Agenda

• Eddyfi overview
• Tubing Inspection
• PEC Inspection: CUI, CUF, RWT under scab
• Applications under evaluation for PEC
• Future Development for PEC
• Questions
Mission

• To develop the industry’s best performing and most reliable NDT equipment, data acquisition software and analysis software.

• To push the limits of electromagnetic testing to new heights.

• To innovate and attempt solving new sets of industry problems.
Eddyfi Technologies overview

Global Presence
- 6 offices in 6 countries
- 1500 units in the field
- 30% of our employees do R&D

Supporting clients over 85 countries

Creation in 2009 with people of substantial experience

Global footprint – approx. 1000 systems currently operating in over 65 countries
OUR SOLUTIONS

Oil & Gas
• Heat exchangers
• Above ground storage tanks
• Piping and pipelines
• Vessels
• Offshore and subsea

Power generation and nuclear
• Heat exchangers
• Turbines
• Piping
• Pressure vessels
• Nuclear components

Heavy industry and mining
• Gears and pinions
• Critical welds and tanks

Aerospace
• Engines, fuselage/structure
TUBING INSPECTION
ECTANE2 INSTRUMENT

• Battery operated (8 hr)
  • No down time due to power loss!

• Versatile – Multi-technologies
  • All in one box
  • ECT, RFT, NFT, MFL, ECT ARRAY and IRIS
  • Supports Tubing and Surface applications

• Easily deployed
  • Light weight (15 lbs) and portable
  • Rugged, sealed enclosure, external heat sink
  • Automatic connection to lap top computer
  • Over 700 units deployed world wide
MAGNIFI SOFTWARE

- **Magnifi 4.3**
  - Automatic data screening analysis program
  - RFT one-click calibration (permeability variations)
  - Landmark DQV program
  - Improved sizing for typical ID pits

- **Magnifi 4.2**
  - Intuitive user interface
  - Powerful data processing and management for improved productivity
  - Fully automated acquisition sequences for manual tubing inspections
  - Multiple reporting formats (word, excel, PDF)

- **TubePro 5**
  - Tube sheet drawing generated from a digital picture!
EDDY CURRENT TUBING INSPECTION PROVIDES THREE MAIN PIECES OF INFORMATION

- **Detection of the defect:**
  Defects should have a minimum signal to noise ratio of 3 to 1.

- **Characterization of the defect:**
  Is the defect a pit, wear, cracking etc.

- **Sizing of the defect:**
  Choosing the best calibration sizing curve based on the proper calibration standard.
STANDARD ECT AND RFT PROBES

Detection of the defect
- Strip chart analysis

Characterization of the defect
- Level IIA analyst required
- Minimum of three years analysis experience
- Pulled tube experience needed

Sizing of the defect
- Could over or under size defect if not properly characterized
- Impossible to accurately size multiple defects at the same axial location
- Mix channel required for ECT applications
ECT ARRAY - DEFHI PROBE

Higher quality data
- For use with non-magnetic materials
- Intuitive 2D/3D C-scan imaging
- High resolution
- Repeatable and Accurate data

Detection / sizing capabilities
- Easily detects circumferential and axial cracking located at the support plates or severe cracking at the tube sheet
- Accuracy is ±5%
- No other probe offers higher resolution than the DefHi technology
- IRIS detection is limited on thin wall tubing
- No re-scan required!

Circ. / Axial C-scan

Circ. 3D C-scan

Axial 3D C-scan

Circ. crack located under support
NEAR FIELD ARRAY (NFA)

Designed for carbon steel tubes with aluminum fins (Fin Fan Coolers)

Detection / sizing capabilities
- Detects and sizes ID pitting, erosion and cracking
- Detects ID circumferential cracking at the tube sheet
- Accuracy of ±10%

Easy to deploy on site
- Used with the Ectane instrument (battery powered)
- Compared to IRIS, no need for external power, water supply or centering devices & no missing data
- NFA inspections are fast, accurate and cost effective!
NFA FIELD DATA

Data taken from a fin fan air cooler that was 28 years old

- NFA pull speed of 6 in/s vs 1.0 in/s for IRIS (six times faster than IRIS)
- No missing data points
- Higher definition at the tube sheet
- Same sizing results as IRIS!

New applications for NFA:
- Internal cracking at the boiler tube sheet
- Carbon steel heat exchanger U-bend internal inspection with a flexible NFA probe
Eddyfi Technologies

PROBOT

Decreased inspection time:

- **Compare the Probot vs hand pulling the probe**
  - Consider a tube bundle, 20 feet in length
  - Manual inspection on a good day can collect 1000 tubes in 8 hours
  - The Probot allows over 2000 tubes collected in 8 hours
  - **Twice the speed equates to higher productivity and significant cost savings!**

- **Automatic data screening vs manual analysis**
  - Considering a 20 foot bundle with 500 tubes (*assume 15% of the tube have indications*)
  - Manual analysis requires approximately 20 seconds / tube (3 hours of analysis)
  - Automatic data screening with setup time (25min) + time to analyze 15% of tubes ≈ 1 hour
  - **Analysis and reporting can be delivered three times faster vs manual methods!**
PROBOT

Benefits of accurate historical data

- **Encoded and correlated data**
  - Higher precision and data accuracy
  - Highly repeatable data
  - Eliminates negative effects due to the human factor
  - Indications location with axial sizing coverage
  - Allows historical data trending for optimal unit integrity assessment
  - Accurate life cycle

- **Easily deployed**
  - For *all tubing probe* technologies including IRIS
  - Wide speed range
  - Light weight, compact, sealed (IP65), small footprint
  - No compressed air or separate power supply required