

Image Cover Sheet

CLASSIFICATION

SYSTEM NUMBER

510370

UNCLASSIFIED



TITLE

X-RAY DIFFRACTION DETERMINATION OF RESIDENTIAL STRAIN FOR MARINE PLATFORMS

System Number:

Patron Number:

Requester:

Notes: Paper #27 contained in Parent Sysnum #510343

DSIS Use only:

Deliver to: DK



X-ray Diffraction Determination of Residential Strain for Marine Platforms

by

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ABSTRACT

While x-ray diffraction techniques have long been applied for the determination of surface residential strain states, the bulky nature of the required apparatus has severely limited the usage of these techniques. Advances in solid state x-ray detection devices and computing systems have permitted the development of a fully portable miniature x-ray diffraction system (MXRD) for application on complex welded structures such as marine platforms. Residential strain is defined as the aggregate of those strains which are present in the structure in the absence of external loading. In marine platforms, these strains include the welding residual strain component, the restraint strain component as a result of joining structural sections and the dockside strain component present due to the weight of the structure. MXRD is capable of fully characterising the residential strain states in complex welded structures as well as the applied strain states due to external static loading conditions.

Recent advances in the current MXRD development activity will be described with an emphasis on the differences between this system and earlier diffractometers. The potential for the use of portable x-ray diffraction systems in non-destructive testing on marine platforms will be discussed, as well as several relevant case studies, involving the application of MXRD for the measurement of residential strain.