FLOW-3D
Customer Success Profile

HIGHLIGHTS

Featured Customer

Albany-Chicago Co.

Industry

Metal Casting

Challenge

Albany-Chicago discovered that conventional simulation methods could not help detect the problem of microporosity in its cast parts, and traditional trial-and-error methods were too expensive for today's competitive environment.

Results with *FLOW-3D*

Albany-Chicago engineers have begun using ***FLOW-3D***'s microporosity model on every new die. Now, most dies work perfectly on their first iteration. Without multiple iterations, the company has substantially reduced its costs and the average time required to bring a new die into production.

Flow Science, Inc.
683 Harkle Road, Suite A
Santa Fe, NM 87505
sales@flow3d.com
www.flow3d.com
505-982-0088

FLOW-3D from FLOW Science

www.flow3d.com

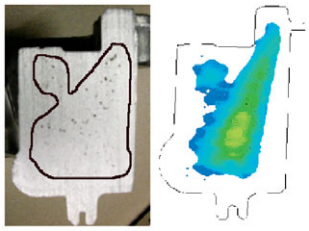
Albany-Chicago Co. Reduces Die Iterations to One Using Simulation to Detect Microporosity

Using a new model in FLOW-3D software from Flow Science, Albany-Chicago effectively simulates microporosity. *Now, most dies work perfectly on their first iteration. Without multiple iterations, the company has seen significant results:*

- **Substantially reduced costs**
- **A decreased average time to bring a new die into production**

The Challenge of Microporosity

Die casters have made dramatic strides in improving quality in recent years by using computer simulation to diagnose and eliminate conventional macroporosity caused by trapped gas as molten metal solidifies. But even as this problem has become manageable, today's higher quality requirements expect more of the die casting process.



Albany-Chicago Co., an aluminum die cast and production machining company in Pleasant Prairie, WI, comes face to face with these challenges in the development of its products. With a central focus on the relationship between the part design and the final product, the company relies on simulation to help it predict potential problems.

Albany-Chicago discovered that conventional porosity models failed to predict the problem of microporosity which is believed to be caused by the reduction in pressure that occurs as metal cools, drawing liquid metal to replace the volume lost to shrinkage. If liquid cannot flow due to solidification, internal void formation can occur when the pressure is lowered below the vapor pressure of the liquid. The result: some dies which were otherwise predicting perfect parts sometimes showed problems.

In the past, Albany-Chicago engineers were typically able to solve the problem by trial and error using the traditional solution of adding water lines in the affected area. But this was difficult, expensive and fraught with uncertainty.

*"We've discovered that **FLOW-3D** can accurately predict microporosity, making it possible to identify problems and evaluate design changes that can either eliminate microporosity or move it to areas where it's not a problem. As a result, we have been able in most cases to completely eliminate die iterations from the process of proving out a new die."*

***Alex Reikher**, Design Engineer, Albany-Chicago Co.*

Reducing Iterations and Cost with *FLOW-3D*

Using a new model available in *FLOW-3D* software from Flow Science, Inc., Albany-Chicago more accurately simulates microporosity. The model tests each element during the solidification process to determine if the adjacent elements that share a common face with the element have a solid fraction above the rigidity point. If all neighboring elements exceed the solid fraction for rigidity, then liquid feeding is not possible and the microporosity of the element is increased by the amount of shrinkage in that element during the time step. The model requires only basic material property data and adds virtually no noticeable CPU time to a casting simulation. It also complements macro-porosity models, and may be used in conjunction with either a complete hydrodynamic shrinkage simulation that includes fluid flow or with a faster shrinkage simulation based on bulk fluid flow.

Applying the microporosity model, Albany-Chicago exports its initial die design geometry to *FLOW-3D* and then uses the software to simulate the molding process. Engineers applied the model on a three-gate part in which microporosity was detected. Simulating the part revealed that microporosity was indeed forming in the critical area. Changing the model to add water lines as close as possible to the problem area showed that it was not possible to solve it in this manner. Instead, engineers modified the model to change the way in which the die was cooled between shots. In fact, this change did solve the problem on the physical die.

The company also used the new model to correct a problem on a spacer that goes between the cover and the block of a diesel engine. Mounting holes drilled through the part leaked during runoff testing. Again, the microporosity model accurately predicted the point at which microporosity would occur. Engineers changed the model to determine the effect of adding waterlines in different locations, and the solution fixed the problem on the very next die iteration.

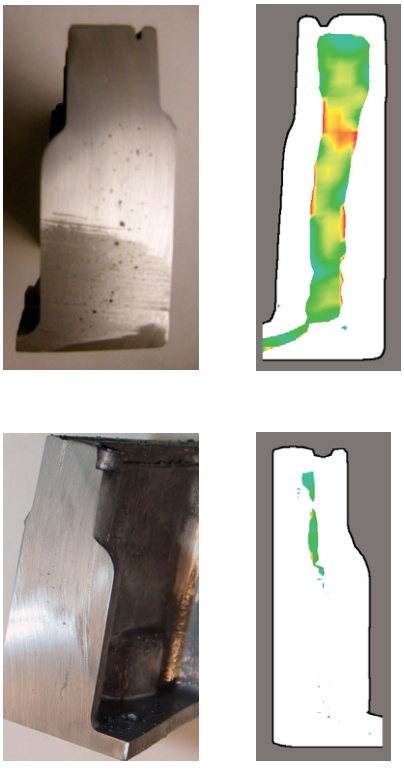
Albany-Chicago engineers have begun using this model on every new die, and have been so successful at predicting microporosity that most dies now work perfectly on their first iteration. Without multiple iterations, the company has substantially reduced its costs and the average time required to bring a new die into production.

About Albany-Chicago Co.

The Albany-Chicago Company, a subsidiary of CPL Industries, Inc., was founded on Albany Street in Chicago in 1953. Now based in Pleasant Prairie, Wisconsin, Albany-Chicago die casts complex aluminum parts and performs production machining to precise tolerances. Its customers are Original Equipment Manufacturers in such industries as diesel engines, hydraulics, electromechanical devices, computers, health, agricultural equipment and others. The company employs more than 400 people in its 200,000 square-foot facility.

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.

Microporosity Prediction



*Simulations were run for the same part made in two different dies. Parts are gated at different locations. **FLOW-3D**'s new micro-porosity model accurately predicted both the location and the amount of porosity in both parts.*