

# Powder and Bulk Engineering

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## BAGGING AND PACKAGING

## Plant tour

# Plant addition increases a company's production capacity and versatility

A company adds six new silos, a computerized color-matching system, and 20,000 square feet of warehouse space, increasing its production and storage capabilities.

Since 1991, Empire Blended Products Inc., Bayville, N.J., has produced custom-blended cement, grout, stucco, and related products for several regional companies. To meet its customers' demands for more products and a more versatile product range, the company decided to expand its production operation.

And because many of its customers wanted to store the finished products in the company's warehouse before receiving them, the company also decided to expand its warehouse space.

To increase its production capacity and versatility, the company added



The new 100-ton-capacity silos are installed outside the production facility approximately 80 feet above the ground.

six new 100-ton-capacity silos to its main production line's eight existing 50-ton-capacity silos. Jay Gornitzky, Empire Blended Products president, and Martin Tanzer, vice president, designed the six new silos to store the various aggregates and cements that the company uses in its custom-blend operations. The additional silos allow the company to keep a wide range of cement and aggregate on hand at all times for producing custom-blended products.

The company also added a computerized color-matching system to produce a wide spectrum of custom-color products. The color-matching computer interfaces with the company's main computer system, which controls the production lines. To accommodate the increased production and provide storage for its customers' finished products, the company added 20,000 square feet to its existing 20,000-square-foot warehouse.

Let's take a look at how the company's main production line functions since the addition of the new silos and extra warehouse space.

### Touring the main production line

The company's main production line consists of two side-by-side blending and packaging operations — one for colored products, the other for white products. The major ingredients — various types of aggregates and cements — arrive at the plant in 25-ton-capacity pneumatic trucks and 100-ton-capacity pneumatic railcars. The aggregates are pneumatically conveyed into six of the 50-ton-capacity silos, and the cements are pneumatically conveyed into the remaining two 50-ton-capacity silos and the six 100-ton-capacity silos. Each 100-ton-capacity silo has a 2,250-cubic-foot capacity, which is equivalent to 224,000 pounds of sand or 212,000 pounds of cement or limestone. The silos that hold the various

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*To increase its production capacity and versatility, the company added six new 100-ton-capacity silos.*

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**An operator adds minor ingredients to a 6,000-pound-capacity paddle mixer.**

aggregates have air-operated slide gate valves to control material discharge, and the silos that hold the various cements have aerator pads to assist material discharge through 12-inch screw conveyors.

After receiving a customer's order for colored stucco (for example), a company rep will first show the customer one of the company's 24 standard colors. If the desired color isn't among these, the rep has the customer send the company a color sample — a paint chip, a brick, or any material that clearly shows the desired color. The rep takes the sample to the company's test lab where an operator formulates and duplicates the sample's color using the computerized color-matching system.

"It allows us to control the consistency and quality of every color batch we make. So if we make a color batch on Tuesday, we can make that exact same color batch again at any time in the future," says Gornitzky. "Even if the customer comes back a year later and the cement and aggregate colors are slightly different than before, the new color batch will match the exact same color standard as the previous batch because we've trained our personnel to compensate for such changes."

The company's test lab contains several mixers and blenders that range in capacity from 1 to 50 pounds for small test batches and 500 to 6,000 pounds for large test batches. Given a product formula or material sample, the company can prepare product batches to demonstrate blending quality and accuracy for the customer. To do so, the company requires at least a 5-pound material sample along with a Material Safety Data Sheet. The company's test lab can also perform mesh-size analysis and field-test the basic properties of cementitious products.

After formulating the customer's desired color, the operator sends the original sample and duplicated color sample back to the customer for approval. Upon approval, the operator

programs the custom-color stucco formulation — which includes major ingredient weights, minor ingredient weights, blending time, and bag weight — into the company's main computer.

The company's main computer is key to its custom-blend operation. It's a PLC that controls the production line's entire operation from batching to blending to packaging. Once it's programmed, production can begin.

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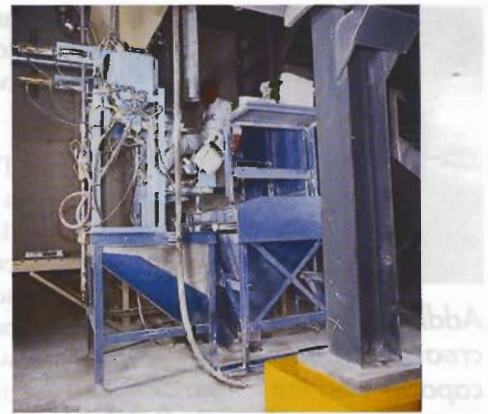
*To accommodate the increased production and provide storage for its customers' finished products, the company added 20,000 square feet to its existing 20,000-square-foot warehouse.*

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The PLC first tells the silos how much of each aggregate and cement type to release into a 6,000-pound-capacity traveling weigh hopper located beneath the silos. The weigh hopper travels under the silos on a track between two fill stations. Each fill station accommodates seven silos, allowing the weigh hopper to draw from one or several silos, depending on the formula. The weigh hopper is mounted on four electronic load cells that communicate the hopper's weight to the PLC as the ingredients sequentially fill into it. The weigh hopper is accurate to within  $\pm 5$  pounds per 2,000 pounds for each ingredient. After filling, the PLC directs the weigh hopper to an inlet for the color-product production line and discharges the major ingredients into a 6,000-pound-capacity paddle mixer.

"The weigh hopper is totally self-cleaning," says Gornitzky. "It has an epoxy-coated lining and uses vibration and air to discharge all of the material. We can switch from one product to another without ever having to manually clean it."

The paddle mixer begins operating as the major ingredients fill into it. Load



**An operator prepares to hang an empty 50-pound bag on the packer's fill spout.**

cells mounted under the mixer detect and communicate the mixer's weight to the PLC. After all of the major ingredients have been added, the PLC stops the mixer and signals the operator to manually add any minor ingredients — such as pigments, nonshrink additives, and waterproofing agents — that the formula may call for. The operator manually weighs the minor ingredients, adds them to the mixer, shuts it, and pushes a button to alert the PLC that the minor ingredients have been added. The load cells detect the mixer's weight, and the PLC verifies that the correct amount of minor ingredients has been added. The mixer then blends the ingredients for a predetermined time. The mixer's high-speed intensifier blades ensure that the color pigments and other minor ingredients are evenly blended throughout the batch. After blending, the mixer discharges the ingredients into a 12,000-pound-capacity surge hopper located below the paddle mixer.

Between batches of different products, the operator uses a soft broom to sweep any material remaining in the mixer down into the surge hopper. Meanwhile, the batching process continues as the traveling weigh hopper collects the major ingredients for the next batch.

The ingredients discharge from the surge hopper through a splitter that simultaneously feeds two side-by-side



**Additional warehouse space increased the company's storage capacity and the length of time a customer can store its finished products.**

impeller packers or a bulk bag packer. During large production runs, the company generally maintains the surge hopper's level between 3,000 and 9,000 pounds. When the hopper gets down to the 3,000-pound mark, its automatic level indicators signal the PLC, and another batch automatically drops in from the paddle mixer.

"During large production runs, we can do one batch about every four minutes," says Gornitzky. "We can weigh all the major ingredients, drop the batch into the mixer, manually add the minor ingredients, completely blend everything in two minutes, drop it into the surge hopper, and then repeat the process."

The impeller packers, which are suspended on load cells, can fill 25- to 100-pound-capacity bags. An operator hangs an empty bag on a packer's fill spout, and the packer automatically senses the bag and fills it. When the load cells detect that a bag has reached the designated weight, the packer seals the bag and discharges it to a mesh conveyor that vibrates and levels the bag. Each impeller packer can fill up to 12 bags per minute to within 0.5 percent accuracy.

A hopper located under the mesh conveyor collects any material that leaks from the bags. The hopper is part of a reclaim system that pneumatically conveys any spillage back to the surge hopper for repackaging. Also, a grate in the floor behind the impeller packers

and bulk bag packer allows an operator to empty any broken or off-weight bags directly into the reclaim system.

The mesh conveyor carries the bags to a belt conveyor that carries them by a digital scale located next to the belt conveyor before a printer station. The scale allows an operator to remove a bag from the conveyor and manually weigh it, guaranteeing that the bags are properly filled before they reach the printing station. The operator then notifies the packer operator whether the bag is too light, too heavy, or just right. If a bag is underweight or overweight, the operator removes the bag from the conveyor and empties it into the reclaim system. At the beginning of a product run, the operator will check the first 10 bags to ensure that the packers are filling the bags accurately. After that, the operator checks 2 bags per pallet load. After passing by the scale, the conveyor carries the bags to a printer station, where an inkjet printer prints the appropriate batch code onto each bag. The conveyor then carries the batch-coded bags to a semiautomatic palletizer for palletizing.

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*The company added a computerized color-matching system to produce a wide spectrum of custom-color products.*

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The company mainly uses standard 40-by-48-inch wooden pallets, but it can use different pallet sizes depending on a customer's needs. The palletizer stores 10 empty pallets in its magazine. An operator arranges one layer of bags at a time, and the palletizer automatically lowers the bag layer onto the pallet. The palletizer then resets to accept another layer. Depending on the bag size and stacking pattern, the operator can palletize 30 to 35 100-pound bags per pallet or up to 70 50-pound bags per pallet, stacking the pallets up to 60 inches high. The company generally keeps the pallet weight between 3,000 and 3,500 pounds.



**The company operates its own fleet of trucks to pick up raw materials and deliver finished products.**

The palletizer automatically discharges the filled pallet to another belt conveyor that carries it to an automatic stretch-wrapper. The stretch-wrapper is equipped with its own PLC and wraps the pallet a preset number of times from top to bottom with plastic film. The stretch-wrapper then discharges the stretch-wrapped pallet to another belt conveyor that carries it to a loading station, where it sits until a forklift operator takes it to the warehouse or loads it onto the back of a truck.

The production line for blending and packaging white products is located next to and set up similarly to the color-product production line. The white-product production line is controlled by the same PLC and uses the same traveling weigh hopper to batch the major ingredients from the 14 silos. Both production lines also use the same printer station, semiautomatic palletizer, stretch-wrapper, and loading station.

However, after the weigh hopper is filled, it discharges the major ingredients to an inlet for the white-product production line. This divergent blending and packaging line has its own 6,000-pound capacity paddle mixer (sans high-speed intensifier blades) and 12,000-pound-capacity surge hopper. It uses two airflow packers rather than two impeller packers, and has its own bulk bag packer, mesh conveyor, and reclaim system. The mesh conveyor carries the white-product bags to the printer-station belt conveyor where the production lines converge.

"We only require four workers to operate both production lines," says Gornitzky. "An operator on the blending level adds the minor ingredients to the paddle mixers and sweeps them out between product runs. A second operator runs either the impeller or airflow packers, depending on which production line is running. A third operator operates the semiautomatic palletizer and positions the bags. And a fourth operator runs the forklift and is responsible for taking away the full pallets, weighing the bags before the printer station, sending the minor ingredients up the freight elevator to the blending level, supplying the packer operator with empty bags, and delivering empty pallets to the palletizer."

### Increased capacity and versatility

Since adding the six new 100-ton-capacity silos, computerized color-matching system, and 20,000 square feet of warehouse space, the company has increased production capacity and versatility, decreased its lead times to 2 to 3 days, and increased its storage capacity and the length of time a customer can store its products in the warehouse.

"Previously, when we didn't have as many silos, if a customer wanted a custom-blended product that required a special ingredient, I'd have to figure out when I could schedule an empty silo to receive and store the special ingredient. Then I'd have to shut down production, pump in the new material, and run it through the production line," says Gornitzky. "Now, with so many more aggregates and cements being stored in the silos, I can go from one custom-blended product to the next without having to worry about receiving a special ingredient as often, which makes things so much more streamlined."

The company is also much more in tune with making color products since installing the computerized color-matching system. "Prior to its addition, we only did gray and white products," says Gornitzky. "We'd do some color products by special request, but we'd never encourage this because we didn't have a computerized color-matching system to ensure the product's color quality over time."

And Gornitzky adds, "The extra twenty-thousand square feet of ware-

house space allows us to do extra warehousing for our customers. We're able to store more finished products for our customers for longer time periods, instead of telling them that they've only got two days to remove the finished product."

**PBE**

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### Equipment manufacturers

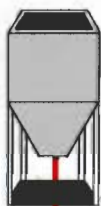
Paddle mixers (2): **Marion Mixers,  
Marion, Iowa, 319-377-6371.**

Impeller packers (2): **ECC Inc.,  
Crofton, Ky., 270-269-9100.**

Airflow packers (2): **Taylor Products,  
Parsons, Kans., 620-421-5550.**

Semiautomatic palletizer (1): **Besser  
Co., Alpena, Mich., 989-354-4111.**

Stretch-wrapper (1): **Liberty Tech-  
nologies, Youngstown, Ohio,  
800-860-4744.**



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