Remote Technology – Digital Log

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1. Remote technology – current status
2. Problem definition
3. Technology solutions
4. Digital log examples
5. Initiate an industry conversation around IoT as a supplement to inspections
Remote Technology – Current Status

- Asset management is driving remote visual inspection technology.
- Code cases and code changes for remote visual.
- Primarily to address safety.
  - COVID access issues,
  - permit required confined space entry
  - Side benefit - cost savings
- Large applications
  - Large utility, large PV,
  - vessels needing scaffolding or containing hazardous materials.
What about Main Street?
IoT – Digital Log

- Needs for inservice are different than asset management or shop inspections
- IS inspections
  - Visual external and internal
  - Witness control testing
  - Logbook review
- Smaller equipment
  - Shorter visits
  - Time savings and risk avoidance a lot harder to justify
- Remote visual – not an easy solution for main street
- IoT as a digital log has potential
Elements of an IoT Solution

- **Infrastructure**
  - Gateway
  - Servers

- **Sensors**
  - temperature
  - thermal switch
  - pressure
  - water
  - vibration
  - etc.

- **Back End (Home Office)**
  - Algorithms
  - Automatic Alerts
  - Reporting (i.e. Logs)

- Technology will become less expensive
What Can be Monitored Now? What Could be Monitored? What Should be Monitored?

- Testing of Safety Devices
  - LWCO (non-probe type)
  - Relief Valve
  - Other?

- Key operational
  - Blowdown
  - On/off – cycles
  - Temperature differential
  - Other?

- Boiler Control Tie-in?
  - Alarm log
  - Operating parameters

- Related
  - Water presence
  - Humidity (ambient)
  - Temperature (ambient)
  - Historical temperature (weather data)
  - Sound levels
  - Vibration
  - Amps

Current  Possible Future
Potential Issues / Concerns

- Customer acceptance
- Cyber security
- Responsibility / liability
- Invasiveness
- Standards for boiler manufacturers and vendors
Case Studies – Heating Boilers and HP Steam Boiler
Space Heating – Steam and Hot Water
Predominantly cast-iron boilers

- Steam boiler losses
  - LWCO Failure
  - 32% of events represent 68% of losses
  - Lower freq – higher severity
- Hot water heating boiler losses
  - Over 95% of losses were cracks
  - Significantly dominates loss history
  - Higher frequency – lower severity
First Step – Key loss event
Steam Boilers – LWCO failure

- Cast Iron Boiler
  - A total loss
  - Potential for property damage/personnel injury

- Large FTSM – Low water events
  - Lower frequency, higher severity
  - Potential for property damage/personnel injury

REGULAR TESTING of LWCO is KEY to minimize losses.
Digital Log – LWCO
Steam Heating Boiler

Regular Testing of LWCO

Irregular Testing of LWCO
Dry Cleaner Installation

150 HP FTSM

LWCO

Blowdown
Digital Log
Dry Cleaner Boiler – (LWCO and Bottom Blowdown)
Dry Cleaner Boiler – 1 Week

- Friday in August

Boiler Started, LWCO Tested, Bottom Blowdown 6:00 AM regularly. Boiler off-line over weekend.
First Steps – Key Loss Event
Cast Iron Boilers Sectional Cracking

- Cast Iron Boilers – Cracked sections
  - High frequency, lower severity events
  - Disruptive – Most common during coldest month of the year.

- Contributing Factors
  - High temp differential
  - Cold water shocks
  - Frequent cycling
  - Low water outlet temps
Example Data
Example Data

Operating temperatures and cycle times within manufacturers specifications

Cold water returned to a hot boiler is a cause of thermal shock
Summary

- Remote visual and remote NDE will continue to grow their roles for large equipment inspections
  - Asset management
  - Shop inspections
  - Limited jurisdictional

- Most jurisdictional inspections are performed at main street businesses.
- Remote visual has challenges in main street businesses
- Currently – IoT is being used for loss prevention services
Let the Discussion Begin

- Can IoT be used as a supplement for external inspections?
  - Replace?
  - Extend time intervals?

- What other technologies are needed/in flight?

- Vendors? Standard set of data output

- Must overcome concerns raised and get buy-in from all parties

- Not a replacement for trained inspectors nor operators
Thank you