pressurized gating for in-mold ductile iron treatment. Simulations of typical gating practice showed flow at the gates for the oil pan to be at a rate of 70 in./second. Aarrowcast engineers slowed the flow to 25 in./second by stepping the gates for lower pressure.

Depending on the engine, the oil pan castings require up to 13 cores, all of which are manually set into the mold by Aarrowcast technicians. To ease coresetting, Aarrowcast adjusted the core locks and used seats for chaplets to facilitate core placement. But plant supervisor Mark Burmeister said training also was integral to achieving tight tolerances. “It takes a skilled hand to put the mold together,” he said.

After the oil pan had been in production for a few months, Aarrowcast was discouraged by ongoing issues that resulted in too many scrapped castings and too much rework. The casting facility contacted John Deere’s CCOE for help. Jim McKee, manager of John Deere’s CCOE, stepped in to assist in resolving the issues.

McKee worked to draft a critical acceptance criteria document for the oil pan casting using finite element analysis data as a guide. This document outlined where various imperfections could or could not occur for salvage filling surface defects in the casting,” McKee said. Aarrowcast worked with the CCOE and John Deere Product Engineering to define the acceptance criteria that ultimately helped achieve higher throughputs.

“This part has to be ultra clean because it has to meet engine criteria,” Smith said. “But in some cases, we were putting too much work into the part than was needed in finishing.”

Additionally, the machining strategy was later adjusted to put all the machining locators on the drag side of the mold where all the cores are set. Previously the locators were on both sides of the parting line and caused excessive part-to-part variation through machining.

Now the part runs smoothly through Aarrowcast’s operations and machining processes, and both customer and suppliers are pleased with the results.

“Aarrowcast is happy with the business, and we are happy with their part of the business,” McKee said. “And now the machine shop is happy because they get consistency from part to part.”

The lessons learned from the collaboration on this project have not been lost on the metalcasting facility. Throughout development and into production, engineers from John Deere and Aarrowcast met face to face and electronically to work through several iterations with a goal of achieving sound metalcasting practices to meet the application’s requirements.

“We probably would not be in production if that level of effort was not put in up front,” Smith said.

Olson can’t imagine not establishing similar collaboration on future new projects. “Put it this way, if our customer doesn’t hold a design review with us, we’re holding it with them,” he said.

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**Best-In-Class**

**Electronics Mount**

**Aristo-Cast Inc.**

**Almont, Michigan**

**Material:** AZ91E-T6 magnesium.

**Process:** Investment casting.

**Weight:** 54 grams.

**Dimensions:** 3.681 x 4.488 x 2.933 in.

**Application:** Hand-held device used in aerospace.

- The component acts as a bracket to mount processing electronics and acts as a heat sink to manage the thermal load from all of the electronics. It also ties the two halves of the housing together, preventing it from “oil-canning” under external pressure loads.
- The investment casting process provided the ability to combine many parts into one and lower part cost and weight.