

New installation

Removable agitator ribbon ensures pure additive blends

A polymer additives manufacturer installs a ribbon blender to allow quick product changeovers and increased capacity.

Chemtura Corp., Middlebury, Conn., manufactures pre-blended polymer additives that are widely used in the plastics industry in PVCs, polyolefins, and rubber compounds. These additives prevent plastic degradation caused by high heat or UV radiation exposure, protecting such end products as plastics bags, floor coverings, vinyl siding, automobile dashboards, and disposable diapers. To make the additives, the company blends several powder ingredients together with a very tight composition specification. After blending, the additives, also known as processing aids or polymer stabilizers, are further processed into a pellet or other compacted product and are ready to be shipped to a customer.

In 2003, the company put in a new production line to provide additional

capacity at its polymer additives manufacturing plant in Morgantown, W.V. The blender used in the company's other production line was working fine, but the company wasn't able to produce blends as quickly as needed with it. "Additive blends must be extremely pure and homogenous," says Kief Hess, Chemtura plant manager at the Morgantown plant. "Because we have multiple products, we have to ensure the highest quality possible with absolutely no contamination between product runs." That means that the company has to do thorough cleaning between batches, and this was a time-consuming process with the blender they were using.

The company also wanted to eliminate the risks associated with operators climbing inside the blender for cleaning and maintenance. The company needed to find an easy-to-clean



A flat-flange, clamshell coupling allows operators to raise the ribbon agitator out of the blender without moving the end shafts, bearings, or seals, saving hours of time between batches.

blender that would reduce the amount of time between changeovers and increase production capacity and operator safety.

Hunting for a supplier

The company contacted several ribbon blender suppliers, including the supplier of its other in-house blender. “In talking with the suppliers, we found that most ribbon blenders have a permanently fixed agitator ribbon and shaft,” says Hess. “But we wanted to try something more innovative. We needed to find a supplier that would work with us to provide a customized blender with special design features to meet our stringent requirements.”

While paging through a copy of *Powder and Bulk Engineering*, Hess found information about a blender supplier that seemed like a match for the company’s needs. The supplier, Charles Ross & Son, Hauppauge, N.Y., is a manufacturer of mixing equipment, including paddle and ribbon blenders, for various powder and

bulk solids applications. The supplier also specializes in collaborating with customers to design equipment to meet specific application requirements. Hess contacted the supplier and explained what the company was looking for. “The supplier was very open to working with us and hearing our ideas,” says Hess. “We felt confident that they would provide us with exactly what we wanted.”

Designing a custom solution

To begin the custom-design process, the supplier’s representatives visited the company’s plant and met with the operating technicians and engineers there. The supplier gathered information on what drawbacks the company was experiencing with its other production line’s blender during product changeovers and what capacity the company was hoping to achieve.

Together the company and the supplier determined what specific requirements the ribbon blender must have, and the supplier began drawing

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The removable ribbon is hoisted out using an overhead crane so operators can quickly and easily clean both the ribbon and the blender's trough.

schematics. “We were on a very tight design and construction timetable,” says Hess. “Fortunately, the supplier was extremely cooperative, and we transferred drawings back and forth electronically so we didn’t have to approve hard copies, which takes a lot more time.” The supplier also did some testing in its test lab, running small batch runs on lab equipment and using that information to scale up the blender.

The final custom-designed blender features an agitator ribbon that can be easily and quickly removed without moving any of the drive components, saving hours of changeover and cleaning time with every batch. “Since this blender’s agitator can be taken out between batches, it’s extremely easy to clean,” says Ken Langhorn, Charles Ross & Son technical director. “And because the company can quickly and thoroughly clean the blender between product changeovers, it eliminates any possibility of contamination, which was an important feature for the Morgantown plant.”

Because the company was putting in an entire production line and needed to have it up and running quickly, the supplier had to manufacture and install the custom blender under an extremely tight deadline. “We had a very unreasonable timetable,” confesses Hess. “Originally the supplier told us it would take about twelve to sixteen weeks to manufacture and ship the blender, and we told them we had to have it in eight weeks. Luckily, they were able to find ways to shorten the construction period.” One time-saver was that the supplier manufactured some of the blender’s parts in its Chinese plant, then found an alternative route to ship the pieces back into the US, with a freight transportation time of just a little over a week.

In September 2003, the company’s operators installed the new blender directly into the new processing line. The blender started right up with no problems and no adjustments.

Using the new ribbon blender

The 215-cubic-foot sanitary ribbon blender is constructed of Type 316 stainless steel and has a capacity of up to 6,000 pounds, depending on the bulk density of the materials being mixed. The blender consists of a trough containing an agitator assembly. The agitator assembly is a continuous ribbon mounted on its own shaft and attached at each end to a short shaft that runs through the trough ends. At each trough end, a seal and bearing assembly mounted on the end shafts keeps material in the blender and keeps external contamination from entering the blender. One end shaft connects to the drive assembly that rotates the agitator ribbon. The drive assembly is powered by a 60-horsepower variable-speed motor.

The blender trough’s hinged lid opens up to allow easy access to the trough and the agitator ribbon assembly. The hydraulically operated lid can support a full pallet of raw materials and contains an 18-inch, quick-release charging port that can be oriented to different angles and can be adjusted to accept ingredients from drums, bags, or other containers.

The blender is designed for easy ingredient loading, and the trough interior and the agitator ribbon are polished to help eliminate material sticking, material buildup, and product contamination.

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To make a blend, the company manually dumps two to seven ingredients into the blender through the charging port. The main ingredients are phosphate antioxidants, which are combined with other primary and

secondary antioxidants, including clarifiers, neutralizers, UV stabilizers, and lubricants. The ingredients are gently and thoroughly mixed to make a powdered blend. After mixing, the blend discharges from the blender through a bottom outlet valve and is pneumatically conveyed to a holding bin. From the holding bin, the blend will be transferred into other equipment to be further processed into a free-flowing final product, such as granules, pellets, or other compacted material, and shipped to customers.

Once a blend discharges from the blender, operators quickly and meticulously clean the blender to prepare it for the next batch run. “On a blender with a conventional removable agitator,” says Langhorn, “you have to remove the end shaft from each side of the agitator so you can actually raise the agitator out. This involves loosening the end shafts from the support bearings, seals, and packing assemblies. But with Chemtura’s blender, we used a specially designed flat-flange, clamshell coupling to attach the agitator to the end shafts.”

An operator basically uncouples the clamshell flange and uses a hoist to lift the agitator ribbon out at lifting points attached to the agitator ribbon shaft. The end shafts, bearings, and seals remain undisturbed. The entire process is done in just minutes, whereas it could take hours with a conventional removable ribbon design.

“The concept of a removable ribbon isn’t new,” says Langhorn. “But this one is unique because it’s designed for speed. Removing and reinstalling this ribbon is like changing a wheel in a NASCAR pit — it’s simple and fast.”

The system is entirely manual, except for a small Allen-Bradley PLC that runs the pneumatic conveyor that transfers the blend to the holding bin.

Experiencing a positive outcome

The company operates on a continuous basis 24 hours a day, 7 days a week, and

produces four to six different 5,500-pound powdered blends in a 24-hour period. The customized ribbon blender has exceeded the company's expectations to provide increased production capacity through quick product changeovers. In addition, no significant repairs have been required, and only minimal maintenance is needed to keep the blender running smoothly.

The removable ribbon design has also eliminated operator safety risks associated with climbing inside the blender for cleaning. "Once the ribbon is hoisted out, operators have easy access to the ribbon and to the walls of the blender itself," says Mike Firockman, Chemtura operations team leader at the Morgantown plant. "That means the operators can clean the blender by hand without having to actually climb down inside and work their way through the blender and around the ribbon. It's much easier to clean this way, and operators receive both ergonomic and safety benefits." In addition, the more complete cleaning helps ensure product purity by eliminating any chance of contamination between product runs.

"We've been extremely happy with the blender and with the supplier," says Hess. "I have no doubt that if our company ever needs to purchase another ribbon blender, we'll go back to Ross at the first opportunity. From a manufacturing focus, the blender's customized design helps us provide low-cost, quick-turnaround, and high-quality service to our customers with the purest and most accurate additive blends possible." **PBE**

Note: To find other articles on this topic, look under "Mixing and blending" in *Powder and Bulk Engineering's* Article Index at www.powderbulk.com or in the December 2005 issue.

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