

Automated weighing and batching system kicks it up a notch

A food processing company automates a spice-batching process to improve quality control and production rates.

JTM Food Group, Harrison, Ohio, is a specialty food processor that produces various prepared-meat products, kettle-cooked products, and baked goods for the food service industry, the military, schools, and retail consumers. Many recipes include a spice mixture that gives a product its unique flavor. In the past, operators manually scooped the various spices into a batch bucket positioned on a scale, individually weighing each ingredient. However, over the years as customer demand increased, manually scooping and weighing the spices was taking too much time and causing a bottleneck in the production process. The company needed to find a way to improve its spice weighing and batching.

Manual spice-batching process causes problems

The plant operates 16 hours a day, 5 days a week, and produces three separate food product lines: The prepared-meat operation produces preformed burgers, meatballs, sausage links, and other fully cooked meat products; the kettle-cooking operation makes

sloppy joe mixes, taco fillings, soups and sauces, and other flowable products; and the bakery operation produces hoagie rolls, Kaiser buns, and other baked goods that are sold in area stores and used for making the company's sandwich products.

To prepare a spice mixture for a prepared-meat or kettle-cooked product, an operator printed out the mixture's recipe, then brought the first spice bag to the scale and hand-scooped the spice from the bag into the bucket until the proper weight was achieved. The operator then gathered the second spice and hand-scooped the proper amount from the bag into the bucket. The operator repeated this process for each of the recipe's spices and other minor ingredients. To speed up the batching process, sometimes several operators worked together gathering and hand-adding the various ingredients.

This process had several problems: "It was too easy for an operator to misread the scale or grab the wrong spice bag," says Joe Maas, JTM Food's operations



The automated weighing and batching system can make a spice batch with up to 24 different ingredients in less than 8 minutes.

vice president. “And if they put too much of an ingredient or the wrong ingredient into the bucket, they’d have to throw out the batch and start over, which led to excessive product loss. Also, manually batching the spices limited production, because we couldn’t make a product if its spice batch wasn’t ready. In addition, the process required a lot of labor and time, taking a good twelve to fourteen hours every work day to make all the batches.”

As the company’s business grew and production requirements increased, the problems with the manual spice-batching process became more noticeable. According to Maas, to keep pace with customer demand the company needed to find a way to eliminate the production bottleneck.

Working with a familiar system supplier

In 2004, the company had worked with a local weighing-and-batching system supplier to automate the bakery operation’s microingredient batching process. After installing the custom-designed system, the company saw immediate improvement in the batching process efficiency and accuracy.

So in early 2008, the company decided to work with the same supplier to de-

sign an automated weighing and batching system for the spices and other minor ingredients. “The supplier was my first and only call because the bakery operation’s system works so well, and we wanted an automated system similar to that one,” says Maas. “However, for the spice-batching process, we needed a much more complicated system that could handle twenty-four different ingredients, produce multiple recipes simultaneously, and make up to one-hundred-pound batches.”

The weighing and batching system

The custom-designed automated gain-in-weight weighing and batching system consists of 25 32-gallon batch buckets, 24 28-cubic-foot ingredient dispensers, 24 screw feeders with helix screws, one infeed belt conveyor, four weighbelt conveyors, one outfeed belt conveyor with a checkweigh station, and one PLC controller that controls the entire system’s operation. The batch buckets and ingredient dispensers are constructed of polyethylene and approved for use in USDA, FDA, and 3-A Dairy applications.

A stainless steel, variable-speed screw feeder installed at each dispenser’s bottom discharge bulk-and-dribble-feeds the ingredient. The feedrate is deter-

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Operators on the system’s walkway platform, mounted directly above the weighbelt conveyors, have easy access to the dispensers for inspection and refill.

mined by the ingredient in the dispenser, with a maximum rate of 70 ft³/h. Each feeder's screw length is determined by a dispenser's distance from the batch bucket's filling position, which ranges from 18 to 54 inches.

The 30-inch-wide infeed belt conveyor, weighbelt conveyors, and outfeed belt conveyor are constructed of stainless steel and approved for food-grade applications. The infeed conveyor, which can hold up to nine empty batch buckets, is more than 20 feet long, while each weighbelt conveyor is about 10 feet long. A gain-in-weight scale mounted on load cells is installed at the center of each weighbelt conveyor, forming the weigh station where a batch bucket sits during filling.

The system's PLC controller has a flat-panel touchscreen that allows an operator to easily call up the various spice-batch recipes, monitor the system's components, and manage inventory. For quality control, the PLC sounds an alarm if an ingredient being filled into batch bucket falls outside the system's ± 0.02 -pound accuracy range. The PLC also generates a tag that gives the lot number of each individual ingredient used in a recipe, allowing the company to track lot numbers from the ingredient manufacturer all the way into the finished product to provide complete quality control.

In summer 2008, the supplier — Ingredient Masters, Cincinnati — installed the system in the company's ingredients room. A custom-engineered structural steel frame supports the system's components and creates two 12-dispenser parallel rows with about 50 inches of space between them. The four weighbelt conveyors form a straight line between the two dispenser rows about 40 inches below the dispensers' bottoms. Each weighbelt conveyor runs the length of three dispensers, separating the dispenser rows into four batching zones, each consisting of a weighbelt conveyor with three dispensers on each side of it. The weighbelt conveyors move the batch buckets through the corridor between the dispenser rows, and the six

screw feeders in each batching zone extend from the dispensers' bottoms to feed ingredients into the batch bucket on the weigh station.

To help maintain a clean ingredients room, the supplier mounted the weighbelt conveyors on pneumatic rams that can raise the conveyors about 9 inches so operators can easily sweep and clean under them.

A walkway platform installed about 60 inches above the conveyors allows operators easy access to the dispensers for refilling ingredients. An electric-powered mobile cart that holds a pallet and runs the length of the walkway allows a pallet with multiple ingredients stacked on it to be forklifted up and easily moved to the appropriate dispenser.

To help maintain a clean ingredients room, the supplier mounted the weighbelt conveyors on pneumatic rams that can raise the conveyors about 9 inches so operators can easily sweep and clean under them. Also, a dust collection port is mounted above each weigh station near the screw feeders' discharges to collect any dust generated during the batching process. And a dust collection port inside each dispenser removes dust generated when refilling a dispenser.

Automating the spice-batching process

To make a spice batch using the new automated weighing and batching system, an operator loads the infeed conveyor with empty batch buckets, then accesses the PLC, calls up one or more spice recipes that need to be batched, and pushes the start button. The infeed conveyor then moves an empty batch bucket onto the first weighbelt conveyor, which moves the bucket to its weigh station. Once the bucket is in position, the PLC activates the screw feeders one at a time to feed

the required spices into the bucket.

After the first weigh station's spices have filled into the bucket, the weighbelt conveyor moves the bucket to the next weighbelt conveyor, which positions the bucket on its weigh station. At the same time, the PLC calls up the second recipe in the queue (which may be the same as the first recipe or a different one), and a second batch bucket moves into the system and is positioned on the first weigh station. The PLC activates the required screw feeders in each batching zone to fill the necessary spices into the buckets.

When both buckets have been filled, the weighbelt conveyors advance each bucket to the next weigh station, and the process continues for each recipe in the queue, with the buckets advancing through the system like a train, stopping at each weigh station to receive the required ingredients.

After a batch bucket exits the system onto the outfeed conveyor, it's positioned on the checkweigh station so the PLC and operator can verify the total batch weight. The bucket is then conveyed to an area where operators manually add preweighed minor and micro ingredients, typically in amounts less than 1 ounce. The bucket then moves to a staging area before its contents are used in a product's recipe.

The system, which is programmed so that a bucket can receive ingredients from one to 24 dispensers, can complete a batch in 4 to 8 minutes, depending on the number of ingredients.

Automated system improves production

The automated weighing and batching system improved the quality control of the prepared-meats and kettle-cooking operations. "Everything is done automatically now," says Maas. "The system records each spice batch by lot number, detailing such information as recipe ID, ingredient quantity dispensed, and batch start and stop times, so we know exactly what goes into every batch. The system also im-

proved the accuracy of the ingredient amounts in each batch, which minimized product loss and reduced operating costs. Additionally, the system reduced housekeeping costs because the ingredients room is much cleaner.”

Since installing the system, the labor and time required to make the spice batches has decreased. “We’ve been able to put a couple of employees to work in other areas in the plant,” says Maas. “And we’re only spending about ten hours a day, four days a week making spice batches, which means we can handle future production increases. I feel very comfortable and confident moving forward using the supplier’s system.”

According to Maas, the supplier was easy to work with when designing and installing the custom system. “They were here throughout the installation and start-up process, making sure that all the hiccups got resolved,” he says. “And they have great follow-up service and have been very responsive whenever we’ve had issues with the equipment. The system was well worth the capital investment.” **PBE**

Note: Find more information on this topic in articles listed under “Weighing and batching” in *Powder and Bulk Engineering*’s comprehensive Article Index in the December 2008 issue and at *PBE*’s Web site, www.powderbulk.com, and in books available through the Web site in the *PBE* Bookstore. You can also purchase copies of past *PBE* articles at www.powderbulk.com.

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