

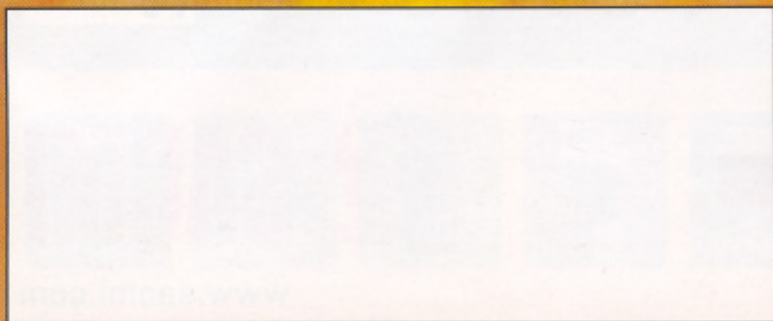
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# Rapid Glass Blending

*Glass can be blended rapidly with an abrasion-resistant rotary mixer.*

**A**lthough most people may be unfamiliar with the Kopp Glass name, they 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-molded, industrial-quality technical glass.

## Background

The company is known worldwide among the industries it serves as a producer of molded 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, as well as custom formulations in any desired shade or color.

The glass is used in such diverse applications 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 computerized network of thousands of glass globes about 14 in. (35.5 cm) in diameter below the surface of the ice. The globes contain sensors that are designed to help capture subatomic particles called neutrinos.

## Production Process

According to David Pungratz, Kopp's mix and melt manager, the company produces its glass in small batches, typically in the range of 100-1000 pieces. The powdered ingredients are mixed, melted in a pot furnace, and then molded by skilled craftsmen. "All our products are made by hand," he says.

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 originally had a rotary pan mixer that had been in the plant for many years, but the company has replaced this with a rotary mixer made by Munson Machinery Co., Inc. The rotary mixer is a horizontal, rotating drum powered by a 5 HP (3.7 kW) motor that is supported on either end by trunnion rings and driven by rollers. 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 40,000 lb (18,144 kg) capacity. The rest of the ingredients, including borax, metal oxides and various other minerals, arrive in bags, drums or barrels.

The batch ingredients 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.



The rotary batch mixer features a horizontal, rotating drum with a stationary inlet at one end and a stationary outlet at the other.

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

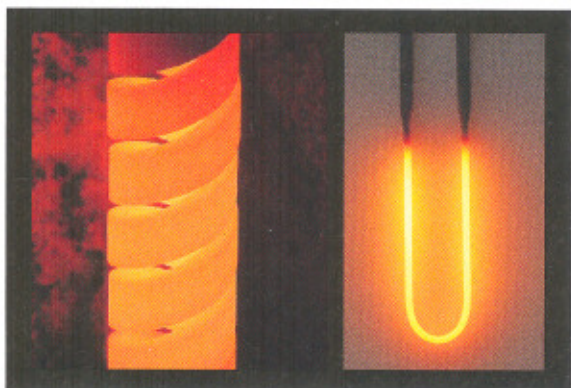
## Rapid Mixing

The mixer (model GB10 glass batcher) has a capacity of 10 ft<sup>3</sup> (2.8 m<sup>3</sup>) or 1500 lb (680 kg) for glass. However, Kopp's operation is limited to 700 lb (317 kg) by the size of the hopper. 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 and are designed to with-



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## CASE STUDY

stand the abrasive mixture of ingredients (particularly sand) in Kopp's formulations. Mixing times are only about 5 min, which is 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, so our standards are very high," he says.

Once a batch has been mixed, it is discharged into a wheeled cart or wagon and taken to a furnace. Kopp has



The flange of a discharge valve at the hopper's outlet is positioned on top of the inlet of the mixer using an overhead hoist and trolley.

two furnaces; one can accommodate 16 melting pots, while the other can handle 12 pots. Most of the pots have a glass capacity of 2500 lb (1134 kg). The furnace operates at 2600°F (1427°C), but the temperature of each pot can be individually controlled and ranges from 2000-2500°F (1093-1370°C), depending on the composition of the glass.

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 molds of stainless steel or cast iron. This operation is carried out by two skilled craftsmen, whose respective job titles are glass gatherer and presser.

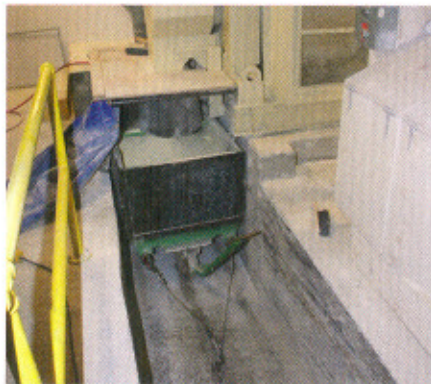
Each piece is made individually. The gatherer accumulates the appropriate amount of glass needed for the piece, using a punty (a steel rod that has a clay ball on one end). The punty is placed into the mouth of the pot until it touches the molten glass and then turned in a way that gathers glass on the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

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 Fresnel lenses with a 24-in. (61-cm) diameter, are made by layering three molten gobs of glass.

### Additional Advantages

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 readied for the next batch. The machine processes 10-20 batches per day, typically

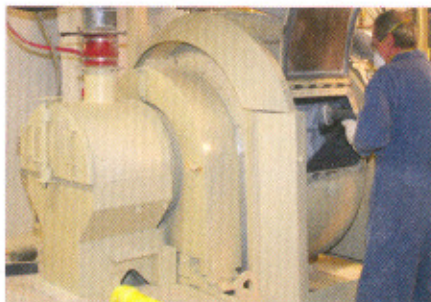




The batch is discharged from the mixer into a cart that transports it to the furnace.

of several different colors, so it is important to avoid residue from one batch that might contaminate the next one.

Contamination has not been a problem with the glass batcher, according to Pungratz. Essentially all the material is rapidly discharged, leaving minimal residue, he says, and cleaning takes only about 10 minutes with a dedicated vac-



Access doors facilitate interior inspection, cleaning and maintenance.

uum. 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 advantage is that the mixer is essentially maintenance free. "We



Robert Diana, Kopp's director of Manufacturing, inspects a large fresnel lens.

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," says Pungratz. ☉

For more information, call Munson Machinery Co., Inc. at (315) 797-0090; email [info@munsonmachinery.com](mailto:info@munsonmachinery.com); or visit [www.munsonmachinery.com](http://www.munsonmachinery.com). Kopp Glass' website is located at [www.koppglass.com](http://www.koppglass.com).



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