AMC

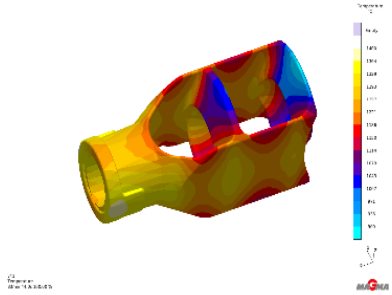
AMERICAN METALCASTING CONSORTIUM

Critical High Performance Steel Casting Leverages R&D

Program Overview and Objectives

The University of Iowa (UI), University of Northern Iowa (UNI), and Steel Founders' Society of America (SFSA) and its Casteel Technology Associates (CTA) consultants, sponsored by the American Metalcasting Consortium (AMC), are working with Rock Island Arsenal (RIA) to evaluate and improve casting production of the M776 Muzzle Brake. The Muzzle Brake is a complex part with tight design tolerances and high quality requirements. This R&D effort aims to leverage the advanced capabilities and technologies developed from previous programs sponsored by DLA and US Army Benet Laboratories.

UI is leveraging their state-of-the-art casting flow and solidification modeling tools and their dimensional and distortion model to reliably predict the quality and performance of the casting. UNI is integrating the solid model designs and constructing molds and cores using advanced printed sand mold additive manufacturing technologies. SFSA and their Steel Casting Wiki toolkit along with the Society's CTA are providing the technical guidance to prevent potential manufacturing issues.



SUCCESS STORY

Problem

The Muzzle Brake is a challenging part to make and has few capable manufacturers, but it is essential to the function of the howitzer. This casting has a tight design tolerance and complex geometry along with high quality and mechanical property requirements which make production difficult.

Solution

SFSA pulled together a team of experts to assist RIA with the latest casting technology to develop a manufacturing plan to achieve the TDP requirements for the Muzzle Brake. Using UI's solidification modeling and their dimensional and distortion model, the rigging system was designed to have minimal hot tears and porosity in the casting. Despite the complex geometry of the part, UNI's 3D printing capability simplified the production of the mold and allowed for a thinner wall in the mold and cores which minimized hot tears in the casting. Chromite chills were used to provide directional solidification and promote fine microstructure which improved the soundness and mechanical properties. These technologies along with best practices for melting, heat treatment, and welding were implemented to ensure sound quality casting production.

Benefits

Years of research from multiple programs are being leveraged to manufacture this complex casting to support the Army. The improved foundry capability to produce the Muzzle Brake will reduce costs and lead times and the best practice manufacturing plan will expand the network of qualified foundries for this part.

"This joint effort to leverage the latest R&D and process technologies is critical to improve the acquisition cost and producibility of complex muzzle brake castings."

-Victor Pugliano US Army RDECOM ARDEC

SFSA | The University of Iowa | University of Northern Iowa | ATI | Rock Island Arsenal

FOR MORE INFORMATION ABOUT AMC GO TO: AMC.ATI.ORG OR CALL 843-760-3483

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