Emerson Reliability and Performance Monitoring

PHM 2018 – Philadelphia

Shannon Jelken
Emerson – Fisher Valves
Outline

- Why the need for improved Diagnostics/Prognostics?
  - Current State of Diagnostics
  - Future Direction: Prognostics
- Software Analytics
- Sensors / New Technology
- Remote Access for Monitoring
- Questions & Discussion
Why Prognostics / Monitoring Now?

- Workforce changes
  - Senior/Experienced users continue to retire
- Fewer customer personnel dedicated to valve issues
  - No time to become valve experts, busy running the plant
    - Small customers lack resources
    - Large customers lack focus and consistency
- Technology has evolved to enable a more cost effective solution
  - Sensing / communications / embedded solutions / etc
- Smart Phone Culture
  - People are becoming used to having access to information
    - NOT just data – but **ACTIONABLE** information
Emerson Performance & Reliability Monitoring

- Steam Trap
- DeltaV System
- Vibration System
- Instrument
- Process Equipment
- Machinery
- Control Valve
- Flow Meter
- Gas Analyzers
- Performance Monitoring Services
- Alarm System
- Machinery
Today’s Digital Valve – Measured Variables
The Parameters That Power ValveLink Diagnostics

DVC Temperature

<table>
<thead>
<tr>
<th>Diagnostic Information Inferred From These Sensors:</th>
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<tbody>
<tr>
<td>Assembly Friction</td>
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<tr>
<td>Seat Load</td>
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<tr>
<td>Spring Rate</td>
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<tr>
<td>Supply Air Consumption</td>
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<tr>
<td>Electronics Health</td>
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</tbody>
</table>

Also: Drive Signal and other electronic parameters
How do we.....

- Turn data into useful, actionable information?
  - And get it to the right person,
  - And integrate as much “valve SME knowledge” into the device as possible.

- Integrate new sensors and technologies into Fisher valves
  - Thinking outside the “grey” box

- Develop forward looking health predictors and user interfaces
  - Will this valve operate acceptably:
    • Today?
    • Until a scheduled maintenance opportunity?
    • Can we skip this outage and wait until the next?
Prognostics Expands On Today’s Capabilities

- **Diagnostics** and monitoring provides:
  - Simple data and assessment
  - Uses DVC sensors
  - Present condition
  - Subject matter experts

- **Prognostics** can provide:
  - More data through additional sensors
  - Data with analytics
  - Information is presented
  - Uses extensive valve knowledge
  - Future condition prediction
We are investing in additional methods for early failure identification.
The Future Fisher Digital Valve

Enabling Sensing Technologies:
- Accelerometers
- Acoustic Emission
- Fiber Optic
- Passive Wireless Sensors
- Strain Gauge
- RF / Wireless
- Many Others

- Diaphragm and Spring Health
- Vibration
- Trim Condition
- Pressure Boundary Integrity
- Process Related / Cavitation
- Force / Torque (stress / strain)
- Thru-Valve Leakage

Emerson Proprietary
Delivering Future Value

• Acquiring and evaluating new measurands requires new sensors

• Exploring techniques for expanded health monitoring is multi-faceted
  • Leverage and manage the convergence of new technologies

• Accelerating Time-to-Market
  • Force multiplier using contractors vs developing everything in-house

• Capturing domain knowledge
  • SME informed health indicators
  • End goal automated CBM

- Expand Sensor Deployment
- Collect More Field Data
- Embed Next Generation Sensor Technologies
- Improved Data Analytics – Machine Health Indicators
- Prognostics Dashboard
New Tools and Health Indicator Analytics

Valve Health Index - SPE

- Valve 1 (Sliding Stem)
- Valve 2 (Sliding Stem)
- Valve 3 (Rotary Ball)
- Valve 4 (Rotary Disk)
- Valve 5 (Rotary Ball)
- Valve 6 (Rotary Ball)
**IIoT Enabling Technology**

- Advanced Technology is investigating sensors and areas around the control valve including:
  - Leak Detection and Vibration Monitoring
  - Cavitation Detection and Characterization
  - Trending / Monitoring of Remote Locations
    - Monitoring in Support of Prognostics Development
    - What Parameters are Important for Valve Health?
  - Communication of Data
    - How do we get / use data that was traditionally unavailable
  - Predictive analytics (data to information)

- Sensing is achievable, but there are challenges around:
  - Power, cost, and mounting
  - Wired or wireless technology
  - Integration and communication with hardware and software
  - Third party approvals (IS, Explosion Proof)
  - Ruggedness and high temperature capability
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