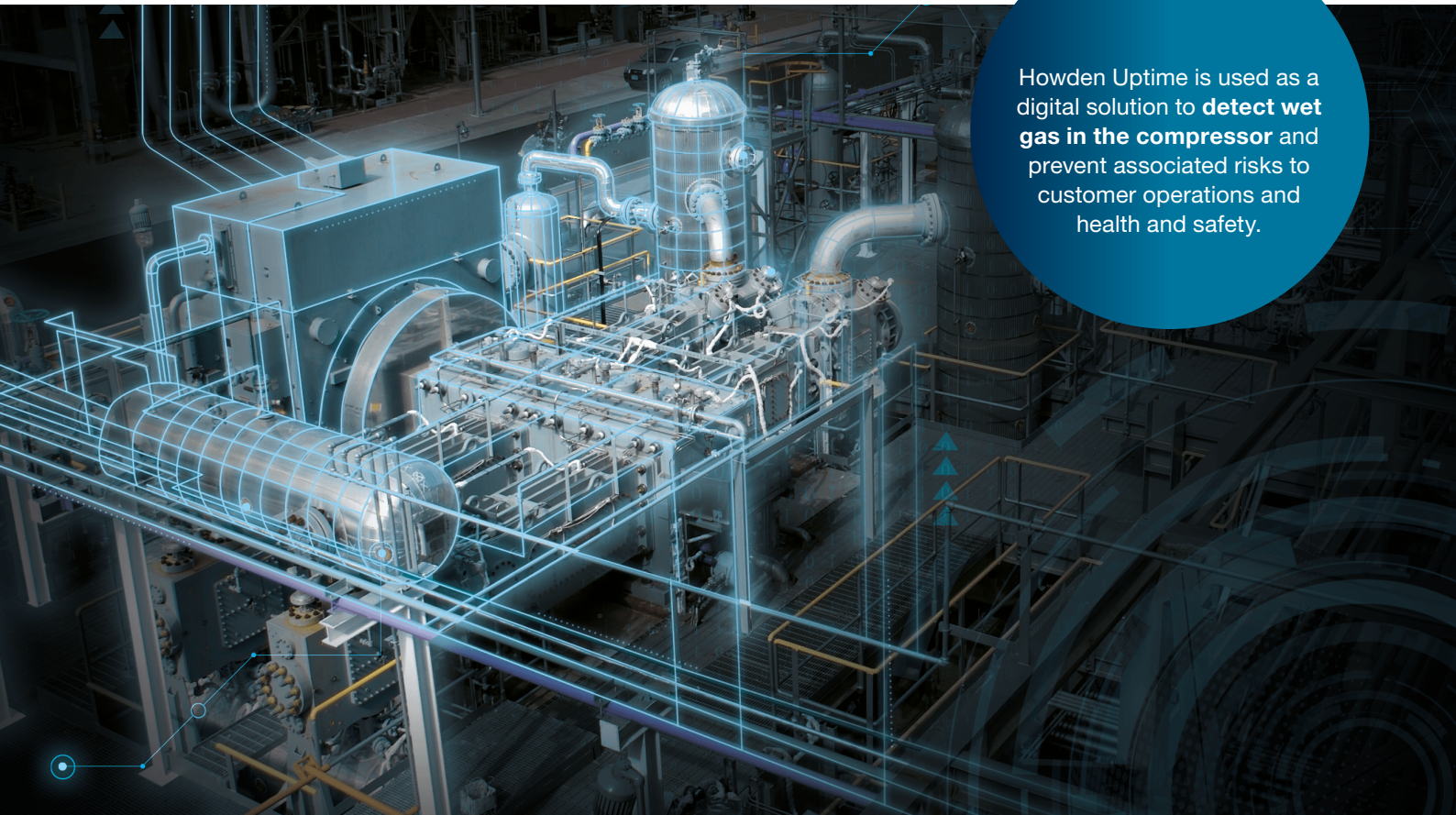


Saturated process gas detection using Howden Uptime



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The challenge

A Howden customer with several reciprocating compressors installed at their plant, and prior to having Howden Uptime installed, experienced a crankshaft failure. Without a performance monitoring system in place, the root cause analysis pointed in the direction of liquid slugging but there was no way to be certain.

As an original equipment manufacturer (OEM) of reciprocating compressors for more than 165 years, Howden, a Chart Industries Company, has seen several catastrophic failures at various customer sites due to liquid ingestion. Early detection of wet process gas is critical in order to take mitigating actions.

In reciprocating compressors, liquid ingestion causes serious problems and wet process gas can increase the pressure up to

five times its normal value.

As a result, the rod load and power consumption will also increase.

The valves and piston rings are typically the first parts to fail. However, a substantial amount of liquid (+/- half a cup) can even destroy major parts such as the piston rod, piston and crankshaft or even bend and damage the connecting rod, and if left undetected can pose a health and safety risk.

The solution

Howden Uptime is a digital solution tailored to optimise the performance of rotating equipment. Having Howden Uptime installed on the equipment, enables the measuring of crank angle-referenced pressure readings, crosshead vibrations, cylinder vibrations and rod drop.

Digital Twin technology provides a real-time model representation of the compressor performance on a cycle-by-cycle basis.

Together with Howden compressor experts, the technology identifies wear or developing failures and advises on efficiency improvements and maintenance actions.

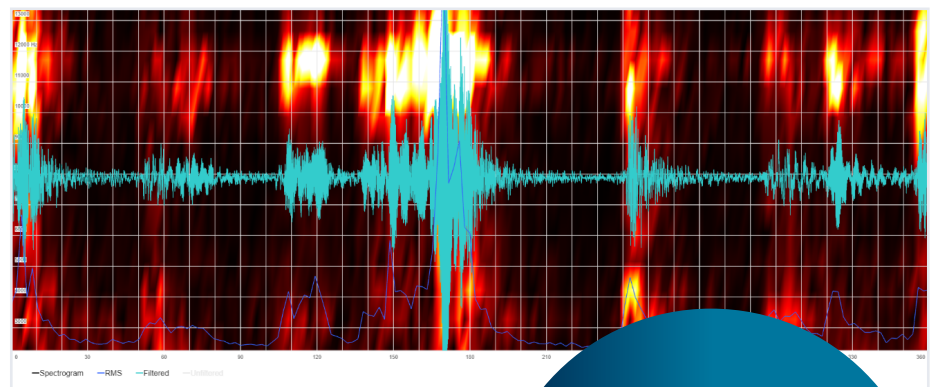
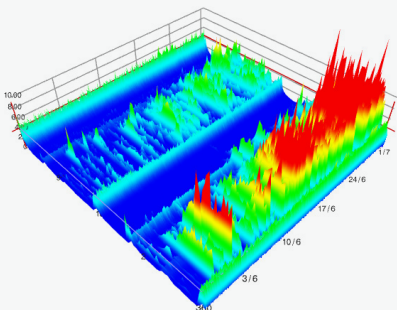
In case of performance deviations, the Digital Twin supports our compressor experts to accurately model effects of different failure modes and match the results of these scenarios to find the root cause.

Howden Uptime captures different vibration signatures for different operation modes, and measured vibration data is continuously benchmarked against these signatures. Any anomalies will trigger an email alert that is sent to the Howden experts and, on request, to the customer via the web-based Howden Uptime portal. Logging into the portal will give our compressor experts and our customers a range of tools to do a root cause analysis of the received alert.

Within this portal, there are visualisation tools such as The Howden Uptime waterfall plot and Fast Fourier Transform (FFT) feature, which plot vibration patterns. The FFT functionality determines which frequencies are present in the vibrations of a running asset.

As all vibrations are crank angle-referenced, we can link these vibrations to specific events, for example valve opening and closing.

In our waterfall charts, we show these vibration patterns but also cylinder pressure and rod drop measurements over time, all crank angle-related from 0 to 360 degrees. This visualisation method helps our portal users and technical experts to easily spot changes in vibration patterns.



The outcome

After installing Howden Uptime, the technology detected an increase in the vibration on the compressor at both crank end and head end, showing peaks at 90° - 180° and 300° - 360° crank angle. This coincides with the opening and closing of the discharge valves. The majority of the vibrations were in the frequency range of 11000 hz.

The audio playback confirmed the typical squeaking noise that is normally heard when wet gas is passing through a valve.

It was concluded that it may be worth reviewing the gas condition and separator functioning, as well as cylinder lubrication as wet gas can also influence the rider and piston ring wear.

Additionally, the platform has an **audio playback functionality** that enables the user to listen to the compressor, in order to identify sounds typically associated with performance issues.

The vibration signature is intermittent and vibration monitoring will continue on the compressor.

Howden Uptime technology helps customers identify the root cause from the earliest signs of error allowing maintenance to respond faster and more effectively. In this case, Howden Uptime provided the customer with the right data to be able to find a solution for the wet gas issue.

For further information get in touch with our team today:

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