



CONFORMAL COOLING USING 3D ADDITIVE MANUFACTURING



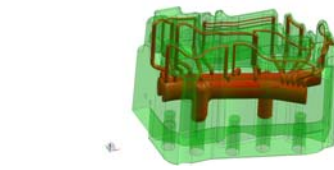
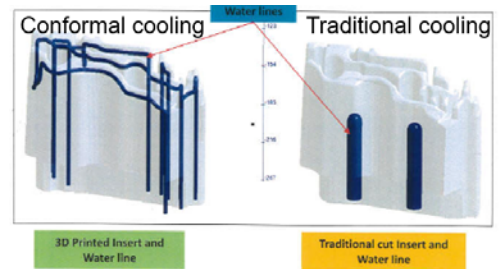
Program Overview and Objectives: Rapid Creation of Tooling with Conformal Cooling is an AMC Innovative Casting Technologies project sponsored by the Defense Logistics Agency. It is a collaboration between AMC, the North American Die Casting Association (NADCA), Worcester Polytechnic Institute (WPI), Mercury Marine, and Ryobi Die Casting. The project uses additive manufacturing and powdered steel to create die cast die inserts with unique conformal cooling systems to aid in solidification and reducing die cast scrap.

SUCCESS STORY

Problem: Properly placing cooling lines within the hottest areas of a high-pressure die casting is necessary to achieve uniform solidification and reduce shrink porosity throughout the casting. Currently, cooling lines can only be located in the tooling where it can be machined in place during the production of the steel components. This results in cooling lines that are often straight and located away from the hot regions of the die cast part.

Solution: With additive manufacturing, cooling lines can be 3D printed in any geometry, eliminating the need for the lines to be straight. By printing the steel insert, cooling lines can be placed with different configurations and with closer proximity to the hottest areas of the dies. Three inserts printed using this technology ran in a production die casting machine at Ryobi in Shelbyville, Indiana. These conformally cooled inserts outperformed previous inserts by extracting more heat and also showed less signs of wear. In addition, the castings produced using these inserts showed a reduction in scrap.

Benefits: This process has the ability to produce more uniform cooling and consistently better-quality high pressure die cast parts. Additional benefits include longer tool life, reduced cycle time, improved operation efficiency, and less leakers.



Initial Design from traditional to conformal cooling



3D Printed Insert



Conformally Cooled Traditional Insert

“The significant scrap reduction along with better insert life will prove to be a great benefit to Ryobi Die Casting.”
Dr. Yeou-Li Chu, R&D Director, Ryobi Die Casting

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