Oprex™ Asset Management and Integrity

Plant Asset Management
Cavitation Detection System
A critical aspect in Plant Asset Management

A typical process plant consists of numerous assets such as piping, pumps and valves. All such assets need maintenance, but the timing of maintenance is not always clear. Often, periodic maintenance is scheduled much too frequently. This could be costly if it requires the process to shut down. If operators are fully aware of the health status of all assets, they can accurately determine when maintenance is required rather than performing periodic maintenance inappropriately or, even worse, expensive repair work after a failure.

Healthy assets contribute to the plant’s operation, safety and availability. Yokogawa offers a broad variety of measurement instruments, which include self diagnostic functions and algorithms that provide health and operational status information. This information could prevent unnecessary maintenance activity, improve uptime and contribute to a safer operation. But some conditions occur in a plant asset where no measurement device is installed or where traditional measuring principles cannot be applied.

How can cavitation detection contribute to your plant’s profitability?

Process industries use large, highly complex pumps. Failure of such process critical pumps could result in downtime costs that exceed $200,000/day. Therefore, customers closely monitor these pumps and are strongly considering implementation of predictive maintenance solutions.

Since cavitation can damage a pump and result in a performance risk, customers are seeking a reliable solution that allows them to predict and prevent it. Cavitation sensor data analysis leads to informed decision-making and strengthens operational process management in real-time. This intelligent innovative approach to eliminate cavitation will result in very high ROI for process users.

Cavitation Detection System

How the Yokogawa system can accurately detect cavitation much earlier by directly measuring the weak pressure fluctuation as a bubble collapses within the transmitter.

Conventional cavitation detection methodologies deploy sound sensors or vibration sensors to monitor for abnormalities. By the time they report a problem, cavitation could be well underway. However, the Yokogawa system can accurately detect cavitation much earlier by directly measuring the weak pressure fluctuation as a bubble collapses within the transmitter.

Yokogawa's unique and patented technology enables customers to monitor process conditions in a pump to predict the onset of cavitation even before the first air bubble forms. This early detection of a possible cavitation allows plant operators to take appropriate action and prevent any damage to the pump.

Yokogawa’s cavitation detection

Conventional system detects at this stage

Cavitation visualization

- Visualization of data such as:
  - Accumulated cavitation time
  - Cavitation judgement result
- Easy setup menus for startup and maintenance

Cavitation occurs inside pump

- Uses valuable data made available by the differential pressure transmitter.
- Device data is collected via FF high-speed digital communication (100 ms).
- Controller delivers the results of cavitation detection from real time calculation logic.

Cavitation coverage

No cavitation

Cavitation at early stage

Super cavitation

No bubbles

Bubbles form and dissipate on intervals of several seconds.

Large number of bubbles with abnormal sound and vibration

Yokogawa’s cavitation detection

Conventional cavitation detection

Detectable cavitation level (overview)

<table>
<thead>
<tr>
<th>Liquid type</th>
<th>Viscosity</th>
</tr>
</thead>
<tbody>
<tr>
<td>Ethylene</td>
<td>0.01 mPa·s</td>
</tr>
<tr>
<td>Water</td>
<td>1 mPa·s</td>
</tr>
<tr>
<td>Kerosene</td>
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<tr>
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</tr>
</tbody>
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Components of cavitation detection system

Question

Can I avoid a cumbersome installation that requires piping modifications and difficult commissioning?

Answer

Yes. Yokogawa provides an easy setup mechanism that allows automatic configuration of numerous FOUNDATION™ Fieldbus (FF) equipment settings. This system incorporates unique sensing logic suing a high-precision differential pressure transmitter (DPHarp EJX) and a controller (STARDOM) that is capable of real-time operation on a 100 ms cycle.

Applicable pump: Centrifugal pump

Applicable fluid: liquid (recommended viscosity range: 0.78 to 5.00 mPa·s)

Recommended fluid temperature range: 2 to 50 Celsius degree

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