

New installation

Conveying and packaging equipment effectively handles PVC resin powder

A complete supply chain management company installs two new conveying and packaging lines to package a resin powder.

Frontier Logistics, La Porte, Tex., is a complete supply chain management company that provides packaging, warehousing, trucking, and other services for companies that use such products as plastics, fractionation sand, guar beans, and other raw materials and general commercial goods. Polyvinylchloride (PVC) resin is one material the company receives in bulk railcars and then packages in 55-pound bags for customers. In summer 2010, with the PVC resin market favoring powder over pellets, the company decided to install two new resin powder conveying and packaging lines in an existing building furnished with two side-by-side silos. To accomplish this, Glenn Wiseman, Frontier Logistics president, turned to an experienced equipment supplier he had successfully worked with on similar projects in the past.

Searching for a single-source equipment supplier

The company needed to transfer the

PVC resin powder from railcars into the two silos and then accurately fill it into 55-pound paper valve bags at a rate of at least 20 bags per minute. Most important, the conveying and packaging operation had to be fully functional within 8 weeks of finalizing the equipment purchase.

The company started the project in August 2010, and Wiseman contacted several equipment suppliers. "We wanted all of the equipment to be from one source, and we wanted it to be made in the US to minimize technical response and spare parts shipping times," he says. "The equipment had to be easy to operate and maintain and provide fast bag-filling rates and accurate weighments. Plus, everything had to be up and running as soon as possible."

After several weeks of research, Wiseman found only one supplier that could provide everything the company needed in such a short time. "We



The robotic arm (yellow) automatically places empty paper valve bags on the air packers' fill spouts, reducing the operation's need for manual labor.

gave the supplier some resin powder for testing, and the tests proved successful,” he says. “And because I’ve worked with them in the past and used their equipment for a similar material, I knew that it would work for this project, too. To get the bagging rate we needed, we decided to purchase equipment for two parallel conveying and packaging lines.”

The company chose two divisions of Magnum Systems, Kansas City, Kans., to supply the equipment for the lines: Smoot Co. provides pneumatic conveying systems and components and Taylor Products supplies modular packaging and palletizing equipment for handling bulk solids ranging from flowing granules to fragile powders.

The conveying and packaging equipment

The company finalized the equipment purchase in early December and started up the conveying and packaging lines less than 8 weeks later in January 2011. Each conveying and packaging line consists of one Smoot dilute-phase vacuum conveying system, one Smoot 84FR32 filter-receiver with reverse pulse-jet cleaning system, two Taylor Products Model A

air packers, one Fanuc robotic arm with end effector, and one powered belt conveyor with photo sensors. A remote PLC controller at the railcar unloading station and a main PLC controller inside the plant control and monitor both lines.

The resin powder is delivered to the plant in hopper railcars with four 50,000-pound-capacity compartments. After a railcar is positioned at the unloading station, an operator attaches a conveying system’s conveying hose to a compartment’s hopper outlet and activates the system via the remote controller. The company unloads two compartments at a time at a rate of 50,000 lb/h. Each conveying system pulls the resin about 100 feet horizontally and 80 feet vertically through an 8-inch-diameter hose to a filter-receiver mounted on top of a silo. Indicators on the remote and main controllers alert the operator when a compartment is empty. The operator then turns off the system and manually switches the hose to the next available compartment.

Each bottom-access filter-receiver has 32 84-inch-long bag filters and discharges the resin powder through a

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The two parallel packaging lines consistently fill up to 24 bags per minute, exceeding the company’s original packaging rate requirements.

Smoot FT18 18-inch rotary valve into the silo. A pyramid-shaped converging hopper with two pant-leg discharges is installed on each silo bottom. A level indicator in each converging hopper helps maintain proper head pressure. Each pant-leg feeds resin to an air packer installed directly beneath it. Air pads fluidize the resin to aid gravity-discharge to the air packers. Because an air packer uses air to push the resin into a bag, an integral dust collection system removes displaced air and dust from the bag during filling and a dust hood below the spout pulls in any fugitive dust generated when the bag is kicked off the spout.

Each robotic arm services two air packers, automatically placing paper valve bags on each packer's single fill spout. During operation, a robotic arm positions its end effector at an empty-bag magazine and activates two vacuum cups to pick up an empty bag and place it on a fill spout. A plunger on the end effector determines if a bag's valve can be opened; if not, then it removes the bag from the line and picks up another one. Photo sensors on the packers tell the robotic arm which spout is available. If both spouts are unavailable, the robotic arm pauses until one becomes available.

"What's really nice and extremely unique about this system is that we were able to integrate the two conveying lines, two robotic arms, and four packers into one system and everything works well together."

The packer's gross-weight scale weighs the bag as it's being filled, switching from bulk feed to dribble feed as it nears the set weight. When the bag reaches the appropriate weight, the packer kicks it off the spout and onto the belt conveyor, and the pressure of the resin powder in-

side the bag closes the valve. Because the fill time is somewhat erratic, ranging from 4 to 7 seconds depending on the resin's flowability, a sensor on the packer makes sure a bag doesn't get kicked off onto another bag already on the conveyor.

Each line's 30-foot-long conveyor has a 30-inch-wide belt and operates at about 90 ft/min, moving the bags to a single conveyor that moves them to an automated palletizer. Photo sensors on the packers and along each belt conveyor keep the bags evenly spaced to prevent traffic problems and balance the demand going to the palletizer.

US-made equipment proves its worth

Since installing the new conveying and packaging lines, the company has been consistently filling 22 to 24 bags per minute. "We're filling the bags faster than we originally specified, which helps keep our productivity levels high," says Wiseman. "The dilute-phase conveying systems transfer minimal heat during conveyance, the robotic arms quickly and reliably place the bags on the fill spouts, and the air packers accurately fill the bags without degrading the resin powder. And what's really nice and extremely unique about this system is that we were able to integrate the two conveying lines, two robotic arms, and four packers into one system and everything works well together. Plus, since we have two complete lines, the likelihood of having the entire system shut down should something go wrong is slim to none. I don't know of any other company that has tried this."

The conveying and packaging lines require minimal labor to operate. "We need one operator to change the rail-car hose and one to remove full pallets and keep the empty-bag magazines full," says Wiseman. "The equipment is easy to use — an operator just has to connect the conveying hose and hit the go button and the PLC controller does everything else. It sounds an alarm when a compartment is empty

or if anything goes wrong. In addition, the lines are easy to maintain because everything is made here in the US; we don't have to take extra time dealing with foreign suppliers for technical support or equipment parts. We get fixes and parts fast, which reduces production downtime. I've been working with the supplier for about twenty years now, and they've always produced top-quality equipment. They did a great job for this project, especially considering the quick turnaround time we need." **PBE**

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

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