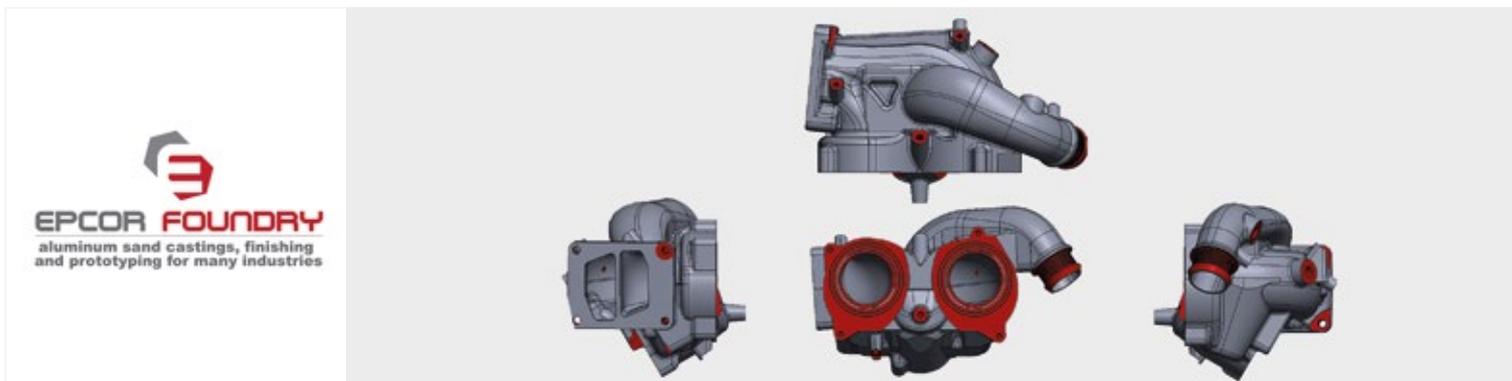


Speeding Past the Competition

Epcor produces quality parts faster than their competitor with ESI QuikCAST casting simulation solution



Challenge

After winning business away from a competitor, Epcor needed to produce complex exhaust gas recirculation (EGR) valves for an automotive parts manufacturer. Most modern engines use this emissions reduction technique to meet automotive emission standards and the valves must be manufactured to high standards. The challenge for Epcor was to produce these parts quickly and without flaw.

Benefits

Using ESI QuikCAST virtual casting solution, Epcor was able to evaluate alternative mold designs at a fraction of the standard development time and cost to deliver higher quality parts to their customer, and be faster than the competition. They successfully achieved a 98% first time throughput for the initial parts.

"We tried QuikCAST on a few trial parts and found that it was able to accurately simulate our molding results. It provides a more effective approach than what we were doing before because it makes it possible to look into / at the casting process one step at a time."

Mike Maratta
Plant Manager
Epcor Foundries

Background

Cincinnati-based Epcor Foundries was able to win business away from its competitor who failed to produce quality exhaust gas recirculation (EGR) valves for their automotive parts manufacturer in the required time.

Although they were happy to gain the business, Epcor knew it would be a challenge to get this intricate part into production quickly while avoiding typical casting manufacturing problems, like shrinkage and porosity.

The standard approach for foundries is for patternmakers to design molds based on their own experience. This method is less than optimal for various reasons, the number one reason being that the initial design is rarely viable.

In the case of the EGR valve, Epcor knew they could not meet the customer's aggressive delivery requirements using the traditional approach. Therefore, after evaluating different casting simulation tools, Epcor turned to ESI QuikCAST. In addition to it being an affordable and easy-to-use solution, Epcor liked the fact that QuikCAST linked them to ESI's more powerful and comprehensive casting simulation program, ESI ProCAST.

To begin, Paul Kiefer, Senior Design Engineer for Hitech Shapes and Designs (an affiliate of Epcor Foundries) performed the simulation of the EGR valve's casting process.



Starting from a CAD model of the valve, Kiefer defined the casting process parameters along with material properties and used QuikCAST to produce a simulation that allowed the team to visualize mold filling and solidification – and eventually predict the part’s quality. From this, they determined that adjustments were necessary due to shrinkage porosity in certain locations of the part (Fig. 1).

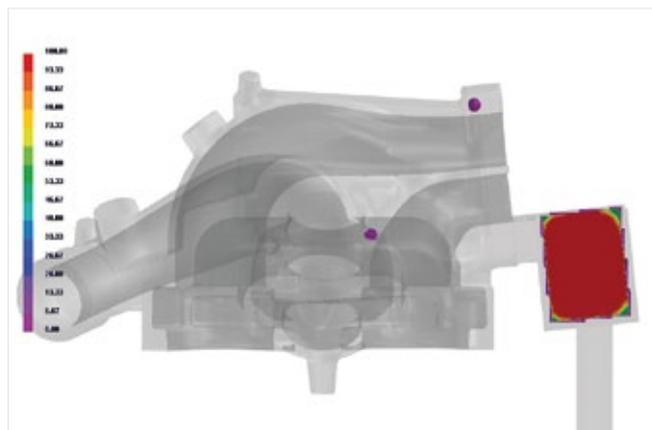


Fig.1: Initial QuikCAST simulation showing shrinkage porosity present in the casting

At this point, it was important to analyze the results further in order to understand the evolution of this porosity during solidification.

Kiefer determined that, in several critical areas, the molten aluminum was solidifying early in the cooling process and creating isolated pockets of liquid metal that could not be fed through because the path to the feeders were cut. This is what caused the shrinkage porosity. A defect like this could actually cause the part to fail during its usage. If they found this defect on the shop floor, instead of in the design phase, it would have meant a delayed delivery, leading to a shutdown of the auto manufacturer’s line due to lack of parts.

Once the baseline simulation model was ready, Epcor could begin making the necessary modifications to eliminate

porosity. Kiefer considered several approaches to address the problem but settled on adding risers. In doing so, shrinkage would occur in the risers and not the casting.

A final run of the part with QuikCAST revealed that the problems were resolved and that the mold would produce quality cast parts on the very first try and each time after that (Fig. 2).

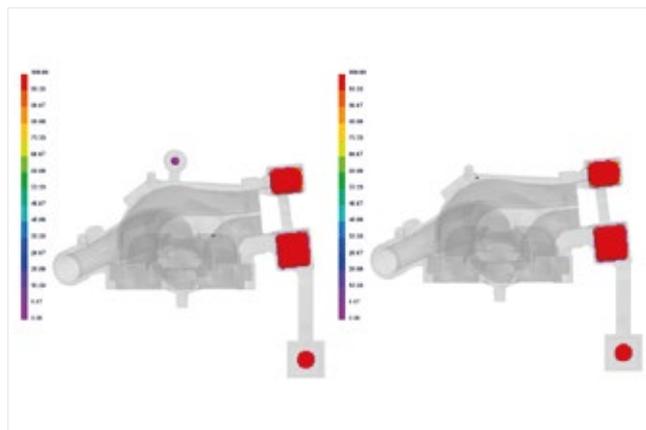


Fig.2: Two simulated views show how the progression of changes in the gating and feeding system reduced the shrinkage porosity within the casting design

Ultimately, Epcor was able to build the mold design verified by QuikCAST. The mold produced good parts from the first run, exceeding their customer’s expectations.

“Our customer was very pleased that we were able to get the new casting up and running so quickly,” says Maratta. “This helped avoid the downtime that our customer would have experienced if there had been significant delays during the process. The startup time and throughput levels were where they needed to be at the start of a program for a complex casting with tight quality requirements.” He goes on to emphasize, “The customer was very happy with our ability to launch such a complex part without any issues.”



virtual manufacturing | ground transportation



About Epcor Foundries

Epcor Foundries, a division of Seilkop Industries, specializes in green sand aluminum castings for automotive and heavy truck producers, automotive aftermarket suppliers, and manufacturers of parts for fueling, bulk handling, pumping, and air movement. Epcor is a privately owned, ISO certified, green sand aluminum casting foundry that specializes in prototypes and medium to high volume castings for several industries, including automotive.

About ESI GROUP

ESI is a pioneer and world-leading provider in Virtual Prototyping that takes into account the physics of materials.

ESI boasts a unique know-how in Virtual Product Engineering, based on an integrated suite of coherent, industry-oriented applications. Addressing manufacturing industries, Virtual Product Engineering aims to replace physical prototypes by realistically simulating a product’s behavior during testing, to fine-tune fabrication and assembly processes in accordance with desired product performance, and to evaluate the impact of product use under normal or accidental conditions.

ESI’s solutions fit into a single collaborative and open environment for End-to-End Virtual Prototyping. These solutions are delivered using the latest technologies, including immersive Virtual Reality, to bring products to life in 3D; helping customers make the right decisions throughout product development. The company employs about 1000 high-level specialists worldwide covering more than 40 countries. ESI Group is listed in compartment C of NYSE Euronext Paris.

ESI Group Headquarters | 100-102 Avenue de Suffren | 75015 Paris | FRANCE | T. +33 (0)1 53 65 14 14 | F. +33 (0)1 53 65 14 12 | info@esi-group.com