoming cotton, requiring ginners to constantly adjust heat inputs. Up to now, this management responsibility has been burdensome and imprecise, primarily because the capability to rapidly monitor two variables crucial to maintaining a real-time, optimal ratio of heat input and moisture was not available. These variables are (1) the volume of seed cotton entering the gin stream, and (2) the fluctuating seed cotton moisture levels.

Our system monitors these two variables in half-second intervals, determines the precise number of BTU's needed to dry seed cotton to the ginner's desired level, rapidly matches heat and targeted cotton, and in 2004 ginning season comparisons with other drying control systems — including the Samuel Jackson Moisture Mirror, IntelliGin, Granberry Fuel Miser, and Honeywell — reduced gas consumption anywhere from forty to sixty percent.

Focusing on energy is what differentiates our concept from all others. When we install our system, we first thoroughly analyze the gin's drying efficiency. By knowing all that is possible to know about a gin's energy efficiency as it pertains to drying seed cotton, we can calibrate our system to accommodate virtually any incoming moisture level ginners encounter.

While other drying systems often target specific temperatures, in our system temperature is a non-issue, at least as far as the system's operating mode is concerned. Our target is the desired moisture percentage in seed cotton entering the stands, regardless of the range of temperatures needed to do so.

To illustrate the efficiency, savings, and profit our system can generate for any gin and its customers, I want to share some data from several gins that used our Precision Drying System during the 2004 harvest season.

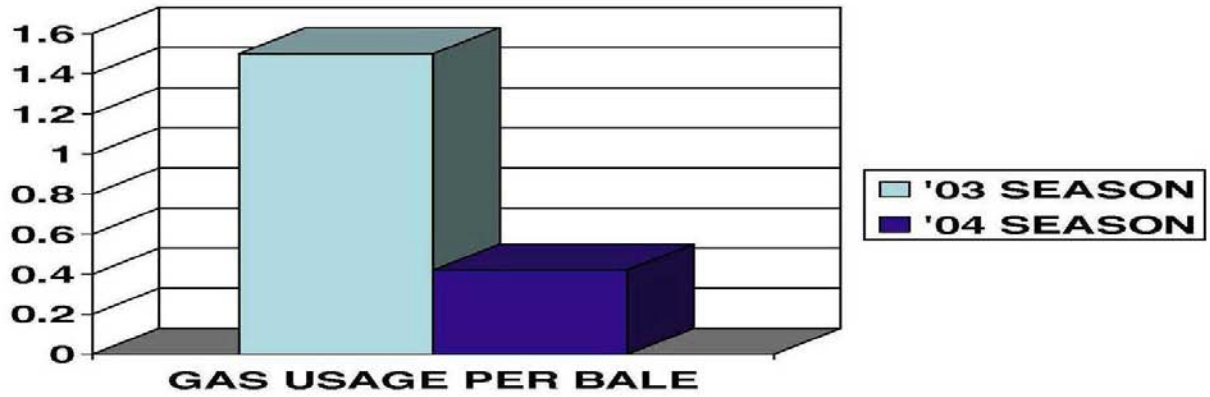

Figure 1. 2003, Credence Clearwater Gin, Boogeytown, Virginia, used 1.5 gallons of propane per bale. 2004, Credence Clearwater Gin, Boogeytown, Virginia, used 0.42 gallons of propane per bale, using PRECISION DRYING SYSTEM. Savings = 1.08 gallons of propane per bale.

Because they shared their propane storage tank with a local distributor and had to install an in-line meter to monitor their usage, the owners of this gin had a unique opportunity to make a precise comparison of gas consumption during two ginning seasons. In 2003, they were not only frustrated by expensive gas inputs, but also by their heater control system's inability to consistently coordinate drying needs with fluctuating moisture.

In 2004, they used our system to control heat and monitored per-bale gas consumption for comparison with the previous season. The results were astounding: They got the desired moisture content at the gin apron, they preserved lint weight, they dramatically reduced fiber damage, and as you can see, consumed 1.08 gallons less gas per bale.

These gin owners observed another advantage with our system. Although most of the cotton they ginned in 2004 was relatively dry and module moisture content remained within the 7 percent to 9 percent range, they also had to contend with high moisture modules on a few occasions.

When processing this kind of cotton, our system will use as much, and sometimes even more, gas than other systems, but because the system reacts instantly to fluctuating moisture in order to maintain the desired moisture at the gin stands, the owners observed that the gin ran continuously without having to stop for choke-ups and without dumping seed rolls.

They were able to maintain normal ginning rates per hour, per day and per week. The savings here do not derive from less gas consumption, but from avoiding more labor, electricity and other overhead inputs per bale…not to mention reducing stress on the gin crew.

Table 1. Precision Drying System v. Alternate System, Curb Service Gin, Boondocks, MS, 2004

System in use	Set point (% moisture)	Incoming Moisture (%)	% moisture at battery condenser	Average cubic feet/gas per bale*
Precision Drying System	4.46	8.13	4.33	136.4
Alternate System	N/A**	9.79	4.62	244.13

*Data represent average of 50-bale increments.
**System did not have a target set point.
FACT: When the alternate system was active, cotton contained 1.2 times more moisture than cotton when the Precision Drying System was in use, but consumed 1.79 times as much gas per bale.

Because this comparison was made at a gin that also operates our Moisture Restoration System, we were able to get an additional confirmation of our Precision Drying System's accuracy in targeting desired gin apron moisture content.

One of the primary components of our Moisture Restoration System is the Near Infrared Sensor that precisely monitors the moisture content of lint exiting the battery condenser. At this gin, the targeted gin apron moisture content of 6 percent equated a NIR reading of 4.6 percent, thus the set point indicated in this graph. Note that the difference in the set point and the actual lint moisture percentage at the condenser is insignificant — less than 3/100ths of a percent — a clear demonstration of our system's capability to dry cotton to precisely maintain the gin's peak operating efficiency.

Table 2. Bougaloo Gin Company, Aardvark, AL. Precision Drying System vs. Alternate System

Heat control	Set point	Incoming Moisture %	Moisture % Exiting Battery Condenser	Average cubic feet/gas per bale*
Precision Drying System	4.41	7.62	4.96	51.88
Alternate System	N/A**	8.54	3.90	224.48

*Data represent average of 50-bale increments.
**System did not have a target set point.
FACT: Precision Drying System's average per-bale gas consumption is 77% less than Alternate System.
FACT: When Alternate System is active, cotton contained 1.12 times more moisture than cotton when Precision Drying System is in use, but consumed 4.3 times as much gas per bale.

FACT: Over-drying by Alternate System hurts producer by reducing lint weight and increasing SFC and neps.

Data from another gin in 2004 shows an even more dramatic performance of our Precision Drying System. One thing you should know concerning these comparisons, should the ginner need his alternate drying system, our system can be deactivated with just the flip of a switch.

When our system is inactive, the valve is open and gas passes through it unobstructed; when our system is active, gas passes through the alternate system unobstructed. I point this out to demonstrate how easy it is to make accurate comparisons rapidly while the condition of incoming cotton remains relatively unchanged.

This gin owner was truly amazed, and who wouldn't be? As you can see from the facts listed below in the graphic, his average per-bale gas consumption dropped 77 percent! Admittedly, the cotton ginned during this comparison was quite dry, and that's when our system really shines.

But to further emphasize this comparison, let's say he normally used 1.5 gallons per bale. If he ginned 50,000 bales, he consumed 75,000 gallons of gas. Factoring in the 77-percent drop, that figure is reduced to 17,250 gallons. Such a vast differential would go a long way toward recouping his investment in our Precision Drying System.

Table 3, Loop-De-Loop Gin, Good Grief, MS, 2004 Ginning Season

Heat control	Bales per hour	Average per-bale Cubic feet gas, burners 1 & 2 combined	Cubic feet gas consumed during 23-minute cotton flow interruption, burners 1 & 2 combined
Precision Drying System	30	160	0
Alternate System	30	241	2386

FACT: Precision Drying System shuts off burners when cotton flow is interrupted.
FACT: 2386 cfm ÷ 160 cfm = gas wasted that could have dried enough seed cotton for 14.9 additional bales.

I'm sharing this final graphic with you to demonstrate what we mean when we say, "When no BTU's are needed, no gas is consumed." When cotton flow is interrupted, our system instantly halts gas flow.

We recorded this data at a Texas gin that uses our Precision Drying System. A problem at the press stopped cotton flow for 23 minutes. During that time, the burners were still operating because the conventional system did not have the capability to shut them down. Had that 2,836 cubic feet of gas been saved because the burners were off, as they would have been when controlled by our system, the wasted gas could have been used to dry enough cotton for an additional 15 bales.

What if this gin's cotton flow had been interrupted a total of an hour and five minutes off and on during the course of a day's run, and what if the burners continued to run during those interruptions? What you would be looking at is enough gas to process 50 more bales at the 160-cubic feet per bale capability our system delivers. Obviously, this is just a hypothetical scenario, but those of you who have worked in or managed cotton gins know how much downtime accumulates during an entire ginning season. Gas wasted during these interruptions seriously attenuates ginning efficiency. Our system prevents this waste.

Conclusion

The Precision Drying System frees gin managers from the task of constantly monitoring burners and allows them to focus on job number one: ginning cotton. This system dramatically reduces gas consumption, increases turnout, safeguards against over-drying, and thereby enhances the value of the producer's commodity.

In concluding this presentation, I want to share a bit of wisdom given to us by that revered philosopher, Yogi Berra, who once said, "When you come to a fork in the road, take it."

We all know that the U. S. textile mill industry, which not too long ago was the American cotton producers' number one customer, is now consuming less than 6,000,000 bales annually, whereas it processed 12,000,000 bales annually not long ago.

The cotton industry as a whole is at an uncertain fork in the road. Our Precision Drying System, which offers more efficiency and greater savings for gins, a more valuable commodity for producers, and the capability to deliver more desirable cotton to the end user, will definitely help those in the U.S. cotton ginning industry deciding which future directions to take.