

Case history

Rotary batch mixer helps a nutraceutical manufacturer simplify its sanitary production process

Daily Manufacturing Inc., Rockwell, N.C., is a small, family-owned business committed to producing nutraceuticals made from natural ingredients. Founded in 1979 by James and Mary Jo Daily, the company originally manufactured only one product, but has since grown to manufacture and distribute more than 50, including vitamins, minerals, digestive aids ranging from activated charcoal to probiotics, and more.

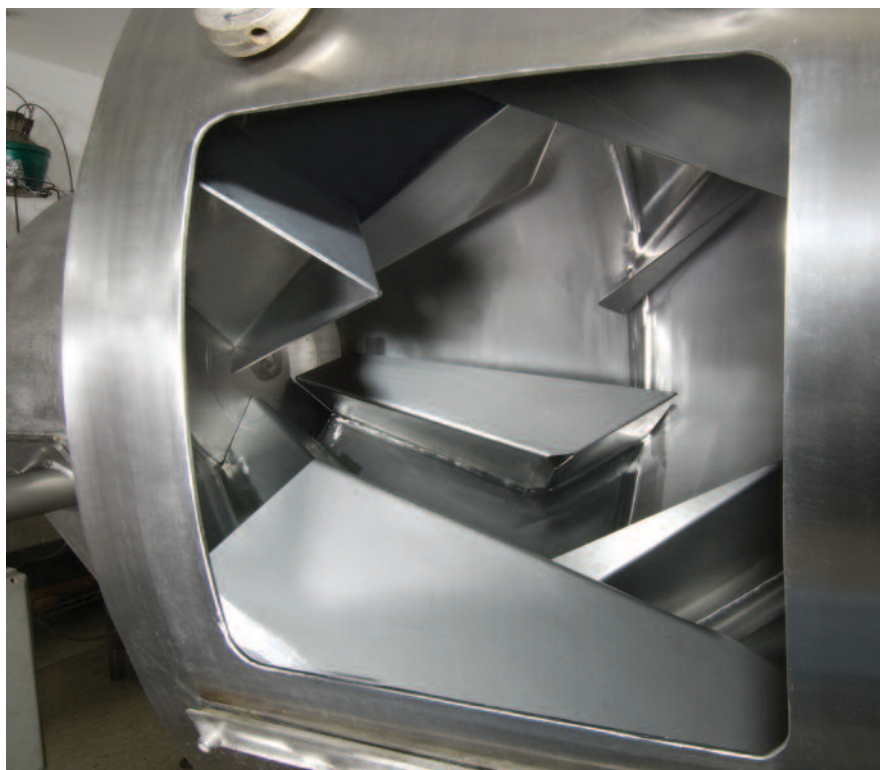
A key step in the manufacturing process is mixing the 2 to 20 ingredients that comprise each nutraceutical

product. It's also crucial for the manufacturer to adhere to FDA sanitation standards because the agency performs regular inspections of the manufacturer's facility. Because the manufacturer experienced ongoing problems with its mixing equipment, it began looking for a better solution.

Existing equipment difficult to sanitize

For several years, the manufacturer used a ribbon blender to mix its ingredients, but as it began to produce more products, sanitizing the equipment became more cumbersome because

A nutraceutical manufacturer finds that a small rotary batch mixer reduces waste and meets sanitation requirements.



The model MX-10-SS rotary batch mixer's drum has continuously welded internal lifters and baffles that lift, fold, cut, and gently tumble the nutraceutical ingredients.

of frequent product changeovers. Multiple products meant mixing multiple batches weekly and sometimes daily, which only made the cleaning and sanitation more difficult. The ribbon blender's components required manual cleaning, which led to equipment downtime and operator overtime.

The ribbon blender consists of an enclosed trough with a ribbon element that rotates to blend the ingredients. The ribbon doesn't fully access the vessel bottom because of clearance tolerances, so product is typically left in the blender's base after discharge. In this manufacturer's case, nearly 2 pounds of material remained in the vessel per 100-kilogram batch.

"The ribbon blender was difficult to clean and required scrubbing with a brush, especially the ribbon's center

shaft, which was hard for the operator to reach," says Jim Daily, Daily Manufacturing's vice president of research and development. "Plus, we had to worry about material that pushes into the inboard bearings. This caused damage to the bearings, especially from our more abrasive ingredients." The damaged bearings leaked fine powders and required frequent replacement. Material also got trapped here, creating a cross-contamination concern, says Daily.

Finding a better alternative

In 2010, the manufacturer decided to find replacement equipment that could mix the ingredients for the growing product line. After a year of research and weighing options, Daily ruled out double-cone blenders and V-blenders because of their larger footprint and their tendency to allow segregation of materials upon dis-

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A 2-horsepower motor equipped with a high-efficiency helical gear reducer connected to a single-strand roller chain-and-sprocket drive powers the 10-cubic-foot-capacity rotary batch mixer.

charge. While attending a trade show, he met representatives from Munson Machinery Co. — a mixing, blending, and size reduction equipment supplier based in Utica, N. Y. — and learned about the company's mini rotary batch mixer. This equipment looked like it would answer the manufacturer's concerns, so he placed an order for a model MX-10-SS mini rotary batch mixer.

About 15 weeks later, the mixer arrived at Daily Manufacturing. Adding it to the process line was simple. The mixer arrived as one integral unit, and it operates with a simple start-and-stop switch, with no installation requirements or equipment training needed. The mixer was specifically designed for the manufacturer's elevated loading and discharge height. The mixer is mounted on a stand with casters, which allows it to be moved readily throughout the facility and plug into any fuse disconnect.

The mini rotary batch mixer

The model MX-10-SS mini rotary batch mixer consists of a horizontal stainless steel mixing drum that's supported by twin outboard-mounted heavy-duty pillow block roller bearings. The drum is filled through a single access door, and material is discharged through a machined discharge gate. The mixer's internal mixing flights are spaced for easy access and are continuously welded to the drum wall for total product discharge. The mixer's internal welds eliminate any corners, cracks, or crevices that could trap material and foster cross-contamination. The mixer has a 2-horsepower motor equipped with a high-efficiency helical gear reducer connected to a single-strand roller chain and sprocket.

The rotary batch mixer's total vessel volume is approximately twice the rated batch capacity, which ensures plenty of fluidization to provide uniform mixing without segregation. The internal mixing flights create a tumbling, turning, cutting, and folding action that uniformly blends the

batch materials regardless of size, shape, density, or microadditions. This gravity-driven mixing process produces a rapid, thorough blend while imparting minimal energy and intensity to the product. When a blend is complete, typically in no more than 2 minutes, the discharge gate opens outward from the vessel allowing the material to be discharged as the drum continues to rotate and blend.

"The mini rotary mixer uses less horsepower than a ribbon blender because you're only tumbling a drum," says Steve Knauth, the supplier's marketing technology manager. "You're not forcing an agitator to work its way through the materials, which requires a lot of energy. With the rotary mixer, you're simply tumbling something on its axis, which requires far less horsepower, and you use half the energy a ribbon blender uses. With half the blend time and half the horsepower, you're using roughly twenty-five percent of the energy used to operate a ribbon blender."

Improving the production process

"The supplier's rotary batch mixer is ideally suited for mixing ingredients, including some with minute quantities of additives," says Mark Brown, the manufacturer's quality control chemist. "With its capacity, it can easily handle a wide variation in batch sizes and provides equally efficient mixing at 100 percent down to 10 percent of maximum capacity, even with ingredients added in trace quantities." This is important, he says, because "the bulk densities of our ingredients vary from 24 to 28 cubic feet and often have disparate particle sizes."

The manufacturer reports that sanitizing the rotary batch mixer is now a simple 10-minute process. After a batch has completed mixing and is discharged, the operator hoses out the vessel to remove any remaining material. Then, hot water is added along with nonfoaming detergent, and the rotary mixer is turned on to mix for 10 minutes. After the cleaning fluid is drained from the vessel, it's typically



The rotary batch mixer is well-suited to blending the small ingredient quantities required in nutraceutical products.

left open and the moisture dries overnight, making it ready for a new batch the next day.

"The rotary batch mixer does a better job of mixing our ingredients, we have less waste, and it's easy to sanitize," says Daily. "The mixer thoroughly blends a batch in less than half the time required by the ribbon blender, greatly increasing our productivity, and it's flexible enough to meet our future needs." **PBE**

Note: Find more information on mixing dry ingredients in articles listed under "Mixing and blending" in *Powder and Bulk Engineering's* article index (in the December 2013 issue and at PBE's website, www.powderbulk.com). You can also purchase copies of past PBE articles at www.powderbulk.com.

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