

The Concrete Producer

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Mixing Profits

▶ A heavyweight batch mixer is ideal for lightweight mix.

Sometimes it pays to be green when a producer can do it efficiently. That was the challenge managers at Charah Inc. faced when they opened a new plant in Emporia, Va.

Their goal was to increase production of concrete mixes containing coal-fired, power generation, plant ash products. The

new production facility would also serve as a warehouse and distribution center for other concrete products.

Profit margins are slim in this high-volume production business. So the management team placed great emphasis on the capital and operational costs of the equipment to be purchased, particularly the

dry bulk blending equipment at the heart of the mixing process.

Charah is a pioneer in utilizing the coal combustion byproducts, which are typically dumped into landfills, to produce aggregates for concrete mixtures and concrete products. The producer has focused its attention on bottom ash, primarily the larger, more

A 90 cubic-foot Munson 700-TH-90-AR rotary batch mixer blends dry cement mixes in less than three minutes with 100% uniformity. Gentle mixing preserves the texture of the coarse material, which is necessary to maximize the strength of cured products.



coarse particles that range from gravel-sized nuggets down to grains of sand.

The producer recently received the Coal Combustion Products Partnership (C2P2) Innovation Award from the U.S. Environmental Protection Agency. The award honors companies that demonstrate outstanding achievements in the constructive use of coal combustion products (CCPs). "We strive to find new ways to utilize coal

combustion products to benefit both the utility industry and the environment," says Charles Price, Charah's president.

Charah developed better methods of processing bottom ash and sorting it by gradation to ensure consistent batching. This allows Charah to substitute the fly ash for a portion of the sand or other material that it mixes with the cement. The producer then sells the concrete mix and

other concrete products to contractors and the public.

The company also sells its premium coal ash-derived aggregate in pure form to large manufacturers of lightweight concrete blocks and precast concrete products. This aggregate meets the ASTM standards for clay lumps and friable particles, organic impurities, unit weight, stain test, and loss on ignition.



The rotary batch mixer totally evacuates blended material, which is gravity-discharged into this 9000-pound capacity surge bin.

Contract haulers deliver fly ash and bottom ash from coal-fired power plants to Charah's plant in Emporia, Va.



Along with being more economically friendly, masonry products batched with the fly ash aggregate are worker-friendly and profitable. Nathan Boone, Charah's vice president of operations, says lighter concrete blocks generally command a premium price. "The fly ash mixture reduces the concrete block's weight from about 32 pounds to the 25-pound range, making them easier for masons to handle," he says.

The plant's profitability hinges, in part, on the mixing equipment. Handling the fly ash can be difficult. Boone's investigation for a better way led him from vertical shaft mixers to a rotary batch mixer.

Producing bottom ash for the bagging operation begins at the power plant. The raw material aggregate is screened on vibrating wet screens to remove oversize particles and excessive fines. The output is then hauled to the producer's packaging facility. It is dried and cooled on fluid bed drying equipment before being placed in 120-ton storage silos.

The entire packaging facility is auto-

mated. When the control panel starts the batching process, flexible belt conveyors transport ash, sand, and stone from storage silos to a weigh-batch hopper on one side of the blender. Screw conveyors move fine cement powder and fly ash from silos into a weigh-batch hopper on the opposite side of the mixer. Then both weigh hoppers discharge into the inlet of the rotary batch mixer.

Mixing 6800 pounds

The blending device is a 90 cubic-foot Munson 700-TH-90-AR rotary drum mixer. It consists of a horizontal rotating drum with a stationary inlet at one end and a stationary outlet with a discharge gate at the other. Internal baffles (mixing flights) and lifters create a four-way mixing action as the drum rotates on two heavy-duty trunnion rings. "We're loading about 6800 pounds of material per batch into the mixer," says Boone.

Although packaging dry mix is essentially a batch process, the mixer's drum

rotates continuously. The machine's action is unique, essentially tumbling, folding, cutting, and turning the material in a multi-directional manner throughout the filling, mixing, and discharging phases. The result is a uniform batch in less than three minutes.

"The blender's ability to gently tumble the materials, yet mix them homogeneously, is vital to the mix," says Boone. "We need homogeneity for uniform product in the bags and to ensure the product properly performs for customers.

"But we also need coarse material in a mix," Boone adds. "Rock and stone can be up to 1/2-inch in size, which achieves the necessary end product strength not always possible with finer sized particles. Also, some types of bottom ash can be friable, which means it can be easily crushed. The vertical shaft mixers we investigated had big plows, also mixing in a horizontal direction, but with a force that might crush the ash material. A rotary drum mixer seemed to offer both the thorough and

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gentle mixing action we needed.”

After three minutes of mixing, the discharge gate opens and the internal flights elevate the material and direct it through the gate as the drum rotates, fully discharging the batch with no residuals into a 100 cubic-foot, 9000-pound capacity surge bin below the mixer.

The surge bin holds blended material until a sensor on the bagging equipment

signals a door on the bin bottom to open. This discharges material onto a flexible belt conveyor that leads to a bagging machine with a capacity of 10 to 12 bags per minute.

Charah is the only company in the country to package cement mixtures in plastic, two-handled bags, rather than paper bags. Plastic virtually eliminates problems of paper packaging, such as dust and breakage. “We believe plastic packaging is the

future,” says Boone. “As bagging technology improves, we expect our bagging rate to increase.”

Ten batches per hour

Within seconds of the previous batch's discharge from the mixer, a subsequent batch of aggregate and powdered ingredients, which were being weigh-batched during the mixing cycle, are released into the rotary batch mixer. “We don't need to shut off between batches,” says Boone. “The mixed batches exit the drum so cleanly, there is no cleanup or prepping of the mixer required between batches, so there are no delays between batches. This enables us to run about 10 batches an hour.”

Unlike stationary blenders whose agitators plow through the material throughout relatively long cycle times, rotary mixers create a gentle tumbling action over short cycle times. And the machine has two other advantages: Product degradation and power consumption are greatly reduced.

Charah's mixer requires only a 15 hp motor to mix 6800-pound batches, less than 1/3 of the power required with stationary blenders of equivalent capacity. “Because our profitability numbers were going to be tight, we found the electrical savings of a 15 horsepower motor versus two 30 horsepower motors found on other blenders pretty significant,” Boone explains.

The abrasive rock and stone in concrete mixes will gouge, dent, and scratch surfaces. To reduce wear, all product contact surfaces are constructed of abrasion-resistant AR235 steel. Depending on the material mixed and the cycle times, flights and baffles can last from three to five years before replacement. The flights and baffles are bolted to brackets welded to the drum wall, allowing rapid replacement.

After operating the Munson rotary batch mixer for one year at the Emporia plant, Charah has ordered a second one for its new Midwest facility, which is currently under construction. **TCP**

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