Protecting Your Pumps, Production, and People
Pump Health Monitoring
Looking to Keep Pumps from Threatening Production?

Industry averages suggest that roughly 5% of production capacity is lost each year due to unplanned downtime. Perhaps more than any other cause, equipment failures are the most common culprit...often exceeding 40% of unplanned outages.

For critical equipment and machinery, you monitor them with expensive OEM monitoring solutions. Take pumps, for example: A typical approach is to dynamically monitor the most critical and expensive pumps. That might mean only 20-30% are monitored real-time. The remainder of your pumps are “monitored” through clipboard walk-arounds and periodic handheld measurement and monitoring devices. This results in pumps running blind most of the time, increasing your risk of pump failures, leaks, fires or other dangerous situations.

What would that mean to your bottom line and your operational risks if you could adapt existing pumps and other essential assets with a low-cost, scalable and easy-to-integrate dynamic monitoring solution?

Common Threats to Pump Health

**RESTRICTION**
A restriction of the pump’s suction can result in cavitation of the pump. Root causes can include a plugged suction strainer, loss of level in the suction drum or a possible valve issue.

**CAVITATION**
As liquid pressure falls below its vapor pressure, bubbles form and implode on impellers and interior surfaces, damaging pump internals, disrupting flow and leading to seal failure.

**LEAKAGE**
Leaks caused by mechanical failures can be catastrophic. Early detection of abnormal conditions such as cavitation, pressure imbalance or excess vibration can help avoid leaks and their consequences.

**LEVEL**
Inadequate monitoring of Auxiliary Seal Flush levels can result in missed low level conditions, indicating a loss of flush or high level conditions, indicating mechanical seal leakage and eventual flaring.

**VIBRATION**
Several detectable root causes for vibration can damage seals or internals and cause pump failure.

**TEMPERATURE RISK**
Blocked-in discharge can result in fluid stagnation, causing a spike in temperature. This can also result in cavitation, damaging pump internals and seal failure. Inadequate monitoring of standby ump temperature can result in damage when a cold pump is put into hot service.

**INSTALLATION**
Improper installation can lead to shaft misalignment, excessive vibration leading to pump damage and failure.
Looking to Keep Pumps from Threatening Production?

What if you had a cost effective, easy to apply solution for monitoring these pumps 24/7?

Being able to detect changes in process variables and equipment condition are the keys to avoiding pump damage, environmental incidents and negative business impact. But not all pumps traditionally met the cost threshold for investing in these kinds of monitoring systems.

Now, thanks to Emerson’s Smart Wireless technologies and integrated approach to equipment protection, the engineering requirement and cost of applying predictive technologies is no longer an obstacle. Without wires, trenching or complex engineering diagrams, having the protection you need is now affordable for nearly all of your pumps.

Scalable and flexible, Emerson’s integrated approach to Pump Health Monitoring lets you monitor the conditions you are most concerned about and retrofit existing equipment with ease. For example, if you have pumps which have experienced cavitation previously, your Pump Health Monitoring kit from Emerson might include Differential Pressure and Vibration detection sensors, letting you identify conditions with time to correct. You could expand your kit to include leak detection or level measurement to gain visibility of seal failures.

Increasing your profit

Industry experts suggest that pump failure and shutdowns are responsible for 0.18% of production capacity. Care to get that back?

INPUT

<table>
<thead>
<tr>
<th>Description</th>
<th>Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Refinery capacity in barrels per day</td>
<td>250,000</td>
</tr>
<tr>
<td>Refinery net margin per barrel refined</td>
<td>$5</td>
</tr>
<tr>
<td>Refinery total annual maintenance spend, excluding turnarounds</td>
<td>$50,000,000</td>
</tr>
<tr>
<td>Refinery annual maintenance attributable to process pumps</td>
<td>7%</td>
</tr>
<tr>
<td>Anticipated reduction in process pump maintenance cost with diagnostics</td>
<td>30%</td>
</tr>
<tr>
<td>Anticipated reduction in lost production with process pump monitoring</td>
<td>30%</td>
</tr>
</tbody>
</table>

OPERATIONAL BENEFITS

<table>
<thead>
<tr>
<th>Description</th>
<th>Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>a. Refinery capacity in barrels per day</td>
<td>250,000</td>
</tr>
<tr>
<td>b. Net margin per barrel</td>
<td>$5</td>
</tr>
<tr>
<td>c. Production capacity lost due to process pump failures</td>
<td>0.18%</td>
</tr>
<tr>
<td>d. Reduction of lost production with process pump monitoring</td>
<td>30%</td>
</tr>
<tr>
<td>e. Operating time in days per year</td>
<td>365</td>
</tr>
<tr>
<td>Annual Net Profit Improvement</td>
<td>$246,375</td>
</tr>
</tbody>
</table>

MAINTENANCE BENEFITS

<table>
<thead>
<tr>
<th>Description</th>
<th>Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>f. Annual maintenance budget</td>
<td>$15,000</td>
</tr>
<tr>
<td>g. Number of essential pumps not currently monitored</td>
<td>80</td>
</tr>
<tr>
<td>h. Reduction in average cost to repair if pumps weren’t run to failure</td>
<td>30%</td>
</tr>
<tr>
<td>Annual Maintenance Cost Reduction</td>
<td>$360,000</td>
</tr>
</tbody>
</table>

TOTAL ANNUAL PROFIT IMPROVEMENT | $606,375 |

Value calculation notes

1. Cost avoidance of doing preventative maintenance when no problem is found
   - Calculation assumes straight-time work versus overtime
   - Cost avoidance of more severe damage versus just beginning to fail
   - Cost avoidance of operation-induced damage due to cavitation, etc.

2. 0.18 percent production capacity loss is based on essential pumps
   - Percentage of production capacity lost, assuming refinery can sell recovered capacity

3. In this example, there are 233 total pumps, 80 of which are considered essential
# Emerson Pump Health Monitoring Products

## SOFTWARE INTERFACE

**AMS SUITE: ASSET GRAPHICS FOR OPERATIONS**
Alerts operators of abnormal operation or imminent failure in an integrated, real-time environment using a pre-engineered algorithm. Graphically displays equipment and key process parameters for easy detection of issues.

## FIELD CONTROLLERS

**SMART WIRELESS GATEWAY**
Connects IEC 62591 (WirelessHART®) self-organizing networks with host systems and data applications.

## DEVICES

**CSI WIRELESS VIBRATION TRANSMITTER**
Measures overall vibration levels as well as stress waves and bearing temperature to detect the earliest signs of bearing and gear wear. When paired with AMS Suite, delivers root cause analysis and corrective action guidance.

**ROSEMOUNT WIRELESS PRESSURE TRANSMITTER**
Detects fluctuations in discharge pressure to prevent cavitation and impeller damage. Provides early warning of suction strainer plugging, which can lead to cavitation, impeller damage and seal failure. Detects increased seal flush reservoir pressure, indicating possible inboard seal failure, fluid vaporization, and flaring.

**ROSEMOUNT WIRELESS VIBRATING FORK LEVEL SWITCH**
Provides detection of low fluid levels, indicating possible seal failure and conditions that require normal fluid service.

**ROSEMOUNT WIRELESS DISCRETE TRANSMITTER with TraceTek option**
Discrete sensors for hydrocarbon leak detection, providing warning of hazardous leaks before they become catastrophic.

**AMS SUITE FOR MAINTENANCE**
Allows Maintenance to diagnose equipment problems using predictive diagnostics. Early warning enables planned maintenance practices and reduces downtime.

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