

METAL CASTING

Project Fact Sheet



FATIGUE PROPERTIES DATABASE

NEW DATABASE WILL BE INTEGRATED WITH MODERN DESIGN TECHNIQUES AND FILL CURRENT GAP

BENEFITS

- Increases ability to produce lightweight cast iron components
- Opens new market opportunities for U.S. iron foundries
- Lower weight castings reduce melting requirements, save energy and reduce emissions

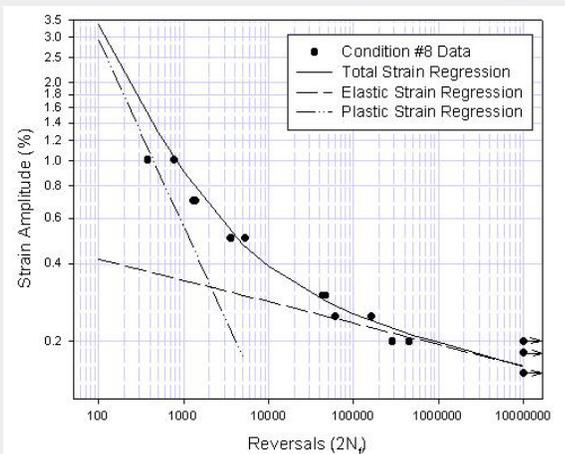
APPLICATIONS

The results of this research can be distributed to the design community. In particular, it will improve the industry's ability to compete in markets for light weight, high strength components. The results will be made available on the AFS website.

A comprehensive strain-life fatigue database for the structural grades of graphitic cast irons will be developed. The purpose is to enable designers to use modern durability modeling to develop more precise and efficient cast iron components. Currently, a coherent database that is appropriate for component design with cast iron is not available to domestic cast iron producers and end users. Establishing such a database will extend design capabilities, which are currently available for many wrought alloys, to cast irons. The enhanced design capabilities resulting from the database will open new markets and increase competitiveness for domestic cast iron producers. It will lead to more efficient (lighter/smaller) component designs, shorten development times, and reduce development costs. Also, as a result of lighter and smaller component designs, foundry energy consumption and associated emissions will be reduced.

The scope of the project involves structural grades of gray iron, ductile iron, austempered ductile iron, and compacted graphite iron. An estimated 18 materials will be tested to complete the database. Climax Research Services will conduct strain-life fatigue testing, analyze the results, construct a database, and report the findings. They will combine the newly generated data with strain-life fatigue data from the literature and unpublished data provided by industry partners. The final database will be similar to the format used by the DOE/USCAR light cast metals database to facilitate ease-of-use. The database also will be made available on the American Foundry Society website.

STRAIN ANALYSIS FOR CAST IRONS



Strain-life fatigue data and predictions for high-hardness Grade D5506 (Fer-rite - Pearlite) ductile iron.



Project Description

Goal: The objective of this project is to develop a comprehensive database of strain-life fatigue data for graphitic cast irons. Specifically, the structural grades of gray iron, ductile iron, austempered ductile iron and compacted graphite iron will be included.

Progress and Milestones

This two year project began in January 2000. Specific tasks include:

1. Acquisition and analysis of unpublished data - Fatigue data not currently published will be collected from industry partners and analyzed. It will be combined with currently published data.
2. Acquisition and characterization of test materials from industry - Material characterization will include precise modulus determination, Poisson's ratio, monotonic stress-strain properties, bulk hardness, graphite and matrix microstructure quantification and alloy chemistry. The results will be evaluated.
3. Cyclic testing of 18 materials - Tests will include determination of cyclic stress-strain behavior as well as strain-life testing. Eighteen samples will be included in the strain-life test matrix for each material.
4. Analysis of results - The second year of the project will include a comprehensive analysis of the results including a determination of strain-life coefficients and exponents.
5. Database and Final Report – The combined data will be tabulated into a database patterned after the DOE/USCAR light cast metals database. This will facilitate ease of use. The American Foundry Society will make the database available on their website.



PROJECT PARTNERS

Climax Research Services
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American Foundry Society
Des Plaines, IL

Applied Process
Livonia, MI

Arvin Meritor Automotive
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Bay Engineered Castings Inc.
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