

# Sanitary Processing & Handling

## CASE HISTORY

## SANITARY VACUUM CONVEYING SYSTEM PROVIDES DUST-FREE FLOUR TRANSFER

A noodle company installs a bulk bag discharger and dilute-phase vacuum conveying system to improve its noodle production process.

produces preservative-free, home-made-quality noodles, sauces, salsas, jams, jellies, and other food products. The company operates 24 hours a day, 4 days a week, and produces more than 80,000 pounds of various types of noodles each week. When making the noodles in the past, operators manually emptied 50-pound bags of flour into a 1,500-pound-capacity holding tank. A pneumatic conveyor then transferred about 1,000 pounds of flour per hour from the tank to a high-speed premixer, where other

**M**rs. Miller's Homemade Noodles Ltd., Frederickburg, Ohio, is a family-owned and -operated company that



The custom-designed bulk bag discharger stand provides dust-free bulk bag unloading and is easy to clean around, improving the plant's sanitary conditions.

dry ingredients were mixed with the flour before further processing. Because this method of handling the flour was inefficient, labor-intensive, and dusty, the company needed to find a better way of transferring the flour to the mixing operation.

### Unloading and transferring the flour

To improve efficiency and reduce labor requirements, the company switched to receiving the flour in 2,000-pound bulk bags. “We used a forklift to lift a bulk bag above the holding tank, and then an operator opened the bag to gravity-discharge the flour into the tank,” says Morris Miller, Mrs. Miller’s Homemade Noodles plant manager. “However, we still weren’t completely satisfied because the forklift had to stay in po-

sition until the bag was empty, making it unusable anywhere else in the plant. We also still had issues with fugitive dust. And the holding tank was in the corner of the room tight up against the wall, making it difficult to clean thoroughly behind it.”

The company also experienced problems with the conveying system used to transfer the flour. “The conveying line periodically plugged up, and we’d have to shut down production to unplug it,” says Miller. “And the gear boxes for the two augers in the holding tank’s bottom couldn’t handle the extreme amount of torque required to feed the flour into the conveying line and would burn out. We also had to empty the bag filter on the system’s cyclone receiver twice a week and dispose of twenty-five to forty pounds

of flour that stuck to the bag each time. Additionally, the electric motors that ran the conveying system and augers were noisy and inefficient.”

### Finding a new conveying system

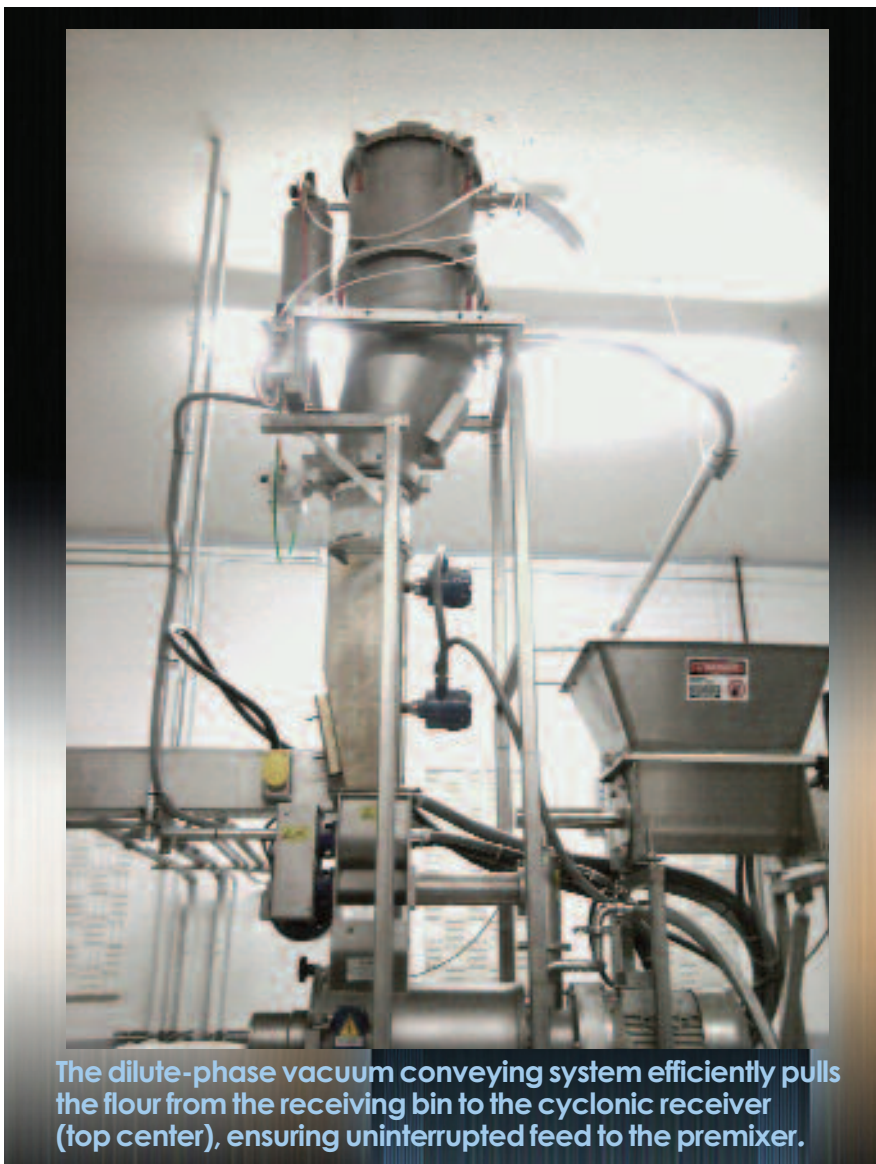
In fall 2008, Miller decided to re-search conveying system options that could improve the flour transfer process. “We needed to eliminate the issues associated with filling the holding tank, and we needed a conveying system that could consistently convey twenty tons of very fine flour per week,” says Miller. “I talked to a local manufacturers’ rep who put me in contact with a supplier that could provide a dust-free bulk bag unloading station and an efficient vacuum pneumatic conveying system to meet our requirements.”

This supplier, Vac-U-Max, Belleville, N.J., designs and builds custom and semicustom pneumatic conveying systems and support equipment for conveying, batching, and weighing dry materials.

### The bulk bag discharger and vacuum conveying system

In spring 2009, the new custom-designed bulk bag discharger stand and dilute-phase vacuum conveying system was installed and commissioned. The discharger stand consists of a spring-loaded bag rack, a dust-tight bag-seat ring, and a 7.8-cubic-foot-capacity receiving bin. The conveying system consists of an 8-foot-long food-grade PVC flexible hose, a 25-foot-long stainless steel pipe, and a 1-cubic-foot-capacity cyclonic receiver with a venturi eductor on the clean-air side. All material contact surfaces, except the PVC hose, are constructed of Type 304 stainless steel and have a highly polished finish to prevent the flour from sticking.

To seat a bulk bag in the discharger stand, a forklift moves a bag-frame above the bag, and an operator connects the bag loops to the frame’s lifting hooks. The forklift then maneuvers the bag frame into the bag



The dilute-phase vacuum conveying system efficiently pulls the flour from the receiving bin to the cyclonic receiver (top center), ensuring uninterrupted feed to the premixer.



rack, positioning the bag so that its spout extends down through the center of the bag-seat ring to the receiving bin's top. After the spout is connected to the bin's dust-tight inlet and untied, the operator activates the discharger stand's pneumatic bag massagers to promote gravity-discharge from the bag to the bin.

A high-level sensor in the bin deactivates the massagers when it detects that the bin is full, stopping flow from the bag. As the bag's weight decreases, the spring-loaded rack rises to keep the bag upright and assist discharge. The bin's offset design and an electric vibrator in the bin's bottom promote mass flow from the bin into the conveying line. The vibrator only functions when the conveying system operates.

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*A compressed-air source connected to the eductor creates a vacuum through the system, pulling the flour from the bin to the receiver.*

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The 2-inch-diameter flexible hose connects the bin's bottom outlet to the steel piping, which directs the flour 15 feet vertically and then 10 feet horizontally to the cyclonic receiver's top-side inlet. A compressed-air source connected to the eductor creates a vacuum through the system, pulling the flour from the bin to the receiver. Once in the receiver, the flour separates from the air, with the air being pulled through a high-efficiency filter and the flour falling to the receiver's bottom.

The conveying system and cyclonic receiver's outlet gate are programmed to activate at predetermined time intervals. The conveying system transfers about 1 cubic foot of flour from the bin to the cyclonic receiver every conveying cycle. And about every 30 seconds, the cyclonic receiver discharges flour into a 5-pound-capacity receiving bin, which feeds a feeder that precisely meters it into the premixer.

## Improving noodle production

The bulk bag discharger stand and vacuum conveying system have improved the noodle production process. "The conveying system operates more efficiently and quietly than our other system did and requires much less floor space than the large holding tank did," says Miller. "The system works flawlessly and is easy for our operators to use. It's also safer because the bulk bags hang in the discharger stand, not from the forklift, and operators don't have to manually empty bags. Now we can also use the forklift for other jobs in the plant."

The new system has minimized the amount of fugitive dust in the plant. "The discharger stand allows us to discharge the flour into a completely enclosed system, which prevents dust from becoming airborne and maintains a clean environment," says Miller. "And we no longer have product waste because the cyclonic receiver's filter keeps all the flour in the system, ensuring that it all gets put into the noodles. We've also been able to reduce the labor required to run the noodle production process from two operators to one. And because the receiving bin is designed to promote mass flow, we eliminated the need for augers in the bin bottom, which has reduced maintenance requirements and downtime."

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The company performs a general cleaning of the conveying system every week. "It doesn't take much to clean or maintain the system since it works on compressed air instead of electricity and has few moving parts," says Miller. "To clean it, operators empty the flour from the receiving bin, run the system to clear the con-

veying line, and then use compressed air to clean everything. They can also clean around and behind the discharger stand, which has improved the plant's sanitary conditions."

According to Miller, the supplier provides excellent customer service. "Our bulk bags are oddly sized, and they initially didn't fit properly in the discharger stand. So I told the supplier about the problem, and in less than a week a new stand that works with our bags arrived at the plant." **PBE**

**Note:** Find more information on this topic in articles listed under "Pneumatic conveying" in *Powder and Bulk Engineering's* comprehensive Article Index in the December 2010 issue and at *PBE's* Web site, [www.powderbulk.com](http://www.powderbulk.com), and in books available through the Web site in the *PBE* Bookstore. You can also purchase copies of past *PBE* articles at [www.powderbulk.com](http://www.powderbulk.com).

**Note:** Learn more about pneumatic conveying systems in conferences taking place at *PBE's* upcoming 2011 Northeast Conference and Exhibition, occurring May 23 to 25 at the DoubleTree Hotel and Garden State Exhibition Center in Somerset, N.J. For more details and to register, go to [www.powdershow2011.com](http://www.powdershow2011.com).

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