

WELD INSPECTION USING DUAL FREQUENCY EDDY CURRENTS

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Abstract

Eddy Current Weld Inspection has made a great impact in the Petrochemical, Construction, Power Generation, Civil Engineering Structures and Shipbuilding industries due to the time saving and cost effectiveness over other Non Destructive Testing methods. By introducing the latest technology of, Dual Frequency Eddy Current Inspection, more time and cost saving can be achieved, when inspecting welded components and structures.

The improved inspection, using the Dual Frequency technique, enables paint thickness measurement to be continually monitored during inspection, thus providing information for instant gain control, essential for a consistent inspection. This results in a 'one scan' operation therefore reducing the inspection time.

Dual Frequency Eddy Current inspection has been established in tube Inspection, recently introduced in Aerospace procedures and now in industries where weld inspection is required.

1. Introduction

Eddy Currents have been used to inspect ferromagnetic structures for over six years with the great advantage of not having to remove the paint from the component being tested. During this inspection however the paint thickness had to be monitored as any increase in paint thickness reduces the sensitivity of the inspection and correction had to be applied during the operation at regular intervals. Dual frequency enables a constant visual check without the regular manual thickness measurement so providing a quicker and more cost effective inspection.



Absolute for Coating Thickness assessment
Bridge / Differential for the detection of defects.

2. Equipment listing

Phasec 2d portable Instrument package comprising:-

Phasec 2d instrument

Operating manual

Battery Pack

Battery Charger

Software, Supervisor PC

Lead RS232

Carry Case

Generic Power Cord.

Weldscan Probe

Test Block

3. Specific Applications



Shipping Industry



Off Shore structures both Topside and Underwater.

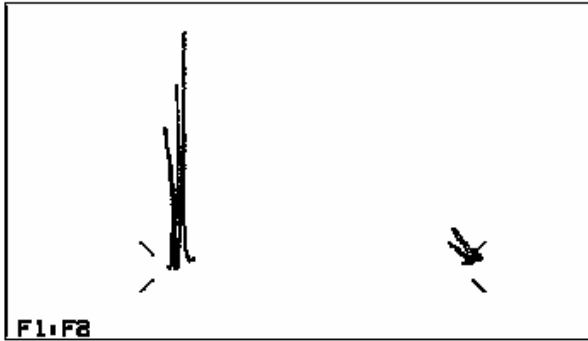


Bridges and Construction

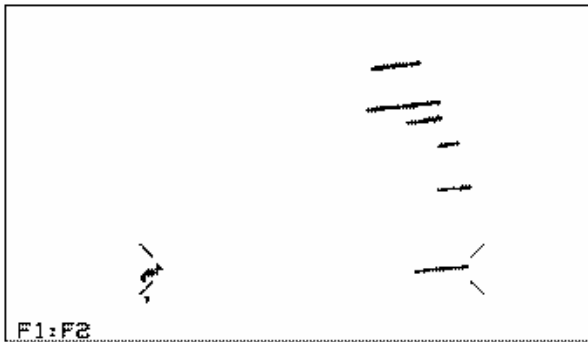


Amusement Parks and Fairgrounds

4. Weldscan Signatures



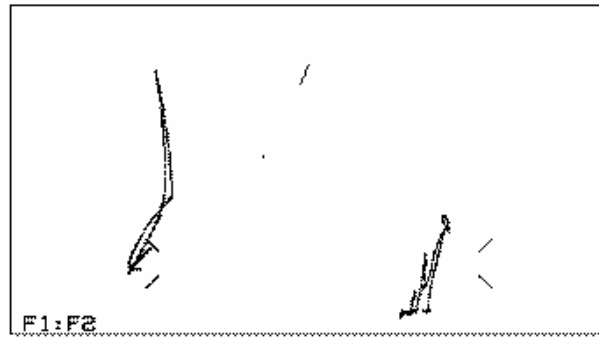
Left 100 kHz (Bridge), artificial defects and Right 10kHz (Absolute), paint thickness response Test Block with 0.5, 1.0 and 2.0mm defects.



Left showing Nil Defects and Right with Lift Off on Test Block 0.5mm steps up to 2.0mm and top signature in air.



Scan on Weld Cap of sample in Defect free area



Scan with Artificial Defect in Weld

5. Certification

Personnel Certification-
PCN EN473 levels 1 - 3
ASNT levels 1 - 3

6. Inspection Standards

British and European Standard
BS EN 1711 : 2000
Eddy Current examination of welds by complex plane analysis.
Covers :-

The use of Weldscan Inspection by single frequency operation.
Reference to other relevant standards
Equipment and settings
Personnel requirements
Equipment calibration
Calibration blocks
Acceptance criteria
Recording inspections
Reporting inspections

Also:-
Weld considerations
Scanning methods
Coating measurements
Testing plan
Method Flow diagram
Detectability of Flaws
Non acceptable indications.

7. Approvals for Weldscan

Lloyds Register
DNV (Det Norske Veritas)
Bureau Veritas
PCN Qualification system.

8. Developments

Ware resistant Tips to Probes:-

Stainless Steel and Ceramic working face to probes.

High Temperature Probes:-

Working Temperatures up to 200 degrees Centigrade.

Array Probes:-

To increase scan width or match contour of test object.

9. Conclusions

The additional advantage of Dual Frequency Eddy Current Inspection is mainly the time saved in the inspection procedure. Dual Frequency inspection of welded structures has decreased the time of inspection, so reducing the cost.

Eddy Current inspection is an effective surface breaking flaw detection method in ferrous and Non Ferrous structures, due to the high flaw detection rate, reduced costs in down time, lower consumable costs and minimal surface preparation.