AMC

AMERICAN METALCASTING CONSORTIUM

MODELING OF DISTORTIONS AND PATTERN ALLOWANCES FOR STEEL CASTINGS

Program Overview and Objectives

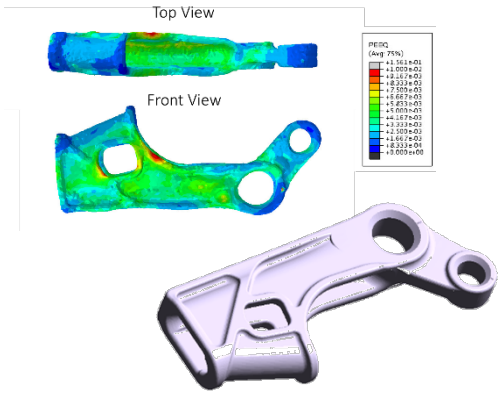
University of Iowa is developing modeling tools for dimensional and distortion prediction that would be beneficial to production of lighter-weight, higher performing steel castings. Casting contracts as it solidifies and cools in the mold. This contraction is accommodated by incorporating pattern allowances which is referred to as patternmaker's shrink. Several factors such as casting design, mold material, and mold restraint may cause various degrees of contraction in a casting. These dimensional deviations from the patternmaker's shrink are considered casting distortions. If not accounted for in the design phase, these dimensional inaccuracies can lead to higher costs and longer lead times due to additional post-casting operations or the casting being scrapped. This research aims to develop modeling algorithms to reliably predict these dimensional changes and distortions in steel castings.

SUCCESS STORY

Problem: Current casting simulation software fails to accurately predict final dimensions, distortions, residual stresses, and cracks in steel castings.

Solution: Modeling algorithms and mechanical property data sets for mold and metal were developed for accurate predictions of dimensions and distortions in steel castings.

Benefits: The improved capability to predict and control dimensional changes in steel castings would allow a 3 – 5% cost reduction in finishing and rework of higher volume castings, reduced lead times, higher quality castings, and a 5% weight reduction on large limited production items.



"The ability to accurately predict as-cast dimensions and distortion through modeling simulation will have a huge positive impact on new product development. Such modeling will help shorten lead times and reduce costs for customers and end users like the DLA by reducing sample iterations, tooling costs and unnecessary machining stock."

- Joe Boose, Boose Aluminum Foundry Company, Inc.

ATI Advanced Technology International

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CONTACT AMC:
(843) 760-3483
AMC@ATI.ORG
HTTP://AMC.ATI.ORG

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