

Ultrasonic Application Solutions

## Metal Coating Thickness – Eddy Current Scanner

### Application

- Eddy current techniques are often used to nondestructively measure the thickness of nonconductive coatings on nonferrous metal substrates.
- A similar technique can also be used to measure the thickness of thin overlaying conductive layers by using a combined conductivity reading from both metals.
- To ensure product reliability, it is important that manufacturers and asset owners run coating thickness measurement on materials to detect abrasion, erosion, or other forms of corrosion in a wide variety of fields. Eddy Current NDE can be used in many different ways (digital temperature compensated or analog continuous mode) along with different probe types to perform inspection.

### Customer challenge

- The team was challenged to develop a continuous rotating eddy current (EC) application for measuring the thickness of a refractory metal coating on the surface of another refractory metal base on a disk. The disks spin at high rates and are used to generate x-rays in CT scanners where the thickness of the top metal coating is critical.
- During manufacturing of these target disks, the customer currently performs Eddy Current conductivity spot checks. The turntable system will acquire a full view of the thickness values over the entire surface area on the disk.
- A study using cut-up samples will be performed to build a regression curve to relate conductivity values to actual observed coating thickness.



Figure 1: CT Scanner

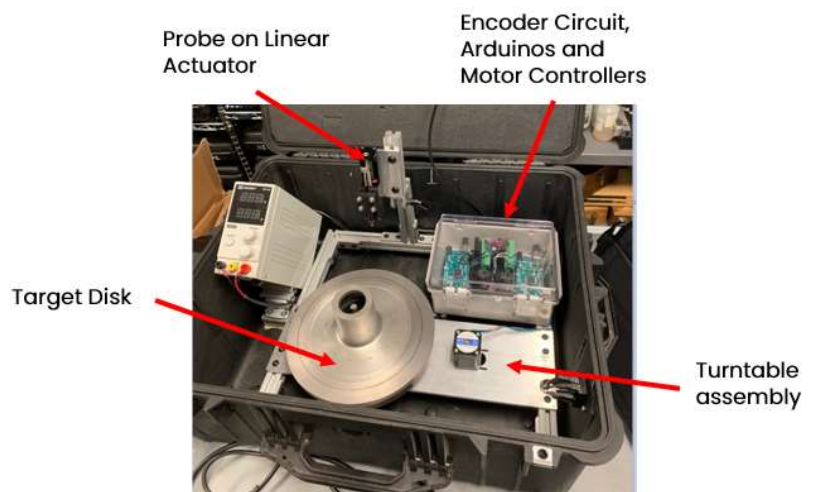


Figure 2: Turntable solution mounted in travel case

### Our Solution:

The solution includes a method of acquiring the data using standard eddy current probes to provide complete coverage for the required inspection. An encoded turntable and linear motor are used to spin the part and to move the probe across the area of interest. The scans are captured using the Mentor EM eddy current instrument while verifying precise positional accuracy. The data is then exported to a PC for the thickness analysis.

Data analysis is accomplished using a custom developed software which includes strip charts, lissajous XY display and color-coded rotary C-scan display. The software enables the customer to use their own developed regression curves for thickness prediction and results export to spreadsheet. The user can choose amplitude or phase-sensitive c-scan displays along with custom balancing features to aid in the analysis of the data.

### Solution benefits:

- Proved feasibility by relating coating thickness to the measured conductivity of both metals.
- Designed and built the Arduino motor-driven mechanical assembly
- Designed motor and encoder electronics for accurate control and positioning
- Developed custom PC analysis software to customer specs

### EC Test Equipment:

- Mentor EM 022-510-812 – Standard Probe Module with USB/Encoder Module (encoder enabled update)
- Abs Shld Pencil Probe 610-094-111



Figure 3: Closeup view of EC probe riding on surface of target disk

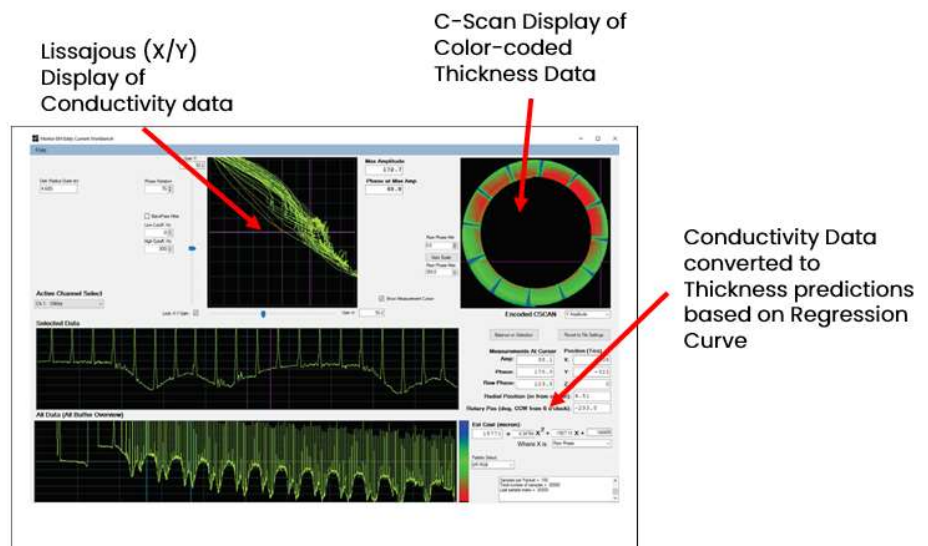


Figure 4: EC Analysis Bench – custom software developed for this application