

Engineering solution

Automating material transfer

An equipment and systems supplier automates material transfer in a manufacturer's new blending line, improving efficiency and increasing product quality and yield.

Compact Industries, St. Charles, Ill., is a contract manufacturer of powdered cappuccino, cocoa, and flavored coffee mixes and other flavored and milk-based powdered drink mixes for various companies. One step in the process — moving a powdered-mix batch from the blender to the packaging system — was proving to be a challenge for the company. An operator discharged the powdered mix from the blender into a portable bulk bin and then used a pallet jack to manually move the bin to the packaging system. This created labor, cost, sanitation, and production concerns for the company. To resolve these concerns, the company worked with an equipment and systems supplier to design a new process line with an improved method for transferring the powdered-mix batches from the blender to the packaging system.

Producing powdered-mix products

The major powdered-mix ingredients arrive at the company's facility in bulk

bags, which are indexed and stored in a warehouse until needed. An operator uses a pallet jack to manually move a bulk bag from the warehouse to a staging area near the blender. A dedicated hoist lifts the bag from the staging area into position over the blender's inlet. A standard tie box above the inlet allows the operator to access the bag's discharge spout and untie it for material discharge. After the major ingredient gravity-discharges into the blender, the operator manually adds other preweighed minor ingredients via a bag-dump station adjacent to the bulk-bag inlet, depending on the product being made. The empty major-ingredient bulk bag is then removed and stacked for recycling.

In the past, the operator started the blender and blended the major and minor ingredients for a predetermined time. After the appropriate blending time, the operator discharged the powdered-mix batch into a portable bulk bin staged below the blender's discharge. Each bulk bin had a conical discharge outlet in its



The Model DRB-155 sanitary double-ribbon blender has a 155-cubic-foot capacity and operates at about 30 rpm.

bottom, allowing for easy discharge. The operator used a pallet jack to manually move the bin and position it over the packaging system's inlet. The operator then discharged the mix through the inlet to a feed hopper. The feed hopper discharged the mix to a vertical form-fill-seal machine that packaged it into flexible bags.

After the bulk bin emptied, the operator used the pallet jack to move the bin to a cleanout area, where an operator washed it for reuse. The company operates the process line and packaging system 20 hours a day (two 10-hour shifts), 4 days a week, with each shift manually moving approximately the same number of bulk bags and bulk bins.

Concerns with manually moving bulk bins

Manually moving the bulk bins from the blender to the packaging system created several concerns for the company. One concern was labor. "We were concerned with the ergonomics of the process and the operators' safety, especially considering how many bins they handled during a shift," says Larry Lindberg, Compact

Industries's vice president of operations. "Labor costs were also a concern because of the extra operators that were needed to manually move and clean the bins."

Other concerns included the cost of purchasing enough bins to handle the production volume and the cost of maintaining the bins to sustain their operating life.

Sanitation also caused the company concern. "We wanted to find a way to minimize the amount of dust that escaped into the plant during material loading, transfer, and discharge, and we wanted to eliminate washing the bins between product runs," says Lindberg.

After considering these issues, the company realized that it was time to design a new powdered-mix process line. The company wanted to eliminate the bulk bins from the process and improve the process line's efficiency, decreasing the time needed to move the mix from the blender to the packaging system. The company also wanted to improve product quality and yield.

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Three discharge valves in the blender's bottom allow for rapid material discharge to the surge bin.

Quick fix

It didn't take the company long to find a solution. "When we started thinking about designing a new process line, we immediately contacted American Process Systems, because we already had five of their double-ribbon blenders operating in other process lines in our facility," says Lindberg. "We've worked with them over the years and like the way their equipment performs, so we decided to stick with them."

American Process Systems, a member of the Eirich Group, Gurnee, Ill., designs, manufactures, and supplies various batch and continuous equipment and systems for processing raw materials, compounds, wastes, and residues in various industries.

The company and the supplier met several times for a series of round-table discussions. They discussed how to optimize the new process line to improve its efficiency and increase its capacity. The supplier recommended that the company install a new double-ribbon blender and surge bin to handle larger powdered-mix batches, and a closed feed system consisting of two covered screw conveyors, a bucket elevator, and a vibratory sifter to move the mix from the surge bin to the packaging system. The company would continue handling the major-ingredient bulk bags and preweighed minor ingredients as it did in the past. The company agreed with the supplier's recommendations, and in August 1999, placed an order for the new equipment.

New powdered-mix process line

In January 2000, the new blender, surge bin, screw conveyors, bucket elevator, and vibratory sifter arrived at the company's facility, along with two level-sensor probes for the packaging system's feed hopper. The company hired a rigging company to install the new equipment.

The Model DRB-155 heavy-duty, stainless steel, sanitary double-ribbon

blender has a 155-cubic-foot capacity and operates at about 30 rpm. The blender is 50 inches wide, 120 inches long, and about 60 inches tall. It has a 50-inch-diameter blending chamber. Once the major and minor ingredients are in the blender, the operator pushes a button to start the blending process. After the appropriate time, the operator pushes a button to open three discharge valves in the blender's bottom. The valves allow for rapid material discharge to the surge bin located directly beneath the blender. After the material discharges, the operator pushes another button to stop the blender.

The surge bin has 1½ times the capacity of the blender, which allows for continuous batching and uninterrupted material flow to the packaging system. Two Model SC996 variable-speed covered screw conveyors at the surge bin's bottom control the material discharge from the surge bin and the material feedrate to the bucket elevator. Material discharge from the surge bin stops when the screw conveyors stop. Each screw conveyor has a 9-inch-diameter screw and can operate between 0 and 100 rpm, depending on the desired feedrate.

The closed feed system improved the company's product quality and yield, providing contaminant-free material transfer and reducing material loss caused by spills.

The screw conveyors move the material horizontally about 8 feet at a set rate before discharging it to a sanitary bucket elevator, which has plastic buckets. The bucket elevator moves the material vertically about 25 feet at a set rate before discharging it to the vibratory sifter, which screens the material before discharging it to the feed hopper.

The feed hopper has two level-sensor probes — an upper probe and a lower

probe — that are connected to the screw conveyors and bucket elevator. As material discharges from the feed hopper to the vertical form-fill-seal machine for packaging, the material level inside the feed hopper decreases. When the material level reaches the lower probe, the lower probe signals the screw conveyors and bucket elevator to turn on and feed more material to the feed hopper. When the material level reaches the upper probe, the upper probe signals the screw conveyors and bucket elevator to shut off. Both the screw conveyors and bucket elevator operate as needed, depending on the material level in the feed hopper.

No more cause for concern

Since installing the new process line, the company has reduced its labor requirements. "The whole key to this project was the closed feed system that moves the material from the surge bin to the packaging system," says Lindberg. "We don't need as many operators to manually move or clean bulk bins anymore because the surge bin, screw conveyors, and bucket elevator eliminated them from the process, which also eliminated the wash-out time involved with cleaning the bins for reuse. And because the operators were already familiar with how to operate the supplier's blenders, they didn't need to be trained."

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The closed feed system also improved the process line's efficiency, providing uninterrupted material flow to the packaging system. "We've increased production capacities because the packaging system doesn't have to wait for or depend on material being manually moved from the blender anymore," says Lindberg. He adds, "Since installing the new process line we

haven't had any problems. It's been operating so well that we recently ordered a duplicate system." **PBE**

**American Process Systems,
Member Eirich Group,
Gurnee, IL**

847-336-2444

www.eirich.com/usa/

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