



Shelled to perfection

U.S.-based Franklin Bronze turned to automation to answer its needs for more capacity and volume from its investment casting. The results have been not just greater efficiency, but also higher-quality products and a cleaner work environment.

“We’re increasing our molds per day by 30 to 40 percent with the same amount of people.”

Kevin Weaver



> When Franklin Bronze and Alloy Inc. first opened for business in Franklin, Pennsylvania, in 1878, automobiles had yet to be invented, let alone robots.

More than a century later, the foundry – one of the oldest continually operating facilities of its kind in Pennsylvania – has rocketed into a new era with the addition of a state-of-the-art shelling system that was installed in 2005 by Shell-O-Matic Inc. of Montreal, Canada. The centerpiece of the system is ABB’s IRB 6600 robot, which has exponentially increased the foundry’s capacity while simultaneously improving the uniformity of the shells it creates.

“We were making good parts on this system from Day One,” says Kevin Weaver, who manages the Shell-O-Matic system for Franklin Bronze. “We weren’t expecting that.”

The investment casting facility produces ceramic shells to create parts for a multitude of industries ranging from automobiles to door hardware and industrial valves. Among its biggest product lines is a part that is used in conjunction with molds for creating glass bottles. In this area, Franklin Bronze is an industry leader, supplying most U.S. manufacturers as well as clients in 15 to 20 other countries.

Shells begin with wax patterns, which are injected to a high tolerance, measured down to 1/500th of an inch. Up to seven coatings, including colloidal slurry and a thin layer of sand, are applied to the shells before they are hung on industrial-sized racks to dry for specified amounts of time.

When done by hand, the dipping process can be both fatiguing and cumbersome. Six employees produce about 100 molds a day, standing for long hours over a vat of slurry or sand, allowing the coatings to drip off before hanging them on a rack.

“To remain competitive in the industry, we needed more capacity, more volume,” says Franklin Bronze President Robert Barber.

In 2005, the foundry invited suppliers to submit proposals for an automated solution. Among the bidders was Shell-O-Matic, a longtime partner that supplies the investment casting industry with both stand-alone equipment and totally integrated systems.

“They knew we were a reliable partner, and our price was right,” says Shell-O-Matic President George Muri. “I think we gave them exactly what they were looking for, formulated in a way that addressed their needs.”

In July 2005, Shell-O-Matic installed a complete shelling system, including the robot, slurry tanks, fluidized beds and a rainfall sander with automatic sand feeding. Four compact conveyors are used to dry the molds from each coat.

A supervisory computer with a barcode reader tracks parts as workers load them onto the conveyor. The computer determines which dipping program the robot will follow for a certain part. Once dipped, the mold is then routed through the drying process by the computer. The robot lifts the hanger on which the molds are attached and steers it through the room’s controlled climate according to the parts’ drying schedule. As a finished mold exits the system, a report is automatically printed out with the manufacturing details for that shell. Workers manually unload the finished pieces from the conveyor.

Under the new system, three workers make approximately 200 molds every day, compared with the six workers who produce half that amount in a section of the foundry that still dips by hand. Prior to the installation of the new robotic system, Franklin Bronze’s maximum capacity was 140 molds per day, using nine workers. Today, its maximum capacity is up to 400 molds per day with six people, although it has yet to reach that point. Man-hours have been reduced from 56 hours a day to 32.

In addition to the increased production, the qual-



ity of the shells is better, because the machine dips them the same way every time. The Shell-O-Matic system can also hang more shells up to dry – up to 250 pounds. This contributes to the increased capacity.

“It has great ease of programming,” Barber says, “and the reliability of the ABB robot is excellent.”

In a neighboring room, where employees still dip shells manually, a refurbished Shell-O-Matic 5-axis machine helps with some dipping and hanging, although its technology dates back to the 1980s. Barber says the company plans to upgrade to a second IRB 6600 by mid-2007.

In the new room, Weaver explains, “there’s not as much slop. When the guys are dipping manually, it gets a lot messier.”

Workers appreciate the impact the shelling system has had on improving their quality of life in the workplace. Not only is the environment cleaner, but the job is also less physically fatiguing.

“It’s much easier for the workers to use the robotic system,” Weaver says. “Each coat you put on gets a little heavier.”

Today, employees have a less-hecktic workday. The tasks are easier, and the job is generally less stressful.

“Any time you’re working with a labor force, it’s better to streamline things as much as possible,” says Weaver.

The system, which cost approximately 250,000 u.s. dollars, is expected to pay for itself within 2½ years of the November 2005 production startup, Barber says.

The return on investment “is very good,” says

Choosing automation

Benefits for Franklin Bronze of Shell-O-Matic’s automated shelling system with the IRB 6600 robot from ABB include:

- Reduction of man-hours from 56 per day to 32 per day
- Increase of mold production from 140 per day to 200 per day
- Improvement of shell quality due to uniform dipping
- Return on investment of 2.5 years
- Cleaner environment for workers, including reduction of physical stress.



Ceramic shells for making bottles are dipped by an IRB 6600 robot. The uniform dipping makes for higher quality shells.

>FACTS

At a Glance: Shell-O-Matic Inc.

Founded: 1978

Location: Montreal, Quebec

Production details: Designs and manufactures specialized equipment for wax pattern and ceramic shell production in the investment casting industry. Solutions include both stand-alone machines and totally integrated systems.

At a Glance: Franklin Bronze and Alloy Inc.

Founded: 1878

Location: Franklin, Pennsylvania.

Number of employees: 100 total, 85 in the investment casting plant.

Production details: Manufactures precision castings in brass, bronze, aluminum, stainless steel and nickel-based alloys ranging in size from a few ounces to 15 pounds for the investment casting industry. The company manufactures 250 shells per day, with a capacity of 400 shells per day.

Weaver. “We’re increasing our molds per day by 30 to 40 percent with the same amount of people, and there is still a lot of capacity left.”

Shell-O-Matic provided startup and training and spent time at Franklin Bronze to fine-tune the system, and glitches were minimal.

“All in all, we had no major surprises,” says Shell-O-Matic’s Muri. “It worked fairly well, and I believe they’re quite pleased with the results.”

“The robot itself has pretty much performed flawlessly,” says Weaver. “Nothing’s fazed it; it just keeps moving.” ☺