

New installation

Horizontal batch mixers produce custom color blends, satisfy customers

A toll processor works with a mixer supplier to design and engineer two mixing lines, from silos to pallet hooper, for mixing and packaging custom cement and masonry mixes.

Scruggs Blending and Packaging, a division of The Scruggs Co., has been operating a toll processing facility in Valdosta, Ga., since 2011, mixing and packaging custom-color cement and masonry mixes for various US cement manufacturers. The custom mixes are distributed throughout the southeastern US for use in industrial, commercial, and residential construction projects. When the company was planning the facility, it needed efficient and accurate mixers for two high-capacity mixing lines — one for nonsanded gray mixes and the other for sanded and nonsanded white, gray, and color mixes. To find mixers for the toll processing facility, Billy-Joe Lovett, Scruggs Blending and Packaging division manager, traveled to the *Powder and Bulk Engineering 2009 Southeast Conference and Powder Show* in nearby Atlanta.

Finding a mixing systems designer

While at the show, Lovett stopped at a supplier's booth showcasing a high-

capacity, single-rotor, horizontal batch mixer. The mixer uses the supplier's patented low-speed internal propellers to provide rapid mixing of large batches and homogenous particle dispersion for mixes with wide particle size distributions. The supplier demonstrated the mixer, and Lovett saw how much faster and more accurately it could mix a batch and disperse minor and micro ingredients than a ribbon blender could.

"We were expanding our business to toll-process cement and masonry mixes, and I knew this mixer would help us to do that," says Lovett. "It's light years ahead of a ribbon blender; it mixes a batch about ten times faster and produces better particle distribution in the end product. A short time after the show, we had them bring a mixer down to our headquarters in Hahira, Georgia, to demonstrate it for our toll processing facility planning team."

The supplier and mixing systems designer, A&J Mixing, Oakville, Ont., supplies high-performance batch and



The 110-cubic-foot-capacity horizontal batch mixer with eight Shear-makers has a 7,000-pound-batch capacity and can produce nonsanded gray cement mixes at up to 25 t/h.

continuous mixers, dryers, hoppers, controls, and other dry bulk solids handling and processing equipment and systems.

After the on-site demonstration, Lovett maintained contact with A&J Mixing president Bliss Flower over the following months, discussing the toll processing facility's design, expected procedures, and necessary mixing specifications. In June 2011, with favorable market conditions and committed customers, the company was ready to begin building the facility and purchasing equipment. Lovett contacted the supplier and purchased two horizontal batch mixers. He also had the supplier design and engineer the facility's two mixing lines, from silos to pallet hooper, including an integrated computer control system and large support mezzanine.

The mixing and packaging lines

In February 2012, the toll processing facility started up the two mixing lines, each of which can produce up to 200 tons of custom cement mixes per 8-hour shift. Equipment specified for the two mixing lines includes five large storage silos, six screw feeders, two weigh hoppers, one 110-cubic-foot-capacity batch mixer on load cells, one 74-cubic-foot-capacity batch mixer on load cells, five Chantland 4010 semi-automatic valve-bag baggers, two bulk bag filling stations with platform

scales, two Chantland robotic palletizers, one pallet hooper, one personal-computer-based (PC-based) control system, two PLC controllers, and other ancillary equipment.

The mixers are installed on the 35-by-65-foot mezzanine above the packaging and palletizing equipment. The 110-cubic-foot-capacity PHLAUER AJSP 558 mixer (known as the *gray mixer*) handles nonsanded gray cement mixes and discharges a completed batch to three valve-bag baggers. The 74-cubic-foot-capacity PHLAUER AJSP 486-6 mixer (known as the *color mixer*) handles sanded and nonsanded white, gray, and color cement and masonry mixes and discharges a completed batch to either two valve-bag baggers or the bulk bag filling stations.

Two silos supply nonsanded gray cement to the gray mixer's weigh hopper via two 25-foot-long, 14-inch-diameter screw feeders, each dedicated to a silo. The other three silos supply Portland and masonry cement, sand, and calcium carbonate to the color mixer's weigh hopper via four 25-foot-long, 12-inch-diameter screw feeders. (Three feeders move material from dedicated silos, and the fourth feeder moves material from the gray cement silo shared with the other mixer.) Each weigh hopper is installed on load cells above the mixer and is sized slightly



The two parallel mixing lines can operate simultaneously and package the cement and masonry mixes in either paper valve bags or open-top polypropylene bulk bags.

larger than the mixer's batch capacity. The discharge end of each feeder's screw has double-wrapped flights to ensure weighment accuracy.

To ensure a high-quality end product, the toll processor takes material samples at various times during the mixing process.

The process for making a custom batch mix is the same for both mixing lines. All batch recipes are stored in the centrally located PC-based master controller that's connected to the two PLCs, each of which controls a mixing line's electrical devices via the PC and is positioned adjacent to the mixer. For example, to make a custom nonsanded color cement mix, an operator accesses the PC, selects the color mixing line, calls up a recipe, and then selects the packaging destination: the valve-bag baggers or bulk bag filling stations. The operator then starts the line, and the appropriate silo's screw feeder feeds the batch's major ingredient (nonsanded cement) to the color mixer's weigh hopper. The weigh hopper's load cells send weight readings to the PC, which monitors the major ingredient addition by gain in weight.

When the proper weight is reached and the mixer is ready, the weigh hopper discharges the major ingredient to the mixer, and the mixer's load cells send the weight data to the PC to checkweigh the addition. The mixer's PLC then prompts the operator to add any required minor ingredients, specifying the amount and order in which to add them. The minor ingredients are in 50-pound bags, and the operator typically empties several bags into the mixer. The mixer's scale readout is near the mixer, so the operator can see the weight change in real time as ingredients are added to the mixer to avoid overfills.

After the PC verifies the minor ingredient additions, it prompts the operator to add any required micro ingredients,

which are preweighed in a pail on an independent scale next to the mixer. The micro ingredients are in 25- or 50-pound bags, and the operator typically adds several pounds to the mixer. Once the PC verifies the micro ingredient additions, the operator pushes the start button to activate the mixer, which completes a batch in 3 to 6 minutes, depending on the recipe.

To ensure a high-quality end product, the toll processor takes material samples at various times during the mixing process. And to ensure product consistency from batch to batch, the PC records each batch's individual weighments and compiles a batching report. The PC also maintains an ingredient-usage report, allowing the toll processor to know when to order ingredients and fill the silos.

When the predetermined mixing cycle ends, the color mixer stops and discharges the batch to the preselected packaging destination. (The mixers' PC control ends after the product reaches a bagger's hopper.) If the bulk bag filling stations are selected, the batch discharges by gravity to a split hopper with two outlets. A feed chute with a butterfly valve at each hopper outlet allows the company to direct the material to one or both bulk bag filling stations. Each station's platform scale sends weight readings to the scale controller and the operator monitors the bulk bag weight by gain in weight. When a bulk bag reaches the proper weight, the flow-control valve activates to shut off material flow, and a forklift moves the filled bag to a warehouse for storage before transport.

If the valve-bag baggers are selected, the batch discharges by gravity to the baggers' hoppers, which are directly interfaced with the mixer. An operator then manually places empty bags on the baggers' fill spouts to fill them. After a bag is filled, the bagger automatically kicks it off onto a conveyor that moves it through a bag flattener and to the dedicated robotic palletizer for palletizing. A forklift moves the completed pallet to the pallet hooper,

which places a plastic film hood over the bags to secure them for transport and protect them from the elements after delivery to a job site. From the hooper, the forklift moves the hooded pallets to the warehouse for storage before transport.

The gray mixer's independent three-bagger bagging line is the same as the color mixer's bagging line and includes a conveyor, bag flattener, and standalone robotic palletizer. The forklift also moves the palletized bags from this line to the pallet hooper. The company can package the cement and masonry mixes in 70-, 75-, and 93.6-pound paper valve bags or 3,000-pound open-top polypropylene bulk bags, depending on the product and customer.

About the mixers

The 40-horsepower, single-speed, PHLAUER AJSP 558 single-rotor horizontal batch mixer is 85 inches tall and has a 55-inch-diameter, 96-inch-long rotor. Its paddles and housing sides are constructed of heat-treated, abrasion-resistant plate that has a minimum 400-Brinell hardness. The mixer's three top inlets allow the material to quickly charge into it from the weigh hopper, and its drop-bottom discharge empties the material from the mixer to the baggers in 15 seconds. The mixer has a 7,000-pound-batch capacity and can produce 25 t/h and fully develop the color of each batch in 3 minutes.

The 30-horsepower, single-speed, PHLAUER AJSP 486-6 single-rotor horizontal batch mixer is 71 inches tall and has a 48-inch-diameter, 78-inch-long rotor. Its paddles and housing sides are also constructed of heat-treated, abrasion-resistant plate that has a minimum 400-Brinell hardness. The mixer's two top inlets allow the material to quickly move into it from the weigh hopper, and its two PC-connected discharges allow for automatic discharging to two destinations. The default discharge (so-called because it's used the most) is on the mixer's drive end and feeds to

the baggers; the second discharge is on the idler end and services the bulk bag filling stations. For sanded cement and masonry mixes, the mixer has a 5,000-pound-batch capacity and can produce 25 t/h and fully develop the color of each batch in 3 minutes. For nonsanded cement and masonry mixes, the mixer has a 4,500-pound-batch capacity and can produce 18 t/h and fully develop the color of each batch in 6 minutes.

Each mixer's drive turns the paddles at 300 fpm at the periphery, which is an ideal speed for mixing friable and fragile materials like coffee beans or abrasive materials like sands and aggregates. The mixers are capable of mixing to a coefficient of variation (CV) of 5 percent in 1 minute. To ensure predictable, reliable, and repeatable color development, eight PHLAUER-TECH Shearmakers with low-speed, aggressively designed propellers are installed in the AJSP 558 mixer's side, and three PHLAUER-TECH Shearmakers are installed in the AJSP 486-6 mixer's side.

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Mixing high-quality custom blends

Since starting up the toll processing facility, the company's new mixing lines have been meeting daily production quotas and producing high-quality custom cement and masonry mixes. "We can operate both mixing and packaging lines at the same time, and each batch takes about fifteen minutes to complete from when the cement is conveyed to a weigh hopper to when it discharges from a mixer," says Lovett. "To guarantee top-quality mixes, we follow a rigorous point-of-control quality control process for each batch that involves ingredient

weighment verifications and material samples."

The supplier trained the company's operators how to use the computer system and mixing and packaging equipment. "The computer system manages all of our production, keeps track of the products we make, and tells us when we need to order more raw materials," says Lovett. "The supplier's mixers have met all of our requirements regarding production rates and mixing specifications for the cement and masonry mixes. Their system has given us the edge in the marketplace because the quality of our products, bar none, is better than any other cement toll processor's; others can't compete with us because we can produce large volumes of high-quality products at a low cost." **PBE**

Note: Find more information on this topic in articles listed under "Mixing and blending," "Bagging and packaging," and "Systems or equipment design, fabrication" in *Powder and Bulk Engineering's* Article Index in the December 2012 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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