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A touch of glass

Glass is blended rapidly with abrasion resistant rotary mixer from **Munson Machinery**



While most reading this article may be unfamiliar with the Kopp Glass name, most are likely familiar with Kopp Glass products. From a humble beginning more than 80 years ago, as a manufacturer of red glass for railroad signals, Kopp now claims to be the world's leading producer of precision moulded industrial quality technical glass.

The company is known worldwide among the industries it serves as a producer of moulded borosilicate glass, a tough material that can withstand harsh industrial environments and is resistant to degradation from sunlight and weathering. The company offers more than 300 standard glass compositions, plus custom formulations, in any desired shade of colour.

The glass is used worldwide in diverse applications such as airport and aircraft lighting, chemical process equipment, medical device illumination, light filters of all types (including military night vision equipment), electrical transformers, architectural and theatrical lighting — and railroad and traffic signals. Kopp glass can even be found at the South Pole, where scientists have installed a computerised network of thousands of 35.5 cm dia glass globes about a mile below the surface of the ice. The globes contain sensors, with the goal of capturing sub-atomic particles, called neutrinos.

Kopp produces its glass in small batches, typically in the range of 100 to 1,000 pieces, says David Pungratz,

the company's mix and melt manager. The powdered ingredients are mixed, melted in a pot furnace, then moulded by skilled craftsmen. "All our products are made by hand," he says.

THE IMPORTANCE OF THOROUGH MIXING

The mixer is a vital part of Kopp's operation. "A batch may contain anywhere from five to 15 ingredients that must be mixed thoroughly in order to guarantee product quality," says Pungratz.

Kopp uses a rotary mixer made by Munson Machinery Co., Inc. (Utica, New York). It replaced a rotary pan mixer that had been in the plant for many years. The rotary mixer is a horizontal, rotating drum that is supported on either end by trunnion rings and driven by rollers, powered by a 3.7 kW motor. It has a stationary inlet at one end and a stationary outlet, with a discharge gate, at the other end. Mixing flights or baffles tumble the batch in a multi-directional manner.

While many ingredients are used in Kopp's products, sand accounts for 60–75% of a formulation, so sand is delivered to a silo in tanker trucks of 18,144 kg capacity. The rest of the ingredients, including borax, metal oxides and various other minerals, arrive in bags, drums or barrels.

The ingredients for a batch are loaded into a large rectangular hopper that is set on load cells. Sand from the silo is fed to the hopper by means of a screw conveyor and a chute. When the amount of sand reaches the preset weight, an operator manually shuts off the conveyor. Other major ingredients are added manually, one by one. Finally, the minor ingredients, which are pre-weighed, are introduced into the batch.

When the batch is complete, the hopper is raised into position above the mixer's inlet by an overhead hoist and trolley. The flange of a discharge valve at the bottom of the hopper rests on a rubber seal affixed to the mixer's >>>

The flange of a discharge valve at the hopper's outlet, is positioned atop the inlet of the mixer using an overhead hoist and trolley, due to ceiling height restrictions



Access doors facilitate interior inspection, cleaning and maintenance

Kopp replaced a rotary pan mixer with a Munson rotary batch mixer

inlet, after which the valve is opened and material flows into the machine, aided by two vibrators located on the exterior of the hopper.

MIXING IS RAPID

The mixer (model GB10 glass batcher) has a capacity of 2.8 cu m, or 680 kg for glass. However, Kopp's operation is limited to 317 kg by the size of the hopper. Pungratz explains that larger hoppers cannot be used because of the limited clearance above the mixer.

The liner and other contact surfaces in the glass batcher are made of abrasion resistant steel, designed to withstand the abrasive mixture of ingredients, particularly sand, in Kopp's formulations. Mixing times are only about 5 minutes — less than half the time required by the pan mixer, says Pungratz. Nevertheless, the machine's slow tumbling action, aided by the baffles, makes for "a homogeneous mix. We make the best hand-pressed glass in the world, with minimal defects," he asserts, "so our standards are very high."

Once a batch has been mixed it is discharged into a wheeled cart or wagon and taken to a furnace. Kopp has two furnaces, one of which can accommodate 16 melting pots and the other 12 pots. Most of the pots have a glass capacity of 1,134 kg. The furnace operates at 1,427°C, but the temperature of each pot can be individually controlled and ranges from 1,093–1,370°C, depending on the composition of the glass.

A MATTER OF INDIVIDUAL SKILL

When a batch of glass is ready for use the pot is opened and cooled to a working temperature, then the glass is cast in moulds of stainless steel or cast iron.

This operation is carried out by two skilled craftsmen, whose respective job titles are glass gatherer and presser.

Each piece is made individually. The gatherer accumulates the appropriate amount of glass needed for the piece, using a punty — a steel rod that has a clay ball on one end. The punty is placed into the mouth of the pot until it touches the molten glass, then the punty is turned in a way that gathers glass on the clay ball. The glass is carried to and released into the mould and the presser shears off the flow, then pulls a lever to bring the plunger (the mould's male part) into the mould.

Pungratz notes that the glass gatherer and the presser use their experience to calculate the exact amount of glass needed for a piece. Large products, such as 61 cm diameter Fresnel lenses, are made by layering three molten gobbs of glass.

Meanwhile, the mixer provides a continual supply of mixed glass ingredients to the furnaces. As soon as one batch has been discharged, the machine is cleaned and

recidied for the next batch.

The machine processes 10–20 batches per day, typically of several different colours, so it is important to avoid residue from one batch that might contaminate the next one.

However, contamination has not been a problem with the glass batcher, says Pungratz. Essentially all the material is rapidly discharged, leaving minimal residue, he says, and cleaning takes only about 10 minutes, using a dedicated vacuum. A door on the side of the machine provides full access to the interior.

A second vacuum system removes any airborne dust that results from the cleaning operation. However, in contrast with the pan mixer, the rotary mixer generates very little dust, says Pungratz, and "this was a big selling factor for us." He adds that the rotary machine is "extremely quiet, while the pan mixer was very noisy."

Another big advantage is that the mixer is essentially maintenance free, he says. "We just have to grease a couple of fittings about every two weeks, and in the six years we've owned the machine we have not seen any wear on the liner and have had to replace only one seal." ■

For more information visit:
www.munsonmachinery.com