

Seedcotton Conditioning Update

November, 2003

Following a banner wet year in 2002 in the United States, 2003 has provided some of the driest conditions in recent memory. Both situations have helped fuel new interest in seed cotton conditioning.

The first thing that came to my mind in viewing the flooded conditions across much of the mid-south in 2002, was “Why would anybody be interested in seed cotton conditioning with all this cotton under water?” The answer is that once the crop dries out (if it gets a chance to dry out), the fiber is more vulnerable than ever to breakage in a saw gin plant. In fact, these are the conditions where we see staple preservation approaching a full 1/16”!



Wet cotton conditions can strip the fiber of natural waxes. If the crop dries before ginning, the fiber is particularly easy to break, reducing staple.

I learned a little trick to help quickly evaluate the extent of fiber breakage. Take a close look at the seed pile from the gin. If there is an unusual amount of small fiber floating in the air or laying on top of the seed pile, enjoy the view. It is costing somebody plenty of money because you are looking at the staple that is being lost due to breakage.



Seed moisture, natural waxes, and ambient relative humidity while ginning all play a big role in staple preservation.

As mentioned in the previous seedcotton conditioning update, the moisture of the seed appears to play a big role in fiber breakage. If the seed has moisture, it will naturally migrate to the fibers, particularly close to the seed, and offer a form of inherent protection to the fiber when saw ginning. When the seed is dry, this protection is absent and the fiber is particularly vulnerable to breakage.

This situation can be compounded by factors other than moisture of the seed. Some of these include the amount of natural wax left on the fiber, which could have been stripped, as previously mentioned, by a flood or



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heavy rain condition. It is also impacted by the ambient relative humidity that the gin is operating in. A worst case scenario then, might be described as a cotton crop that has experienced heavy rain or flooding, followed by a very dry period, with the modules being ginned on a dry afternoon with low relative humidity.

I have received a number of comments about how many gins and agronomists are convinced that new cotton varieties are to blame for short staple. There is probably a lot of merit in their argument. It would be short-sighted however, to ignore the gin's role in loss of staple under the conditions described above and lay the entire problem at the feet of the plant breeders. Our observations and tests have shown that this is simply not the case.

Some gins I have visited carry the attitude that equipment to protect against fiber breakage benefits only the growers and that there is nothing in it for the gin, other than an increased gas/electric bill for running a humidifier for the seedcotton conditioning products. That is definitely NOT the case. The best evidence of this is seen in the eagerness of the vast majority of ginner to turn on the moist air for the gin stands. My curiosity was piqued by this one day and I learned a good bit from visiting with ginner about why they like running warm moist air at the stands.

Although different stands behave in subtly different ways to conditioned seedcotton, they share a number of common attributes. The primary difference is the capacity of the gin stand under conditions where seedcotton is arriving at the gin under 5% moisture. The conditioning process picks up capacity approximately 20% on each stand. This is true with the old Murray 90 and it is true with the highest capacity stands from Consolidated, Continental, and Lummus. It appears to be a natural and longtime phenomena of saw type ginning on dry cotton.

A good ginner will keep in mind that too much of a good thing can quickly become a bad thing. If incoming seedcotton shifts to a higher moisture content, even 7% or more, aggressive conditioning at the stands will quickly tighten up the seed roll and slow the stand down, or shut it down. It is for this reason that a good incoming moisture reading is a critical tool in operating hoppers at the maximum level for greatest benefit. It is for this reason that the Moisture Mirror product from our company includes a special alarm contact that can be wired to instantly divert the moist air away from the stands when a sudden upward shift in moisture occurs at the module feeder. Moist air



The Moisture Mirror includes a hopper cutoff function to immediately close moist air valves when wet cotton enters the gin.



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will be restored immediately when the modules are dry again. (That is what a “moisture coordinator” like the Mirror is for!)

Another common attribute is natural dust control. I was entering a gin in Africa recently when I noticed a row of bale bags rolled up forming a shallow dam about around the floor area surrounding much of the gin. A man with a fire hose was dispersing water in a gentle spray to keep the floor wet. The ginners were walking around in puddles of water on the floor. I was choking badly trying to breathe as I had forgotten my dust mask in the truck. I managed to form a question through my coughs to the technical manager at the gin. I asked, “Did you have a big fire here?” He pointed to the new Humidaire Unit waiting to be started (with a connection to the gin stands) and indicated that he was anxious to start it. After we commissioned the unit and the water temperature began approaching setpoint, I could instantly breathe freely again. I understood why he was anxious to get it started! There were huge smiles all around the gin, and I can guarantee that it was not because of the staple benefits!



In this photo, moist air is being applied at the feeders. The puddles of water on the floor were from spray to control airborne dust.

It is becoming common knowledge that seedcotton conditioning gives the ginner an edge for restoring moisture at the press, typically by a margin of an extra 5 pounds per bale. This makes the press crew’s job much more pleasant and speeds up the gin in some cases. It is not that the moisture is added to the fiber



A new style of double-entry hoppers places the valves on the side and avoids a moist air pipe over the gin apron.

to supplement the moisture restoration system at the press. In fact, the moisture added to the seedcotton is lost at the lint cleaners. Then why would the lint moisture system be improved? I feel it is because the cotton fiber has been prepared to accept more moisture at the press by the preconditioning process. Whatever the explanation is, it is a wonderful result, best appreciated firsthand by an experienced ginner.

In the early 1990’s, we were asked to



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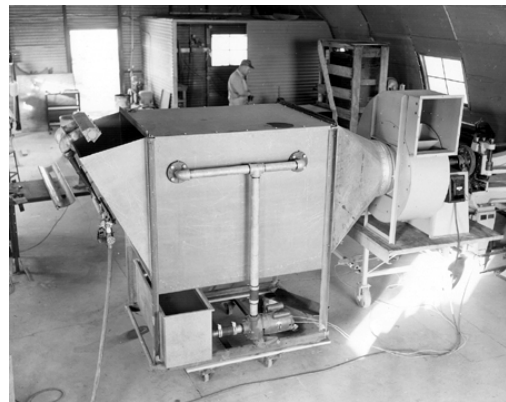
develop a hopper more effective for handling the increased flow of cotton through high capacity gin stands. For complex reasons that I will not go into here, we developed the “double-entry” hopper to provide moist air flow from both the rear and front of the hopper. This has become a popular and effective way of dealing with today’s high capacity conditioning needs. There has been a bothersome side effect of this however. The front entry on these hoppers has required a moist air pipe across the front of the gin stands. In cold weather, this pipe has the potential to drip on the gin stand aprons and it is seldom attractive in even the best of situations.

Several of our customers have suggested hopper styles that can avoid this pipe along the front. This year we took the dive and installed an experimental set in a high capacity gin in the Lubbock area. So far, the results appear quite good and we are considering adding this to our product line, replacing the old style of double-entry hoppers. The appearance is excellent and we see nothing taken away in performance.

For those unfamiliar with the conditioning hopper and its background, I will repeat a portion of the last seedcotton conditioning update below.

Background of the Conditioning Hopper

Many ginners know that the moist air generator for cotton gins was developed by Samuel G. Jackson in 1957 in a small factory in Lubbock, Texas. This generator was given the trade name of Humidaire Unit (a name still used for the more advanced devices manufactured by Samuel Jackson, Inc. today). Many cotton industry people think of the Humidaire Unit as synonymous with moisture restoration at the press, a testimonial to its extensive use in this application for reduction of hydraulic pressure, elimination of tie breakage, etc. What many people in our industry do not realize is that the first use of moist air at the press did not occur until the mid-1970’s! There is a 15-year period of moist air history that is helpful to review today in light of HVI classing, mill-direct contracts, and staple penalties.



The first Humidaire Unit (Model HU-40) being tested in 1957. These units were developed for seedcotton conditioning.

The primary reason the Humidaire Unit was developed was for seedcotton conditioning through a device called the



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Conditioning Hopper, located between the conveyor distributor and feeder inlet (replacing the original rectangular chute in that position). The vast majority of early applications were in arid regions of the Cotton Belt. Results were wide and varied, due to two influences.

- Lack of knowledge and shared data from seedcotton conditioning.
- Lack of High Volume Instrument classing.

The result was that there was no discernable benefit for the normal gin to operate a seedcotton conditioning system and many of those early systems were left to degrade due to lack of maintenance and attention. The only systems maintained and operated were at a small number of gins that sold directly to mills. The gin owners in these cases commented to Samuel G. Jackson that although they could not point to anything in particular, they felt that the conditioning gave their cotton some preferential treatment by mill buyers. Their gut instincts have recently been proven to be correct.

Samuel Jackson Conditioning Hoppers have been used for more than four decades in many of the arid regions of the world and are only recently being “rediscovered” in North America.

Principle of Operation

The Conditioning Hopper is custom manufactured by Samuel Jackson to fit the dimensions of the existing chute located between the conveyor distributor and gin stand feeder. Certain minimum dimensions are necessary, but it is rare to find a conveyor distributor so closely coupled that hoppers will not fit. On relatively low capacity gin stands, we employ a “single-entry” hopper with the moist air entering from the rear. The moist air exits upward, through the conveyor distributor. On high capacity gin stands (>10 bph), we use “double-entry” hoppers. In the early 1990’s, with the advent of high capacity gin stands in areas where hoppers were used, users noticed a “front” of moist air due to the relatively short residence time of the seedcotton in the hopper. This resulted in uneven conditioning. This observation ultimately gave birth to the product we know today as the “double-entry” hopper for high capacity gin stands.



An air-actuated valve stops the flow of moist air to seedcotton when the feeder stops. Note the black Cotton Koozie insulation system being used on the pipe in this system.

Each hopper moist air entrance is gated with



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an air-actuated stainless butterfly valve to stop the flow of moist air when the feeder stops. This prevents condensation buildup in the hopper and conveyor distributor. Moist air pressure and volume is regulated throughout the system so, that as gin stands come in and out, uniform conditioning is maintained at each stand. A compressed air regulator, filter, and lubricator assembly is supplied with each set of hoppers and the user is responsible for running the compressed air line for the valves. This compressed air line connects to the gin's compressed air supply. A small electrical control panel with interposing relays is also provided for the gin's electrician to wire feeder signals to the hoppers for automatic operation.

Characteristics of Operation

When ginning in extremely dry conditions (<6% incoming moisture), the characteristics of the seedcotton at the gin stand apron change dramatically. It requires no moisture meter to determine that the cotton is receiving significant humidification. The texture of the cotton changes to a soft velvety feel and the cotton hugs the apron on its way to the saws. Gin stand dust is reduced dramatically. When ginning dry cotton, we have observed seed roll density decreasing with the application of the moist air, while ginning rate increases by as much as 20%. Conversely, if the incoming cotton becomes more moist (>8% incoming moisture), this application of moist air increases seed roll density and can slow ginning rate if moist air saturation is not closely controlled. In addition, fiber property changes from the hoppers become much less significant as the incoming seedcotton moisture increases (>9% incoming moisture). At this time, we know of no fiber quality



Access is provided at each end of a double entry Hopper. Inside is the cavity where dry seedcotton receives intense conditioning.

benefits derived from running the seedcotton conditioning hoppers when ginning incoming cotton that is already moist.

Maintenance

Perhaps the most pleasant surprise for users of Samuel Jackson Conditioning Hoppers is from the standpoint of maintenance. Original hoppers introduced in the early '60's introduced the moist air through slots inside each hopper. These slots formed collection points for sticks and trash that could eventually choke the flow of cotton through the hopper. Thanks to valued input from an experienced user in the United States, a change was made to eliminate this problem. New hoppers channel the moist air through louvers not unlike those on an air conditioning register. The buildup problem has been eliminated, making maintenance a non-issue. Significant improvements in Samuel Jackson Humidaira Units have also dropped maintenance and cleaning expenses to levels where little if any cleaning is necessary during the course of a typical season.



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It's Nice to Share



The inside of a Conditioning Hopper as viewed from an access door. Louvered air inlets prevent buildup of sticks and trash but provide full flow area for moist air to enter hopper.

In the case of smaller gins (<20 bph) it is possible to share a single Humidaire Unit between a Lint Slide Grid at the press and the hoppers. In these cases, maintenance and investment in a single Humidaire Unit makes the installation of hoppers an easy decision. If one were to pose the question, "Will I get equivalent results to dedicating a Humidaire Unit to each application?" the answer would probably be "No", especially in exceptionally dry ginning conditions. The advantage for the small gin however, is that they receive a large return on investment from the use of a single Humidaire Unit and can migrate to independent units in the future if dry conditions remain and economics justify the expense.



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