

You don't have to be a vibration expert, 2006

Wilcoxon Research

# You don't have to know vibration to benefit your process

Even if you aren't a vibration expert, you can monitor critical machinery vibration levels using sensors and transmitters that run on common 4-20 mA loops.

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MEGGITT

# Machinery health monitoring is critical to every plant's reliability program.

*Regardless of your process*

- ▶ Pharmaceutical
- ▶ Food and beverage
- ▶ Brewing
- ▶ Water and waste water
- ▶ Petrochemical
- ▶ Pulp and paper
- ▶ Power generation

**Wilcoxon has experience working with manufacturers in these businesses.**

# Machinery health monitoring is critical to every plant's reliability program.

*Regardless of your application*

- ▶ Pumps
- ▶ Motors
- ▶ Fans
- ▶ Cooling towers
- ▶ Compressors
- ▶ Gear boxes

**You need machinery health monitoring to evaluate machine condition and perform predictive maintenance.**

# Machine monitoring is a vital part of maintenance programs that reduce costs and downtime

Using preventative and predictive maintenance technologies to track machine health is a proven industry best practice. By monitoring machinery health, outages and downtime are reduced, and **you save money**.

Maintenance indicators can be examined through vibration analysis, oil analysis, infrared (thermal) monitoring, motor circuit evaluation, and ultrasonic monitoring.

Maintenance indicators are used to examine machines while they are running. Without interfering with a machine's normal operation, you can effectively estimate the machine health.

## Why choose vibration data?

Vibration monitoring has been one of the anchors of predictive technologies because it can detect several causes of machinery fault.

You can use vibration monitoring to detect:

- ▶ Shaft misalignment
- ▶ Rotor imbalance
- ▶ Gear failure, and
- ▶ Bearing faults.

Trending vibration data allows you to monitor machinery and detect these faults, even if you aren't a vibration expert.



## Benefits of vibration trending

Trended data is obtained during loop-powered monitoring and provides 4-20 mA output that indicates overall machine health with no analysis required.

- Provides converted output of raw vibration data into 4-20 mA data which can be integrated with your plant DCS/PLC.
- This pre-processing allows operators to focus on trends in the data.
- Trended data can give useful advanced warning (1 month to 3 months) of equipment failures.
- Simple alarm limits can be set.
- Spectral data is usually available as well, and can be accessed to diagnose problems.

## 4-20 mA data addresses your needs

**You already have the PLC / DCS network installed, you are already taking data points on pressure, temperature, or maybe flow. Now you can get vibration data as well.**

- Budgets continue to be squeezed.
- “Do more with less” is the mantra of today’s business environment.
- Minimize complex analysis - operators can focus on trends in the data, you don’t need a vibration expert.
- Variety of options
  - Loop Powered Sensors can output 4-20 mA data and also make dynamic vibration data available
  - Vibration transmitters can use your existing sensor infrastructure to trend raw vibration data
  - Sensors and transmitters interface with vibration alarms or your existing PLC or DCS for immediate notification of extreme vibrations



## What is needed to start a new vibration trending program?

- Wilcoxon Loop Powered Sensors (LPS®) are available in configurations for virtually every use. Our dedicated team will help you determine which sensors are best for your application.
- Mount sensors to machines at the bearings.
- Use simple shielded, twisted pair cable – similar to wiring for other 4-20 mA devices – to wire sensors to a PLC or DCS analog input.
- The LPS® output is based on overall vibration, you don't have to be a vibration expert to interpret the data.





# Where do the sensors mount?

## 4-20 mA Loop Powered Sensors for vibration trending mount at the bearing location

- Horizontal mounting is preferred for pedestal supports.
- Axial mounting may be used at the thrust bearing location.
- Wilcoxon application guides offer detailed mounting information.

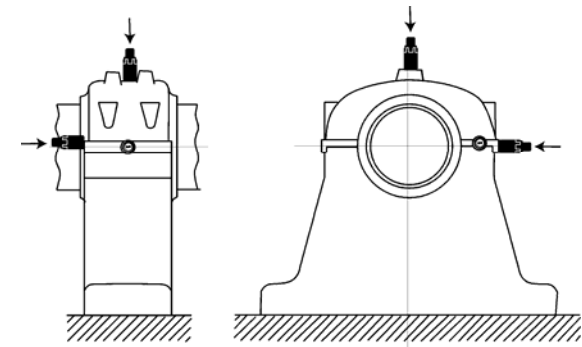
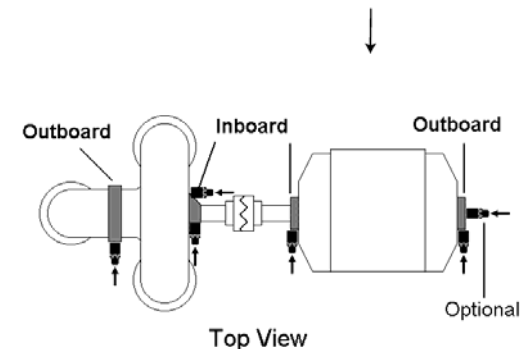


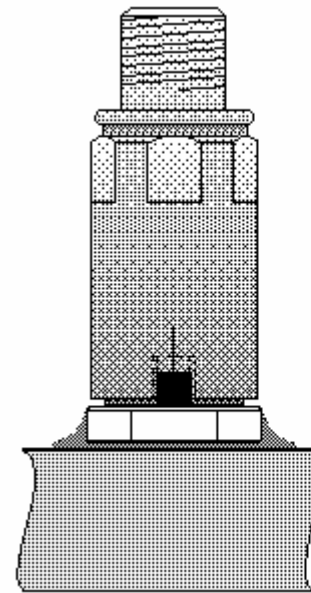
Figure 1 - Measuring points for pedestal bearings



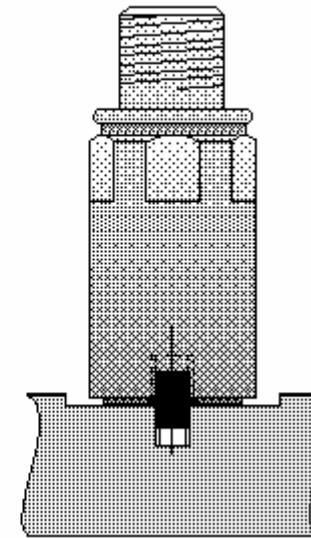
# How do the sensors mount?

**LPS® Sensors require a permanent mount on the machine to generate consistent measurements and provide data for trending.**

- Cementing pad on machine surface, or
- Drill and tap on machine surface



SF 8 cementing pad

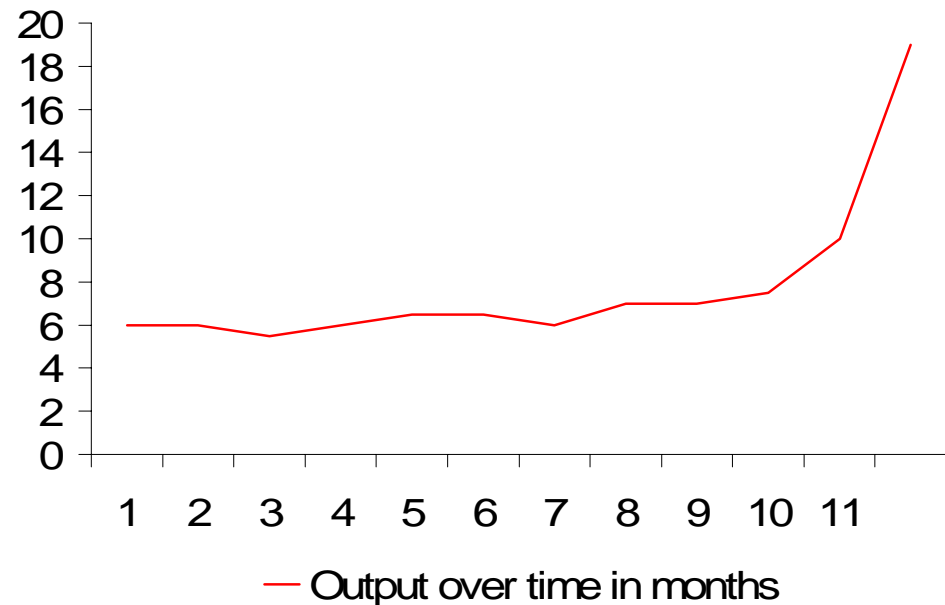


SF 6 stud

# Who analyzes the data?

## Sample trended data from a 4-20 mA LPS®

- ▀ Data “analysis” is not necessary.
- ▀ The trend of the vibration provides guidance for millwrights or mechanics.
- ▀ The vibration changes will indicate machines that require attention.
- ▀ Contact Wilcoxon to discuss your needs and application and to determine if detailed vibration analysis is necessary.



# When is maintenance required?

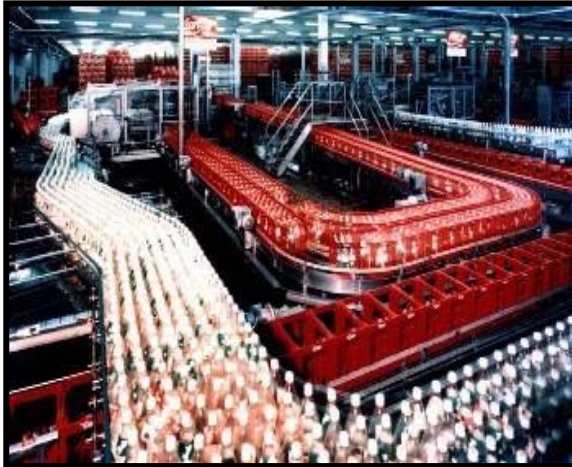
Since 4-20 mA data does not have to be analyzed by an expert, there are general guidelines on when maintenance should be performed.

- ▶ When vibration changes are gradual, maintaining a more frequent watch over the machine will usually suffice.
- ▶ Use a sensor such that the baseline is ~15% of full scale. An increase by 2.5x the baseline requires immediate action.
- ▶ ISO 10816, *Mechanical vibration -- Evaluation of machine vibration by measurements on non-rotating parts*, is a guideline that advises typically acceptable vibration levels.


Example of ISO 10816 vibration recommendations

Vibration Velocity in/sec. peak (mm/sec. r.m.s.)	Class I	Class II	Class III	Class IV
2.5 (45)				D
1.6 (28)			D	
1.0 (18)	D	D		
0.63 (11.2)				C
0.4 (7.1)			C	
0.25 (4.5)		C		B
0.16 (2.8)	C		B	
0.1 (1.8)		B		
0.063 (1.12)	B			A
0.04 (0.71)			A	
0.025 (0.45)	A	A		
0.016 (0.112)				

# Simplified Condition Monitoring



- Trended data can be used for critical assets when no vibration monitoring program exists, or for the balance of plant machinery that is not currently being monitored.
- The ability to trend data on motors, pumps, fans, and gearboxes allows you to maximize your resources.
- **It's not a new concept, just a practical, cost effective approach.**



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## What's the cost impact ?

Depending on your needs and specific application, your cost per monitoring point – including a 4-20mA LPS<sup>®</sup> sensor with a 64 foot cable and sensor connector – may be as low as \$363.

## Can LPS<sup>®</sup> sensors withstand the harsh plant environment?

- ▶ Wilcoxon's LPS<sup>®</sup> sensors are hermetically sealed and use cases machined from 316L stainless steel.
- ▶ The cables and connectors recommended for use with the LPS<sup>®</sup> sensors use materials with good chemical resistance.
- ▶ All LPS<sup>®</sup> sensors are rated for continuous use up to 85°C (185°F).
- ▶ All LPS<sup>®</sup> sensors are Helium Leak Tested to insure a true hermetic seal, providing you excellent MTBF.

## What about special applications?

- ▶ FM, CSA, SIMTARS, and ATEX certification are available.
- ▶ LPS® sensors are available with intrinsically safe and explosion proof ratings.
- ▶ Top exit, side exit, integral cable, stainless steel braid are just some of the many options available with the LPS® series.
- ▶ Dual-output of temperature and vibration data is offered.
- ▶ If you have a special application which requires special certification, let us know the details of your needs.






# Control your process with simple vibration monitoring



- ▶ Wilcoxon's TLC (Total Lower Cost of Ownership) offers you a way to monitor your process with vibration monitoring, even if you aren't a vibration expert.
- ▶ Wilcoxon has a global reputation for providing the best industrial sensors on the market.
- ▶ Some of our customers are the leaders in their markets – you know them by name.



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