



Expand your vibration program
to new heights.

Cooling Tower Monitoring
Wireless Vibration Monitoring for Motor and Gearbox Combination



Monitoring your cooling towers presents a unique set of challenges

Cooling towers are particularly complex to monitor – they have many of the same characteristics as other rotating equipment, but come with a unique set of challenges.

Cooling tower fans operate under different load conditions. They often only run at peak load for short periods. With differing stresses over a prolonged period, the mechanical components can develop degraded performance, which leads to failure. As with any rotating equipment, bearing and gear failures, misaligned drive shafts, and excessive vibration are common.

But the structure of a cooling tower makes collecting vibration data on the gearbox difficult and dangerous without permanently installed sensors. Because the gearbox is a typical failure point, lack of feedback on the machine’s health puts you at risk for unexpected failure.

Predictive diagnostics can identify the following types of faults in cooling towers:



Imbalance



Resonance



Water intrusion



Misaligned gears



Misaligned drive shaft



Bent shaft



Rolling element bearing failure



Damaged couplings



Chipped, broken or worn gear teeth



Lubrication problems



Structural and mechanical looseness





Simplify vibration monitoring of a cooling tower fan

Access to continuous information allows you to detect problems before they lead to failure. As part of Emerson's wireless sensing network solution, the AMS 9420 Wireless Vibration Transmitter provides insight into the health of cooling tower gearboxes and motors. Vibration alerts warn of pending problems, enabling further investigation to detect and diagnose the fault so maintenance can be scheduled.

Overall vibration with embedded temperature measurement will identify developing mechanical faults. Emerson's unique PeakVue™ technology provides advanced diagnostics for early indication of bearing and gearbox faults. Vibration energy bands enhance trending and alarming, making it easier to interpret the data. More detailed information can be accessed through high resolution spectra and waveform data. Trend values can be compared against appropriate alert levels, informing you when the condition of the gearbox or motor is deteriorating — as well as providing the underlying cause of the problem.

Vibration monitoring data is communicated over a self-organizing network, removing the additional costs associated with running cables.

Diagnose vibration faults on mechanical equipment

The AMS 9420 delivers insight on the health and performance of previously inaccessible cooling tower gearboxes and motors. Vibration diagnostic data allows reliability specialists to analyze and troubleshoot developing issues.



AMS Software Applications

- Asset dashboard displaying health of the asset, sensor, and transmitter
- High resolution spectra, waveform data, and vibration energy bands for enhanced trending and analysis



Looseness

Excessive coupling wear can lead to looseness. Bearing looseness can also cause severe problems on the motor or gearbox, which are particularly important to detect.

LAN Network
(control system)

Smart Wireless Gateway
or other WirelessHART gateway

AMS 9420 Wireless
Vibration Transmitter



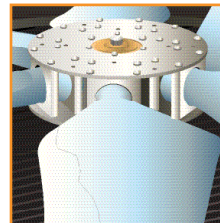
Standard accelerometer



Accelerometer with embedded temperature



WirelessHART



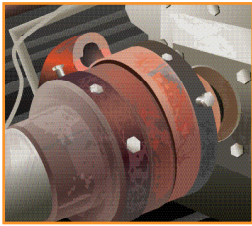
Imbalance

The impeller often has holes in the blades to remove condensation. These can become filled with water, causing imbalance. Other causes of increased imbalance are a crack, bent shaft, or missing shaft keyway. Imbalance can be aggravated by resonance.



Bearing Defects

Bearings often operate under heavy, variable load and extreme environmental conditions. Because of the force applied to bearings in a cooling tower, defects often progress quickly and lead to friction, bearing damage, and gearbox failure.



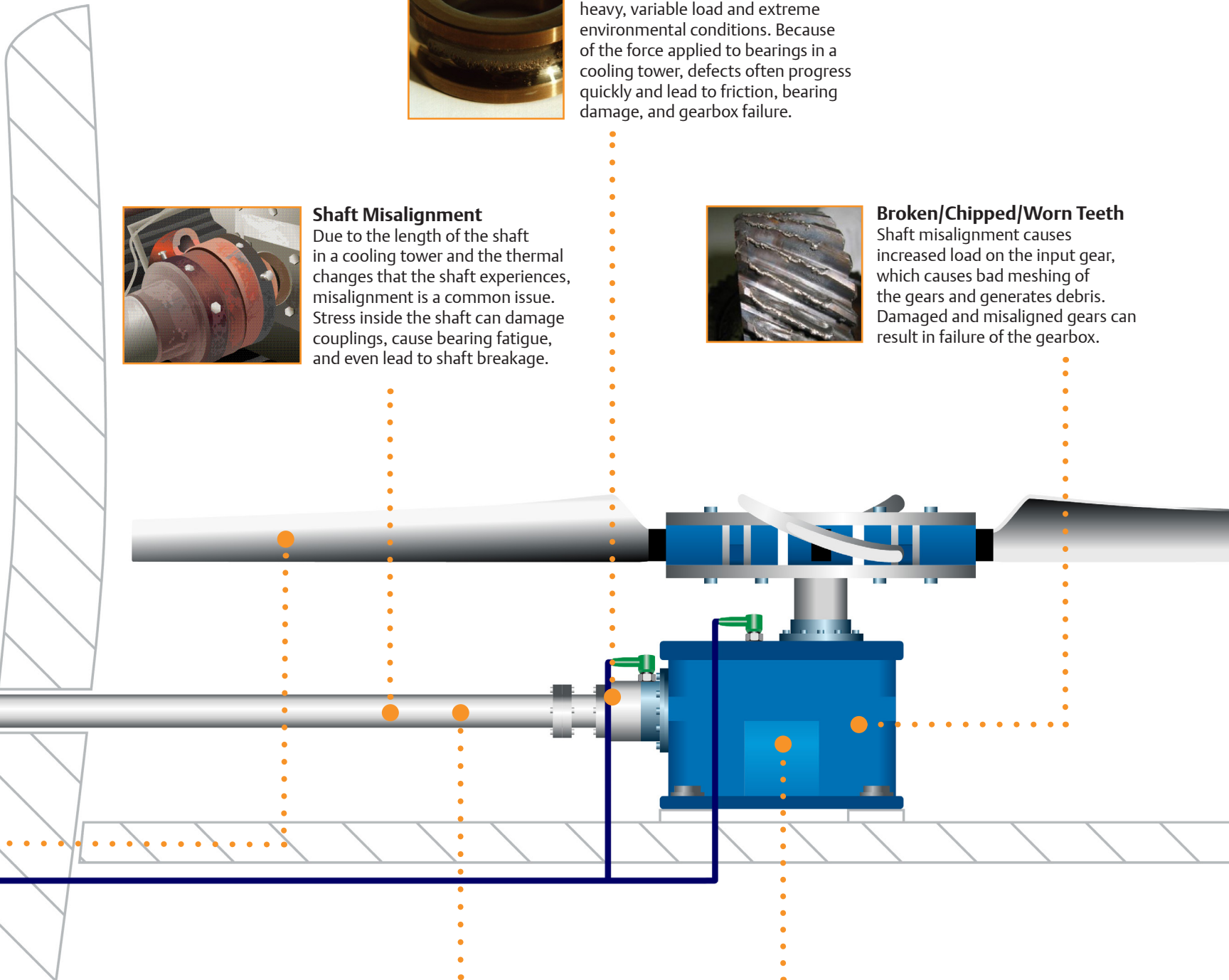
Shaft Misalignment

Due to the length of the shaft in a cooling tower and the thermal changes that the shaft experiences, misalignment is a common issue. Stress inside the shaft can damage couplings, cause bearing fatigue, and even lead to shaft breakage.



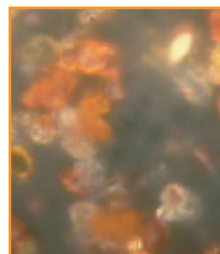
Broken/Chipped/Worn Teeth

Shaft misalignment causes increased load on the input gear, which causes bad meshing of the gears and generates debris. Damaged and misaligned gears can result in failure of the gearbox.



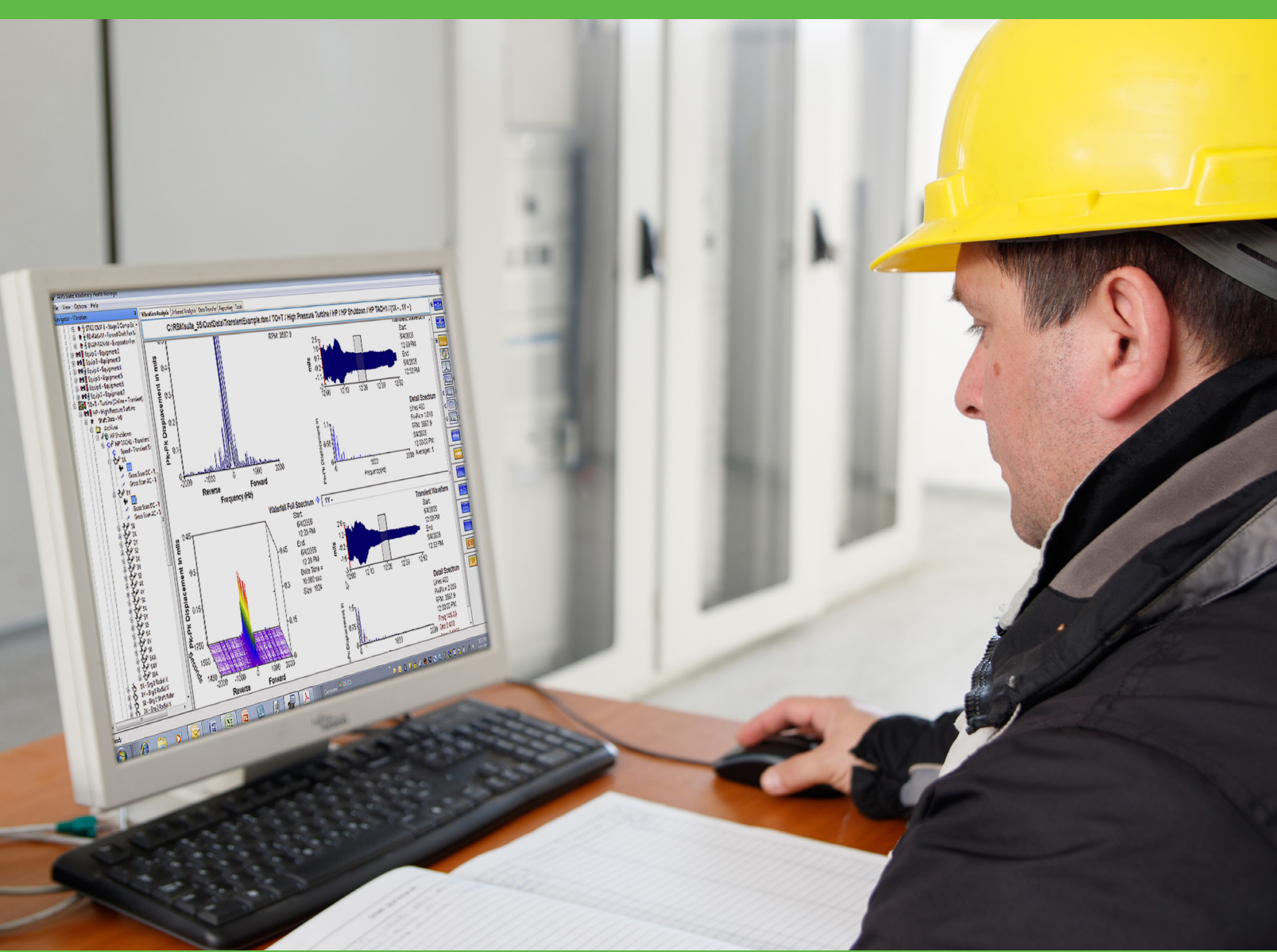
Coupling Issue

Excessive shaft misalignment can damage the coupling, which can lead to shaft separation. Severe coupling damage can lead to gearbox failure, damaged shafts, and rotor cracks.



Insufficient Lubrication

The extreme conditions of the cooling tower often lead to issues with lubrication. Bearing wear and gear teeth damage caused by insufficient lubrication contributes to premature equipment failure. However, the inaccessibility of a cooling tower makes it virtually impossible to perform accurate grease and oil analysis.



Access data for valuable information

Collecting data from the rotating assets inside your cooling tower is just the first step. Accessing, understanding, and sharing the information from that data is critical to identifying developing faults and avoiding unexpected shutdowns.

Advanced diagnostic data can be displayed and trended in AMS Machinery Manager software. The Machinery Manager dashboard displays the health of the motor and gearboxes being monitored along with detailed diagnostic data such as vibration energy bands and thumbnail spectra for discovering imbalance, misalignment, and mechanical looseness. Using PeakVue technology, users can separate stress waves from overall vibration data for accurate, early identification of wear on bearings and gearboxes.

The comparison of vibration data to an alert level provides both an alarm notification when the asset condition is deteriorating and information about the underlying cause of the problem. This allows operators to take action to protect the asset, while maintenance personnel can diagnose the root cause and schedule work. Now with the introduction of Emerson's Plantweb Optics collaboration software, key personnel can be alerted on their mobile device to the overall health or developing problems in critical assets. Plantweb Optics allows users to connect back to AMS Machinery Manager or AMS Device Manager for more data to determine the appropriate course of action.

Emerson offers integrated solutions for cooling towers

The AMS 9420, together with AMS software, provides an early warning of vibration problems. This is just one of a portfolio of integrated wireless technology for cooling towers.

Rosemount Pressure Transmitter



Detects variations in discharge pressure, an early warning of impending suction strainer plugging, which can lead to cavitation, impeller damage, and seal failure in cooling tower pumps.

Rosemount DP Flowmeter



Provides high performance flow measurements to give valuable insight into cooling tower operation. Cooling water supply and return flows are an indication of cooling tower performance and can indicate potential problems with an associated pump.

Rosemount Level Transmitter



Provides high/low level indication of water level in the cooling tower system.

Rosemount Temperature Transmitter



Enables temperature measurements to determine heat transfer efficiency in cooling towers. Ideal for this high-performance application to enable optimization of cooling tower at a lower cost.

Rosemount Guided Wave Radar

Use with the Wireless THUM Adapter



Enables continuous measurement of the water basin level, ensuring adequate supply of cooled water for the heat exchangers while preventing overfills.

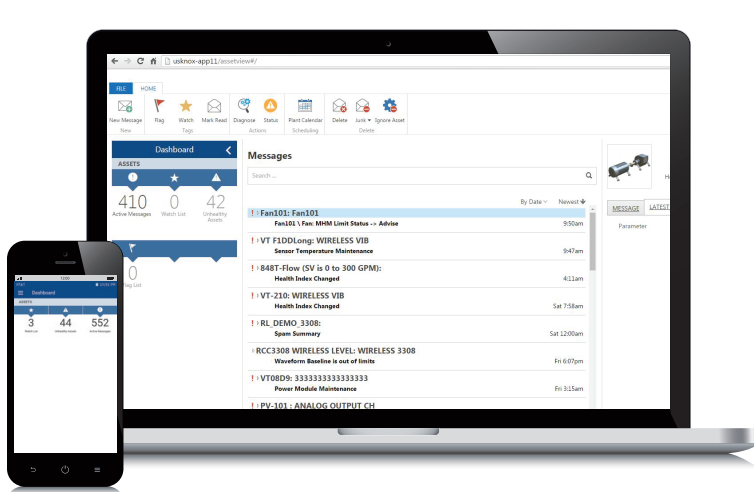
Rosemount Dual-Input Analyzer

Use with the Wireless THUM Adapter and Toroidal Conductivity Sensor



Monitors conductivity, an indication of dissolved solids concentration (leading to build-up of scale), so that adjustments to blowdown rate can be made.

Streamline maintenance and maintain throughput by knowing the health of your cooling towers.



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