Emerson Reliability and Performance Monitoring

PHM 2018 – Philadelphia

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Emerson – Fisher Valves

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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

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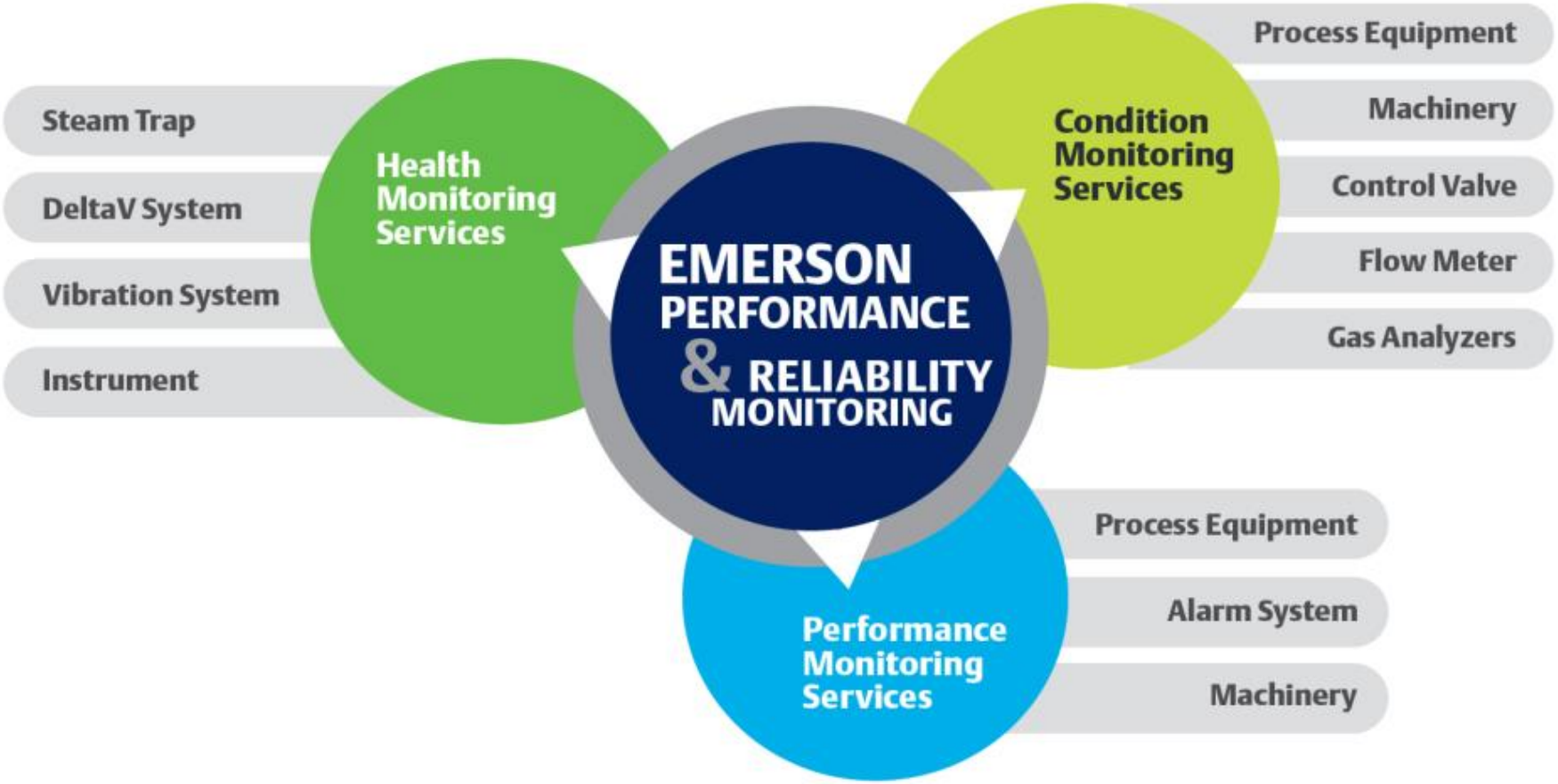
Emerson Performance & Reliability Monitoring



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Today's Digital Valve – Measured Variables

The Parameters That Power ValveLink Diagnostics

DVC Temperature

Diagnostic Information Inferred From These Sensors:

Assembly Friction	Trending
Seat Load	Step Response
Spring Rate	Actuator Sizing
Supply Air Consumption	Alerts
Electronics Health	Many others…..

Also: Drive Signal and other electronic parameters

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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**?**

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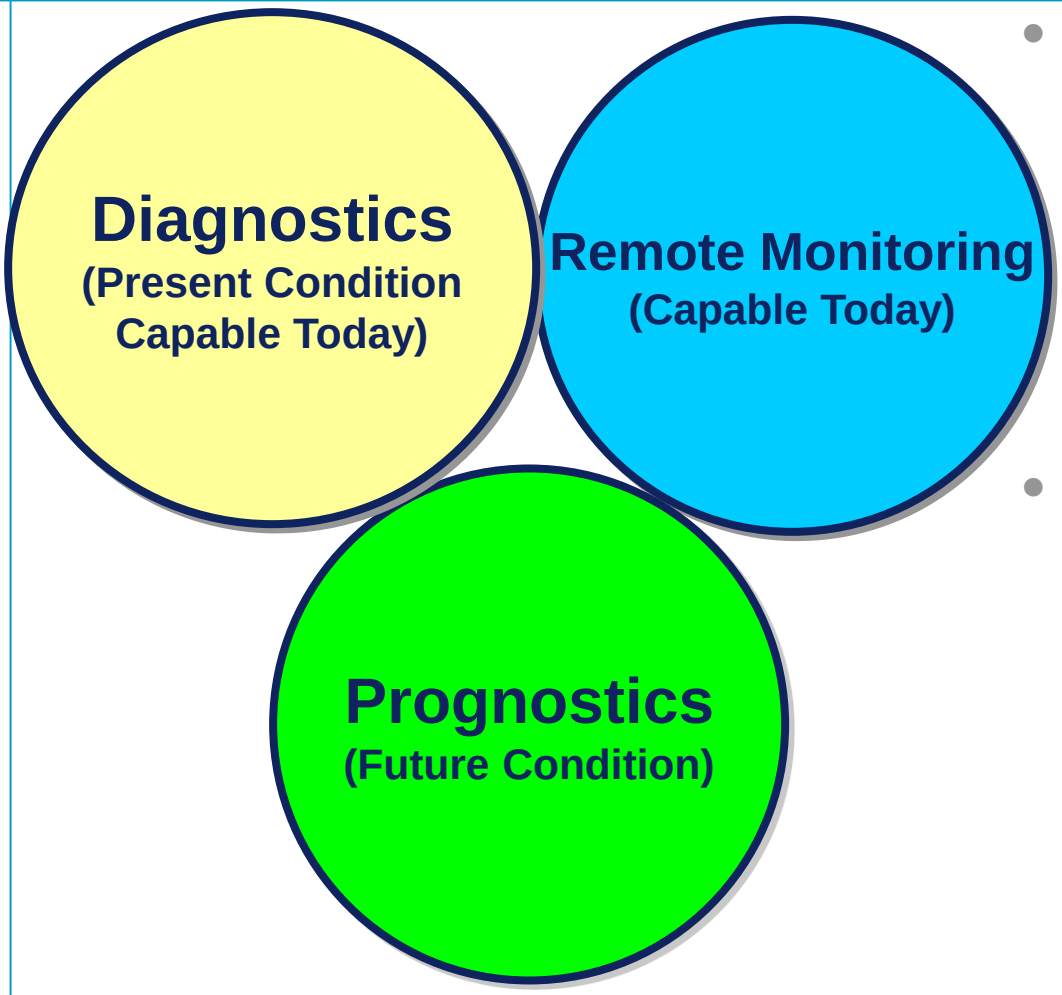
Prognostics Expands On Today's Capabilities



- 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

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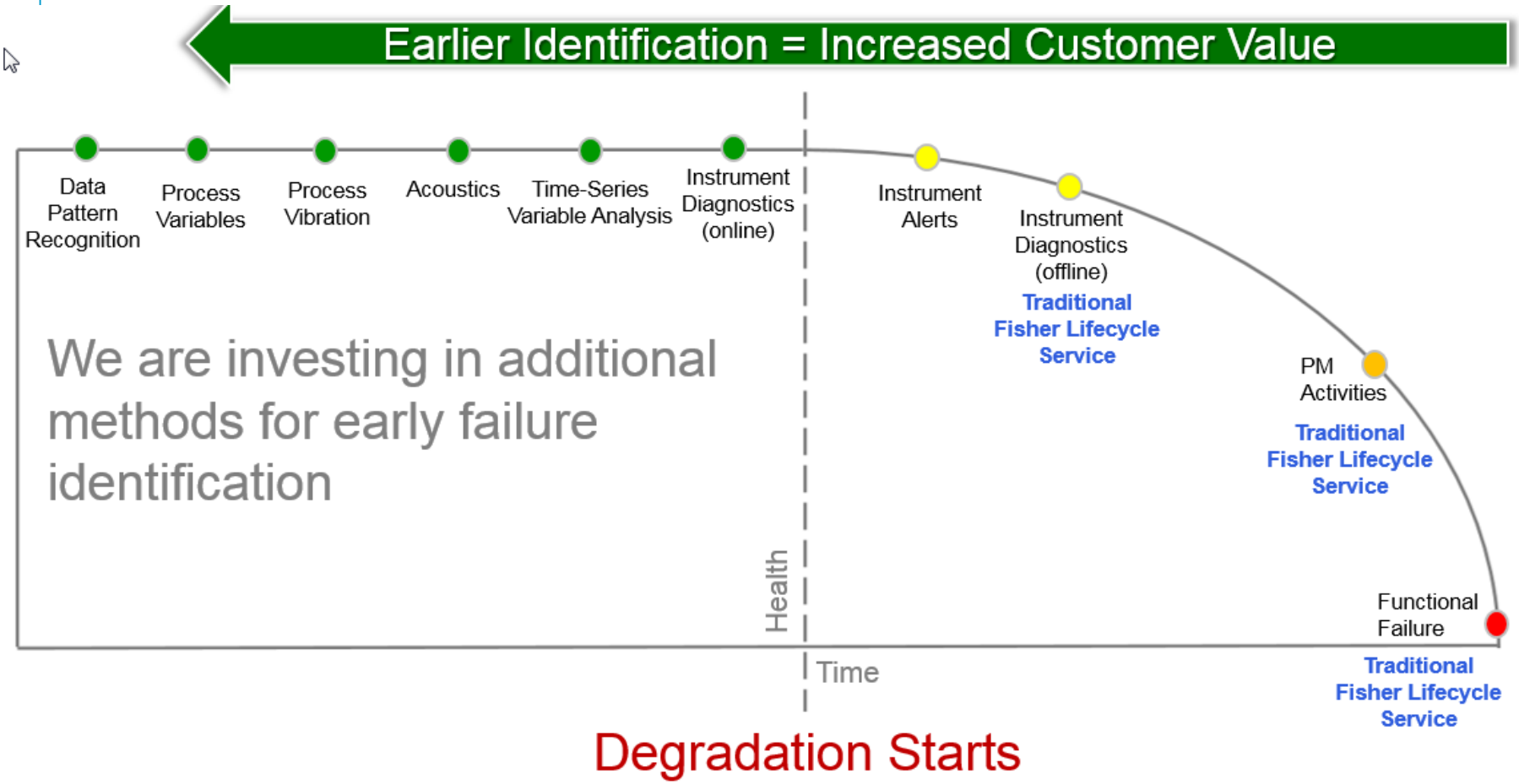
Prognostics and Valve Condition Monitoring



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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

Force / Torque
(stress / strain)

Pressure Boundary Integrity

Thru-Valve Leakage

Process Related / Cavitation

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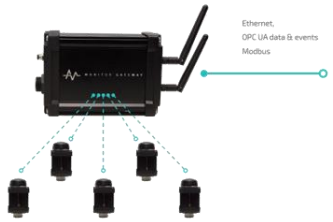
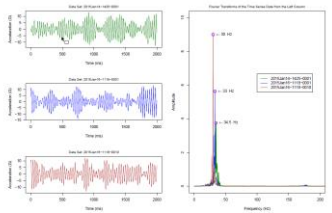
Delivering Future Value

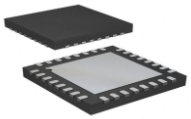
- Acquiring and evaluating new measurands requires new sensors
- Exploring techniques for expanded health monitoring is multi-faceted
  - Leverage and manage the convergence of new technologies
- Accelerating Time-to-Market
  - Force multiplier using contractors vs developing everything in-house
- Capturing domain knowledge
  - SME informed health indicators
  - End goal automated CBM



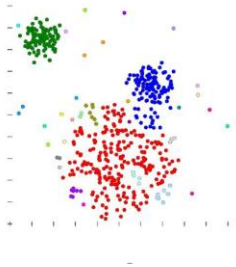
Expand Sensor Deployment



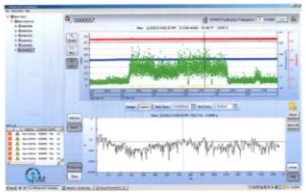
Collect More Field Data



Embed Next Generation Sensor Technologies



Improved Data Analytics – Machine Health Indicators



Prognostics Dashboard

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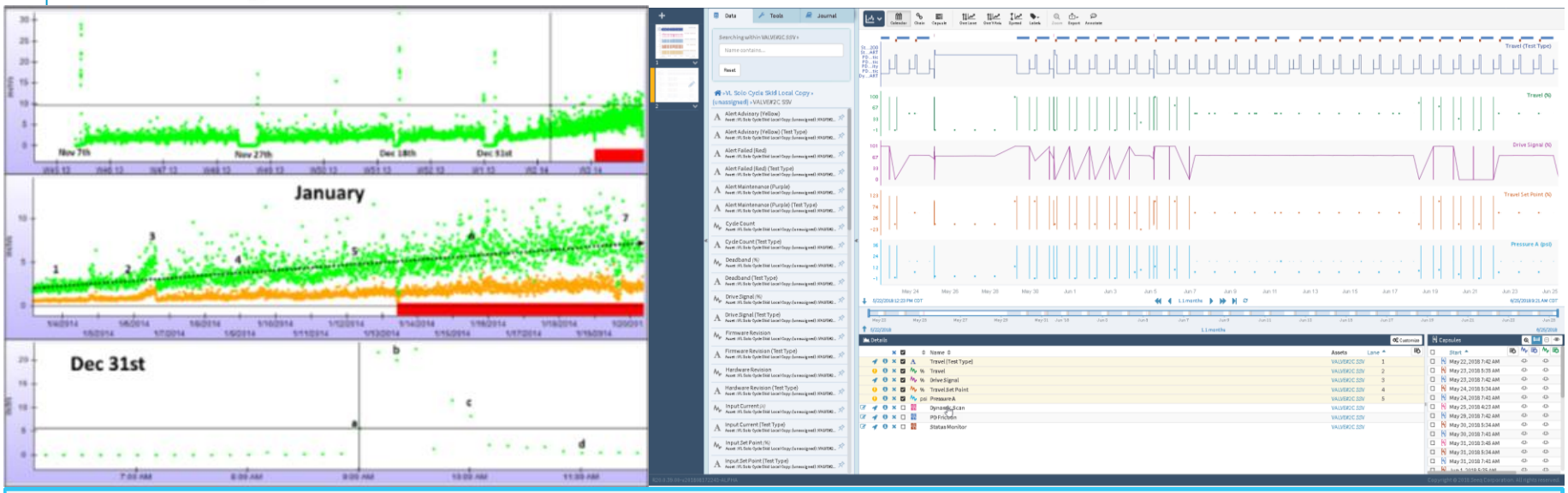
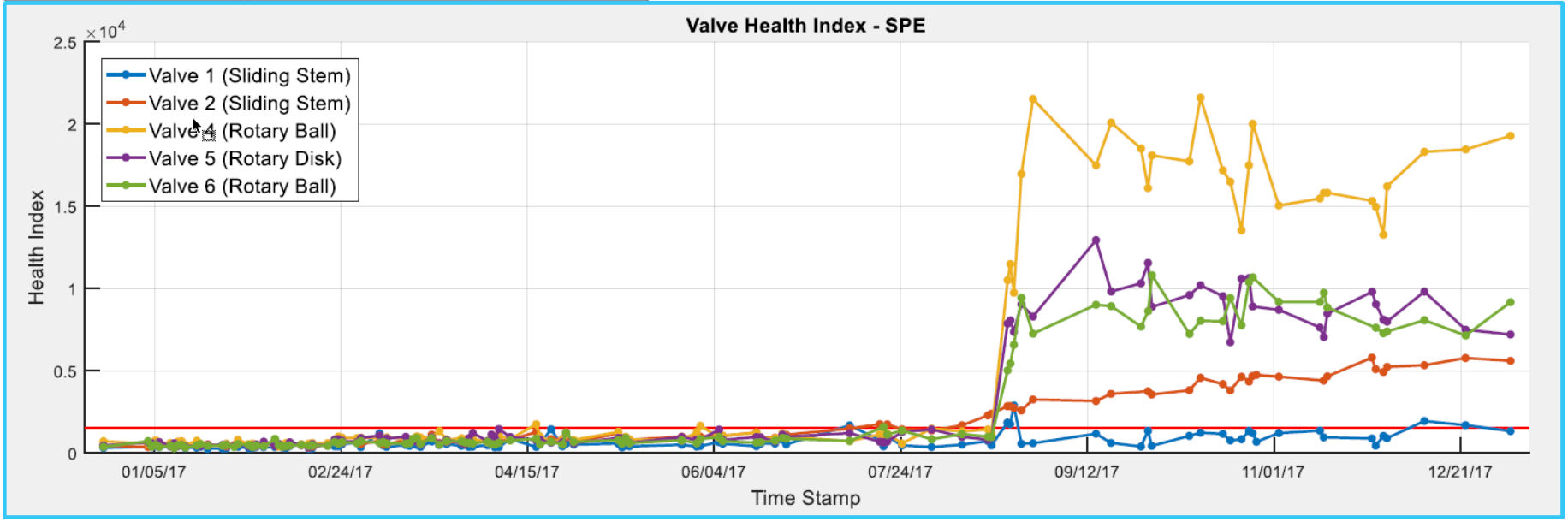
New Tools and Health Indicator Analytics





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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