Monitoring vibration to detect an equipment's unusual behavior

This application note explains:
✓ Examples of using the XS770A for equipment maintenance
✓ Equipment diagnosis with vibration monitoring

Sushi Sensor

Yokogawa’s ideal equipment maintenance

To ensure the safety and quality of production, it is important to maintain production equipment appropriately.

Mounted on many instruments, Sushi Sensor uses industrial IoT technology to monitor their status. Sushi Sensor can help perform the following tasks for condition-based maintenance (CBM):

- Identifying the status of the entire equipment in plant and visualizing its soundness
- Monitoring the trends and precisely identifying signs of abnormality
- Accumulating digital data of instruments and optimizing equipment maintenance plans

CBM enables customers to optimize equipment inspection (reducing inspectors’ workload and improving safety) and reduce the total cost. Yokogawa helps customers achieve CBM and minimize equipment maintenance costs.
Early detection of abnormality enables maintenance to be performed before any actual failure occurs, preventing unexpected shutdowns that would result in losses.
**Q&A**

<table>
<thead>
<tr>
<th>Question</th>
<th>Answer</th>
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<tbody>
<tr>
<td>Why do you measure vibration?</td>
<td>Vibration is a good parameter to identify the deterioration of motors, pumps, and other equipment.</td>
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<td>What is revealed by vibration measurement?</td>
<td>Vibration increases as an instrument deteriorates. Quantifying its magnitude helps identify the degree of deterioration.</td>
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<td>What can we use the measurement results for?</td>
<td>Maintenance can be performed before any actual failure occurs.</td>
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<td>What criteria are used to estimate the need for maintenance?</td>
<td>For example, ISO10816-1:1995 is useful as guideline (Figure 1). Note that there is no absolute standard that applies to all cases because the size of target equipment and the stiffness of mounting bases differ.</td>
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<td>In practice, how should we estimate the need for maintenance?</td>
<td>Measure the same place of an instrument continuously and see how much vibration deviates from normal. This method is called relative evaluation (Figure 2), and the XS770A is ideally equipped to implement this method.</td>
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<td>Is there any other estimation method?</td>
<td>Compare the vibration of multiple instruments of the same specifications. This method is called mutual evaluation (Figure 3), and can be used when the XS770A is mounted on each instrument.</td>
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**What is the difference between simple diagnosis and detailed diagnosis?**

When an unusual behavior is detected by simple diagnosis, a detailed diagnosis is performed to identify its cause. It is essential to obtain sufficient evidence to judge whether maintenance is required and when it should be done. Therefore, detailed diagnosis involves elaborate signal processing such as FFT analysis.

**Doesn't the XS770A need the FFT analysis function for simple diagnosis?**

For simple diagnosis, monitoring the long-term trend of vibration is more effective for detecting an unusual behavior than FFT analysis.

**What can we use velocity and acceleration data for?**

Velocity data are used for detecting signs of axis imbalance or misalignment. Acceleration data are used for detecting signs of damage in ball bearings. A single XS770A can measure velocity and acceleration simultaneously.

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