Lightweight Innovations

Technology Project Abstract:
Melt 5b – Thin-Wall Aluminum Die Casting Development

Project Summary
This project focuses on the development of High Pressure Die Casting (HPDC) technologies for aluminum alloys that are required for producing high quality thin-wall aluminum die cast components.

Technology Gap / Need
The current technology gaps in the area of thin-wall aluminum HPDC castings create three opportunities for improvements:

• Reducing the minimum wall thickness of die castings to less than 3 mm in parts with larger surface areas, and still achieve complete mold fill.
• Reducing the variability of, and increase the minimum mechanical properties of HPDC castings, which currently limit their use for structural applications in both automotive and aerospace industries.
• Creating custom processes for designing die castings. Current casting design practice applies the minimum mechanical properties of cast alloys uniformly to the whole casting, which generally results in over-design of a casting, especially when a large safety factor is used.

Proposed Technology
Integrate key process technologies (super vacuum die casting and shortened heat treatment) with integrated computational materials engineering (ICME) tools for 300 series (Al-Si-Cu-Mg based) die casting alloys to reduce the variability in quality and improve the mechanical properties of high pressure die castings.

Project Benefits
• Reduction of the minimum wall thickness of parts to reduce weight
• Use of HPDC to replace unitized thin aluminum sheet metal built-up assemblies for manufacturing cost reduction

Workforce and Educational Impact
The American Foundry Society (AFS) and the North American Die Casting Association (NADCA), through workshops, webinars, technical conferences, and training programs, will assist in the dissemination of knowledge and create new courses on how to manage this new thin-wall aluminum die casting in a production environment. LIFT will support the development of ICME workforce development initiatives.

Period of Performance
Start Date: July 2015
End Date: June 2017

Funding
Total Project Value: $2.2M

Participants

Industry Partners
Alcoa
American Foundry Society
Boeing
Comau
Eaton
NADCA
Nemak

Research Partners
Massachusetts Institute of Technology
Southwest Research Institute
The Ohio State University
University of Michigan
Worcester Polytechnic Institute