



Proven Approaches to Machinery Analysis Success

Emerson's PeakVue™ technology cuts through the complexity of machinery analysis to enable faster, more informed decisions.



PeakVue in Action

Machinery vibration problems lurk just beneath the surface at facilities everywhere. But they cannot hide from teams using PeakVue to identify impacting in critical machinery. PeakVue shines a light that guides experts and beginners alike to address machinery problems long before they impact production.

Gaining Deeper Insight into Critical Machinery

Sometimes traditional vibration monitoring simply isn't enough. For one manufacturer, a gearbox on a critical asset was regularly monitored using portable analyzers so technicians could trend any deviations and be alerted well in advance of a failure. Regular readings taken from the gearbox showed significant sidebanding that suggested gear wear or gear tooth misalignment. Peak velocity amplitude and acceleration data were low, so the fault was not considered to be significant.

However, because the asset was a critical machine, the maintenance team decided to err on the side of

caution and collect a PeakVue measurement the same day to rule out more troubling causes. The result? Waveform data indicated significant cracked or broken teeth in two regions of a gear turning at high speed. After immediate shutdown and inspection of the machine, technicians discovered that the PeakVue analysis was correct, and that there were also cracks at the roots of the gear's teeth. Early warning allowed the maintenance team to quickly replace the gears and avoid catastrophic failure.

One Success Leads to Another

For one automotive manufacturer, successful production depended on multiple lines working together in concert. One day during regular operation in the press and plastics production area, a press machine seized, triggering an extended shutdown.

The forceful stamping of the press prevented high-quality analysis of vibration conditions. Then the team tried Emerson's PeakVue technology, which provided fine enough resolution to enable them to zoom in on the areas of gearbox vibration between press impacts.

The press team began using PeakVue vibration analysis, and earned the site's best reliability key performance indicators (KPIs). Hearing about the success, the paint



department requested a demonstration and found the source of recurring fan fires and fixed them before another occurred.

Now that it's possible to predict failures and be proactive with fixes to the equipment, teams can address issues during planned shutdowns so overall site targets are not affected.



Relieving Stress When Under Pressure

For one petrochemical manufacturer looking to increase throughput, reliable condition monitoring of pumps was critical to success. Achieving peak throughput meant extra stress on these devices, so enhanced and organized awareness of machinery health was essential, and the more people who were made aware, the better.

Emerson's patented PeakVue technology helped the organization bring operators into the fold of condition monitoring to ensure that any increase in production didn't result in a decrease in reliability. Now, when operators increase flow or pressure in a process, PeakVue vibration alerts notify them if the change is not safe for the process. These capabilities link operators to maintenance, ensuring more people are aware if process changes have a negative impact on machinery in the plant, giving the whole organization peace of mind that any deployed process changes, no matter how seemingly insignificant, will always be low risk to operations.

Traditionally, turning vibration data into actionable information has required the scrutiny of a professional vibration analyst to sift through reams of content from vibration sensors and painstakingly extract information from the data.

Emerson's PeakVue technology cuts through the complexity of machinery analysis to focus on impacting, providing a much better indicator of overall asset health on rolling element bearing machines.

PeakVue delivers simple, reliable indication of equipment health that anyone can understand and employ to help make better decisions with speed and confidence.



In the first eight months of the new detection scheme, the facility found and addressed four potentially hazardous situations.

Early Warning of Defect Developments

When faced with a process hazard analysis (PHA) showing that 110 high-risk pumps could be subject to vapor cloud release and explosion, a U.S. manufacturer chose an effective method to obtain early warning of pump defect developments.

They chose Emerson's AMS 9420 Wireless Vibration Transmitter for early detection of hazardous vibration and impacting combined with PeakVue measurement as an analysis tool to indicate high-risk operating states.

PeakVue provided early detection of the impacting caused by rolling element bearing faults, under-lubrication, and pump cavitation—all major causes of pump failure if left unaddressed.

Reducing Costly Outages

Even a short stoppage at a cement mill can cost tens of thousands of dollars. When a mill in the Middle East detected excessive vibration on critical rotating machinery, technicians investigated the problem but couldn't detect anything unusual. Fearing that a problem might still be present, the maintenance team chose to investigate further—they took PeakVue measurements and immediately saw the indication of a serious problem.



A bearing crack detected using PeakVue data would likely have led to a sudden failure and an extended unplanned outage.

Based on the PeakVue data and multi-spectra views, the team discovered a developing bearing fault and was immediately able to pinpoint its location. It was clear that an essential bearing was cracked and flaking. Though the repair required the plant stop production for 12 hours, had the fault gone undetected it likely would have led to a sudden failure that caused additional damage and took much longer to repair. The planned shutdown was a far better solution.

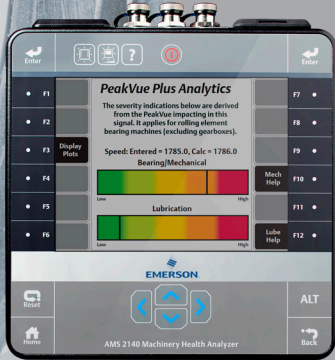


Embedded Expertise

Building on PeakVue technology, PeakVue Plus is a powerful tool to bring reliability to the process floor and the control room. Personnel with no special training in machinery diagnostics can easily act or suggest actions to avoid machinery failures.

PeakVue Plus analyzes PeakVue data and presents the information in a color-coded bar graphic so that users can, at a glance, identify not only a machinery issue but its severity. PeakVue Plus analytics prescribe the necessary corrective actions to preserve bearing life and ensure long-term availability of machinery assets.

It's like having an expert available at the touch of a button.



An Expert in the Hand is Worth Two in the Office

Imagine that a technician is walking a monthly route while carrying a machinery expert. Stopping at a motor driven fan critical to the process, the technician uses the expert — a handheld AMS 2140 Machinery Health Analyzer — to measure the machine's vibrations.

Noting indications of impacting in the data, the technician touched the screen to initiate the embedded expertise of PeakVue Plus analytics. The PeakVue Plus color bars indicated that the fan was properly oiled. The bearing/mechanical bar at the top, however, indicated that the fan could be experiencing periodic impacting, potentially related to a late-stage bearing issue.



Even with little analysis experience, the technician recognized that the PeakVue Plus information and an associated trend plot strongly indicated a moderate mechanical issue. The technician changed the monitoring frequency of the fan to weekly versus monthly so the asset would be monitored closely.

The following week's analysis showed that the impacting trend significantly increased. The next planned shutdown was less than a week away, so the technician requested the fan bearing be scheduled for replacement and an unexpected shutdown was avoided.

Repurpose a Tool to Avoid Compressor Failure

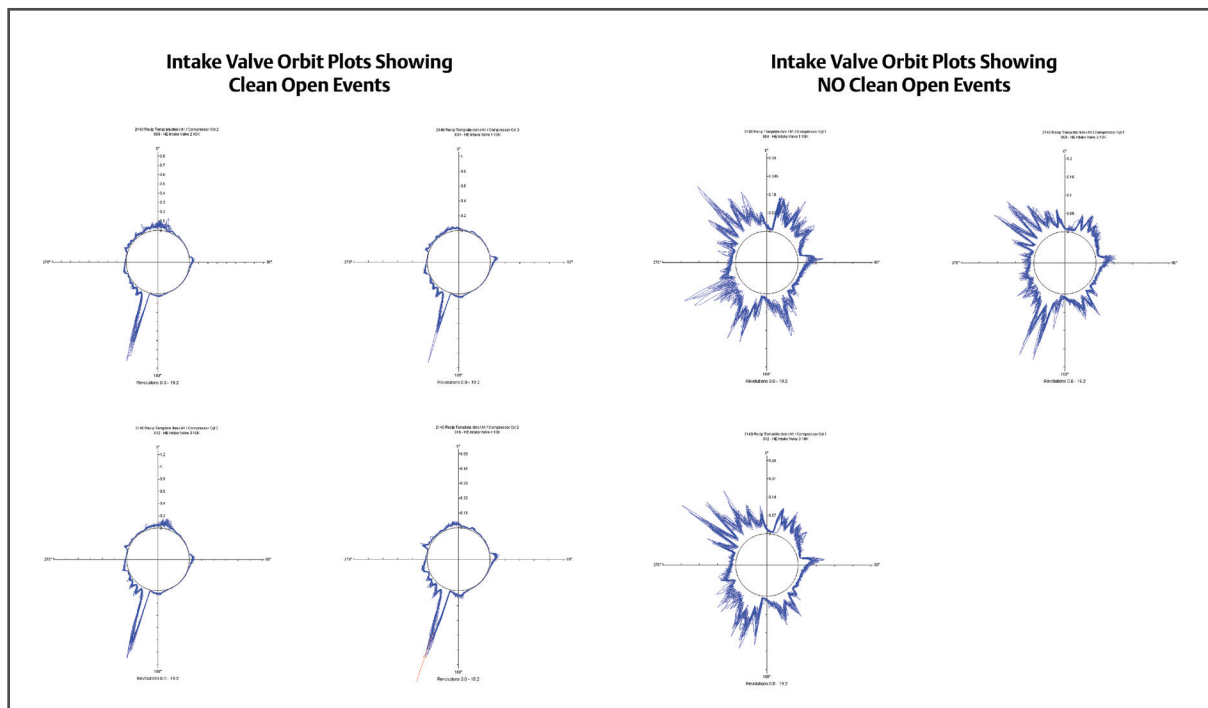
A U.S. chemical manufacturer found savings by repurposing an existing tool for another — profit-saving — function. Each quarter the manufacturer invited a consultant to collect and analyze data about reciprocating compressor health. But the maintenance team began noticing the compressors had issues between assessments.

The team knew that predicting machinery issues on their own and fixing them during planned shutdowns could prevent compressor leaks from sapping process efficiency. They wanted to perform assessments with no additional testing equipment or additional expertise.

A new Emerson method turned their existing AMS 2140 machinery health analyzer and PeakVue analysis technique to a different use — examining high-frequency flow turbulence instead of impact events. The technique showed whether gas was escaping compressors and assessed mechanical reliability.

Any technician—regardless of vibration analysis training—could see if the compressor had changed for the worse. After collecting data and reviewing plots (Figure 1), the technician then could perform preliminary troubleshooting and call in an expert if needed. With this early warning, the team could avoid an unplanned shut down.

The company now fights compressor failure with the same route tools they have successfully been using for years to find vibration issues.



The polar plot, on the left, shows healthy compressor-valve operation with clean open signatures on both intake and exhaust events (intake only shown here). The signature on the right indicates leaking rings or gas blowby.



Putting Bad Actors Back on the Right Path

Sometimes individual assets in a plant can be “bad actors.” These assets experience repeated problems, or, in the worst cases, repeated failures. This was the case for one plant which had a forced-draft air blower servicing a vintage natural gas-fired boiler. The boiler provided critical steam for a facility that was unable to operate without it. However, because it was oversized for normal demand, it constantly cycled on and off, putting extra stress on the blower. At one point, a catastrophic impeller failure tore the blower apart causing an extended outage and requiring extensive repairs.

Once repaired, the blower motor was fitted with a vibration monitor providing PeakVue measurements. The sensor detects the impacts that occur when metal impacts metal. Using the detailed PeakVue data, operators can monitor the health of the blower and plan and perform repairs as necessary to avoid another failure. Now the operations crew can continue production without the safety or productivity risks of unexpected shutdowns.

Causality Beneath Contradiction

When a large industrial plant discovered improper lubricant had been used on ball bearings in roller bearing applications, the maintenance team immediately set out to replace all the bearings to ensure safety and proper functionality. After they replaced the bearings on a variable speed drive incinerator fan, vibration readings indicated that everything had gone well and that the fan was operating as expected.

PeakVue data collected one minute after the vibration data told a different story. Pronounced spikes occurred with each revolution of the fan shaft. Moreover, the PeakVue spectrum suggested a mechanical looseness condition.

Though the PeakVue readings seemed to contradict the vibration data, the team chose to return the fan to maintenance and investigate the bearings. In doing so, they discovered a crack on the inner ring of one bearing.

Using PeakVue data allowed the maintenance team to see deeper, allowing them to identify flaws that might otherwise have gone unnoticed.

Identifying and rectifying potential problems earlier has helped minimize pump failures and maintenance costs and has improved maintenance scheduling.



Increasing Awareness of Machinery Health to Drive Peak Performance

For a power plant relying on turbines to provide energy during peak seasons—such as the surge that comes with running cooling systems in the summer—reliable equipment isn't just a bonus, it's a necessity. A turbine failure could mean long outages and extensive repairs, both of which can quickly become very expensive.

At one such plant, the reliability team has looked to continuous online monitoring with Emerson's patented PeakVue technology to help maintenance track the exact health of all equipment at any time. PeakVue waveform data helps the team

make sound business decisions about when to bring equipment down for maintenance and has the added benefit of delivering performance monitoring, allowing the organization to track the efficiency of all its turbines.

Knowing that the organization's employees and critical assets are always protected from the repercussions of unexpected failure gives everyone in the plant peace of mind, even when it is operating at full capacity.

Trust but Verify

The best technicians use a combination of intuition and equipment to diagnose faults in critical equipment. One of the best tools for supplementing intuition is Emerson's patented PeakVue technology.

When the maintenance team at one facility heard screeching on a high-velocity motor, they immediately turned to their vibration data to identify the source of the problem. However, vibration data showed very little activity—certainly nothing indicative of a problem.

Relying on their intuition, the technicians dug deeper using PeakVue waveform data. PeakVue identified increasing harmonics, suggesting under-lubrication. Even as the technicians added lubrication to the problem bearing in the motor, they could watch the PeakVue readings return to normal in real-time, validating that they had made the right choice to fix the problem they knew was there, even though it was outside of the range that vibration software could detect.



How Can You Be Sure You Won't Miss a Problem?



Manufacturers often realize that between manual readings of vibration data potential problems can arise leading to higher maintenance costs and reduced plant availability.

A European olefins plant chose to alleviate issues between readings by installing a wireless condition monitoring and prediction system that included the AMS 9420 Wireless Vibration Transmitter and PeakVue technology.

The 9420 transmitter measured overall vibration and temperature while PeakVue technology

detected faults that could cause friction, impacting, and fatigue—particularly in gearbox and rolling element bearings. The monitoring system reported machinery health alerts every 30 minutes and conducted an in-depth, full-spectrum analysis once every day.

Since installation, the AMS 9420 and PeakVue analysis have alerted the facility to several problems that could have resulted in equipment failure, including a chipped tooth on a gear and an impending bearing failure.

Identifying and rectifying potential problems earlier has helped minimize pump failures and maintenance costs and has improved maintenance scheduling. It also has helped reduce the risk of unexpected failures that can result in lost production as well as safety and environmental incidents.



Let's begin your success story.

Where in your facility do you suspect that machine impacting could disturb your process? Alleviate the stress and find potential problems with PeakVue technology. Address underlying issues and make way for smoother operation.

Emerson offers the technologies and expertise to drive predictive and integrated protection to help organizations achieve Top Quartile reliability.

We invite you to explore your path at [Emerson.com/reliability](https://www.emerson.com/reliability).

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