

Case history

Mixing and bagging homogeneous results

A specialty chemicals producer replaces a ribbon blender with a new batch mixer and blend-pack system to improve a mixing and bagging operation.

Prosel SRL de CV, Monterrey, Mexico, makes both solid and liquid processed specialty chemicals that are used by water treatment facilities, power plants, petrochemical facilities, oil refineries, and steel mills for industrial water treatment, metal cleaning and finishing, and other applications. The solid prod-

ucts can consist of all powder ingredients or a combination of powder and liquid ingredients. To improve the solid-products production operation, the company decided to look for a new mixer and bagging equipment to decrease energy costs, increase mixing and bagging efficiency and productivity, and improve operator safety.



The 3,000-pound-capacity stainless steel mixer can homogeneously blend batches as small as 5 to 10 percent of the rated capacity.

Problems making a solid product

To make a solid product, the company's production department issues a production schedule and production order (PO). The PO tells the operators how to make the product and indicates each ingredient's quantity, the addition order, and the mixing time between the additions. Workers in the warehouse prepare the various ingredients for the PO, individually weighing each ingredient and placing the various containers of powder and liquid ingredients on pallets.

In the past, an operator used a forklift to move the pallets to a staging area near a 50-cubic-foot-capacity batch ribbon blender with a 25-horsepower electric motor. The operator manually added each ingredient to the blender in the order specified by the PO. To add a powder or liquid ingredient, the operator had to stop the blender, manually dump in the ingredient, and restart the blender.

"We had to stop the blender because manually adding the powder and liquid ingredients to an operating

blender would've exposed the operators to fugitive dust that would've escaped the blender and pervaded the plant," says Hector Garza, director of Prosel. "Another problem with the ribbon blender was that the liquid ingredients didn't always get evenly blended into a batch — some sections of a batch would be very wet and other sections would be very dry."

After 3 to 4 hours of blending, the operator emptied the product from the ribbon blender into 25-kilogram bags. To fill the bags, the operator placed an empty bag on a scale and manually filled it with material scooped from the blender. "If the operator put too much material into a bag, he had to scoop out the extra," says Garza. "And if he put in too little, he had to scoop in more. This wasn't efficient or ergonomic."

Additionally, the long blending times generated excess heat inside the ribbon blender and allowed moisture to accumulate, which caused the final product to clump up in the blender and in the bag. "And even with the

To increase productivity, decrease energy costs, and improve operator ergonomics and safety, the company decided to look for a new blender to make the solid products.



The platform, which is built around the mixer, holds three fully loaded pallets of powder ingredients and allows an operator easy access the mixer's dust-free bag-dump station.

long blending times, the ribbon blender didn't always produce a homogeneously blended batch, which led to segregation in the final product," says Garza. "Also, the ribbon blender's large electric motor consumed a lot of energy."

To increase productivity, decrease energy costs, and improve operator ergonomics and safety, the company decided to look for a new blender to make the solid products.

Search for a complete mixing system

In March 2004, Garza was in the process of finalizing a purchase order for a new ribbon blender. However, before turning in the order, he decided to search for more information about other available mixers. "I was surfing the Internet when I found *Powder and Bulk Engineering's* Web site," says Garza. "I went to the Supplier Links section and opened the Mixers and Blenders category. I clicked every mixer supplier link and opened each supplier's Web site, which is how I found Continental Products' Web site and information about its batch mixer."

After reading about the mixer's ability to create homogenous blends in a short time with materials that have completely different material characteristics and particle sizes, Garza sent an e-mail to the supplier requesting more specific mixer information. His e-mail also stated that he wanted an elevated mixer platform with a staircase, a bag-dump station with a dust collector, and automatic weighing and bagging equipment. The supplier e-mailed back the requested information to Garza as well as a list of customer references.

Garza reviewed the information and called the supplier, saying he wanted to see a mixer in action. Unfortunately, the supplier couldn't find a nearby company in Texas or Mexico that would allow Garza to make a plant visit. Garza then told the supplier that he would be in Chicago soon and wanted to know if there was a plant in the Chicago area that he

could visit during his stay. After hearing this, Bill Callaghan, Continental Products Corp.'s director of engineering, realized that he could put a 5-cubic-foot-capacity production mixer in a van and drive it from his headquarters in Milwaukee to Chicago to demonstrate it for Garza.

One week later, Callaghan drove the van and small production mixer to Chicago and parked it in front of the hotel where Garza planned the meeting. With the hotel's approval, he ran an extension cord from the hotel lobby to the van and set up the mixer for the demonstration. After Garza arrived, Callaghan turned on the mixer and put in 80 pounds of a powdered laundry detergent followed by about four-tenths of 1 percent of colored cookie sprinkles.

"It took about four revolutions to homogeneously blend the materials," says Garza. "It was amazing how fast the mixer worked. And because the supplier had installed Plexiglas on the mixer's back and mounted a light inside the mixer, I could actually watch it operate."

One week after seeing the demonstration and learning that the mixer could homogeneously blend batches as small as 10 percent of the rated capacity, Garza decided to buy a stainless steel mixer with a liquid spray system and the supplier's dust-free blend-pack system, which includes a bag-dump station with a dust collector and automatic weighing and bagging equipment.

"We shipped the mixer and other equipment to Garza about ten weeks after receiving the purchase order," says Callaghan. "We also sent him blueprints and engineering details so he could build a mixer platform and staircase around the mixer in Monterrey to avoid US construction and shipping costs."

The mixer and blend-pack system

The Model 62-50/60S Continental Rollo-Mixer Mark VI is 7 feet wide, including the controls and drive system; 5 feet deep; and 7 feet tall. The



The bag-dump station's integral dust collector pulls away dust generated when an operator manually dumps the powder ingredients into the mixer.

mixer sits on a 4-foot-tall support base, putting the overall mixer height at 11 feet. The 3,000-pound-capacity (50-cubic-foot-capacity) mixer is designed to handle material with a density up to 60 lb/ft³. The mixer's 74-inch-diameter rotating drum assembly (or batch vessel) with standard internal mixing flights is mounted on a rotating shaft supported at each end by a pillow-block bearing mounted on a steel frame. A front hood assembly encloses one end of the drum assembly and houses the mixer's inlet and discharge chutes. The mixer's interior and all material contact parts, including the inlet and discharge chutes, are made of Type 304 sanitary stainless steel.

The mixer's control box operates a 3-phase, 230-volt, 7.5-horsepower TEFC (totally enclosed, fan-cooled) single-speed electric drive motor. The drive motor, which is linked to a drive chain that's wrapped around the drum assembly's rear head, rotates the drum assembly at 4 rpm. As the mixer's drum assembly rotates, the internal flights create a free-falling material

curtain that exposes each particle's surface area and allows for the liquid ingredients' uniform dispersion.

The drum assembly rotates independently from the front hood assembly and is the mixer's only moving part. An inlet chute at the top center of the mixer's front hood assembly and a discharge chute on the front hood assembly's face just beneath the inlet chute are independent of the rotating drum assembly, so a dust-tight connection can be made to both for dust-free mixing.

The platform built around the mixer accommodates three fully loaded pallets of powdered ingredients. The staircase allows an operator access to the platform's top level, which is at the same height as the mixer's top.

The bag-dump station, which the supplier manufactured, is connected to the mixer inlet and protrudes through the platform. Its 30-by-36-inch-wide opening is about 32 inches above the platform floor. Because an operator manually loads the powder ingredients into the bag-dump station from 50-pound-capacity paper bags and other containers, the supplier installed a grate and screen to prevent any bag pieces or other debris from entering the mixer. A Donaldson UMA 150H dust collector pulls dusty air from the bag-dump station for dust-free loading. To clean the dust collector's filter, the operator pushes a button and a device shakes the filter, allowing the fines to fall off the filter into the mixer.

The mixer's spray system consists of a compressed-air source, an air-operated diaphragm pump, a 3/8-inch-diameter flex hose, and a spray lance with two spray tips. The flex hose connects a liquid-ingredient container to the spray lance. The spray lance is mounted in the mixer's upper right quadrant near the inlet, and the spray tips are pointed at the free-falling material curtain. The company also purchased an extra spray lance for backup and four extra spray tips to use with liquid ingredients that have different viscosities.

The automatic weighing and bagging equipment, which is mounted directly on the mixer's discharge chute, consists of a gross-weigh bagger and bagging scale with air-operated bag clamps and flexible connections for dust-control, a foot-pedal controller, a conveyor, and an automated bag sewer. After a bag is filled, the conveyor moves it to the automated sewer, which sews the bag top shut. An operator then manually places the bag on a pallet. The company can fill 55 25-kilogram bags from each batch at a rate of about 8 to 10 bags per minute.

New solid-products production process

In July 2004, after building the platform and staircase, the company installed the mixer. Now, after the warehouse workers prepare the various ingredients for a solid-product PO, an operator uses a forklift to move the pallets to the mixer platform. Before lifting the pallets up onto the platform, the operator removes the liquid-ingredient containers and places them on the floor in front of the mixer. After placing the pallets on the platform, the operator turns on the mixer and dust collector and starts adding the powder ingredients to the mixer in the order specified by the PO.

The new mixer has increased the company's mixing and bagging efficiency and improved productivity by about 70 percent.

When the PO indicates a liquid ingredient, the operator walks down the staircase and connects the appropriate liquid-ingredient container to the compressed-air source and air-operated diaphragm pump. The operator then activates the spray system by opening a valve on the diaphragm pump that allows the liquid to move from the container into the mixer. When the container is empty, the operator closes the valve, disconnects the container from the compressed-air source and di-

aphragm pump, and, depending on the PO, either connects the next liquid-ingredient container to the compressed-air source and diaphragm pump or walks back up to the platform's top to add the next powder ingredient.

When the batch is done mixing, the operator leaves the mixer running and walks down to the floor to discharge the material into 25-kilogram bags. To discharge the material, the operator first uses the foot-pedal controller to open two bag clamps that are located on the bagger's discharge spout. The operator slides an empty bag's top opening over the bagger's discharge spout and uses the foot-pedal controller again to close the clamps around the bag top, creating a dust-tight seal for dust-free bagging.

After securing the bag to the bagger's discharge spout, the operator pulls down a lever located on the mixer's front hood assembly below the inlet. This lever extends the mixer's interior discharge-chute gate into the curtain of free-falling material. As the mixer continues rotating, the material flows by gravity into the gate and is redirected to the mixer's discharge chute and into the bagger's discharge cavity, which holds 25 kilograms of material.

To fill the bag, the operator opens the bagger's discharge gate and exactly 25 kilograms of material discharges from the discharge cavity into the bag. The bagger's discharge gate then closes and 25 kilograms of material from the mixer fills into the discharge cavity for the next bag.

After a bag is filled, the operator uses the foot-pedal controller to open the bag clamps and release the bag, which drops a short distance onto the conveyor. The conveyor moves the bag to another operator who guides it through the automated bag sewer, which sews the bag top shut. This operator then manually lifts the bag from the conveyor and places it on a pallet. This bagging and palletizing process continues until the mixer is empty.

Positive results mixed and bagged

The company's product quality and batch consistency have dramatically improved since installing the new mixer. "With the supplier's mixer, we always get a homogeneous blend, regardless of the batch size or material characteristics, and the spray system always uniformly sprays the liquid ingredients onto the powder ingredients," says Garza. "The mixer's ability to consistently produce homogeneous blends has given us peace of mind because we know that every batch will be the same, regardless of when we make it."

The new mixer has also increased the company's mixing and bagging efficiency and improved productivity by about 70 percent. "We can now do more solid-product production runs in a day," says Garza. "And since the production is more efficient, those operators have more time to help the operators in the liquid-products production area, which has helped improve that area's productivity as well."

The supplier's blend-pack system improved operator safety because the bag-dump station's dust collector and the dustless bagging system prevent fugitive dust from escaping into the plant. Also, because the mixer uses a 7.5-horsepower motor and the dust collector uses a 3-horsepower motor and because it takes about 30 minutes to blend and package a batch, the company consumes about 70 percent less energy than it did with the ribbon blender. "Additionally," adds Garza, "the mixer and bagger are very easy for our operators to use, and the short mixing times don't generate heat or moisture, so we no longer have a problem with material clumping in the mixer and in the bags." **PBE**

**Continental Products,
Milwaukee, WI**

414-964-0640

www.continentalrollomixer.com