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INSPIRING PLASTICS PROFESSIONALS

Blown Away

E-commerce Drives New Package Designs

WILEY

Everlasting Performance

A pair of rotary batch mixers still deliver on-spec phenolic compounds in minutes after almost four decades of service

Reliability and performance are key considerations for every company that invests in process machinery. Which is why reports of machines that run reliably for decades invariably attract attention. Consider the case of Plastics Engineering Co. (Plenco) of Sheboygan, Wis., which has been operating two rotary batch mixers for almost 40 years that still deliver on-spec performance in blending operations.

Plenco manufactures a range of custom-formulated molding compounds and industrial resins. A big share of production is dedicated to novolac and resol thermoset compounds—also known as phenolic resins—which it sells under the Plenco brand. Since these resins are used in many specialized applications, the company tailors the products to each end-user's needs. This involves formulation tweaks that include adjusting molecular weight, moisture content, viscosity, pH level, particle size and reactivity among other properties.

Immediately prior to packaging, the resins are blended with reinforcements, minerals, fillers and/or liquid additives, a task performed by two model 700-TSC-180-MS Rotary Batch Mixers from Munson Machinery Co. of Utica, N.Y., which have been in service at the compounder since 1983.

One of two Munson Rotary Batch Mixers, model 700-TSC-180-MS, that have been in operation at Plastics Engineering Co. since 1983. All photos courtesy of Munson Machinery Co.

Tumbling Action Is Key

The mixers have no agitators, internal shafts or related bearings or seals. Instead, a horizontally oriented vessel rotates on external trunnion rings located at each end. Materials flow into the vessel through a stationary inlet at one end and discharge through a stationary outlet at the other. Within the vessel are mixing flights, also called baffles or lifters, which create a gentle four-way tumble-turn-cut-fold mixing action that produces on-spec blends in 3 to 5 minutes. Randy Block, a mechanical engineer at Plastics Engineering, says, "We get a good, thorough blend without degrading the product."

To fill the vessels, a pneumatic conveyor transports resins from the compounding lines to a holding hopper, which also separates out dust. When enough material accumulates in the hopper, it is discharged to one of the mixers as it slowly rotates.

To fill the vessels, a pneumatic conveyor transports resins from compounding lines to a holding hopper. (Left) Continuous rotation of the drum during discharge prevents stratification of ingredients having disparate sizes, shapes and bulk densities, and empties the batch in a steady stream. (Top-Right) Hinged access doors at either side of the vessel provide access to all material contact surfaces for cleaning and visual inspection. (Bottom-Right)

After a mixer receives a dose of powdered additives from a loss-in-weight hopper above, a valve stops the flow, and the mixer makes a preset number of revolutions. When specified, liquid additions are pumped through spray nozzles onto a wide bed of moving material within the mixing vessel. At the end of the batch cycle, the mixer's discharge gate opens while the vessel is rotating. This allows the mixing baffles to guide the batch toward and through the discharge gate with little or no residual material left behind. "They do a good job of moving the material quickly and efficiently," Block says. "If we've got a straight dry material, there isn't much to clean out."

The gentle mixing action is critical, Block notes, because it preserves product quality. "We get a good thorough blend, but we don't degrade the product. If we used a typical paddle mixer, we would grind the granules against each other and create dust. That doesn't happen with the Munson blenders."

Continuous rotation of the drum during discharge prevents stratification of ingredients having disparate sizes, shapes and bulk densities, and empties the batch rapidly in a steady stream. "That's important because it minimizes wait times at the packing stations," Block says. "Because of that quick discharge, we are more efficient when packing bulk containers."

Blending, moreover, is just as uniform on short runs as it is across larger ones, he says. "We've made the same product as a 5,000-pound (2,268-kg) order and as a 250,000-pound (113,398-kg) order."

The mixing flights also create a dynamic bed of material, ideal for incorporating liquid additions. "We get a good consistent dispersion. The product doesn't get too wet in some parts and less wet in other parts," Block remarks. "A typical paddle mixer would give us a less-even coating."

Since their installation in 1983, the mixers have rarely been idle. Over the last 12 years, one mixer has had 34 hours of downtime and the other just 4.5 hours.

"The longevity of the machines is a testament to my predecessors who specified them," says Block. "We've been pleased with the lack of downtime and maintenance costs. They're quality pieces of equipment and reliable."