

Reduce Shutdowns and Fulfill Production Goals

Compressor Health Monitoring



Keep compressors from causing unplanned downtime

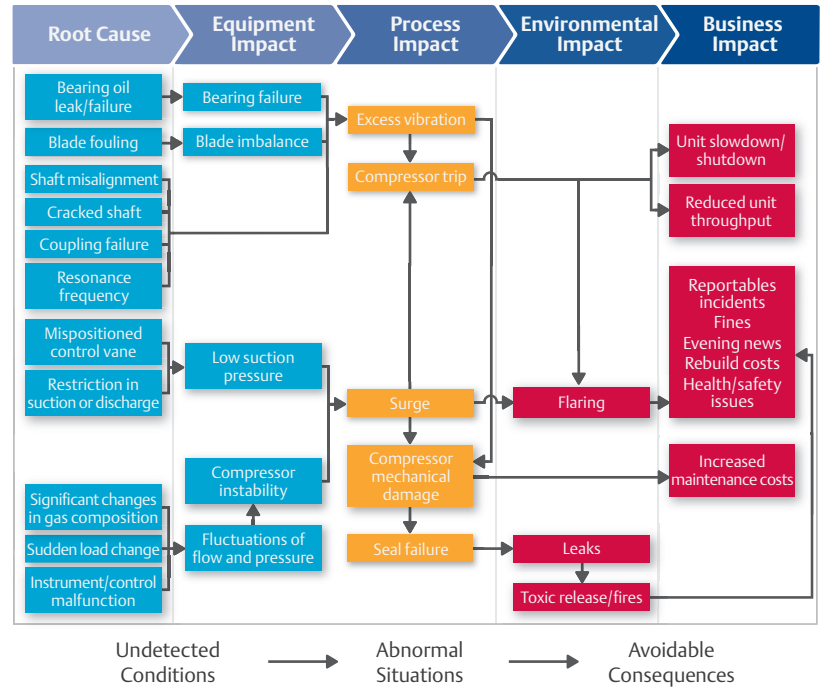
Cost has long been the main barrier to installing automated monitoring on essential (non-critical) compressors. This continues to be the case despite the many times a compressor failure has caused missed production targets and repairs that cost more than the expense of monitoring instruments.

Many essential compressors go unmonitored, but since power consumption represents the majority of compressed air costs in plants, there are opportunities for savings from automation.

A seemingly insignificant essential compressor failure can become a costly environmental incident. A hazardous or toxic fluid release or an unforeseen leak could not only cost your staff time with paperwork and meetings, but also put you on the evening news.

The pressure from emergencies can overwhelm even the most skilled operators, causing more damage and leaving them to ask, "Why couldn't this be prevented before we have to fix it?"

Anatomy of Compressor Failure



Common Threats to Compressor Health



HIGH VIBRATION

Increasing vibration indicates blade, bearing, shaft, or coupling issues that can lead to compressor failure and a potential unit shutdown. This reduces throughput, increases maintenance costs, and generates environmental issues. Root causes include blade fouling, lubrication and coupling failure, shaft misalignment, and operating near resonance frequency.



FLUCTUATIONS IN GAS FLOW

Fluctuations in gas flow and pressure result in instability that can lead to surge, causing mechanical damage and/or compressor trip. Root causes include instrumentation malfunction and sudden changes in gas composition and compressor load.



SURGE

Surge occurs when flow in the compressor is too low in relation to its speed. Sudden changes in composition, flow, or suction pressure can trigger surge, which, if uncontrolled, could have catastrophic consequences.



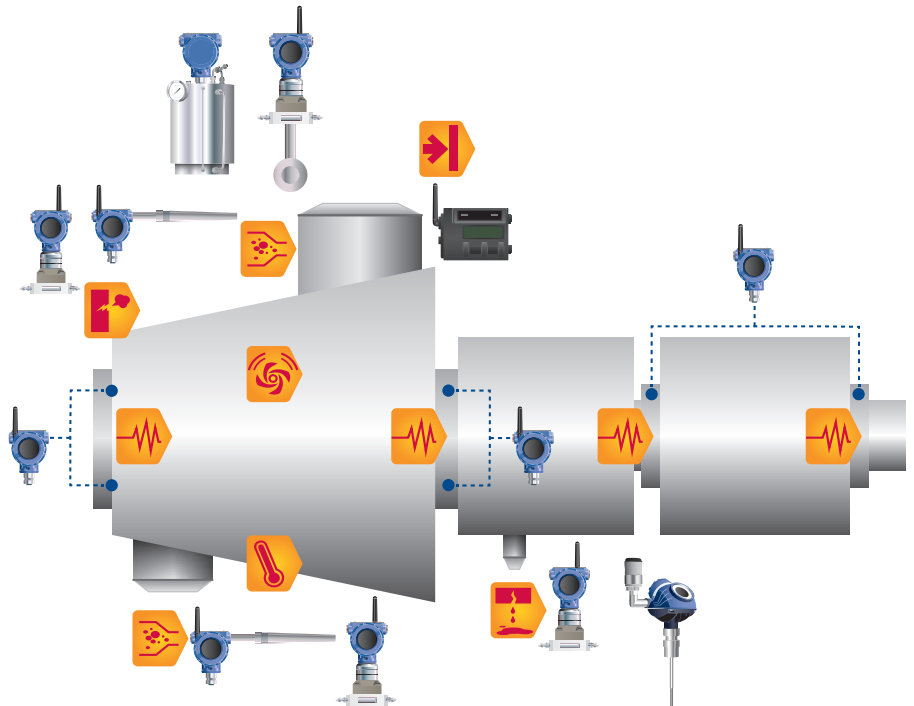
RESTRICTIONS

Restrictions on the compressor's suction or discharge lead to low suction pressure which can result in compressor surge. Root causes include a plugged suction filter, control valve issues, and a poorly positioned control vane.



TEMPERATURE RISK

Temperature spikes can result in damaged compressor internals and seal failure.



HYDROCARBON VAPOR RELEASES

Excessive vibration can cause process gas seal failure, resulting in possible flaring, toxic releases, and fires, leading to reportable incidents and fines.



LUBE OIL LEAK/FAILURE

Inadequate lubrication can result in bearing failure, which causes excessive vibration and leads to mechanical damage of the compressor.

What if a compressor didn't fail unexpectedly, causing lost production and sudden, costly repairs?

With the proper insight that comes with automated monitoring, you can reduce unplanned slowdowns and shutdowns, along with the lost production and frustrations that accompany dealing with the unexpected.

Reduce Unplanned Shutdowns

Automated and trendable asset health data will allow your reliability engineer to run root-cause and failure analysis. If compressor failure is approaching, there may be time to perform life-extending repairs. If repairs aren't enough, operations can at least anticipate production changes and prepare a timely and effective response.

Increase Asset Reliability

Increasing asset reliability does not have to be an unachievable goal. With early warnings and algorithms that detect when a compressor operates outside of required operating parameters, your maintenance staff will know when a compressor is not operating the way it should be. Your operator can then make preventive adjustments before the asset falls prey to a "bad actor" and becomes an unreliable piece of equipment that keeps you from meeting production requirements.

Mitigate Safety and Environmental Risk

Imagine that your operators had sufficient warning prior to abnormal operation or imminent failure of a compressor. An operator could then perform a controlled shutdown or switch to a backup compressor, if available. A controlled shutdown reduces your plant's exposure to environmental and safety risks, and takes the control and puts it into your operator's hands. An effective controlled shutdown starts with timely and accurate information, which Emerson's automated monitoring provides.

Protecting your profit

Industry experts suggest that compressor failure and shutdowns are responsible for 0.6 percent of production capacity loss. Care to get that back?

INPUT

a. Plant capacity in tons per day	1,700
b. Plant net margin per ton	\$200
c. Operating time in days per year	365
d. Capacity utilization	0.93
e. Plant total annual maintenance spend, excluding turnarounds	\$40,000,000
f. % of production capacity lost due to compressor failure	0.60%
g. % of plant total annual maintenance attributable to compressors	12%

OPERATIONAL BENEFITS

h. % reduction in lost production with compressor monitoring	30%
Annual Net Profit Improvement (= a x b x c x d x f x h)	\$207,743

MAINTENANCE BENEFITS

i. % anticipated reduction in compressor maintenance cost with diagnostics	30%
Annual Maintenance Savings (= e x g x i)	\$1,440,000

TOTAL ANNUAL IMPROVEMENT

\$1,647,743

Notes
This is an example of an olefin plant.

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Compressors

Emerson's integrated solutions for compressor monitoring allows your operators and engineers to detect conditions that can cause compressor failure. With that knowledge, you can prevent potentially dangerous situations. Integration means that there will be not only fewer headaches, but also much less confusion in using and maintaining equipment. The clarity will allow personnel to focus their attention on the key priorities of increasing efficiency, asset planning, stopping unplanned shutdowns, and reducing the risk of environmental and safety incidents.



Learn More

Visit the Emerson Process Management website to learn more.



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[EmersonProcess.com/
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Emerson Compressor Monitoring Products

SOFTWARE INTERFACE



AMS SUITE: ASSET GRAPHICS FOR OPERATIONS

Provides online graphical displays that indicate abnormal operation, including compressor instability, control vane defect, low differential pressure, high differential temperature, plugged suction filter, and overall compressor health. A pre-engineered algorithm delivers diagnostic information for alarms, process analysis, trending, historization, and key performance indicators.



NETWORK INTERFACE



SMART WIRELESS GATEWAY

Connects IEC 62591 (*WirelessHART*[®]) self-organizing networks with any host system.



DEVICES



CSI WIRELESS VIBRATION TRANSMITTER

Provides early warning of excessive vibration in compressors. Helps determine root cause and guides corrective action. Optional functionality can identify premature bearing wear and predict failure.



ROSEMOUNT WIRELESS PRESSURE TRANSMITTER

Detects compressor instability conditions from a statistical analysis of discharge and suction pressure. Provides early warning of plugged suction filter and enables monitoring of lube oil pressure.



ROSEMOUNT WIRELESS TEMPERATURE TRANSMITTER

Enables temperature measurements to monitor compressor suction and discharge temperature limits and optimize compressor performance.



ROSEMOUNT WIRELESS DP FLOWMETER

Provides high performance flow measurements, to give valuable insight into compressor operation. Significant increases in gas flow can indicate compressor instability problems.

ADDITIONAL OPTIONS



ROSEMOUNT GUIDED WAVE RADAR with Smart Wireless THUM Adapter/Wireless Vibrating Fork Level Switches

Enables level measurements to monitor lube oil tank level on compressors. Guided Wave is a suitable technology for continuous level monitoring. For high/low level indications, vibrating fork switches may be more suitable.



FISHER WIRELESS POSITION MONITOR

Indicates equipment position with a percent of span plus on/off indication. Monitors position of mechanical control vanes for mechanical defect detection.



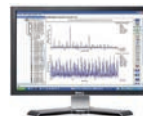
SMART WIRELESS THUM ADAPTER

Allows devices compliant with Hart 5 (and later revisions) to wirelessly transmit measurement and diagnostic data that was previously unavailable.



MICRO MOTION GAS SPECIFIC GRAVITY METER

Provides gas molecular weight measurement for detection of unstable conditions. Responds quickly and dynamically to process changes, with self compensation for gas composition and compressibility variations, reducing fluctuations in measured gas flow.



AMS SUITE FOR MAINTENANCE

Aids early identification of asset problems using predictive diagnostics, allowing maintenance to schedule repairs while reducing cost and downtime.

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