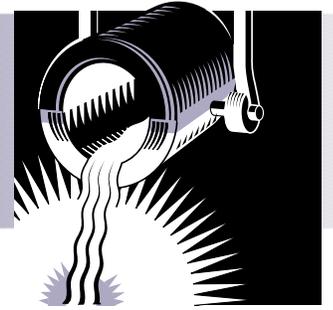


METAL CASTING

Project Fact Sheet



CASTING CHARACTERISTICS OF ALUMINUM DIE CASTING ALLOYS

MATERIAL ANALYSIS HELPS INDUSTRY REALIZE THE POTENTIAL OF ALUMINUM DIE CASTING ALLOYS

BENEFITS

Currently, about 5% of all castings must be scrapped due to poor quality. Such inefficiencies waste an estimated \$100 million per year in remelting costs in addition to significant amounts of energy. A database of melting and solidification characteristics of aluminum die casting alloys, together with a fundamental understanding of the effect of alloy composition on melting and solidification, will significantly reduce the frequency of casting defects. This will in turn save energy in melting and remelting. By 2020, the results of this project are estimated to save 1.9 trillion Btu per year.

APPLICATIONS

The results of this research can be applied throughout the aluminum casting industry. They will help increase the viability of aluminum castings in numerous applications including automotive and other commercial markets. Increased use of lightweight aluminum components in automobiles will produce the secondary benefit of improved fuel efficiency.

Recent innovations in die casting technology have significantly expanded commercial applications for cast aluminum products. However, the optimization of existing alloys, the development of complementary new alloys, and the documentation of reliable data on mechanical and physical properties for these alloys have lagged behind. This is creating a barrier to realizing the full potential of aluminum cast products.

Previous research performed by Worcester Polytechnic Institute (WPI) in conjunction with the North American Die Casting Association investigated alloy-microstructure property interactions in die casting alloys. The result was a database that relates the chemistry of aluminum die casting alloys to as-cast microstructure and mechanical and physical properties. The research also resulted in findings which enable metallurgists to tailor an alloy to a given application. The findings also allow part designers to predict part performance from alloy chemistry.

WPI is currently taking this research to the next stage -- that of examining the melting and casting characteristics of the selected aluminum die casting alloys. Melting and casting characteristics to be considered include: quantity and type of sludge produced during melting, melt fluidity, tendency of the alloy to die sticking, and alloy machinability. The comprehensive data set that will result should enable metallurgists, die casters, and design engineers to fully exploit the potential of aluminum die casting alloys.

TESTING OF ALUMINUM DIE CASTING ALLOYS



Critical melting and casting characteristics of aluminum die casting alloys undergoing testing.



Project Description

Goal: This research will examine the melting and casting characteristics of aluminum die casting alloys. The specific objective of this project is to relate alloy chemistry to critical melting and casting characteristics such as the quantity and type of sludge produced during melting, melt fluidity, the tendency of the alloy to stick to the die components, and the tendency of the alloy to hot tear.

Progress and Milestones

This two year project was awarded in 1999. Specific tasks include:

- Literature Review - WPI has completed compiling and reviewing literature on the castability of aluminum die-casting alloys.
- Alloy Production - Alloy production is complete. Twelve aluminum alloys shown in the earlier work to have optimum mechanical and physical properties have been prepared.
- Assessment of Alloy Castability - For each alloy, the tendency towards sludging has been quantified and sludge factors will be developed. Fluidity will be determined for each. The tendency toward die sticking has been tested specific to the die casting process.
- Technology Transfer - In conjunction with NADCA and project partners, results are continuously being transferred to industry.



PROJECT PARTNERS

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North American Die Casting Association
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Aluminum Casting Research Laboratory
Consortium

Hayes Tech Center
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December 2000