Asset Management in Manufacturing

Accessibility, transparency and digital transformation push condition monitoring technology toward a collaborative future

Matthew Jaster, Senior Editor

What's the secret behind a kinder, gentler shop floor where machine operators and condition monitoring experts partner up to solve manufacturing challenges? The common goal appears to be productivity, safety and accountability. PT products such as gears, motors, pumps, fans and bearings will—without a doubt—continue to run through rigorous and harsh environments for the foreseeable future, but software and hardware improvements aim to disrupt unplanned downtime and machine maintenance through a series of new condition monitoring assets.

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Why Condition Monitoring Will Be Pivotal to Making the Most of Wind Assets in 2023

2023 is set to be another big year for renewables, especially onshore and offshore wind generators, who are among the main beneficiaries of the Biden Administration's Inflation Reduction Act which will see significant investment by the federal government in renewable energy and associated technologies.

In the United States, nearly 70,000 wind turbines are in operation across the country, with their power capacity generating nearly 140 GW (*cleanpower.org/facts/windpower*). It is vital that the industrial sector maximizes the efficiency and longevity of the hardware which makes this energy production possible—the wind turbines. To do this we must leverage available data and digital

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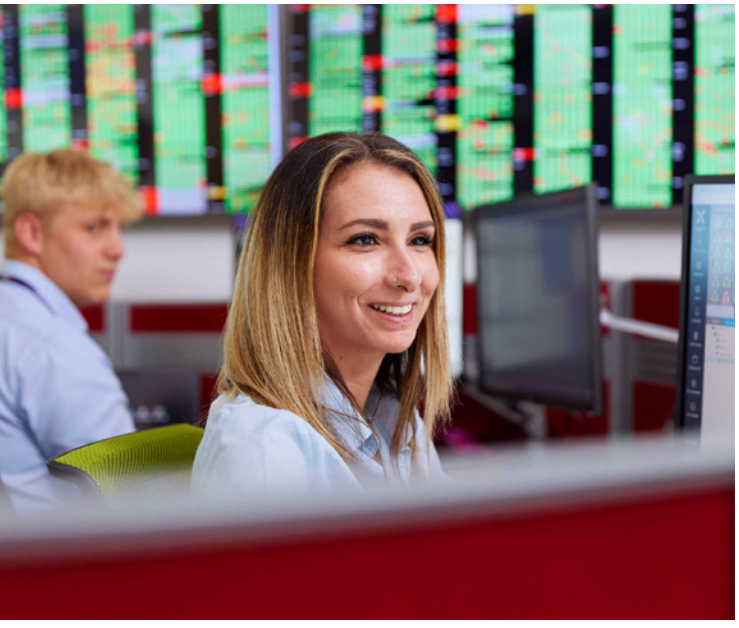
technologies, ultimately improving return on investment in the infrastructure.

"This is something which ONYX Insight is driving forward with its innovation and expert analysis throughout 2023. For operators, effective case management is front and center of their operations. In 2020, 75 percent of wind industry professionals stated that they were under more pressure to run projects profitably, and moving forward into 2023, organizations will see the value of how data can empower condition monitoring to achieve this and ensure maintenance is carried out when needed," said Dr. Evgenia Golysheva, vice president strategy and operations at ONYX Insight.

Embracing digital transformation helps wind owners and operators navigate potential pitfalls. However, the way forward is not always straight forward. Challenges to be tackled as the industry progresses include better integration and interpretation of siloed data, increasingly complex and growing portfolios, and industry requirements for more holistic digital tools, Golysheva said.

Independent providers of digital technologies, such as ONYX Insight, are well placed to help renewable asset owners manage their assets effectively. Unbiased and multidisciplinary, they can offer a deeper understanding of hardware, software and engineering to all. There is space for everyone as the whole sector expands, but the industry must think hard about asset management to safeguard profitability.

"ONYX Insight's own research has found on average, a 100 MW wind farm can produce 200 false alerts per year, resulting in approximately $200,000 in technician labor costs, transport to turbines and lost revenue during downtime. However high-quality predictive maintenance using advanced analytics can reduce those false alerts by 93 percent," Golysheva said.



Data-driven condition monitoring is especially useful for organizations who operate offshore wind turbines, where organizing and carrying out maintenance is complex and costly.

Data-driven condition monitoring is especially useful in this regard for organizations who operate offshore wind turbines, where organizing and carrying out maintenance is complex and costly. By enabling better decision making in offshore O&M, advanced data sensing can optimize fleets and support effective asset management, and in turn boost profitability.

"We are seeing technology and data playing a role in profitable life extension of earlier models of wind turbines. For example, ONYX Insight' ecoCMS has transformed the economics of retrofitting condition monitoring on older, sub-2 MW turbines enabling their modernization, risk management and life extension through detailed analysis and asset integrity monitoring," Golysheva said.

Keeping assets running and maximizing power production has been the default strategy of many operators. Moving forward, they will seek to maximize revenue by optimizing energy sales. This will require flexible operating strategies, underpinned by market pricing, where turbines can be uprated or derated to maximize the value of energy sold.

"In the year ahead, ONYX Insight expects to see greater collaboration between operators and condition monitoring experts to push further reductions in operational expenditure by resolving practical problems, while increasing MWh (megawatt hours) through bespoke analytics engineering. ONYX is beginning the year with the start of its 'Get Ready for the Windy Season' campaign, which will see ONYX work with those in the industry to further supercharge this," Golysheva said. "With world leaders agreeing late last year that we must increase the pace with which we transition towards renewable energies, it will act as a powerful catalyst to further strengthen wind energy's infrastructure."

onyxinsight.com

Balluff Touts Standalone Condition Monitoring System

The retrofitting of manufacturing plants has often failed due to the high effort and the associated costs for the permanent monitoring of relevant machine and process parameters.

With the flexible Balluff Condition Monitoring Toolkit (CMTK) system, users quickly gain deeper insights into the actual condition of machines and can, therefore, detect deviations and problems at an early stage. All components are perfectly matched to each other.

The Balluff CMTK, a standalone system which contains everything needed to monitor the condition of processes and machines, including data acquisition and visualization, now has UL approval for use in the United States and Canada. It provides an easy-to-implement solution for adding condition monitoring to existing machines and processes. With the flexible condition monitoring toolkit, manufacturers can quickly gain deeper insights into the actual condition of their machines and systems, allowing them to detect problems early.

Each system includes the hardware and software and supports up to four IO-Link sensors.

The Balluff CMTK contains everything needed to monitor the condition of processes and machines, including data acquisition and visualization.

The CMTK runs independently, providing actionable data no matter what controls systems are in place. The base unit is a miniaturized computer which can be installed on a DIN rail in a control cabinet for easy deployment. Four IO-Link ports allow to the addition of sensors to measure factors like temperature, vibration, humidity and pressure. Built-in software stores this data, visualizes it on a dashboard, and can send alerts and export data. Built-in LAN ports connect the CMTK either directly to a computer or to an existing computer network. Depending on the sensors selected, the condition monitoring toolkit can be used for a variety monitoring tasks.

This flexible system provides a smart and low-cost way to retrofit plants with comprehensive machine monitoring. The condition data gained through the CMTK provides continuous status information on connected machines, enabling users to perform predictive maintenance. This greatly reduces unplanned downtime and the unnecessary costs associated with it. And it does all this completely independent of a cloud connection or machine control system.

During SPS in Nuremberg, Balluff's exhibition space took condition monitoring directly to its customer base by using a built-in condition monitoring sensor for an automatic coffee machine. The machine not only provided coffee enjoyment during the talks, but also became a real use case thanks to a built-in condition monitoring sensor and machine learning capabilities.

"In order to show visitors concretely how our networked solutions work together, we visualize the data of the exhibits via a central dashboard," said Alexander Schmidt, business strategy manager at Balluff.

Visitors could access a multitude of recorded data including the fact that espresso was the most ordered beverage for visitors to the Balluff booth. This representation of condition monitoring was supported by other exhibits at the booth including CMTK and the Balluff Engineering Tool (BET).

balluff.com

Higher Efficiency Through Transparency

As its latest achievement, SICK AG is now presenting a condition monitoring sensor for simultaneous vibration, shock and temperature monitoring.

The SICK AG Multi Physics Box detects vibrations, shocks, and temperature, providing important indications of faulty processes.

When operating machines with rotating components, i.e., electric motors, fans, turbines or ventilators, it is important to ensure smooth operation and to detect possible signs of machine failure at an early stage. This is where the Multi Physics Box condition monitoring sensor is set to help in the future.

The new Multi Physics Box mpb10 simultaneously detects vibrations, shocks and temperature, thus providing important indications of faulty processes that can lead to machine or plant failures. Based on the sensor data, malfunctions can be detected at an early stage and maintenance can be planned depending on the condition. The result: cost savings and efficiency gains due to less unscheduled downtime.

To be able to identify incipient faults, data interpretation must of course be as simple as possible. And the Multi Physics Box also helps with this. For example, the sensor records vibrations via a MEMS element and processes them directly according to the configurations. The final data output provides indication values in the time and frequency range that are much easier to interpret than pure raw data. If the measured values exceed individually definable limits, an alarm is also output. A multi-level alarm according to ISO 10816-3 can even be implemented for monitoring vibration limits. An optional trigger ensures precisely reproducible measurements. The sensor itself can be integrated into the machine or system via IO-Link or via a simple alarm-based switching signal and functions both on-site and in conjunction with a cloud service.

SICK sees virtually no limits to the range of applications for the Multi Physics Box. The sensor technology is well protected by a robust stainless-steel housing; even fine dust or water cannot harm it thanks to protection class IP68. At ambient temperatures between -40 degrees Celsius and +80 degrees Celsius, the sensors are said to deliver consistently reliable data. Thanks to flexible parameterization options, the sensor can also be used in a wide variety of applications. In other words, the Multi Physics Box is suitable for continuous condition monitoring in almost any industrial context and serves as a reliable data supplier even under harsh environmental conditions.

sick.com

Future Considerations in Real-Time Quality Monitoring

Anomalies and errors in the production process usually result in cost-intensive rework, elaborate final inspections and delivery delays, which in turn have a negative impact on productivity and sustainability.

The goal should therefore be to ensure quality directly at the time of process execution. This is precisely where the German-Czech research project AIQUAMA (AI-based Quality Management for Smart Factories) comes in, which has now been launched with a recent kick-off at the Forum Digitale Technologien in Berlin.

AIQUAMA lists the German Research Center for Artificial Intelligence, the Czech Institute of Informatics, Robotics and Cybernetics at the Czech Technical University in Prague, the Central European Institute of

The AIQUAMA project team at the kick-off in Berlin (courtesy idw/Germany).

Technology and the VSB Technical University of Ostrava as project partners along with Volkswagen AG as an application partner.

"The AIQUAMA project is an immediate and concrete extension of the RICAIP project. The topics not only monitor, but simultaneously formulate the key research trends in the field of Industry 4.0 in the next decade and push the vision of Industry 4.0 to new goals. Importantly, these are trends that our core industry welcomes and supports," said Professor Vladimir Marik, scientific director at the Czech Institute of Informatics.

For additional context, the RICAIP is an international distributed research center of excellence (CoE) that focuses on research in robotics and artificial intelligence (AI). RICAIP is based on the strategic partnership of leading Czech and German research institutions. With a maximum degree of autonomy, it is hosted at CIIRC CTU. The center addresses the current needs, gaps and demands across Europe in utilizing Industry 4.0 concepts in manufacturing.

In order to avoid quality-related errors in advance, an intelligent online planning component will be extended in such a way that quality-related parameters are also taken into account in the best possible way during plan generation and task assignment. Especially in manual assembly or machining processes or in work steps performed by hybrid teams of humans and collaborative robots, errors still happen. One such error is, for example, a worker reaching into the wrong material box or the wrong tool during a manual assembly task or a robot giving a hand at the wrong time.

However, suitable combinations of different sensor systems should now enable errors in the production process to be detected earlier than before and therefore eliminated more sustainably. Detected errors are explained transparently via suitable user interfaces so they can be avoided in the future.

The zero-defect production targeted by AIQUAMA is to be based on incremental quality monitoring in real time. For this purpose, multi-sensor data streams are evaluated using artificial intelligence methods. The evaluation itself is based on real, but also synthetic (training) data, which is analyzed using a combination of symbolic models and statistical machine learning. This research project will span from January 2022 to June 2025 and will no doubt create new advances in real time monitoring for industrial applications.

ricaip.eu

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