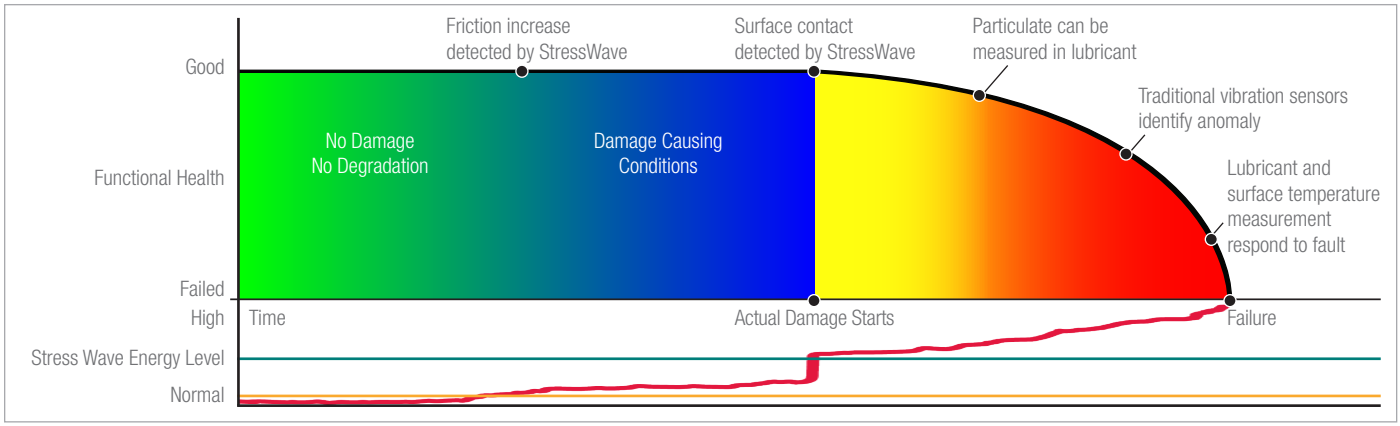
StressWave

StressWave Technology

Power & Process Products and Services



Predicting Failure

StressWave is an advanced condition monitoring system for detecting wear and damage before it becomes excessive, tracking the change over time, and predicting when the damage is likely to result in equipment failure so that maintenance can be scheduled before failure occurs.

There are generally two maintenance strategies employed in industrial settings and in the power generation industry; periodic and run to maintenance. With periodic maintenance, often called preventative maintenance, the frequency of maintenance is based on minimizing the likelihood of an unplanned outage due to failure of equipment occurring before the next scheduled maintenance. Run to maintenance, which is really the more dreadful sounding run to failure, is often used when system redundancy allows plant operations to continue even after component failure.

What are Stress Waves?

Stress waves are acoustic waves that propagate through solid components and through lubricants between solid components. The source of the stress waves are primarily the impacts and collisions that occur due to surface defects, cracks, voids, excessive wear, corrosion, or other damage. Damage that occurs to components such as ball bearings tends to increase exponentially over time. Operators typically do not need highly sensitive equipment to detect failure that has already occurred. The goal of predictive maintenance is to measure and track the condition of bearings and other components such that failure can be predicted allowing maintenance to be scheduled at a convenient time before failure has occurred.

The stress waves targeted are not audible sound. Both the frequency and amplitude are well outside the range of human hearing. Wear and damage sufficient to create audible sound above and beyond normal equipment sounds likely means excessive damage has already occurred.

How it Works

The StressWave system employs distributed data acquisition units and special patented sensors that monitor high frequency sound generated by friction between moving machine components. This technique provides a higher degree of dynamic resolution and more failure lead-time than traditional diagnostic methods.

Imagine a flawless ball bearing spinning in a controlled environment at 5,000 RPM and the sound such a bearing might make. Now imagine that bearing has a tiny defect or excessive wear and the additional sound the bearing might make. The delta between the sound created by the flawless and damaged bearings represents the magnitude of damage and when plotted can be used to predict when catastrophic failure is likely to occur. Now imagine that bearing being at the end of a turbine driven feed pump shaft, with 8,000 gallons per minute of 350°F water flowing through it. Before the delta between the flawless and damaged bearing can be determined, the challenge is to first separate the bearing noise from all of the other much louder sounds generated within the pump and from other nearby plant equipment.

The specially designed piezoelectric sensor is used with a resonant frequency that is tuned to a specific frequency within a band where stress waves occur. The sensor signal is processed by a data collector using proprietary filtering algorithms to focus in on stress waves representative of the machine's operational frequencies.

The Benefits

The downside to periodic maintenance is that maintenance is on average performed prematurely, increasing the long-term maintenance costs to the plant. The downsides to run to maintenance are that failures are likely to occur at inconvenient times and damage to equipment may occur as a result of the failure that was permitted to happen. Plants choosing either of these maintenance strategies are selecting the lesser of two evils.

The solution to performing maintenance too soon or too late requires the ability to accurately predict when failure is likely to occur. Curtiss-Wright's StressWave technology does just that.

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