The mechanics of a sound assessment

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Compressors lie at the heart of countless businesses across countless industries, and those businesses' success depends on their equipment performing reliably, efficiently and sustainably. When this isn't the case, they need easy and fast access to engineering excellence to assess and help them improve their compressors.

However, correctly assessing any issues with a compressor—or areas for improvement—isn't always a simple job. It's a task that must be approached with care and correct planning.

There are three key stages of any high-quality assessment process, ranging from taking precise measurements and carrying out technical meetings through to the careful renewal of documentation. Though they may seem ancillary to the process, these steps are vital to achieving engineering excellence, ensuring operators get the most out of their assessments and helping the assessors do their jobs effectively.

The three key elements of a high-quality assessment process

- **One: Precise measurements**

The foundation of any high-quality compressor assessment relies upon the quality of data collection, and this includes taking relevant and accurate measurements.

This initial phase is critical, forming the bedrock upon which all subsequent analysis and recommendations are built. Measurements, and the collection of instrumentation readings, ensure that the assessment is grounded in objective data rather than subjective judgment, leading to more reliable and actionable insights.

The measurement process involves several key components. Its scope varies depending on the issues operators might be having with specific compressors and includes a wide range of data. This includes everything from standard compressor instrumentation readings, such as pressures, temperatures and gas flow, to measurement of ‘general health indicators’ such as vibration level and temperatures. It also covers more advanced techniques like pV-analysis, time-domain vibration diagnostics and leakage measurements.

Vibration measurements are essential for detecting integrity issues, while comparative thermography is used to identify hotspots and other thermal anomalies within the compressor. Such anomalies often indicate potential problems like leakages, insufficient cooling, excessive friction or inadequate lubrication. These not only cause excess wear but can also result in a drop in efficiency and, therefore, higher emission levels.

Taking this range of measurements for reciprocating compressors allows engineers to gather detailed data on the performance and condition of their components. This includes assessing the integrity of cylinder liners, piston rods, and seals, as well as how the pressure and temperature changes at different stages of the compression process.

These precise measurements offer a data-driven basis for recommendations. This means carefully tailored solutions can address the specific needs and conditions of a system, ensuring that the recommendations are both practical and effective, leading to improved compressor performance, efficiency, and sustainability.

- **Two: Comprehensive technical meetings**

Engaging with the customer's technical team is crucial for understanding the specific needs and performance targets of a compressor. These meetings aren’t just a way to arrange visits and hammer out details; they form a vital part of the assessment

process, as they establish a collaborative environment where detailed discussions can take place and ensure all stakeholders are aligned.

Though the exact makeup of a technical meeting will vary depending on the specifics of the unit where compressors are installed, participants typically include maintenance and reliability teams, process engineers, and experts responsible for efficient and stable operation of equipment. Each group brings a unique perspective and set of insights, contributing to a comprehensive understanding of the compressor's performance and the operational challenges.

The primary objective of these technical meetings is to discuss the current performance of the compressor and identify requests for improvement. These discussions help set clear, achievable performance targets that align with the customer's operational goals. By understanding the needs of the customer and the specific conditions under which the compressor operates, the assessment team can then tailor their recommendations to deliver the most value.

Ideally, these meetings will provide a detailed understanding of the customer's expectations and a collaborative approach to problem-solving. This collaborative environment ensures that the recommendations provided are not only technically sound but also practical and implementable within the customer's operational framework. By engaging all relevant stakeholders, the assessment team can develop solutions that address the root causes of any issues, leading to sustained improvements in performance and reliability.

- **Three: Careful documentation renewal**

Diligently reviewing technical and operational documentation is a crucial step in ensuring that the compressor is operating within design specifications and that the design is adequate to the real-world conditions it’s working in. The types of documentation reviewed include the compressor manual, component information, piping and instrumentation diagrams (P&IDs), and process flow diagrams (PFDs). On top of this, the team will also need to review the compressor’s maintenance

history, as well as all the operational records, trends and data available from its monitoring systems.

The compressor manual provides input on original specifications and intended operation, while schematics and process diagrams provide an understanding about compressor interfaces. This is essential for understanding the overall system configuration, its operating mode and any potential impacts from the process – such as contaminants in the gas, fluctuating operating parameters, or changing demand for compressed gas. Meanwhile, the maintenance history and operational records give a view of the compressor's past performance, detailing any repairs, upgrades, or recurring issues.

By having an accurate and up-to-date picture of the compressor's history and current state, the assessment team can identify patterns and recurring issues. These "bad actors" can include components, operating modes, process conditions, and operating or maintenance practices that are limiting the compressor's reliability or efficiency. This information forms the basis for diagnosing the root causes of any performance problems and developing effective solutions that allow it to operate more efficiently and sustainably.

Importantly, collecting up-to-date documentation also ensures that all stakeholders have access to the same information, facilitating better communication and coordination during the assessment process. It also makes it easier to plan any future maintenance and operational strategies, as it provides a clear record of past issues and interventions and gives a solid foundation for making informed decisions.

How operators can make the most of an assessment

If operators are going to generate the maximum possible value from their assessment, they should recognize that the process is a two-way street and allocate sufficient time and effort to the process. Effective preparation, active participation, and a diligent follow-up can help operators to maximize the benefits of a compressor assessment.

- **Preparing for the assessment**

Before the assessment begins, it is essential to ensure that all relevant documentation is as up to date as possible and accessible. This includes design manuals, schematics, process diagrams, and maintenance records. These documents provide the assessment specialists with the background needed to understand the compressor's design and operational history.

Additionally, operators should make sure that when the assessment specialists arrive, they can provide a clear understanding of their operational goals and challenges. This involves outlining specific performance targets, known issues, and any unique operational constraints.

- **During the assessment**

Active involvement during the assessment is vital to its success. Operators should participate in technical meetings, sharing insights and observations from day-to-day operations. This firsthand information can provide valuable context and highlight potential issues that may not be evident from data alone. Operators should also be prepared to answer questions and provide additional information as needed.

Supporting the assessment specialists in conducting measurements is crucial. This involves ensuring that measurements are made when the compressor is operating under typical—and in some cases problematic or challenging—conditions. Additionally, technical staff should be available to assist with the measurement process and address any immediate queries the assessment specialists may have.

- **Post assessment**

After the assessment, reviewing and discussing the report with the experts is crucial. This discussion helps clarify findings, ensures that all recommendations are

understood, and provides an opportunity to ask questions about the proposed solutions.

Implementing the recommended actions promptly is also a key part in addressing any identified issues and improving compressor performance. As such, the customer should develop an action plan that prioritizes tasks based on urgency and impact. It's also vital that they monitor the effect of these changes to ensure that the desired improvements are achieved. This involves tracking key performance indicators (KPIs) and conducting follow-up assessments as needed.

It's also important to maintain open lines of communication with the compressor assessment specialists for further support; to ensure that any additional issues are addressed swiftly; and that the improvements are sustained over time.

Case study: Agricultural technology company

An excellent example of the benefits of a well-managed compressor assessment can be seen in a recent project.

A leading agricultural technology company encountered significant issues with several newly acquired compressors during the warranty period. These challenges impacted on their operational efficiency and reliability, but the OEM was unable to address the issues. This prompted them to seek assistance from Burckhardt Compression for a comprehensive assessment and solution.

Based on the findings from the assessment, Burckhardt Compression's engineering experts implemented several targeted modifications. The cylinder groups, piston rods, and liners were modified to address the identified issues, and improvements in the compressor's tribology – the areas where two parts move over one another – were also made, significantly enhancing seal longevity and reducing operating temperatures. These changes eliminated the root causes of the problems and optimized the compressors' performance.

The solutions implemented by Burckhardt Compression resulted in several tangible benefits for the company. The reliability and efficiency of the compressors were significantly enhanced, leading to more consistent and dependable operation. Maintenance costs were lowered due to improved component longevity and a reduced need for repairs.

Overall, the performance of the compressors improved, and their lifespan was extended, providing the company with a robust and efficient solution to their initial problems.

This success highlights the importance of not just engineering excellence, but also a thorough and methodical assessment process in identifying and addressing complex compressor issues. By using precise measurements, technical collaboration, and comprehensive documentation review, Burckhardt Compression was able to deliver a tailored solution that met the company's needs and restored the performance of their critical equipment.

The value of comprehensive assessments

A thorough and methodical compressor assessment process is vital for ensuring optimal performance and reliability. Precise measurements, technical collaboration, and detailed documentation review form the foundation of this approach, allowing for data-driven insights and effective solutions.

Partnering with an engineering expert like Burckhardt Compression provides long-term benefits for businesses relying on compressor performance. The company's BC ACTIVATE program, for example, offers a structured assessment for any reciprocating compressor, using advanced measurement techniques and data analysis to identify potential issues, enhancing efficiency, reliability and sustainability. OEM expertise and decades of service experience have been combined to deliver a comprehensive assessment process that reveals bad actors for compressor reliability, excessive energy consumption and gas emissions.

Examining existing data, completing a thorough inspection and collecting additional process data allows the full picture of an installation to be established. The BC ACTIVATE program identifies issues and presents a structured solution tailored to a customer's application—not necessarily built around Burckhardt Compression's own products. Solutions can range from sealing material upgrades to adjustments in alignment and geometry, as well as major upgrades including new cylinders and auxiliary systems.

These solutions, whether they're direct upgrades or simple changes to maintenance plans can drive improved performance, increased reliability and sustainability, and –ultimately – more profitable operations.

Image captions:

Image 1: Vibration measurements are essential for detecting integrity issues.

Image 2: Data collection is the foundation of any high-quality compressor assessment.

Image 3: Active involvement is vital to the success of any assessment.

Image 4: Comparative thermography is used to identify hotspots and other thermal anomalies.

Image 5: Thermal anomalies can indicate potential problems like leakages, insufficient cooling, excessive friction or inadequate lubrication.

About Burckhardt Compression

Burckhardt Compression is the worldwide market leader for reciprocating compressor systems and the only manufacturer and service provider that covers a full range of reciprocating compressor technologies and services. Its customized compressor systems are used in the gas gathering and processing, gas transport and storage, refinery, chemical, petrochemical as well as in the industrial gas and hydrogen mobility and energy sectors. Burckhardt Compression's leading technology, broad portfolio of compressor components and the full range of services help customers around the world to find the optimized solution for their reciprocating compressor systems. Since 1844, its highly skilled workforce has crafted superior solutions and set the benchmark in the gas compression industry.

SIX Swiss Exchange: BCHN
For further information please visit www.burckhardtcompression.com

Press contact:
Burckhardt Compression
Claudia Pröger
Global Marketing Manager
+41 52 261 50 70
claudia.proeger@burckhardtcompression.com

PR agency:
DMA Europa
Anne-Marie Howe
Progress House, Great Western Avenue, Worcester,
WR5 1AQ, UK
Tel.: +44 (0) 1905 917477
a-m.howe@markettechgroup.com
news.dmaeuropa.com