Preventive Maintenance [Rotating Machine]

Wireless Diagnostic System for Rotating Machine Vibration

Service System of Fuji Electric Group

- Fuji constructs the maintenance network system by service office of the whole country.
- Fuji has the system that specialist immediately visits to customer site when abnormality situation occurred at established facilities.

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Explosion-proof WISEROT

The explosion-proof structure has a flameproof construction with Ex db ll B+H2 T4 Gb degree of protection, and is applicable within the scope of Class 1 and Class 2 hazardous locations.

The body is cast aluminum, and polycarbonate is used for the top cover to facilitate wireless communication.

- Explosion-proof certifications
  1. IEC 60079-0/1/1
  2. EN 60079-0/1/1
  3. JNIOSH-TR-46-1, 2. 6: 2015

- Explosion-proof structures
  Wireless sensor: Ex db [a Ga] llB+H2 T4 Gb
  Transceiver: Ex db llB+H2 T4 Gb

Explosion-proof WISEROT

For Safety, Relief and Easy to see.
Contribute to Planning of Preventive Maintenance
by early detection of the unusual movement with trend monitoring
after measuring the vibration of rotating machine operated
as production line or critical equipment.

Early detection of abnormality
- Rotating system (mechanical) abnormality: It can detect by the trend monitoring of the low frequency vibration.
- Rolling bearing abnormality: It can detect by the trend monitoring of the high frequency vibration.

Reduction and safety correspondence of maintenance work.
- The sensor that is wireless vibration type can easily establish to existing facilities.
- The worker can measure without approaching to the dangerous place by automation measurement.

Remove the vibration noise by inverter carrier
- The original bearing vibration of rotating machine can measure by clearing the carrier vibration that occur by inverter operation.

Features of Fuji’s System

Point 1
- Measuring by remote system
  - Can easily install on existing equipment because the wireless sensor have on board battery
  - Can measure even the place that wiring work is difficult

Point 2
- Simultaneously perform trend monitoring and diagnosis
  - FFT analysis of mechanical vibration possible
  - FFT analysis of bearing vibration possible
  - Filter treatment of inverter noise etc is possible
  - Can confirm the variation of vibration quality by FFT analysis

Fuji Wireless Diagnostic System
for Rotating Machine Vibration

1. Wiserot is not a system for continuous measurement and constant monitoring.
2. The work that is petrol measurement with handy-type instrument by maintenance staff is changed to automation system by Wiserot.
3. And, it can perform quick diagnosis using frequency analysis function.
Constitution and Function of "Wiserot"

System Constitution

Vibration Diagnosis Flow for Rotating Machine

Diagnosis analysis software (Main PC)

Wireless vibration sensor

Acceleration sensor (Drive side)

Acceleration sensor (Non-drive side)

Battery

Fast Fourier transform (FFT)

High frequency vibration analysis
  • The absolute determination method
  • The relative determination method

Low frequency vibration (Vertical direction)
  • The absolute determination method
  • The relative determination method

Diagnosis Target

(1) Vibration measurement

Data collection/Diagnosis

(1) Basic measurement screen
  • Show the rotating machine list by facility unit
  • Start command, data collection and diagnosis of rotating machine diagnoses

(2) Event history screen
  • Show the vibration measurement situation list in accordance with search condition: period, facility etc.

Diagnosis trend management

(1) Trend management for diagnosis data
  • Time series indication of diagnosis data
  • Velocity RMS, displacement, N element displacement
  • N element displacement element

(2) Diagnosis trend management in diagnosis data
  • Also used indication of the diagnosis situation of specified the date and time
  • Good, caution, and danger

Use frequency spectrum analysis

(1) Frequency spectrum
  • Show the analysis result: Velocity RMS, displacement
  • Spectral analysis of low frequency of Vibration

(2) Measurement spectrum
  • Graph indication of acceleration spectrum, Velocity spectrum, and displacement spectrum of low frequency vibration

High frequency spectrum analysis

(1) High frequency spectrum analysis
  • Common mode graph indication of acceleration spectrum, Velocity spectrum, and displacement spectrum of high frequency vibration

Judgment and basic value registration

(1) Judgment value registration
  • Available the setup registration of low frequency vibration: Judgment standard and high frequency vibration: Judgment standard

Vibration measurement results output

(1) Vibration measurement result
  • Print the vibration measurement result of specified contents from diagnosis trend screen

Automation diagnosis schedule

(1) Diagnosis schedule
  • Set the diagnosis term of each rotating machine at automation diagnosis

※ This system is not for continuous measurement and monitoring ※ This system is not an accuracy diagnosis tool

Specification

Wireless specification

1. Specific low power wireless of 433 MHz band
2. Communication distance is approx. 30 m (may vary depending on the installation environment)
3. Measurement specification
  • Low frequency: 1 to 250 Hz, but measurement scope is over 1 μm
  • High frequency: 1 k to 10 kHz

■ Operating temperature
  • Main part: 0 to 60 degreeC, sensor part: 0 to 100 degreeC

■ Dust proof/Water proof conform to IP53

■ Communication distance
  • Ethernet: approx. 100 m
  • Wireless communication: approx. 30 m

■ Power supply
  • Main part: battery pack (special battery pack is available as cloud based services.)

■ Operating environment
  • Use environment: indoor, outdoor

■ Measuring cycle
  • Setup the diagnosis term of each rotating machine at automation diagnosis

■ Data collection/Diagnosis
  • Available the setup registration of low frequency vibration judgment standard or high frequency vibration judgment standard

■ Vibration measurement results output
  • Print the vibration measurement result of specified contents from diagnosis trend screen

■ Automation diagnosis schedule
  • Set the diagnosis term of each rotating machine at automation diagnosis

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Football General Rules

- Over the years, the rules of football have evolved, becoming more complex.
- They aim to ensure fair play and balance between offensive and defensive strategies.
- The key elements include:
  - The role of referees in enforcing the rules.
  - The importance of fair play and sportsmanship in the game.
- The sport continues to adapt, with advancements in technology impacting rule interpretations.

For more information, refer to the official FIFA website or consult the latest rulebook.
Diagnosis of original mechanical vibration of rotating machine, which operate with inverter, is to be difficult because the carrier vibration noise of inverter add to mechanical vibration of rotating machine. Analysis of original mechanical vibration of rotating machine is to be possible by cutting the carrier vibration noise.(patented)

**Example of the removal of vibration noise by inverter carrier (Fuji electric original function)**

<table>
<thead>
<tr>
<th>Function</th>
<th>Cost</th>
</tr>
</thead>
<tbody>
<tr>
<td>Portable diagnosis</td>
<td></td>
</tr>
<tr>
<td>Handy type vibrometer</td>
<td></td>
</tr>
</tbody>
</table>

Before remove the carrier noise:
- Q value (estimation value of bearing diagnosis) > 44
- Acceleration effective value (RMS) ≈ 2.8G

After remove the carrier noise:
- Q value (estimation value of bearing diagnosis) < 8
- Acceleration effective value (RMS) ≈ 0.9G
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Wireless sensor Transceiver

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Explosion-proof structures
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Fuji Electric Call Center

Remote Maintenance
Request for Correspondence
Transmission of Response Details
Support 24 hours and 365 days by specialized staff
Response Indication
Diagnosis · Inspection
In the case of JAPAN
Service office of the whole country

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