Remote Pump Monitoring

Hydraulic Institute Annual Meeting
March 17, 2017
Jeremy Frank, KCF Technologies
Julian Atchia, SJE Rhombus
Jack Creamer, Schneider Electric
Henri Azibert, Fluid Sealing Association, Chesterton
What is Important?

90% of Pump Lifecycle Costs are not the Pump!
What Can Be Monitored?

- Temperature
- Suction Pressure
- Discharge Pressure
- Cavitation
- Flow Rate
- Alignment
- Imbalance
- Motor Health
  - Temp.
  - Vibration
- Motor Drive
  - Current
  - Voltage
  - Transients
  - Health

Almost Everything!
What is the Value?

- Monitoring Comes at a Cost
- Value = Benefit - Cost
- Benefits
  - Increased Uptime
  - Extended Pump Life
  - Reduced Maintenance Cost
  - Improved Safety
  - Reduced Energy Consumption
- Costs
  - Sensor, Hardware and Data Acquisition System
  - Installation Cost
  - Cost to Host & Integrate Data
  - Personnel Cost to Interpret Data & Take Action
What will it Not Do For You?

- Fix Your Pump
- Optimize Your Pump System
- Produce Your Product

- Unless you know what to do with the information!
- HI Standards Can Help…
  - HI/ANSI 9.6.5 – Guideline for Condition Monitoring
  - HI/ANSI 9.6.4 – Vibration Measurement and Allowable Values
How to monitor pumps
How to Monitor Pumps?

1. Personnel
   1. Walkaround
   2. Augmented with technology
How to Monitor Pumps?

2. Existing Infrastructure
   1. Controls & systems (existing wires)
   2. Sensor infrastructure (4-20 mA loops)
How to Monitor Pumps?

3. New Infrastructure
   1. Wireless Sensing
   2. Cellular Telemetry
How is data shared
How is data shared?

Direct access via a Human/Machine Interface (HMI) in real time. Use SCADA software or embedded web server.
How is data shared?

Cloud based server. Data is accessed only when needed.
Case Study 1
Sewage lift station
Overview

Typical system
• Wet well
• Two pumps
• Level monitoring
• Control panel
• Cellular RTU
RTU added in the Control Panel

RTU (Remote Terminal Unit)
- Unique address
- Cellular
- Radio
- Wired network
- I/O on board or via communication
Overview of all stations

Valuable tool for Utility Companies for managing Multiple pumping stations

- GPS location
- Station name
- Signal strength
- Alarm status
- Last communication
Station Status Display

- Pump Run
- Pump Fault
- Level + alarms
- Pump Amps
- In Flow GPM
- Pump GPM
- Run Time/day
- Cycles/day
- Power loss

### ALARMS

<table>
<thead>
<tr>
<th>Parameter</th>
<th>Value</th>
<th>Unit</th>
</tr>
</thead>
<tbody>
<tr>
<td>P1 Fail</td>
<td></td>
<td></td>
</tr>
<tr>
<td>P2 Fail</td>
<td></td>
<td></td>
</tr>
<tr>
<td>High Float</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Low Float</td>
<td></td>
<td></td>
</tr>
<tr>
<td>POWER</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

### PUMP 1

<table>
<thead>
<tr>
<th>Parameter</th>
<th>Value</th>
<th>Unit</th>
</tr>
</thead>
<tbody>
<tr>
<td>P1 High Amps</td>
<td></td>
<td></td>
</tr>
<tr>
<td>P1 Dry Run Alarm</td>
<td></td>
<td></td>
</tr>
<tr>
<td>P1 Runtime Alarm</td>
<td></td>
<td></td>
</tr>
<tr>
<td>P1 Amps</td>
<td>44.9</td>
<td>A</td>
</tr>
<tr>
<td>P1 Cycles</td>
<td>36 /Day</td>
<td></td>
</tr>
<tr>
<td>P1 Runtime Minutes</td>
<td>240 /Day</td>
<td></td>
</tr>
</tbody>
</table>

### PUMP 2

<table>
<thead>
<tr>
<th>Parameter</th>
<th>Value</th>
<th>Unit</th>
</tr>
</thead>
<tbody>
<tr>
<td>P2 High Amp.</td>
<td></td>
<td></td>
</tr>
<tr>
<td>P2 Dry Run Alarm</td>
<td></td>
<td></td>
</tr>
<tr>
<td>P2 Runtime Alarm</td>
<td></td>
<td></td>
</tr>
<tr>
<td>P2 Amps</td>
<td>46.5</td>
<td>A</td>
</tr>
<tr>
<td>P2 Cycles</td>
<td>37 /Day</td>
<td></td>
</tr>
<tr>
<td>P2 Runtime Minutes</td>
<td>223 /Day</td>
<td></td>
</tr>
</tbody>
</table>

### Parameters Table

<table>
<thead>
<tr>
<th>Parameter</th>
<th>Value</th>
<th>Unit</th>
</tr>
</thead>
<tbody>
<tr>
<td>Pump HP</td>
<td>60.0</td>
<td>HP</td>
</tr>
<tr>
<td>Pump Voltage</td>
<td>480</td>
<td>V</td>
</tr>
<tr>
<td>Pump FLA</td>
<td>75.0</td>
<td>A</td>
</tr>
</tbody>
</table>

[Image of pump status display]
Alarm Notification

- Select who will be notified
- SMS and E-mail
- Mobile App push notification
- Ack. Requirements
- Cascading Notification
Data Logging and Analysis

- Trending
- Selectable range
- Export to .csv
- Analytics
- Failure prevention

Sensor Data
Click and drag in the plot area to zoom in

In-Flow GPM
- In-Flow GPM
- P1 GPM
- P2 GPM
- Level
- P1 Runtime Minutes
- P2 GPM
- P2 GPM
- P1 Cycles
- P1 Amps
- P2 Cycles
- P2 Amps
- P2 Runtime Minutes
Alarm Notification Report

- Delivery log
- Acknowledgement log
- Time and Date stamped
- Reduce liability
Case Study 2
Irrigation pump
Irrigation Pump Station
Irrigation Pump Station

- Remote start/stop
- Pump run status
- Pump Fault status
- Pressure monitoring
- Pump GPM
- Power loss
ROI

- Alarm notification to service personnel
- Station data and location available prior to service call
- Detect system deterioration via trends
- Detect water infiltration (wastewater)
- Overlay weather data
  - Rain fall
  - Temperature
  - Tide
- Asset management
- Cloud based data
- Deployed to mobile device
- Notification records – liability reduction
- Remote start/stop pumps
Evolution
Emerging technologies

Long range, low power wireless platform. Low cost technology designed for high volume products.
Emerging technologies

Mobile Application
• Activation
• GPS
• Push notification
• Documentation
Emerging technologies

IIoT (industrial Internet of Things)
The trend is to build intelligence and connectivity into our machines.
Industrial Internet of Things - ARC Advisory Group

Industrial Internet of Things

**IIoT for Industrial Operations**
- Predictive Maintenance
- Downtime Avoidance

**IIoT for Products and Services**
- Smart, Connected Products
- Aftermarket Services
Q & A