

Aristo Cast: Accepting the Challenge

By pioneering the use of magnesium in investment casting and positioning itself as a metalcasting facility with rapid prototyping capabilities, Aristo Cast has shown its willingness to meet the challenges facing the industry today.

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Aristo Cast Inc., Almont, Michigan

Year Founded: 1995.

Metals Cast: Carbon and low-alloy steels—300 and 400, stainless steel, tool steels, cobalt- and nickel-based, aluminum, magnesium, copper, bronze, zinc and pH stainless.

Casting Process: Investment casting.

Size: Casting facility—26,000 sq. ft.; Advanced Technology Center—12,000 sq. ft.

Key Markets: Automotive, military, medical, diecast prototypes, food handling, OEM machine, pump and valve, recreational, marine.

Employees: 35.

Nestled in a small town an hour north of Detroit, occupying an unassuming building that, from the street, resembles an office suite more than an investment casting facility, Aristo Cast Inc., Almont, Mich., constantly works to refine a 3,000-year-old metalcasting process.

The firm has pioneered the use of magnesium in the investment casting process and has positioned itself as a source for rapid prototypes. It's not what you would expect from a firm with only 35 employees. But doing the unexpected is how Aristo Cast has built its business.

"As a team, we would get bored without accepting new challenges," said Jack Ziembra, president. "Doing the same thing over and over again is not what these people are cut out to do."

That philosophy led Aristo Cast into the three important segments of its business today—investment casting magnesium components; understanding the value of rapid prototyping; and finding ways to maximize its potential as a job shop.

Quality First

Aristo Cast is a job shop producing investment castings for multiple industries, such as automotive, military, medical and marine. The firm pours predominantly steel and aluminum, but it

also can cast zinc, copper, bronze, and cobalt- and nickel-based alloys.

Inside the 23,000-sq.-ft. investment casting facility, the work is manually operated. The firm's philosophy is that the most important part of the process—shell building—needs personal attention.

"Quality starts with the wax mold," said Larry Blum, chief engineer. "We use material that everyone can buy. It's just all in how you bake the cake."

Opting for the hands-on approach in a job shop with a number of different orders to fill each day does not call for automation. Across the street, however, is a different story.

In February 2004, Aristo Cast opened its 12,000-sq.-ft. Advanced Technology Center (ATC). The building now houses Aristo Cast's tool design and building operations and the majority of its wax and plastic prototype equipment. Future plans have Aristo Cast performing all of its magnesium casting and machining operations in the ATC. The firm now is waiting for the magnesium investment casting demand to take off.

"You have to take calculated risks to get ahead," Blum said. "If you're standing still, you're falling behind. We know there is a market for magnesium investment castings...it's just a matter of how long it will take people to realize that we are a viable source for this product."

Investing in Magnesium

Four years ago, Ziembra came down with a case of pneumonia. He was hospitalized for five days and ended up staying away from the shop for five weeks. When he returned, he needed something to do.

"I got back into the captain's chair here, and I didn't have anything to work on because everyone did a great job while I was gone," he said. "At that time, I sat back and wondered what I could do. Magnesium had always intrigued me, and I started wondering what we could do with magnesium as far as investment casting and producing a high-quality product."

That thought, coupled with the promising forecast for the lightweight metal, brought the firm's experiments with magnesium investment castings to light.

"It wasn't just pulling a metal out of the air and saying, 'We are going to do this,'" Blum said. "The outlook for magnesium in the automotive industry in the short term shows that many more parts are going to be made out of magnesium. The whole philosophy was that if more automotive parts are going to be made out of magnesium, somebody has to make the short-run parts."

Aristo Cast was well aware that if automakers were to be looking for magnesium castings, the majority of which would be die castings, there would be a niche to fill in creating short-run prototypes to prove out the diecasting process or to hold customers over until production tooling could be made. The firm knew this because it had built much



After the trees are dipped into a refractory coating, they are attached to a monorail to dry.

of its existing investment casting business around this principle.

With that, the project took off.

"It took about 2-3 years of trial and error," said Eric Ziembra, sales engineer. "It was a lot of, 'This didn't work, so let's try this instead.' Jack still keeps a thick folder of everything that we tried."

The folder and the firm's first attempted casting (Fig. 1) serve as a reminder of where Aristo Cast started.

"We went through the documentation from the early 1960s and mid 1970s when investment casters were first experimenting with magnesium," Blum said. "If you go back through the paperwork and look at all of the things

that transpired at that time, at the conclusion of all of those documents was that it wouldn't work. What we did was go back through all of these papers that were written and picked out certain areas that we felt were problem areas that weren't addressed properly. We took today's technology and reinvestigated what was being done 30-40 years ago."

What Aristo Cast found to be the major hurdle was preventing the metal-mold reaction. The firm eventually developed what it calls a proprietary method of treating the shells to overcome the reaction that occurs between the metal and the shell.

"Jack has a belief that if we put enough brains into a certain problem area, we can get through it with the more than 200 years of combined experience we have in the industry in this shop," Blum said. "This was one instance where that worked. By our own research and development, we found a method of manufacturing magnesium castings in our process that nobody else can do."

The firm's magnesium investment casting abilities have progressed since the dimpled-out piece of metal it first poured. The firm has since successfully investment cast a magnesium telescopic trailer tow mirror mount for a pick-up



Aristo Cast pours predominantly steel and aluminum, but it also has the capability to pour magnesium, zinc, copper, bronze, and cobalt- and nickel-based alloys.



Fig. 1. Aristo Cast's first attempt at producing a magnesium investment casting was met with a limited amount of success. Shown here is the first magnesium investment casting the firm produced on May 25, 2001.

truck (Fig. 2) and, more recently, magnesium windshield wiper motor components (Fig. 3).

Investing in a Niche

Aristo Cast believes that magnesium will play a significant role in answering the continued demand to reduce the weight of automobiles. It also believes that the ability to produce magnesium investment castings will help position itself to take on many of the prototype jobs before the parts go into full-scale production. How does the firm know this? Because it has done it before and knows there is a market for it.

"When we talk about prototypes with the automotive industry, we are not talking about onesies and twosies," Blum said. "In the automotive world, prototypes might mean 100 or 1,000 because of what they have to do to test these prototypes. There are a lot more than one or two

before it becomes a viable product." Currently, "prototyping" accounts for about 20% of Aristo Cast's sales and 10-15% of its production.

The investment casting process lends itself to proving out designs that will eventually be turned over to diecasters for production castings. It's a niche that Aristo Cast has filled for a number of years.

"We are getting closer and closer to our goal of being a source for diecasting houses to prove out a concept and make sure they are not going down the wrong road," Jack Ziembra said. "We can match the characteristics of a die casting. And once that's done, the customer can go into constructing the expensive diecasting tooling."

Designing an investment casting for the diecasting process can be challenging, but Blum noted Aristo Cast never has taken on a job it could not do.

"Diecasting is a process totally different from ours," he said. "What they can achieve in diecasting can be difficult for us, and what we can achieve in investment casting can be difficult for them. If we are told by a customer that we have to duplicate the math data and drawing without any changes or input of our casting process, then we have to take the bullet and build it

the way they want it built even though it may be more difficult."

It may be more difficult at times, but that's the way the firm wants it.

"We are a job shop more than a production facility," Jack Ziembra said. "When you get involved with the large production runs and that program ends, and it has been my experience that those programs can end abruptly, it leaves a large void. We keep it in smaller amounts, and it fits our system well."

"We've offered customers our expertise in building tooling, refining



Fig. 2. After a few years of trial and error, Aristo Cast was able to investment cast this telescopic trailer tow mirror mount for a pickup truck.

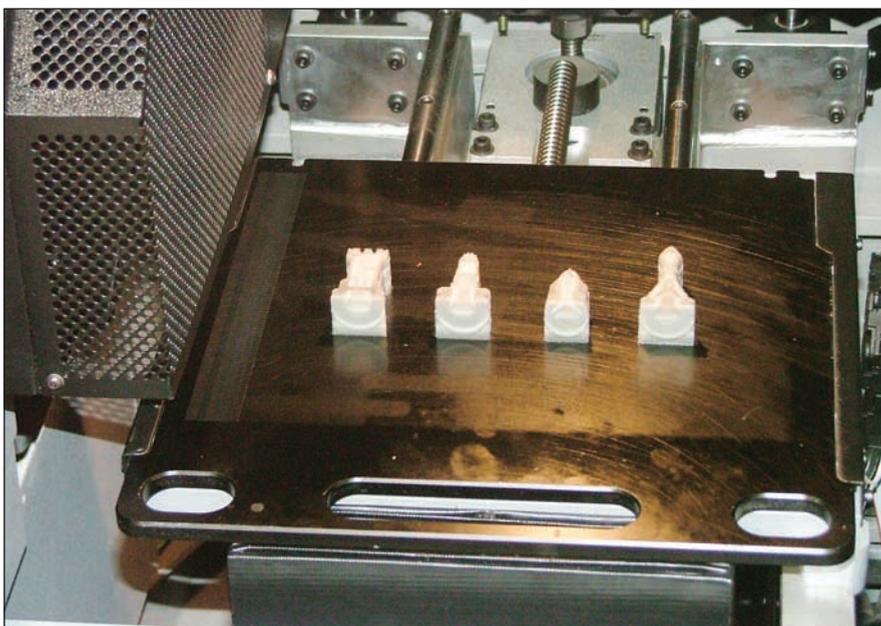
the process and fine tuning the part parameters. And once that's done, we're done. We pass it off. It doesn't hurt my feelings when one of our jobs goes to another process. We want to be that proving ground and then hand the job off."

In doing so, Aristo Cast is able to maintain its status as a job shop and continue to turn components out quickly, keeping leadtimes short.

"Speed is more important now than it ever used to be," Eric Ziembra said. "Our turnaround can be in a matter of weeks instead of months. We do not want the product sitting on our floor. We want it on our customer's floor."

Investing in the RP

With Aristo Cast's belief that time to market is becoming increasingly more important, it is only natural that the firm delves into rapid prototyping (RP). Aristo Cast bought its first two RP machines in 1999 and has since added two more.

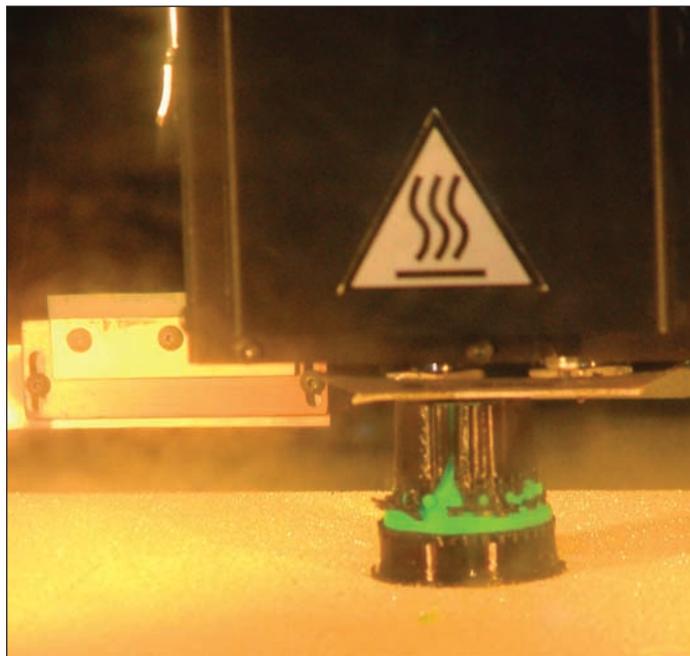


Aristo Cast bought its first rapid prototyping machine in 1999. The firm has since added two more. Shown here is the machine working to produce chess pieces.

"We were at a trade show and saw a RP machine," Eric Ziemba said. "We went to the company that manufactures them—just to look—and not only ended up buying one but signing the confidentiality agreement to buy the newer version. We left there and called Larry...he almost fell out of his chair when we told him we bought two machines."

Aristo Cast has spent the last six years refining the art of rapid prototyping to arm its customers with more options to speed up their time to market. The firm was the fifth in the country to buy the RP machine it selected, and in 2003, it became the second largest user of the machine's wax patterns.

"We create and sell a lot of prototypes that lead to production jobs," Eric Ziemba said. "It gives us a jump that nobody else has on getting a production job. Using a prototyping machine proves out the process so we can tell if it is going to work, and that leads to securing a production job."



Since entering into the rapid prototyping arena, Aristo Cast has spent a considerable amount of time staying on top of new developments in rapid prototyping, such as FDM.

Eric Ziemba also noted that showing potential customers a prototype part while quoting a job doesn't hurt either.

"It is very impressive," he said. "We will actually make a prototype and give them a quote back with the part in their hands in a few days. That is a strong advantage. When you see it on the computer screen, it looks nice and good, but it doesn't compare to the real thing."

Internally, Aristo Cast uses the RP

machines to not only prove out components to see how they will shrink and how to gate them, but also to create tooling cavities.

While casting a component for part of a car's convertible latch system, Aristo Cast constantly ran the RP machines while the production tooling was being finished. Eric Ziemba estimates that without the machines, it would have taken at least four weeks to complete the production tooling and start making parts. With the RP machines, the firm shipped 50 sets of components in two weeks.

"Rapid prototyping is tremendous," Jack Ziemba said. "When you quote an RP job, you have already put yourself under the gun. The term rapid prototype means you don't have a lot of time to sit back and take things cautiously. You are under the gun and challenged to make sure commitments are met."

Jack Ziemba said seeking out those challenges and meeting them has positioned Aristo Cast exactly where it wants to be.

"We are not trying to be everything to everybody," he said. "We want the tougher stuff. As a group, our people enjoy the challenges. We have a strong interest in staying ahead of things. Right now, we're where we think we want to be—a little bit ahead." **MC**



Fig. 3. Recently, Aristo Cast produced these six main motor components for windshield wipers in AZ91E magnesium.

For More Information

"Processing and Evaluation of Investment Cast Magnesium-Base Alloy," M.H. Idris and A.J. Clegg, 1996 AFS Transactions (96-80).