Wilcoxon Research

Vibration monitoring of pumps

Monitor pump health to minimize damage, reduce downtime, and increase productivity

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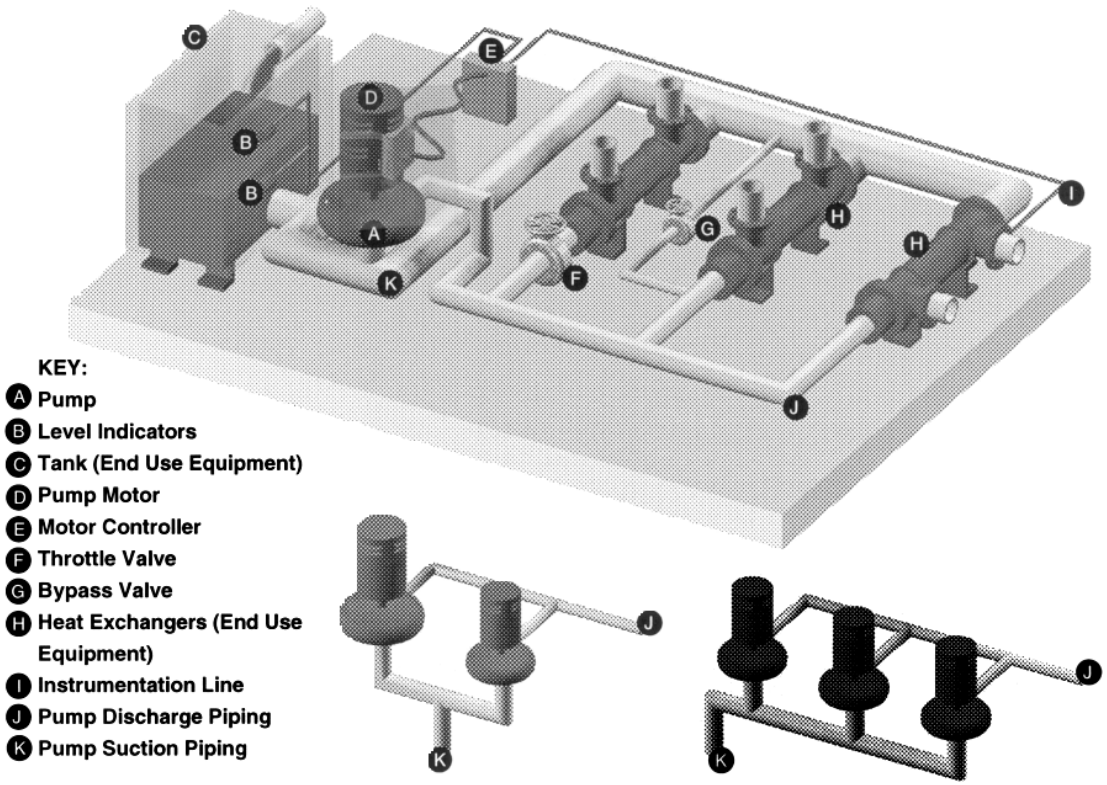
Contents

Typical pumping system and its components



Greatly improve productivity

- Early detection of failure modes
  - Impeller erosion
  - Seal leaks
  - Pump imbalance
  - Shaft looseness
  - Coupling problems
  - Cavitation
- Integral part of an effective preventative maintenance program
- Can be tied into your existing monitoring and control system

Four common reasons pumps fail

These four most common causes of pump failure can be detected using vibration monitoring

Insufficient lubrication – 36%

- Bearings deprived of proper lubrication will cause pumps to fail long before the normal service life

Fatigue – 34%

- Overloaded, unbalanced, or misaligned pumps cause unintended bearing loads

Improper installation – 16%

- Improper installation techniques can lead to failures from load imbalance, misalignment, or bearings cocked on the shaft

Contamination – 14%

- Failure can result from improper seal application resulting in debris or liquid contamination of the bearing or impeller cavity

Source: Associated Products Inc.

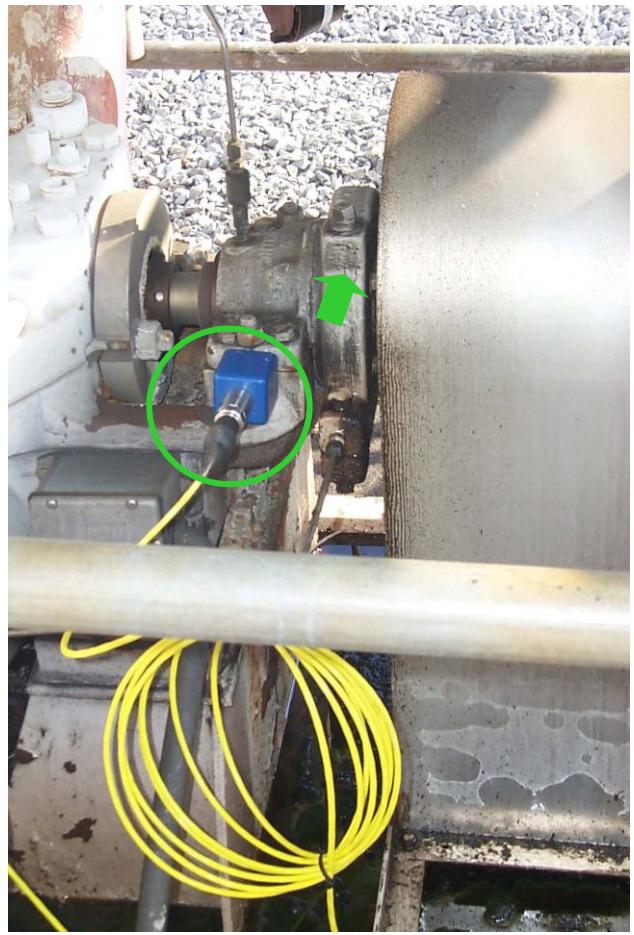
Monitoring specifics

The multitude of pump varieties can make monitoring techniques unclear. Here is a quick guide to cut through some of the complexity.

Centrifugal pumps – horizontally mounted

On horizontally mounted centrifugal pumps:

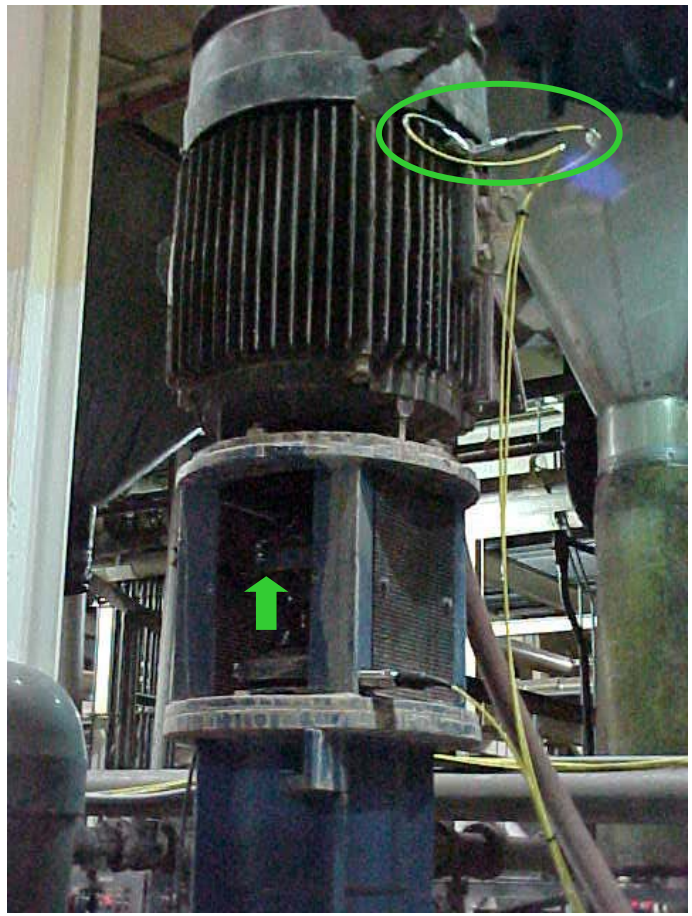
- Accelerometers are mounted perpendicular to the shaft rotation on the pump bearing housing, as close to one bearing as possible
- An axial measurement can be made near the pump casing
- Wherever possible, the accelerometers should be mounted in the horizontal direction, not vertically mounted



Centrifugal pumps – vertically mounted

On vertical mounted centrifugal pumps:

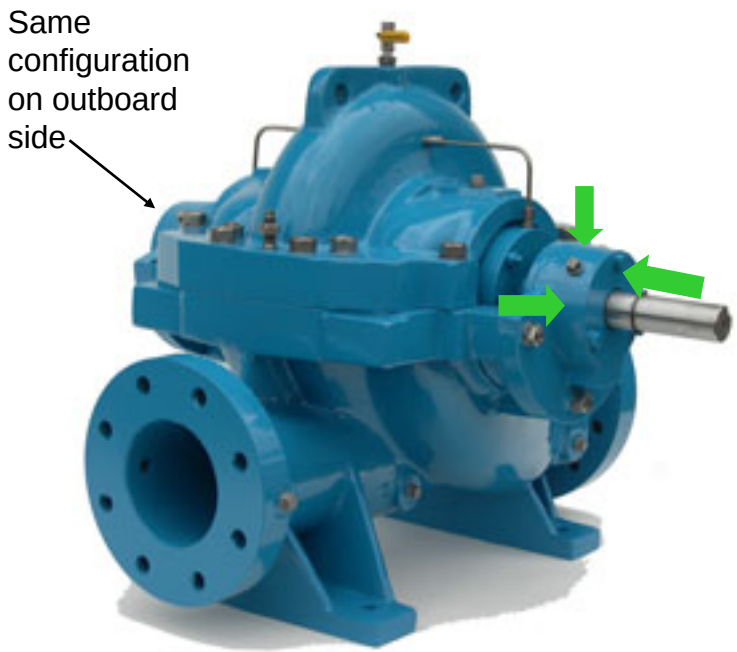
- Two accelerometers should be mounted near the bearing housing, 90 degrees from one another, perpendicular to the shaft rotation
- An axial measurement in the vertical direction can be made near the pump casing



Between bearing pumps

On between bearing pumps:

- Accelerometers should be mounted perpendicular to the shaft, in the horizontal and vertical direction, on both the inboard and outboard side



Vertical turbine pumps

On vertical turbine pumps, also called bowl pumps:

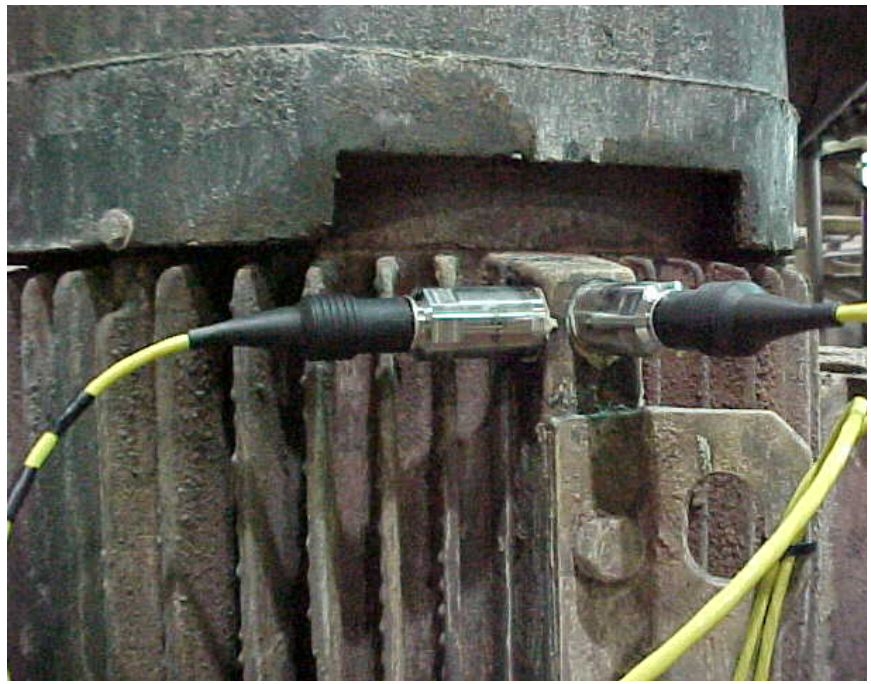
- Accelerometers should be mounted on or near the stuffing box in the horizontal direction, coincident with the suction or discharge piping; a second measurement should be made at 90 degrees to that
- Special precaution should be taken to ensure that the electrical connection is protected against water spray
- In extreme cases it is sometimes necessary to make vibration measurements on the pump bowl; additional influences that must be considered include:
  - Galvanic corrosion
  - Turbulence
  - Protection against the ingress of moisture into the connection
- If you are involved in such a project, contact a Wilcoxon applications engineer for assistance

Monitoring techniques

Sensor output options for critical assets and balance-of-plant equipment

Dynamic vibration monitoring

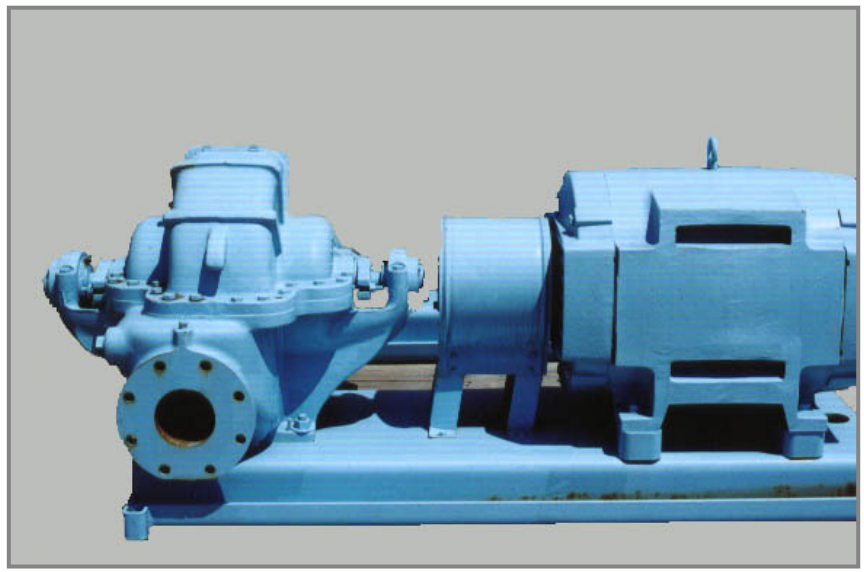
- Detailed vibration data can be used to detect and diagnose potential problems as early as 18 months before a breakdown
- Continuous monitoring or walk-around data collection



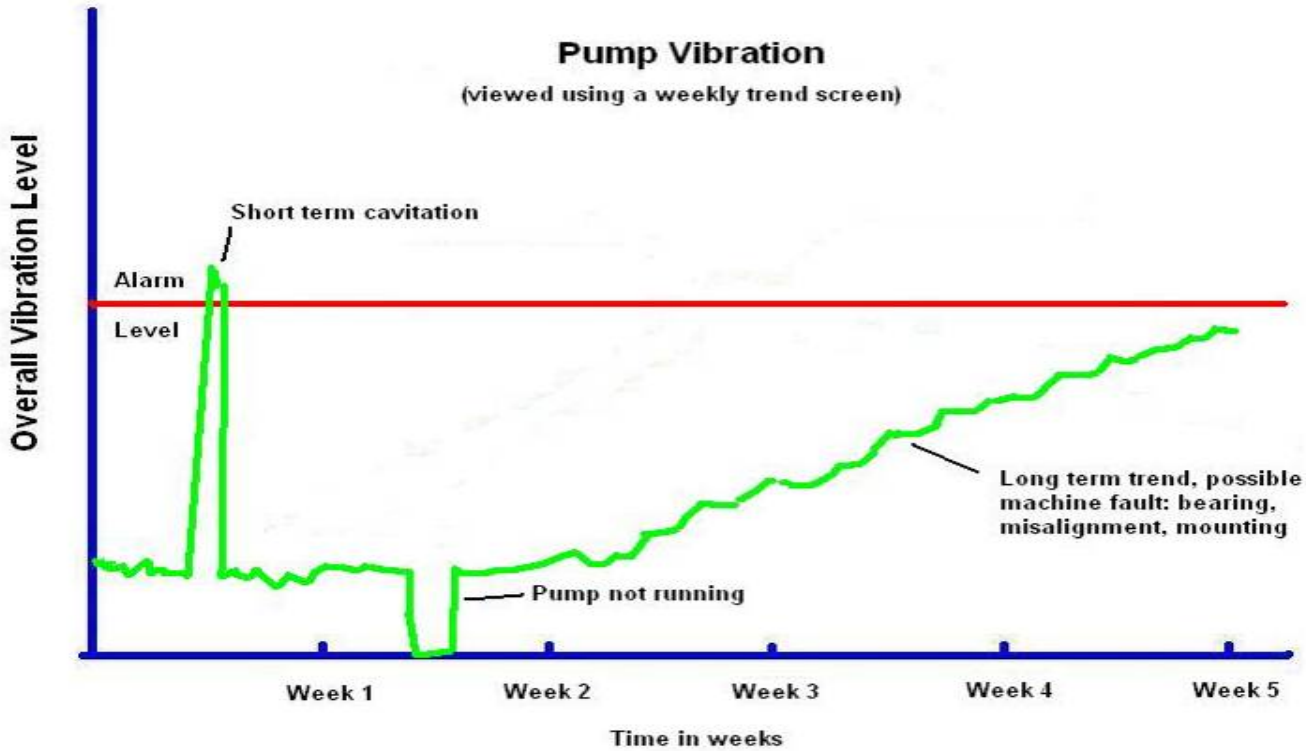
4-20 mA vibration monitoring

Many facilities want to monitor pump vibration, but do not want an expensive vibration program. 4-20 mA sensors output overall vibration levels so that maintenance professionals can take action on pumps that indicate abnormal or increasing vibration.

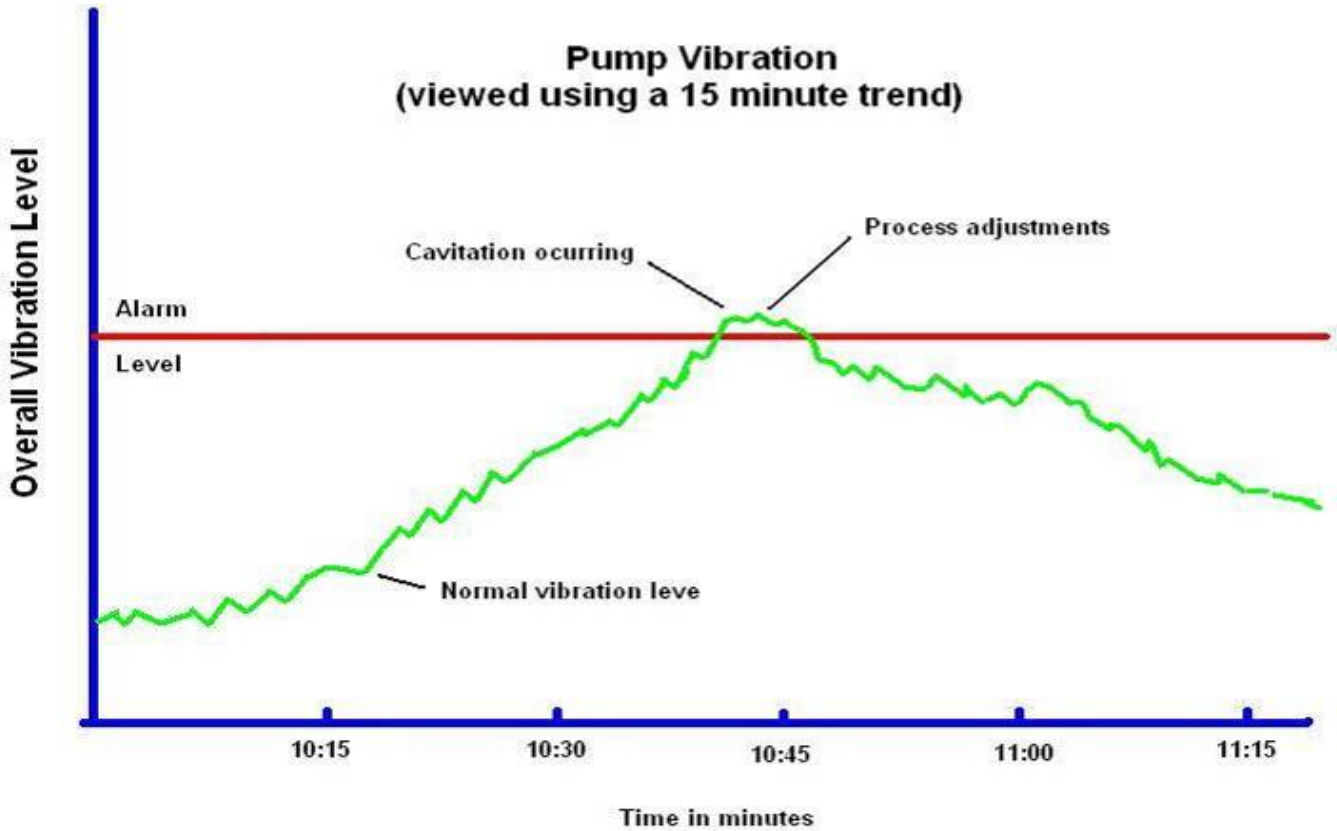
- Output signals fed to a process control computer (PLC/DCS/SCADA) or directly to an alarm module
- No trained analysts needed
- ISO 10816 offers guidance on vibration limits



Short term and long term trends can be detected with 4-20 mA monitoring

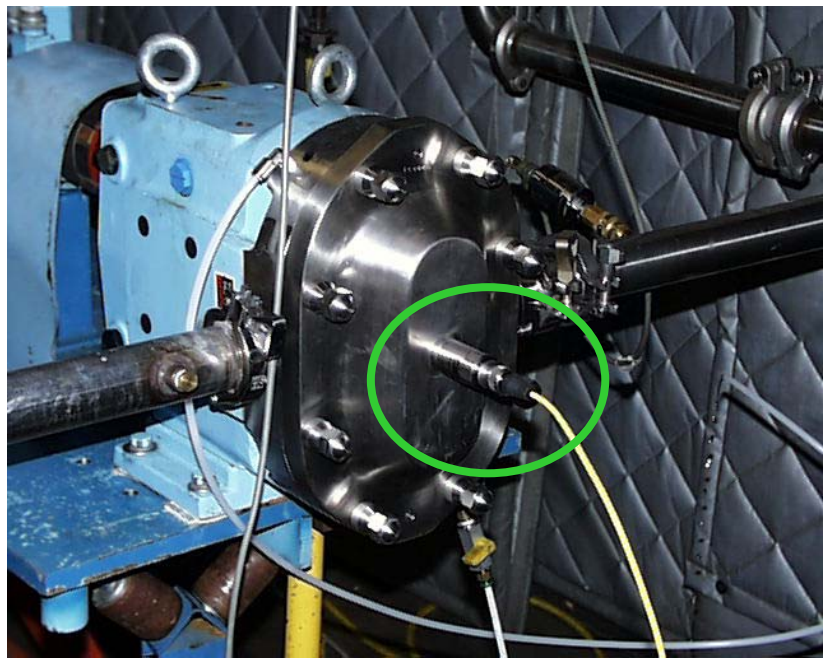


Short term detection



Detect cavitation with frequency-banded sensors

- Cavitation is a destructive condition that can destroy the inside of a pump before you even realize it is occurring
- Early detection of pump cavitation can eliminate or reduce equipment damage
- The high frequencies at which cavitation can be detected are outside the normal range of pump operating frequencies so Wilcoxon developed a sensor tuned to these higher frequencies



Wilcoxon's products

- Accelerometers
- 4-20mA vibration sensors
- Transmitters, alarms and communication
- Intrinsically Safe (IS) sensors
- Cables
- Junction boxes

Dual output accelerometer - 786T

- A single sensor monitors both temperature and vibration at the pump bearing
- Full dynamic spectrum
- Hermetic seal and stainless steel construction for use in the harshest environments
- Intrinsically Safe (IS) version available

Underwater accelerometers – 757 and 746

- Perfect for lower bowl bearing vibration readings
- Usable on submerged pumps at depths up to 1500 feet (457 meters)
- 757 corrosion resistant case and armor braid cable ensures longevity
- 757 biaxial sensor measures vibration in two directions
- 746 titanium case is excellent for corrosive environments such as sea water

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Integral cable accelerometer – 786F

- Ideal for submerged (30 feet or 10 meters typical), high temperature, or corrosive environments
- Integral cable eliminates possibility of contamination
- Use in awkward locations where connector failure is a concern
- Intrinsically Safe (IS) version available

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4-20 mA vibration sensors

- Monitor your pump on your existing PLC/DCS/SCADA network
- Standard frequencies measure between 4 Hz and 2000 Hz
- Optional banded frequencies measure between 3 Hz to 40 Hz or 300 Hz to 2000 Hz
- Focus on your equipment's fundamental running speed or monitor specific problems
- Intrinsically Safe (IS) version available

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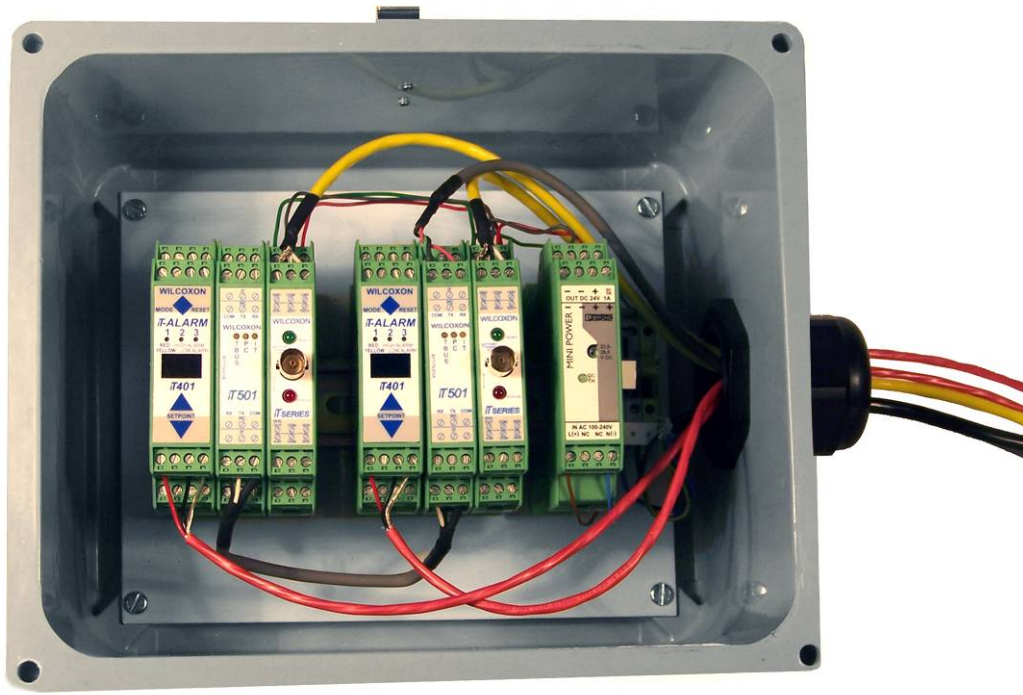
The Intelligent Transmitter (iT) Series

Complement a standard accelerometer's dynamic output with the iT Series of 4-20 mA transmitters, alarms, and communication modules

- The iT Transmitter converts dynamic vibration data to 4-20 mA data
- The iT Alarm notifies maintenance professionals when vibration levels get too high
- The iT Communication Module transmits vibration data to any PC



Sensor networks: cables, mounting accessories and hardware

Wilcoxon manufactures a full line of cables, mounting accessories, power supplies, junction boxes, switch boxes, and enclosures to provide you with a complete sensor network

Precisely what you need

Thank you

For more information, please contact Wilcoxon's customer sales and service team

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Confidentiality agreement

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