AUTOMATED FOUR AXIS EDDY CURRENT TESTING SYSTEM FOR INSPECTION OF BEARINGS

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Eddy current inspection is one of the surface inspection techniques used to detect the defects on the surface and to a certain extent subsurface defects inside an electrically conductive material. This application note discusses an automated eddy current inspection system for bearing components for detecting surface defects.

Dhvani Research designed and manufactured a 4-axis eddy current automated inspection system with customized report generation. The main components of the system are:

1. Mechanical Gantry

2. Motion Control System
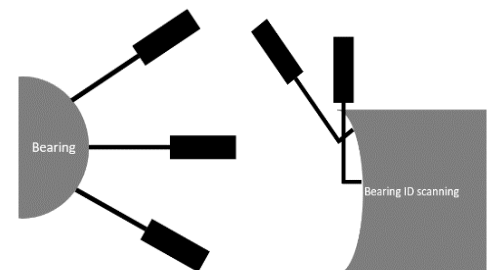
3. Eddy current unit

4. Software

This system can inspect bearings up to 36" in diameter and is used to detect defects in raceways, roller bearings, inner grooves, etc.

1. Mechanical gantry:

The mechanical scanner is mounted on a granite table with a powder-coated mild steel structure.

The axis movements are in Y, Z, Turntable, and probe angular adjustment. The sample can be scanned in both the inner and outer surfaces. A three-jaw chuck mechanism holds the sample in place and is capable of chucking from the inner diameter and the outer diameter. The scanning procedure of the inner (right)and outer race (Left) is as shown below.

2. Motion Control System:

The system is driven by servo motors and drives. The software for motion control is integrated with the acquisition software.

3. Eddy current unit:

The system is designed so that any Eddy current instrument with 2 axis encoder input can be used with the system.

4. Integrated Software:

The system contains two monitors of which one is connected for operating the eddy current system remotely and the other for data acquisition, motion control. The customer can view the data output from the V and H terminals of the eddy current instrument. The software user interface simultaneously displays the impedance plane, Y-T display, and H-T display.
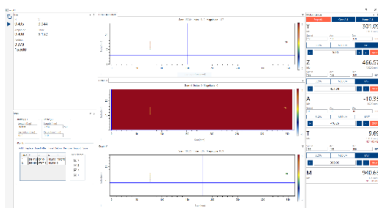
Acquisition software – Data display

The acquisition software has the following data display for defect analysis:

Impedance plot: Impedance plane plot that graphs coil resistance on the x-axis versus inductive reactance on the y-axis. Variations in the plot correspond to variations in the test piece.

H/V Plots:

This is the plot of the V and H values from the eddy current instrument output. Against time/scan position. During scanning, it should display the V and H values across a scan line.

Water Fall Plot: A waterfall plot is a three-dimensional plot in which multiple curves of data, are displayed simultaneously.

Analysis Software:

The data that is acquired at the acquisition stage can be used to do further analysis using the analysis software.
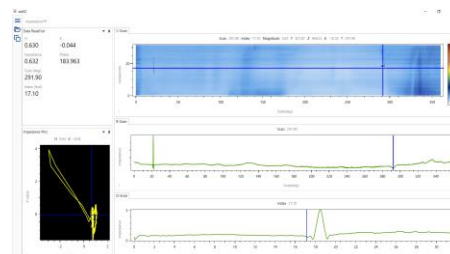

Data display in the analysis software

C- scan Plot: The c scan is plotted from the H or V or the amplitude value of the impedance.

Salient features of the system:

a. Automated inspection system

b. capable of integrating any eddy current equipment with encoder inputs

c. Remote control of the eddy current system.

d. B, D, C-scan and waterfall plot of the inspection data

e. Amplitude, phase, and sector-based alarms while testing is in progress.

f. Customized report generation.

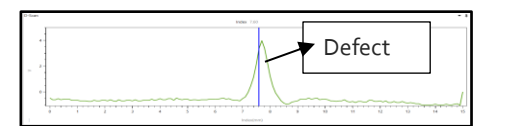Inspection data: The following are the various scan views images during data acquisition

a. C-Scan showing the defects on the sample surface, The C-scan plot is available for H, V, Impedance, and Phase data.
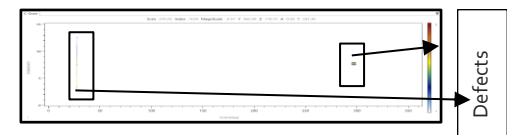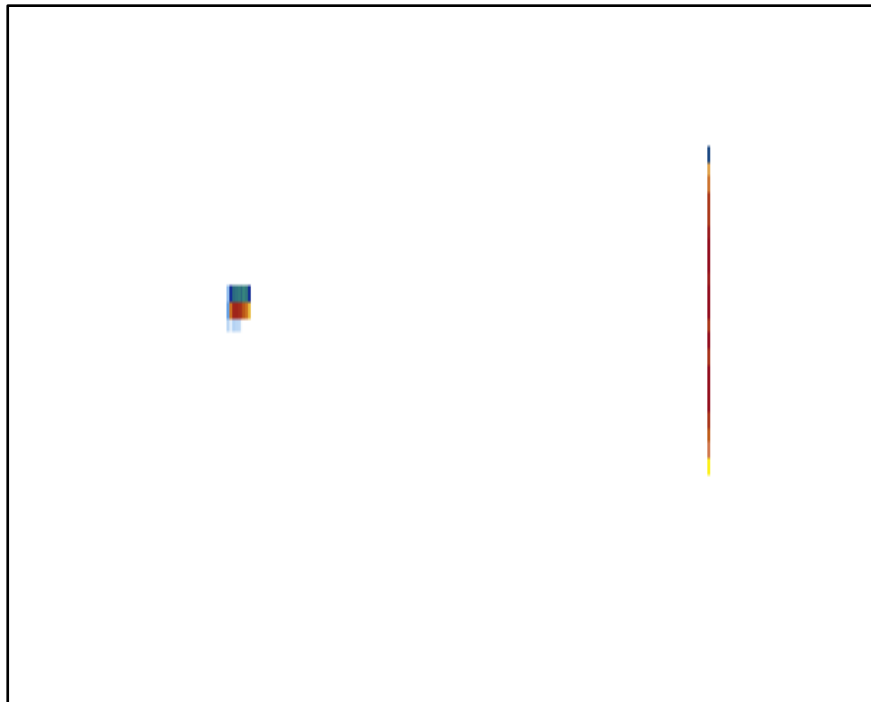

b. B-scan (Strip chart showing defects along the scan-axis)
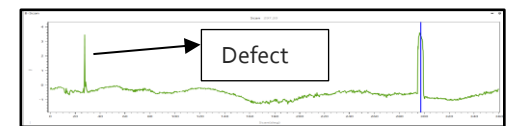
c. D-scan (strip chart showing defects along the index axis)

Automated Four Axis Eddy Current Testing System for Inspection of Bearings – Application Note

Impedance C-scan Plot

A Dhvani Research Application Note

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