CONDITION MONITORING

Intelligent solutions to reduce downtime and unplanned machine failures

Data-driven condition analyses and AI-based fault predictions are becoming increasingly important, and for good reason. Understanding machine health helps operate systems with the highest performance and predictable maintenance efforts. The foundation for this lies in flexible and practical condition monitoring systems that provide meaningful results with the help of smart components.

CONDITION MONITORING – WHAT IS IT FOR?

Plant operators know: machine malfunctions or faults can be expensive. As numerous studies have shown, unforeseen machine failures cost the industry millions of euros every year.

Optimizing Fixed Maintenance Cycles

Operators of large process plants therefore usually rely on fixed maintenance cycles to minimize the risk of unplanned downtimes. However, even then, time and money are often wasted because machine parts are replaced earlier than necessary.

Prevent production downtime

Operators of smaller plants, on the other hand, often only react when a failure or loss of quality actually occurs. However, the measurement-based assessment of production quality in the real operating environment is often complicated by heterogeneous conditions (e.g. varying batch sizes, different raw materials, changing material properties, etc.).

Accordingly, both predictive and reactive maintenance strategies have certain weaknesses in terms of efficiency and cost-effectiveness, which can be compensated by adequate condition monitoring.

REDUCE COSTS – INCREASE PLANNING RELIABILITY

Condition monitoring monitors the health state of machines and plants by means of sensors and suitable analysis methods. For this purpose, data is continuously recorded, and the recorded ACTUAL values are compared with the TARGET values of the machine.

This allows to detect anomalies and deviations; potential fault conditions can be recognized and localized. Moreover, timely forecasts for actually necessary maintenance measures can be made.

INFOBOX

WHAT DOES MACHINE HEALTH MEAN?

Machine health includes measures for monitoring the condition and detecting faults in machines and systems. The aim is on the one hand to record data during normal operation and to identify anomalies as faults (condition monitoring). On the other hand, impending impairments should be proactively detected in order to initiate maintenance measures in a timely manner (Predictive Maintenance).“

Linz Center of Mechatronics GmbH I Science Park I Altenberger Straße 69 I 4040 Linz I Austria I T +43 732 2468-6002 I F +43 732 2468-6005 I office@lcm.at

3 REASONS WHY CONDITION MONITORING DOES NOT (YET) WORK IN PRACTICE

Lack of sensors
To generate relevant data, appropriate sensors is required, which may be lacking, especially in older systems. In newer plants, some of the necessary sensors are already in place. However, for reliable condition analyses, they are often not sufficiently informative due to the lack of connections to operational information systems.

Low susceptibility to errors in modern systems
Many of today's systems are so robust that even over an extended observation period, no errors occur. While this may sound positive in principle, it complicates the design of a fault detection system. Many detection methods can only recognize a fault if it also occurs during the training phase.

External influences
Changing operating conditions (e.g., temperature variations, fluctuating raw material quality, etc.) in the operational environment make it difficult to detect gradual changes in machines. In many cases, it is therefore not possible to distinguish between wear and tear due to operational use and variations in environmental conditions.

SUCCESS FACTORS IN CONDITION MONITORING

If the necessary components for data acquisition and data analysis are already included with the system design of the plant, neuralgic areas of the machine can be considered right from the start, optimized strategically, and ultimately significantly better results can be achieved.

Simulation-based engineering
Model-based fault simulations play a central role in the engineering process. They not only support in the optimization of critical components, but also provide relevant data for future condition monitoring.

ADVANTAGES OF SIMULATION-BASED CONDITION MONITORING

- The plant system can train fault conditions during simulation-supported commissioning.
- In the event of design changes, data generation can be repeated at the push of a button, and the system can be adapted without requiring new measurement series.
- A functional analysis tool is already available during the initial commissioning of the machine.

OPTIMIZATION OF EXISTING SYSTEMS

Equally promising is maximizing the potential of existing sensors. Modern plant systems already record a multitude of measurements, providing a solid foundation for condition monitoring.

In addition, further components can be retrofitted into the machine, for example, to network multiple systems, upload data recordings to a cloud system, and create layered analyses.

CONCLUSION

Smart components offer completely new possibilities for condition analysis, fault detection and fault prediction in machines and plants. As experts in condition monitoring and predictive systems, we would be delighted to assist you in developing a customized solution.

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