

Image Cover Sheet

CLASSIFICATION

UNCLASSIFIED

SYSTEM NUMBER

511917



TITLE

Residual and Applied Stress Characterization of NiAl Bronze using X-Ray
Diffraction

System Number:

Patron Number:

Requester:

Notes: Paper #43 contained in Parent sysnum #511874

DSIS Use only:

Deliver to: CL



Residual and Applied Stress Characterization of NiAl Bronze using X-Ray Diffraction

by Michael Brauss *, John Porter **, Mohammed Belassel *,
Calvin Hyatt **, and James Pineault*

*Proto Manufacturing Ltd, Oldcastle, Ontario, Canada

**Dockyard Lab (A), DREA, Halifax, Nova Scotia, Canada

ABSTRACT

The ability to accurately quantify the residual strains in NiAl bronze components enables a more complete understanding and improved prediction of potential failure mechanisms. The application of x-ray diffraction methods to the measurement of residual strains, while long accepted, has been limited to laboratory based experimentation. In addition, the challenges associated with diffraction measurements in large grained materials have made the application of these technologies to large NiAl bronze castings and components problematic. Developments to create a portable miniature x-ray diffractometer (MXRD) have permitted the field application of diffraction technologies. Specific recent enhancements to optimize the performance of the system, including implementation of automatic Ψ (psi) axis oscillation for large grained materials now permits the characterization of residual strains in these materials, not only in laboratory but also in field experimentation. This presentation outlines the recent MXRD developments, including results obtained from evaluations of NiAl bronze samples loaded in four point bending.