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Rotary drum batch mixer is company's secret ingredient

A food ingredients producer installs a rotary drum batch mixer to expand its custom-blending operation.

Case history

Quality Powderizing Ltd. (QPL), Newmarket, Ont., custom-blends gum-based powdered products that are used by food companies for binding and stabilizing food products. For one major customer, QPL blends products with up to six ingredients ranging from fine powders to granules that food manufacturers use for making hamburger patties, breads, fish, chicken, and dairy products. Over the years, as this customer expanded its business, QPL kept pace using a 5,500-pound-capacity (2,500-kilogram-capacity) ribbon blender to produce the various custom-blended products. However,

by mid-2010, the company realized that it was nearing peak production capacity and needed to add another batch blender to continue meeting the customer's increasing needs.

Expanding the blending operation

QPL operates 5 days a week, 10 hours a day, custom-blending a variety of products that can require anywhere from two to six ingredients per batch. Ingredient particle sizes range from 60 to 300 mesh (250 to 450 microns) and bulk densities range from 30 to 50 lb/ft³ (0.85 to 1.42 kg/m³). The prod-



Ingredients flow from the sifter (upper left) into the mixing drum, where they're homogeneously blended before discharging from the mixer to the packaging equipment hopper (right).

ucts' ingredients are delivered to the company's 20,000-square-foot (1,858-square-meter) facility in 55-pound (25-kilogram) bags. The company typically makes the products in a series of five-batch runs, with batch sizes ranging from 4,400 to 5,500 pounds (2,000 to 2,500 kilograms) and blending times from 20 to 25 minutes, depending on the product. A completed batch discharges from the ribbon blender and is either packaged in 55-pound (25-kilogram) bags or 2,200-pound (1,000-kilogram) bulk bags for shipment to the customer.

In 2010, the company produced more than 2,755 tons (2,500 metric tonnes) of products with the batch ribbon blender. When looking to expand the blending operation to continue meet-

ing customer demand, the company considered the pros and cons of adding another ribbon blender. In doing so, the company noted that the ribbon blender had some limitations.

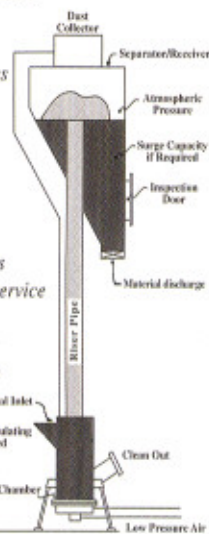
"Since the ribbon blender doesn't completely discharge the batch and we can't sweep out the remaining material for packaging, we have to add seven to eleven pounds [three to five kilograms] of extra material to each batch to ensure a full batch amount," says Charles B. Abarado, QPL president. "We lose about five to thirty-five pounds [three to sixteen kilograms] of product per run because we have to discard the material remaining in the blender to maintain food safety standards. This also slows the product changeover time because an operator

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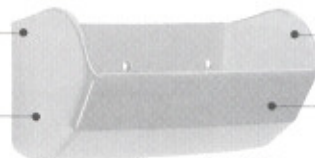
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When the mixing cycle ends, the rotating drum's internal mixing flights and lifters direct the batch to the discharge gate, and it quickly and completely discharges to the packaging equipment.



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has to sweep out and discard the material before vacuuming and performing cleaning and sanitation procedures on the blender."

As the company's production volume increased, so too did the number of product changeovers required during each shift. "There are times when our customer requires us to produce just one batch of a product, or they have an urgent order that needs to be filled right away," says Abarado. "Having to do so many product changeovers with the ribbon blender slowed production because it can take up to an hour and a half to thoroughly clean between products. There were times these production delays from the cleanup pushed us toward overtime work."

Another issue the company had with the ribbon blender concerned the internal shaft seals. "We were spending significant time maintaining the ribbon blender," says Abarado. "The shaft seals come in contact with the powders, some of which corrode or dry out the seals, requiring us to frequently replace them to avoid cross-contamination. We needed to find a more efficient way to blend the products and eliminate the excessive maintenance."

Finding the right batch mixer

In fall 2010, Abarado began searching for a new blender on the Internet, and he soon found a rotary drum batch mixer with no internal shaft seals that completely discharges a batch, leaving little to no residual material in the drum. He called the mixer supplier to learn more about the mixer and then arranged to visit the supplier's facility for a demonstration. A short time later, Abarado sent ingredients to the supplier for tests to verify that the mixer could make the products to the customer's specifications. The tests proved successful, and Abarado purchased a rotary drum batch mixer to augment the company's blending operation.

The supplier, Munson Machinery, Utica, N.Y., supplies a wide range of dry material mixing, size reduction,

and metal-finishing equipment to the bulk solids and other industries.

The drum has a stationary inlet at one end with a self-adjusting face seal for dust-free operation and a stationary outlet at the other end with a steel-reinforced urethane-disc discharge gate.

The rotary drum batch mixer

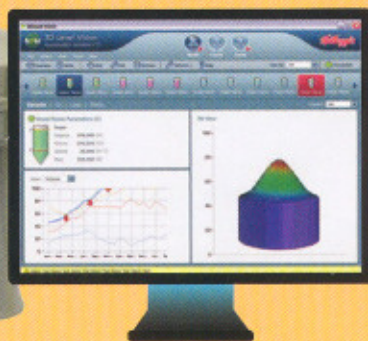
In January 2011, the model 700-TS-140-SS Rotary Batch Mixer with a 140-cubic-foot-working-capacity batch drum was delivered to QPL's facility, and company engineers installed the mixer on an existing structural steel support stand. The mixer consists of a horizontal stainless steel mixing drum that rotates on two heavy-duty trunnion rings. The drum has a stationary inlet at one end with a self-adjusting face seal for dust-free operation and a stationary outlet at the other end with a steel-reinforced urethane-disc discharge gate. An internal spray-line in the drum allows the company to coat materials with liquids or inject moisturized air, although it's not currently being used. The support stand is positioned next to a mezzanine with a vibrating sifter that's connected to the mixer inlet, allowing an operator to sift ingredients directly into the mixer. The support stand positions the mixer discharge so that it's directly above the packaging equipment hopper, eliminating the need for conveying equipment.

"The mixer was easy to install in our facility," says Abarado. "We just mounted it on our support structure, connected the power, and were ready to go. We had no problems with startup; everything internally on the mixer was connected, and we just began blending. Operating the mixer is actually very easy."

A 20-horsepower (14.9-kilowatt) variable-speed motor rotates the mixing

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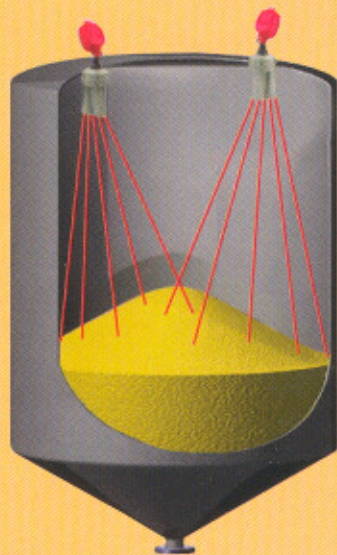
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drum, which can hold up to a 5,500-pound (2,500-kilogram) batch. During operation, the mixing drum rotates clockwise, with the batch positioned slightly off-center in the drum's bottom. (If the rotating drum were branded with a clock face, the batch would mix between 4 and 9.) When mixing, the drum's continuously welded internal lifters and baffles lift, fold, cut, and tumble the ingredients onto themselves in a four-way mixing

action that produces a homogenous blend even with ingredients that have varying particle sizes and material densities. At the end of the mixing cycle, the mixer's discharge gate opens about 60 degrees, and the batch quickly and completely discharges from the mixing drum without segregation. According to Abarado, the mixer can complete a batch cycle in 15 to 20 minutes, depending on the product.

The mixing drum has a drain and two clean-out doors, which allows unrestricted access to internal surfaces during washouts between product runs. The drum's interior has a standard 2B mill finish with 80-grit-smooth welds that prevents material from sticking to the interior surfaces, and all product contact surfaces are stainless steel. The internal welds eliminate corners, cracks, and crevices to prevent material entrapment.

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Mixing a perfect batch every time

Since installing the rotary drum batch mixer, the company has increased production and continued meeting its customer's blending needs for top-quality products. "We still use the ribbon blender, but the operators prefer to work with the rotary mixer because it takes less time to clean and requires approximately one-sixth the maintenance of the ribbon blender," says Abarado. "Because the drum rotates on external trunnion rings, there's no internal shaft seals immersed in the material, which minimizes maintenance requirements and eliminates cross-contamination. Besides routine scheduled maintenance for the mixer's discharge gate, the mixer has much less downtime than the ribbon blender, which has improved our production efficiency."

The mixer's complete material discharge and the mixing drum's clean-out doors allow an operator to thoroughly clean and sanitize the mixer in minutes. "Because product changeover with the mixer is so much quicker, we've improved the blending operation, increased production capacity, and minimized overtime," says Abarado. "We use the mixer for our customer's single-batch and urgent orders now, since it's so much easier and faster to clean. And because the mixer completely discharges a batch, it doesn't require extra material, so we don't lose any product on the mixer line."

"The mixer delivers great batch uniformity regardless of particle size variations, so we use it to blend all of our food products for which homo-

geneity is critical," says Abarado. "And as a result, we've received good customer feedback. The mixer has improved our quality control points and is compliant with food safety standards. We expect that it should last us thirty to fifty years... at least."

PBE

Note: Find more information on this topic in articles listed under "Mixing and blending" 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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