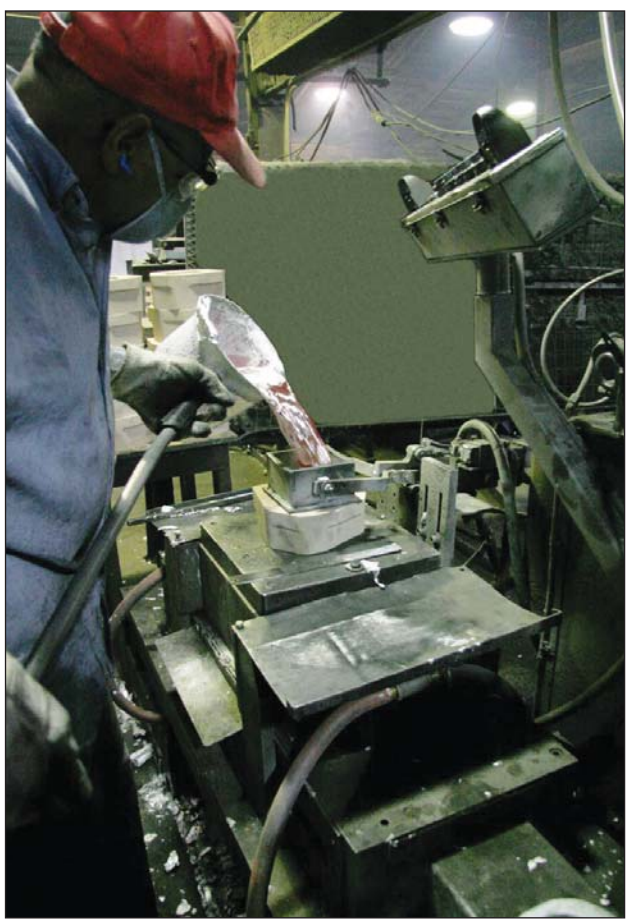
Tweaking Sand Process Leads to Startling

The improved Rock Shell process sends Oberdorfer L.L.C. throughput soaring



Oberdorfer L.L.C. credits its patent-pending Rock Shell process for expediting mold production and improving its productivity of aluminum cylinder heads.

BY PETER B. ALPERN

For decades, Oberdorfer L.L.C., an aluminum foundry in Syracuse, N.Y., has used shell sand to manufacture molds for its castings, which are mainly supplied to aviation industry manufacturers as cylinder heads for aircraft engines.

The shell sand process is quite common and well known to foundries: A heated metal pattern (or hot box) is coated with a mixture of sand and thermoset plastic. A very thin layer of the mixture adheres to the pattern, and this layer is removed from the pattern to form a "shell mold." After the sand is cured, two shell molds are assembled together with any cores to form the casting mold. Molten metal is poured into the mold to form the final cast shape. Once the metal solidifies, the shell is broken and the finished casting is revealed.

The only notable problem with the shell process is the time needed to produce the sand molds.

What Oberdorfer L.L.C. has done is tweak the sand casting process — and it has found startling results. The company's patent-pending Rock Shell process finishes its sand casting in a one-piece flow. Later, Oberdorfer uses recycled water pumped from cooling towers to cool the castings in a closed-loop system. In all, the foundry is making some notable progress in its time and energy saving efforts.

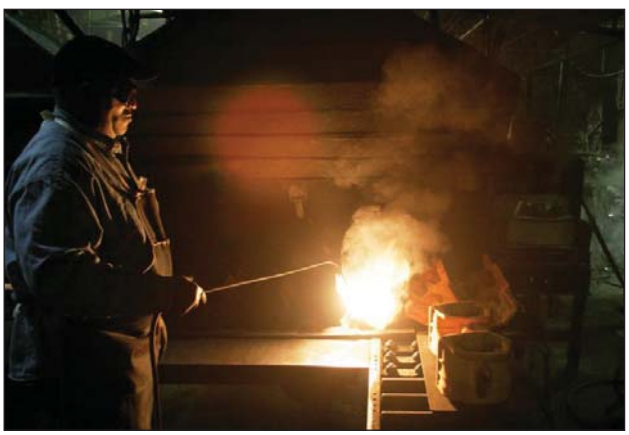
Shell sand molding is already recognized for its ability to produce complex parts, with good surface finishes and dimensional tolerances. Oberdorfer vice president of quality Jim LeRoy says its Rock Shell process improves the dimensional capabilities of the hot-box technique. "We put a little bit different degree of draft onto the pattern to pull it out of there as a 'one-piece'," he reveals, "where a lot of people would have to do it as a two-piece process."

Conventionally, shell processes require heavy investments of time, as sand is heat treated, made into a mold, and then prepared for pouring hot metal. Oberdorfer's Rock Shell technique makes it possible to speed up the process of making sand molds, so the entire production sequence is faster.

"We've improved that changeover with our continuous flow," says LeRoy. "When we make a sand casting, I'm pouring within 20 minutes."

According to Oberdorfer, the new process has increased its throughput of finished castings by between 85- and 97%, and reduced non-value activities by 30%. Finished quality has been improved, too, because the foundry streamlined nitrogen-degassing procedures with automatic controllers. (Nitrogen is used to draw

Results



A worker prepares shell molds at Oberdorfer L.L.C.

hydrogen out of the molten metal, to improve the metallurgical purity of the metal in the casting.) Oberdorfer says the new controllers allow it to reduce nitrogen overall by 40%.

The phrase "Rock Shell" comes from the sand being used, as well as the machine that's used to deposit it on the pattern. It's known as "the Rocket". According to LeRoy, Oberdorfer retrofitted an old core machine to hold the company's hotbox patterns.

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Presently, Oberdorfer uses the Rock Shell process to produce aluminum cylinder heads only, though more types of castings are being considered for future production.

The Rock Shell process came about as a result of a Kaizen event Oberdorfer held in January of this year. Every operator in its Syracuse foundry participated, as the company sought input for new ideas to its various production processes. LeRoy says the group went through the 5 S's (Seiri, which is sorting; Seiton, straightening; Seiso, sweeping; Seiketsu, standardizing; and Shitsuke, sustaining the discipline).

"We discussed some different Lean benefits — like reducing forklift truck usage and reducing floor space — but also finding ways to take waste out of our processes," says LeRoy.

Shell molds ready for assembly and then pouring at the Syracuse, NY, aluminum foundry.

Another innovative approach taken by Oberdorfer was in the way it uses its cooling towers to quicken the process of cooling its castings, with recycled water. "What it's done is take the heat out of the casting much faster, so that I can process my casting in the finishing department a lot quicker and increase my on-time delivery," explains LeRoy. "I think we're at right around 98% right now."

LeRoy compares this change to the effort involved in air-conditioning a large industrial building: to cool the building, a cooling tower is place atop the roof. Water, which has been heated from the air within the building, is then pumped up to the cooling tower, as the heat is dissipates into the air from the water.

"We do the same thing on the cylinder heads," says LeRoy. "We pump recycled water into the cylinder heads under what is called the metal dome. The water never makes contact with the molten aluminum. It makes contact with the metal dome."

Using the recycled water is an important part of Oberdorfer's effort to reduce its environmental impact. The company has also begun to reuse any excess sand cores that it can, says LeRoy, and also to recycle any available waste metal left over from the production of aluminum castings.

"This has all been an effort to improve our quality and take the waste out of our process," says LeRoy. "And we're finding ways to do it without increasing the price to our customers."