

Vacuum Conveyor Yields Higher Wages at Milling Operation

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Since running her own artisanal bakery where she baked breads in brick ovens, with flour milled in-house, former baker, Jennifer Lapidus, now a miller and Founder/General Manager of Carolina Ground, a boutique flour mill in Hendersonville, North Carolina, has let her business decisions be informed by the reality of how the labor of production feels. “I look at it through the lens of how we can be doing things better, more efficiently, easier on the body, and in a way that will make things better on more than one front,” says Lapidus.

One of the early pioneers in the revitalization of locally grown stone-milled flour production that connects the farmer, miller and baker, Lapidus says there really wasn’t a modern example of this type of food production to replicate when Carolina Ground first opened its doors in 2012.

Like most start-ups, human capital and manual labor powered much of production. “In the beginning some of the ways we did things were archaic,” says Lapidus.

“During our first year, a manufacturer’s representative for VAC-U-MAX visited and saw what we were doing with a single mill and a bucket elevator and let us know what was available for automated transfer, even though we weren’t in the position of buying a lot of expensive equipment.”

Known for their expertise in food-grade systems for major food manufacturers including General Mills, Kraft Foods, and Kellogg Company, as well as many smaller specialty food manufacturers, elleville, NJ-based VAC-U-MAX specializes in the design and manufacture of pneumatic systems and support equipment for the conveying,



Vacuum conveyor continuously delivers whole grains from bulk bags to two 48”-diameter artisan cold stone mills.

weighing, and batching of dry materials. With nearly 70-years of experience handling more than 10,000 bulk materials and powders, the company is a pioneer with many firsts, including developing the first venturi-powered vacuum producer that operates on compressed air.

Vacuum conveyors are inherently safer and more efficient than manual transfer of bulk materials and some of the most common reasons that facilities implement them is to meet increased demand; mitigate ergonomic, fall, and fugitive dust hazards; reclamation of expensive materials; and improving end product quality through precision delivery of ingredients, or eliminating cross contamination.

Vacuum conveyor systems consist of four carefully selected components to fit a customer’s process and needs— a pick up point where material enters the system, a vacuum receiver (aka filter receiver) that collects transferred material, a vacuum producer that powers the system and a control module that regulates conveying cycles and integrates with other machinery.

As Lapidus gained her footing in the milling arena and her tiny mill's orders were on the rise she began to look for ways to work smarter while still being intentional about how she grew and mechanized the mill.

One of the first upgrades for the mill was replacing the bucket elevator that fed grains into the hopper above the mill. Bucket elevators have many moving parts, such as belts, motors, bearings, and sprockets, making them costly and time-consuming to maintain—and dusty production environments reduce their lifespan and increase the risk of a combustible dust explosion.

Lapidus replaced the bucket elevator that fed grain into the mill with a small rotary airlock system from the manufacturer of her 48-inch stone mill. That system was more or less a generic option for transporting grains into the mill's hopper, and frequently experienced clogs at a 90-degree elbow causing backups in production.

Often generic one-size-fits-all solutions don't calculate for all conditions in system design, which can cause problems in performance; and, during their fifth year in operation, Carolina Ground purchased its first VAC-U-MAX compressed air-powered vacuum conveyor to feed grain from totes into a hopper above the mill. "It's a simple system," says Lapidus.

Compressed air-operated vacuum conveyors are by far the safest and most economical method for transferring powders and bulk solids as they have no moving parts and are, by design, intrinsically safe, generating no heat or sparks.

Where compressed air is not sufficient for an air powered system, or when conveying materials at higher rates and longer distances, alternative vacuum sources like positive displacement pumps or regenerative blowers are used as appropriate.

Though the milling operation was using a vacuum conveying system to feed grain to the mill, it was not capturing the flour exiting the mill efficiently and safely. The flour from the mill collected in buckets below the mill and then workers flipped the buckets over into bags, which were repetitive lift-and-twist motions that risked lower-back injuries.



Each cold stone mill has its own vacuum conveyor to deliver the whole grain flour to the bagging station where 25-lb and 50-lb bags are weighed out

When the mill was producing smaller quantities, this method was workable, but as the demand for Carolina Ground's stone-milled flour continued to rise, the manual labor to transport 8000 pounds of flour per week from the mill became glaringly problematic. The position of miller was tough to staff.

"It's really a burnout job. It was a lot of work," says Lapidus. There were a couple times where, after one day on the job, workers decided that this work was not for them, despite that they bought into the burgeoning business concept of connecting local farmers, millers, and bakers. "It was going to take more than a love of the concept to keep our staff," says Lapidus.

When the pandemic-related commodity flour shortage further drove up demand for Carolina Ground's stone-milled flour on the retail end, Lapidus decided to do a full upgrade of the milling process during a planned move to a new facility that better suited the milling operation—now with a second mill—and provided a better working environment.

Again, for Lapidus, “upgrading the process was more about doing what we were doing better, more efficiently and providing a better environment for our millers,” she says. She had gained enough confidence in the market and the process to discern that “mechanizing in strategic ways didn’t dilute the craft element of what we were doing.”

“Our intent was to replace processes that weren’t working for us,” says Lapidus. “With the newest VAC-U-MAX systems everything just became a lot more efficient,” says Lapidus.

Carolina Ground now uses three VAC-U-MAX vacuum conveyors in their milling process—a venturi powered system to feed grain into the stone mills and two regenerative blower powered systems that transfer flour from the stone mills to a bagging system.

Each of the three systems has gravity diverter valves to give Carolina Ground the ability to use one vacuum conveying system to feed two different pieces of equipment. A gravity diverter valve acts similarly to a splitter valve, facilitating the use of one vacuum receiver instead of two. The gravity diverter valve has a blade inside that switches from one direction to another, allowing material to feed into the appropriate vessel.

The compressed air-powered system, designed to deliver grain from sacks into hoppers, can service both mills; a surge bin gives Carolina Ground the ability to batch feed with the system by closing off a bin in order to measure how much material is dropping into the hopper when they want to do any blending.

“I like the dual system. I didn’t want to have to have two of everything and VAC-U-MAX was able to make that happen for us,” says Lapidus.

Although Lapidus didn’t want two of everything, she did want each of the mills to have their own conveying system to transfer flour from the mills. After having problems with that first airlock system clogging at the 90-degree angle in the pre-VAC-U-MAX years, she preferred the redundancy of two systems and the



Whole grains from the vacuum receiver are discharged through a magnet and diverter valve to one of the two cold stone mills. Handwheel-operated valves control the flow.

ability to shut one off when volume dictated. Carolina Ground processes flour on demand producing between 6000-12000 pounds per week.

The two regenerative blower powered vacuum conveying systems operate independently and each can feed two different packaging systems. “I’m really happy with having two separate systems. The whole project worked out really, really well,” says Lapidus.

“The VAC-U-MAX system is an amazing improvement. It has reduced our 12-hour shift down to eight hours, and because of that, we are able to pay everyone a little bit more per hour,” says Lapidus, “and our backs are in a lot better shape because there is a lot less heavy lifting.”

Shaving four hours from production and eliminating the need to physically transfer 8000 pounds of flour per week fits with Lapidus’

ethos of doing things better, more efficiently, and reducing wear and tear on the body. The vacuum conveying systems also delivered on the concept of doing something in a way that makes things better on more than one front: it reduced the amount of fugitive dust in the environment and enabled Carolina Ground to reclaim previously lost flour that collected at the bottom of the bucket elevator.

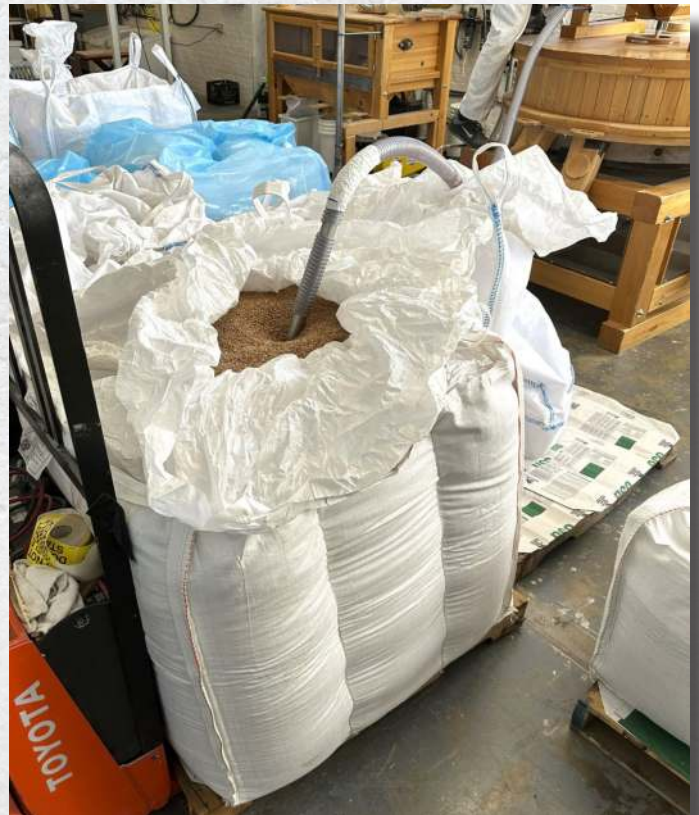
Fully enclosed vacuum conveying systems protect materials from air, dirt, and waste. Because product does not escape the system, particulates are prevented from entering the environment, where they can endanger workers' respiratory health, or settle on equipment and surfaces, posing an explosion hazard.

These vacuum conveying systems have "profoundly reduced the amount of dust in the plant," Lapidus says. "We still clean for an hour a day, but now we have very little dust, it's easy."

"And that lovely oily flour that we used to lose to the pig farmer with the bucket elevator is no longer lost with the VAC-U-MAX system. We are able to recapture it, cycle it back into our stream, and run it right through our product line—there is no loss," says Lapidus.

"Everything that was so hard has just become a lot easier with the VAC-U-MAX systems. We have less waste, we have less dust, and we have better quality product," says Carolina Ground's Lapidus.

Founded in 1954, VAC-U-MAX has been at the forefront of leading-edge vacuum conveying and industrial vacuum cleaning technology, across a wide range of industries including food, pharmaceutical, chemical, plastics, and others. To learn more, visit www.vac-u-max.com and fill out RFQ or call (800) VAC-U-MAX, (800) 822-8629, or (973) 759-4600; e-mail info@vac-u-max.com.



Locally grown whole grains are vacuumed from bulk bags at ground level without operator intervention until the bottom of the bag is reached.

