APPLICATION NOTE

3 ways to improve motor health with vibration testing

It's essential that maintenance teams focus on failure modes in order to match the most suitable tool to the most likely problems. Vibration analysis helps diagnose the most common faults that rotating machines are susceptible to: imbalance, looseness, misalignment, and wear. The compatible trio of owning the right tools, knowing what to test, and sustaining a functional vibration testing program can potentially reduce repair cost and limit unproductive maintenance hours.

1. Buy the right vibration tools

Handheld vibration meters, such as the Fluke 805 FC, help technicians track bearing health, impacting, surface temperature, and overall vibration level. Multiple-function screening tools employ algorithms that can spot flaws earlier, providing methods to share digital results with team members. These meters often employ a sensor tip that detects vibration and force while compensating for user variance, and can be used on most equipment types and components. In a vibration program, the vibration meter is used to screen machines, determining whether they are healthy or show signs of impending problems.

On the other hand, automated vibration testers such as the Fluke 810, are designed to diagnose the severity of the machine faults, if present, and provide a severity level and repair recommendation. Contemporary testers measure rotating equipment and deliver a fast diagnosis of the machine's mechanical fault, location and urgency. Automated testers have diagnostic engines that mimic the logic of human analysts with years of field experience.

Diagnose common faults with the Fluke 810 Vibration Tester.

Laser shaft alignment tools, such as the Fluke 830, can provide up to 65 % reduction in seal repairs, up to 50 % longer bearing life, and 10 % reduction in energy waste. These tools do not require extensive alignment training when operating or interpreting results. The newest models utilize an intelligible user interface that essentially walks the mechanic through the alignment testing task, all while completing complicated calculations for the user. These features help teams quickly align shafts in most of a plant's machines, instead of just a few.

2. Test common faults and failures

Unchecked machine vibration can accelerate rates of wear (i.e. reduce bearing life), damage equipment, create noise, cause safety problems, and degrade plant working conditions. In the worst cases, vibration can knock equipment out of service and halt plant production.

The four common causes of machine vibration are imbalance, misalignment, wear, and looseness. Imbalance can be caused by manufacturing defects or maintenance issues. As machine speed increases the effects of imbalance become greater. It can severely reduce bearing life. Regardless of cause, looseness can lead to vibration-derived damage, likely bearing wear or mount fatigue. Misalignment crops up when, for example, the axis of a motor and pump are not parallel. This fault can occur during assembly or develop over time due to shifting components or if reassembled incorrectly after scheduled or unplanned maintenance. Vibration sometimes arises from worn out drive belts, gears or roller bearings.

Most machines are basic and feature a pair of shafts with two bearings each and something (either a belt, coupling, or gearbox) that connects the two shafts. Many teams get stuck repeating repairs to the same machines. The common stopgap is to replace motor and pump bearings. This often leads to repeat failure and another round of replaced bearings. It doesn't matter which country a facility calls home—worn bearings and seals are symptoms of a problem that rarely reveals a root cause. Research shows that up to 50 % of damage to rotating machinery is a consequence of misalignment. Opting to replace worn bearings instead of regularly aligning machines can lead to losing thousands of dollars per year, not to mention wasted person-hours. One misconception is that installing flexible couplings negates misalignment's ill effects. This approach simply transfers forces to the seals and bearings, which causes rapid wear and unescapable failure. One would be hard-pressed to find a facility manager who doesn't want maintenance operations to run as smoothly as possible. Detecting signs of motor components failure becomes easier when combined with a preventive vibration program.

3. Start and sustain a vibration program

Brand new vibration programs face obstacles that are challenging but not impossible to overcome. These four tips are key for starting up a new maintenance program:

- Start small, show success, and earn more budget to grow. A great method is to start with 25 to 50 assets and gain a few successes. Then let the company higher-ups know that reliability is paying off in a big way. This is a better recipe for success than trying to change company culture overnight.
- Start with simple machines and focus on problem machines. Start with machines that have a tracked history of failure. Even small machines that aren't deemed big enough for a reliability group to monitor may be important to the maintenance and operations groups because they are the ones that require the most attention.
- Focus on the common machine fault. The four most common faults account for 80 % to 90 % of machine faults. Collaborate with your service provider and have them focus on the few, infrequent, and complex faults on your more complex machines.
- Use automation and proven measurement methodology to get a complete picture of the machine's entire power train. Maintenance technicians and operators don't have time to look over reams of data—they have a plant to run. The goal should be a system that screens the data, and provides answers about what is wrong with the machine, and instructs on how to fix it.

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