



AMC

AMERICAN METALCASTING CONSORTIUM

Increasing the Number of Alloys in MMPDS

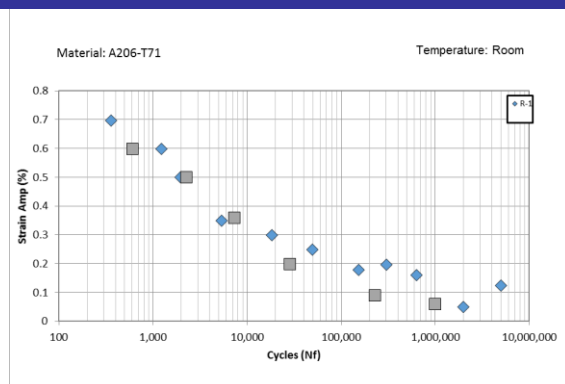


Program Overview and Objectives:

The American Foundry Society (AFS), as part of the American Metalcasting Consortium (AMC), has provided material property design data for the incorporation of aluminum cast alloy A206 into the Metallic Materials Properties Development and Standardization (MMPDS) handbook. This project was a follow-on to the previously completed AMC effort that submitted aluminum E357 statistical data for incorporation into the MMPDS standards.

SUCCESS STORY

Problem: Original Equipment Manufacturers (OEMs) are reluctant to use aluminum castings in the design of critical or structural applications because many of the alloys are not listed in the MMPDS handbook. In addition, many OEMs use a casting “knock-down” factor to estimate allowable stresses, as opposed to statistically driven A and B allowable limits, which makes casting designs unnecessarily heavier. This is problematic when making cast alloy conversion / replacement decisions. Potential cast parts for replacing forgings or weldments could be lighter, more cost effective, and have shorter lead times if their data is readily available in the MMPDS.



Solution: Develop statistically validated data for the A206 high strength aluminum alloy for incorporation into the MMPDS so that it can be readily used to design and manufacture flight critical components in military and civilian aircraft. The project was leveraged on a previous AMC effort for aluminum E357 that designed a series of test specimens encompassing various section thickness utilizing process simulation software, validating the approach metallographically, coordinating the collection of required samples from a consortium of qualified foundries, and submitting the data for statistical analysis and approval by the MMPDS Board for incorporation into the MMPDS standards. In addition, the AMS 4535 specification for A206-T71 heat treatment was revised to include step solution and aging at 390F.

Benefit: The development of statistical based property data will permit the use of castings across a broader range of applications and will allow the Defense Logistics Agency (DLA) Engineering Support Activities to make cast alloy conversion / replacement decisions with assurance using statistical data on tensile, compressive, and shear properties from the FAA recognized source, the MMPDS Handbook. Cost savings will be realized from the reduction of lead times. The potential to reduce part weight will be increased with the ability to utilize new, improved aluminum alloys.

“For the past two decades we significantly decreased our use of castings for structural aerospace applications in commercial aircraft. The principal reason, from a technical perspective, has been the lack of confidence in consistent mechanical property results. Statistically derived mechanical property allowables published in MMPDS provide aerospace engineers reliable strength data to confidently employ cast materials in structural applications. The AFS efforts in coordinating cast material test projects and presenting test results to the MMPDS committee for publication is a tremendous contribution to the future health of the aerospace casting industry.” - David Jakstis, Fellow, Core Structures Engineering & Technology, Spirit AeroSystems



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