FLOW-3D

Customer Success Profile

HIGHLIGHTS

Featured Customer

Littler Diecast Corporation

Industry

High Pressure Die Casting

Challenge

To eliminate porosity, die erosion and filling problems in an electrical switch.

Results with *FLOW-3D*

Littler Diecast landed a new client by identifying existing design flaws through simulation. Littler then took the poorly designed electrical switch that had an unacceptable scrap rate and redesigned and cast it.

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FLOW-3D from FLOW Science

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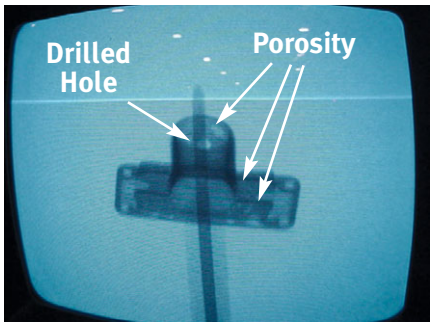
Making the Switch Gives Littler a Big Success

Littler Diecast Corporation recently redesigned and cast an electrical switch frame for an aerospace customer. *Formerly produced by a different manufacturer, there were defect problems in a high number of the castings and a new design was needed to achieve a lower scrap rate. Using* ***FLOW-3D****, Littler Diecast pinpointed the defects through simulation without any previous knowledge of the part's problems. This impressed the client enough to give them the job.*

- **Preliminary simulation results brought in a new client.**
- **Simulations of the filling of the redesigned part showed that porosity would be eliminated.**
- **Casting of the redesigned part showed no porosity or die erosion problems.**

Identifying the Problem

Littler Diecast found that porosity problems were plaguing the switch in two locations; this was later confirmed by the customer. Holes were forming in the plate and the chimney because of the way the part filled.



X-ray of the original part showing porosity problems. The switch, cast from A380 aluminum is approximately 1 1/4" x 1" x 1/2".

Problems with the Original Design

- **Porosity at the plate and the chimney.**
- **A large amount of die erosion around the slot for the lock washer and the sealing surfaces on the bottom of the plate.**
- **Overflows located at the corners of the part were not large enough to allow oxides and air to flow out.**

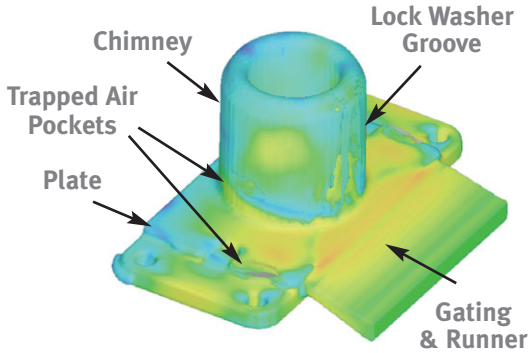


Figure 1: Original design with a single gate. Plot colored by velocity magnitude.

Using ***FLOW-3D***, Littler was able to analyze the flow behavior and visually determine that early solidification was occurring. In this small part, early solidification was occurring due to the rapid cooling in the thin sections. Because the fluid jets across the part and back, it has more time to cool and create entrapped air. A better design is to have the hottest liquid coming in last. With this in mind, Littler Diecast was able to test a number of ideas and finalize a design that minimized the potential for problems and maximized the process window.

Three Major Design Changes

- **Redesigned the gating and runner so the fluid entered through three gates in an entirely new direction.**
- **Created a larger overflow so that less back flow in the plate allowed the hottest fluid to enter last.**
- **Altered the approach angle and locations of the gates, which helped prevent backflow in the chimney.**

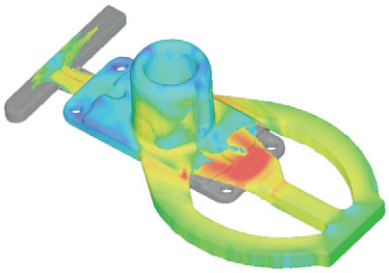


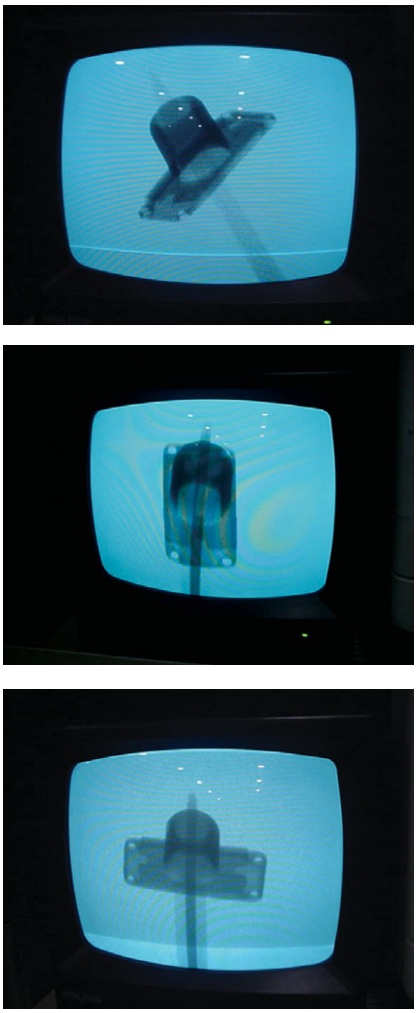
Figure 2: Final design with three gates. Plot colored by velocity magnitude.

This new design also reduced the potential for die erosion. Now fluid jets onto a core pin used for the center hole in the chimney. The core pin is easily replaced, which is much faster and less expensive than repairing the die steel. All of these design changes took place before any new die steel was cut, eliminating the costly process of re-engineering if problems had been discovered after the tooling was produced.

Physical Verification

After a production trial run, Littler Diecast verified the design changes through short shots, x-rays and destructive tests. The short shots showed a balanced runner, and there was no porosity visible in the x-rays. Break testing showed a consistent crystalline grain structure with no voids, demonstrating that the failure was due to the strength of the material and not a casting defect.

As a result of the new design, the part was cast with minimal scrap, saving thousands of dollars and giving Littler Diecast a big success.



X-rays at different angles of a sample final part from the shop floor show no problems.

"Simulation quickly helped us understand how molten metal moved through the cavity and pointed the way towards the improvements needed to solve the problems. The key to obtaining these benefits is accurate simulation and we have found that ***FLOW-3D*** consistently delivers the accuracy we need to solve real-world problems."

Mark Littler, *Littler Diecast Corporation*
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Call 505-982-0088 for more information about how FLOW-3D can enhance the reliability and quality of your casting designs to reduce overall costs.

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