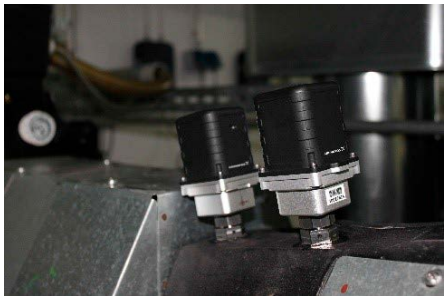
AUTOMOTIVE TEST BENCH COOLING WATER PUMPS UNDER 24/7 MONITORING

GRUNDFOS iSOLUTIONS

PUMP CLOUD SERVICES

In partnership with AUGURY

Grundfos ensures that the cooling water circuits for BMW M engine test benches are available without compromise thanks to the Grundfos Machine Health predictive maintenance concept. The system monitors the condition of the pumps, reacts to the smallest deviations and presents detailed analyses including a promising solution for any looming problems.



Grundfos Machine Health provides benefits for the operator, including greater confidence in the availability of the technology and the ability to plan the maintenance work and avoid unplanned downtime.

Overview

The figure is legendary and can be admired in many films: The grey-haired technician approaches the chugging diesel engine, places a screwdriver on the housing, carefully puts his ear on it and listens with an upward, worried look. After a while he announces: “The first valve is worn!”

This technician, who “hears” and “feels” imminent damage to machines during the daily inspection no longer works in most companies. However, in order to detect faults in technical equipment at an early stage before availability is impaired, sensors and clever diagnostics are required. Data-based and artificial intelligence (AI)-supported forecasts offer the operator the possibility of recognising things that were previously hidden, just like an X-ray image. Predictive maintenance further improves the cost/performance ratio of products, equipment and systems.

Targeted prevention of machine failures

Grundfos Machine Health is based on one of the world’s largest databases of typical machine noise, or vibration profiles, which enables extremely precise diagnosis. Moreover: machine data is transformed into recommendations for action – thanks to real-time messages and algorithms that suggest suitable repairs and maintenance measures.

High-quality sensors and smart algorithms monitor all critical aggregates around the clock. At the very first sign of a problem, Grundfos Machine Health reports back to the operator with a detailed analysis. Even the smallest changes in the machine status are carefully monitored and communicated in the form of easily understandable messages with concrete suggestions for action.

Engine test benches

BMW M is a high-performance car manufacturer based in Munich, Germany. Inspired by motor sports, exclusively equipped BMW M automobiles meet the highest demands for agility, dynamics and power.

The basis is provided by BMW M’s particularly powerful engines, which specialists first design on the computer and then test and optimise with test benches. These test benches test all engine peripheries. The aim is to anticipate real driving conditions even better on the test bench.

To ensure that at least the test benches do not overheat and provide reproducible data, the technical equipment is kept at moderate temperatures by cooling water. Grundfos pumps keep the entire cooling water infrastructure running, including the recooling plant on the roof: Five single-stage standard pumps of the NK series and three multistage high-pressure pumps of the CR series.

CASE STORY INFO BOX:

Topic: Predictive Maintenance with Grundfos Machine Health

Location: Munich, Germany

Customer: BMW M GmbH

Diagnostic as a Service

The Grundfos Diagnostic as a Service programme consists of three main components:

- Connection. Sensors collect the data (triaxial vibrations, surface temperature, magnetic flux) of the rotating equipment and continuously forward this information for cloud-based analysis.
- Diagnosis. The GMH diagnostic system, together with machine learning algorithms, analyses the collected data sets and thus determines usable findings.
- Optimisation. These insights are communicated both on Grundfos' web-based platform and via user-defined alerts. This provides the operator with the necessary transparency to solve machine-related problems.

Predictive instead of just preventive

Since the installation of these pumps in 2005, Grundfos has always been contracted to carry out machine analyses as part of service contracts – the traditional "preventive maintenance". This means that the condition of the pump has been checked at a certain point in time, and preventive maintenance has been carried out. Among other things, this service also included the regular replacement of spare parts.

Now the further development to predictive maintenance has taken place, with the advantage of a permanent monitoring of the machines (24/7) by means of sensors and receivers. Four sensors and receivers are installed on the NK pumps, and on the CR pumps two sensors and receivers are installed. This makes a total of 26 installed sensors or receivers. They form the basis of the Grundfos Machine Health (GMH) which has been implemented at BMW M since March 2020. As central parameters for the evaluation and analysis of the AI algorithms used for GMH, the vibrations of the installed pumps are recorded, as well as the magnetic field of the engines and the temperatures of the cooling fins on the engine.

GMH has been impressive for all those involved. Just a few days after commissioning, GMH provided initial maintenance and action recommendations. An important special feature of GMH is that the database used can make statements about the condition of the plant shortly after the installation of the sensors and receivers. The algorithms of the artificial intelligence do not have to be trained first, as is often the case. Thousands of stored noise and vibration patterns can be immediately compared with the installed machines – and not only for pumps: GMH also monitors compressors and fans (rotating equipment).

'Peace of Mind' for BMW M

GMH provided a significantly improved availability of the pumps and thus of the test benches – one of the main tools of the BMW Group engineers. At the end of the day, the use of the test benches is ensured, the maintenance staff have less work to do than before and costs are reduced. With GMH the customer can assume that even the slightest deviations from the ideal condition of the pumps will be indicated at an early stage and that the necessary maintenance work can be postponed to a favourable time. This is allowed "peace of mind" for a good night's sleep.

Conclusion

With the intelligent, predictive maintenance solution Grundfos Machine Health, the operator can eliminate problems before they occur. High-quality sensors and smart algorithms monitor critical assemblies around the clock. At the first sign of a problem, the system reports back with a detailed analysis including a promising solution for the looming problem. The operator can schedule maintenance measures in a targeted manner (if it is best suited to the operating procedure), they save costs and avoid expensive downtimes.

Grundfos supplied:

Grundfos supplied the Grundfos Machine Health (GMH) system to BMW M for use on the eight cooling water pumps for its engine test bench. GMH continuously monitors equipment using advanced wireless sensors. The sensor data is stored in the cloud and analysed by AI algorithms, capable of spotting even the slightest sign that the pumps and other critical assets need repairs. For more information please see our Grundfos Machine Health site.

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