

A large, blue industrial motor is the central focus of the image. It is mounted on a blue metal frame. The motor has a prominent cooling fan with horizontal slats. In the background, there are blue structural beams and white corrugated metal panels, suggesting an industrial or factory environment. The lighting is bright and even.

Vibration Analysis; A Must-Have for Your Motors

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Industrial manufacturers must ensure that their machinery consistently functions well in order to stay productive. Many companies do so using vibration analysis, a time-tested diagnostic tool that quickly and effectively identifies faulty components and problem areas in facility equipment.

Vibration analysis measures the vibration levels and vibration frequencies of industrial machines and the individual components that comprise them. Abnormal vibration magnitudes or frequencies may indicate that a piece of machinery is currently experiencing or will soon experience a mechanical problem such as:

Misalignment

Imbalance

Bearing damage or failure

Contaminated or insufficient lubrication

Looseness

Excessive or anomalous vibration can result in reduced machinery life spans, poor or inconsistent product quality, and in many cases, emergency shutdowns that cost time and money. Furthermore, workers [who experience machine vibrations](#) may suffer from back pain, carpal tunnel syndrome, and other physical symptoms if it goes unchecked. With these issues at stake, it's no wonder that manufacturers view vibration analysis as an essential part of preventative maintenance.

The goal of any well-thought-out vibration analysis program should be reduced incidences of maintenance. The plan must include root cause analysis of findings. Knowing a machine is misaligned is very different from knowing why it was misaligned and fixing the root cause. Knowing your motor bearing is about to fail and planning ahead to pull the motor out during a planned outage is great, but knowing why the motor failed is more important. Stop making maintenance a routine and start fixing your maintenance routines!

Causes of Vibration and Machine Damage

Several possible issues can cause irregular machine vibration and subsequent damage, including:

- **Improper Installation**

Improper installation is one of the most common causes of chronic machine vibration. It can occur both when installing brand-new equipment and when tuning up or transferring existing machinery. Factors including improperly fitted components, faulty power sources/electrical wiring, and machine misalignment or imbalance can all contribute to unwanted vibration frequencies and magnitudes.

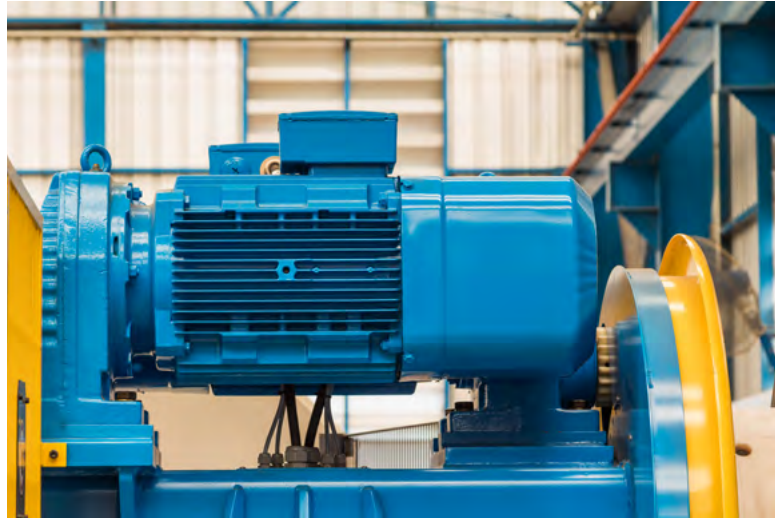
- **Insufficient Lubrication**

Lubrication is the lifeblood of industrial machinery. Insufficient lubrication will increase the friction between interconnected moving components, which may lead to increased wear and eventual failure. Contaminated lubrication that hinders optimal viscosity will inflict similar damage on machinery.



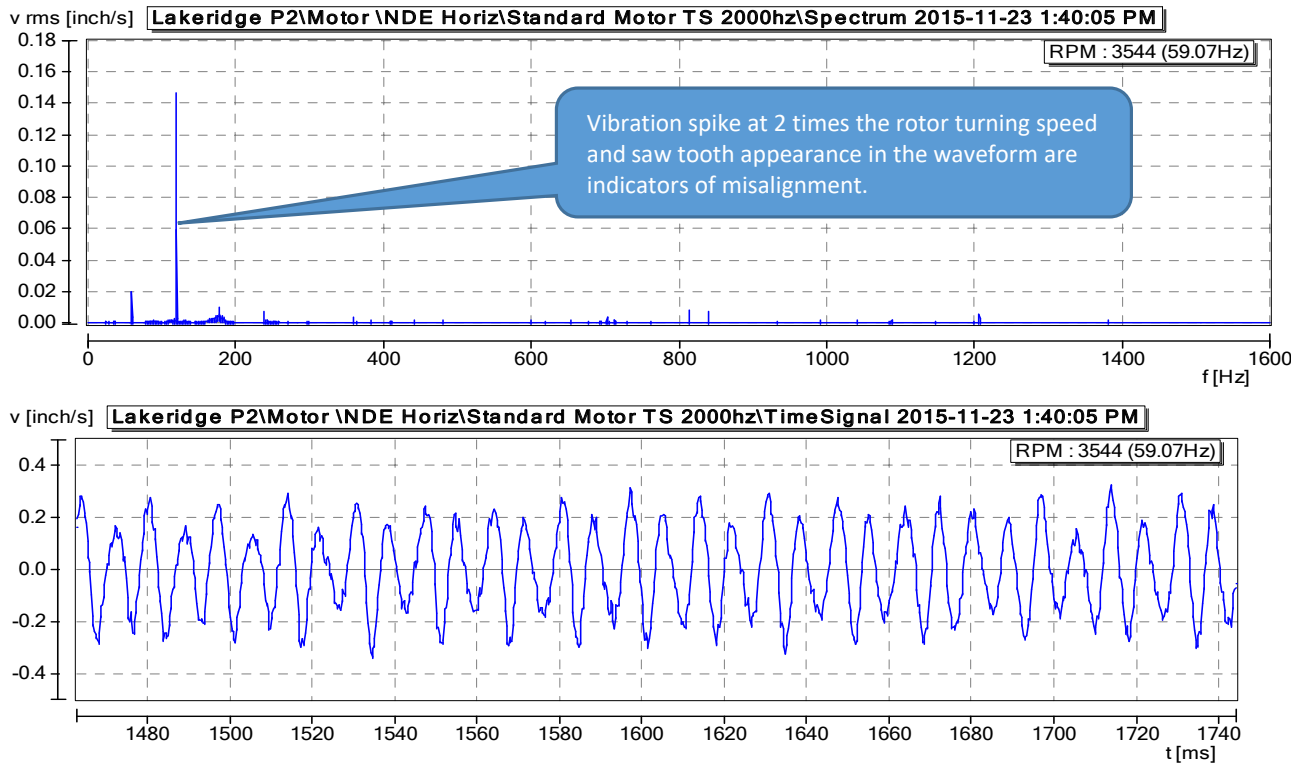
- **Misalignment**

Misalignment occurs when the driving and driven shafts of an industrial machine do not share the same centerline. Think of a straight-backed wooden chair with one leg shorter than the others: As you sit in the chair, it undergoes slight, unintended rocking motion that results from the unequal length and alignment. Similarly, an industrial machine's motor and shaft must be properly aligned, or parallel, or else excess or inaccurate movement will occur.



Misalignment can result from several issues, including incorrect motor mounts (also known as “soft foot”), continued friction in components that aren't balanced across their counterparts, and thermal expansion. While small angles of misalignment may not pose a serious threat to the machine's efficacy or longevity, large angular differences can cause severe damage if not promptly addressed.

Misalignment Spectrum and Waveform



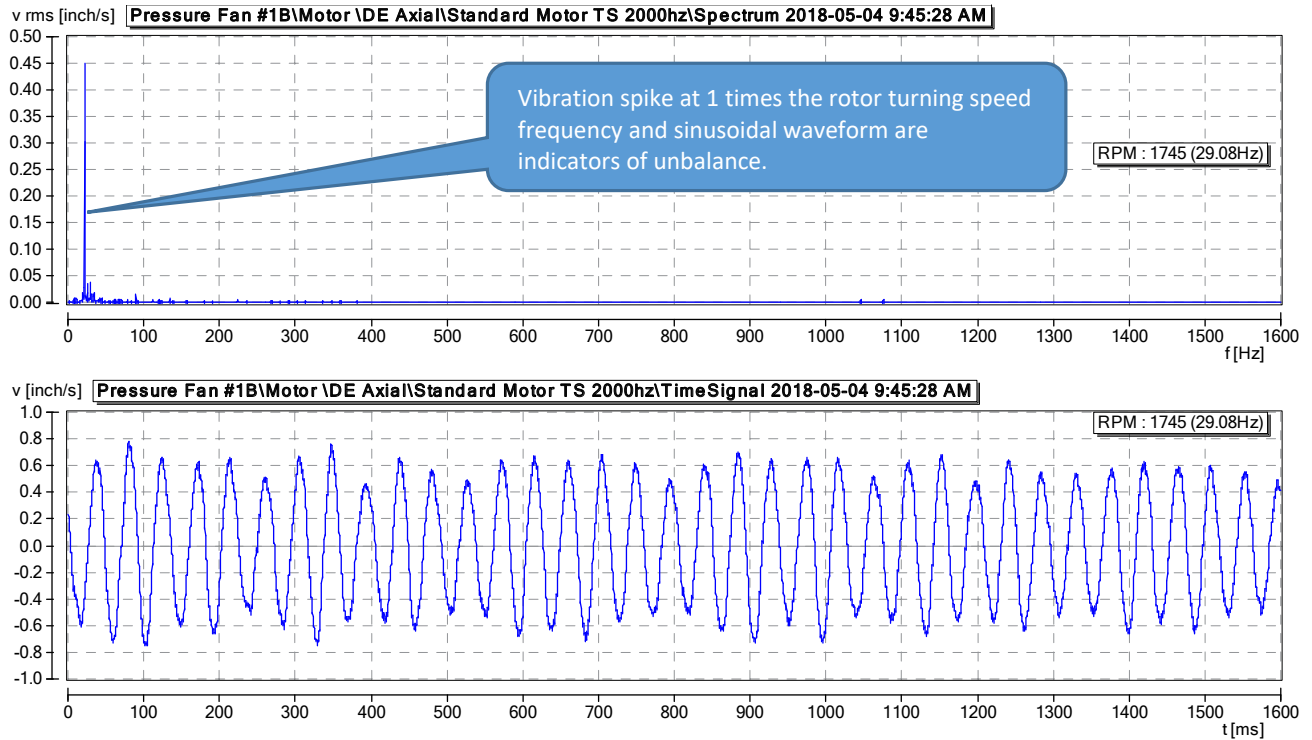
The spectrum above contains a spike at 2 times turning speed or 2 vibrations per revolution indicative of a Misalignment between the motor and the load.

- **Imbalance**

For industrial machines that rotate, it's imperative that the shaft (or axis) balances equally. Just as a bent or distorted axis on a car can result in rough rides and physical damage, the centrifugal force from an industrial machine's imbalanced axis will cause excessive and damaging vibrations.

Causes of machinery imbalance can include manufacturing defects or maintenance issues such as dirty or worn components and missing balance weights.

Unbalance Spectrum and Waveform



The spectrum above contains a spike at 1 times turning speed or 1 vibration per revolution of the motor indicating an Unbalance condition on the rotor/coupling/load.

- **Wear**

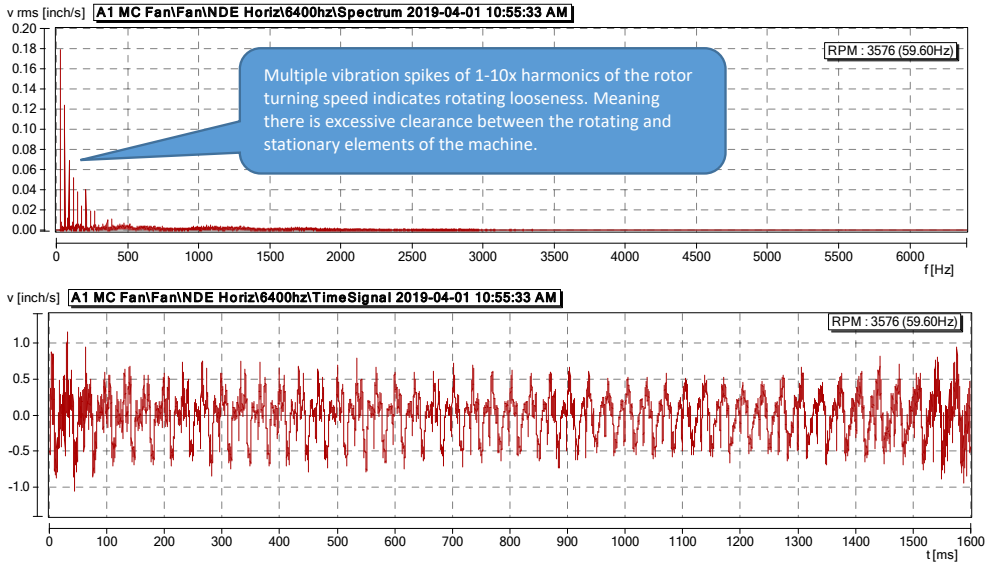
Industrial machinery components wear down through repeated use over time. This can cause chips and gaps to form between bearings, gears, and shafts. When that occurs, consistent misses or "jerks" from the movement of the interlocked components will cause machine vibrations. Even though these gaps may start out relatively small, they may cause vibrations that increase in severity as the machine wears down.



● **Loose Connections**

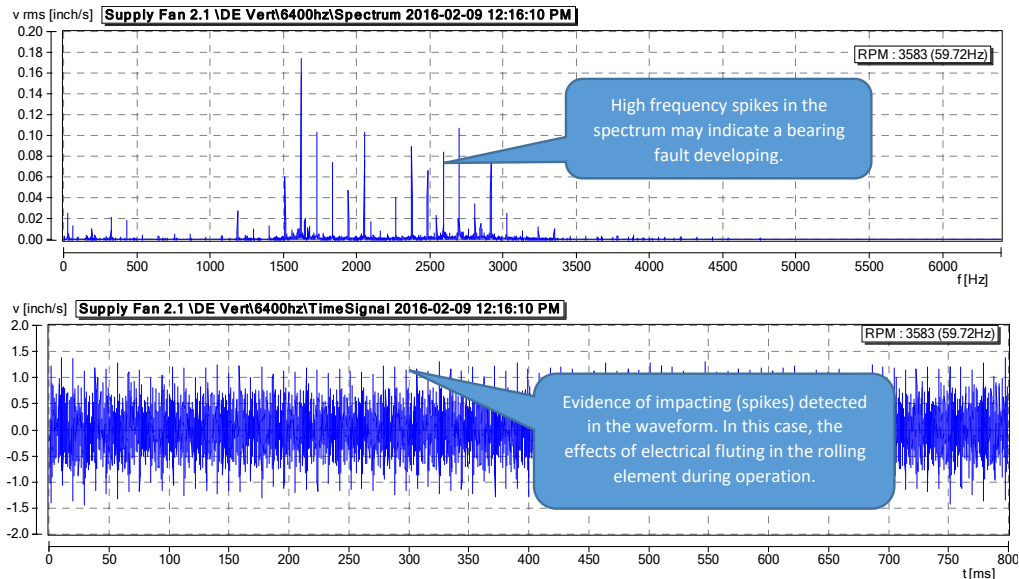
Machines can also develop loose connections between components as they wear down over time. For instance, bearings may gradually loosen from gears, leading to increased vibration as the loose bearings continue to absorb stress from normal machine operations. Loose connections could quickly lead to highly damaging outcomes—in some cases, loose mounts can cause machinery to roll or collapse, potentially resulting in financial loss and injury to plant workers.

Rotating Looseness Spectrum and Waveform



The spectrum above shows rotating looseness which contains spikes at multiples of turning speed or harmonics of turning speed and in this case was a loose/worn pillow block bearing.

Bearing Fault Spectrum and Waveform



The bearing fault spectrum above contains high frequency spikes and elevated noise which is indicative of bearing fluting caused by electrical currents running through the bearings. Further the high frequency in the time waveform indicates impacting at multiple points typical of fluting caused by common mode current from the drive.

Benefits of Vibration Analysis

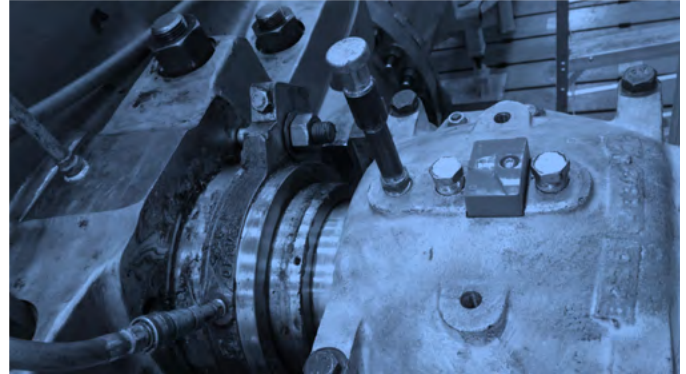
Performing regular vibration analysis comes with many benefits, including:

- **Increased efficiency:**
With a clear idea of the precise locations of problem areas in manufacturing systems, there is no need to waste time diagnosing issues through trial and error. Instead, experts are able to promptly identify and fix snags in machinery while allowing workers to dedicate more time to revenue-generating tasks.
- **Data-driven change:**
Vibration analysis can provide comprehensive data that indicates where vibrations occur, how severe they are, and when and how they'll impact operational efficiency. Armed with such knowledge, teams can better allocate resources within plants and anticipate maintenance delays.
- **Less lost time:**
Vibration analysis can help to prevent mechanical failure and the resulting financial losses caused by unplanned facility downtimes.
- **Increased safety:**
Fixing vibration issues in machinery will reduce the risk of workplace accidents caused by defective equipment, and it will boost the health and comfort of workers who may otherwise experience chronic pain from vibrating machinery.



Vibration Solutions from Renown

At [Renown Electric](#), we offer precision vibration analysis that quickly identifies problem areas, quantifies the type and severity of the issue, and allows you to make informed maintenance decisions going forward. Our skilled technicians follow a three-pronged approach when testing equipment:



1. PREDICTIVE MAINTENANCE

Our technicians start by looking at the basics. We check whether:

- All machine bearings are properly installed
- All journal bearings or “shoulders” of a motor are smooth and burr-free
- Motors are not overly greased

We also [ask questions](#) such as:

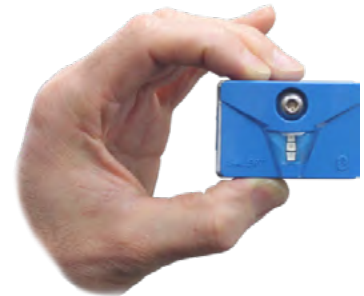
- Are all the bolts on the machinery tight enough?
- Is the operating (hot) alignment good?
- Have any of the machine’s fan blades eroded or broken off?

If we determine that the machinery still has vibration issues after these initial procedures, we move to step 2.

2. VIBRATION ANALYSIS WITH i-ALERT®

Renown partners with [i-Alert®](#) to provide clients with the manufacturing industry’s first Bluetooth-certified wireless vibration transducer. This system combines three products into one:

1. Sensors installed in your equipment that continuously monitor vibration levels and performance
2. An app that allows you to access machine-related data from your phone or tablet
3. A unique AI platform that sends constant reports on your system’s functionality



i-Alert® measures critical machine factors including:

- ✓ Temperature
- ✓ Three-axis vibration
- ✓ Kurtosis (the sharpness of a peak in a frequency distribution curve, which indicates vibration severity)
- ✓ Machine runtime counter
- ✓ Fast Fourier transform
- ✓ Time waveform



After resolving vibration issues, our technicians will return to gather readings from the same points in the system to ensure consistency and accuracy in our process.

The Renown Electric Advantage

Since 1984, Renown has provided top-quality predictive and preventative maintenance to manufacturing clients across Canada and the U.S. Renown's streamlined maintenance programs can cut costs, eliminate machine failures and downtime, and benefit your bottom line.

Contact us today for more information on the advantages of working with [Renown Electric](#).

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