Brüel & Kjær Vibro

A member of the NSK Group

BKV Beyond is installed at the NSK Kielce ball bearing factory

Application Note

Manufacturing

The water and air treatment utilities at the NSK Kielce ball bearing plant have been performing well over time, but in the long run, the interval-based maintenance strategy proves to be costly in terms of unneeded maintenance. Traditional condition monitoring systems can address these issues but there can be considerable capex expense in installing and maintaining such as system. BKV Beyond offered an entirely different solution.



Figure 1. NSK Kielce Plant in Poland.

NSK Kielce plant

The Kielce plant, NSK Europe's largest plant, is a major supplier for the NSK automotive bearings business in Europe. Existing production includes ball bearings for chassis, powertrain, engine and electrical motor applications. A major department of NSK's European Technology Center (ETC) is also housed at the Kielce plant, where the team focuses on product development and testing.

In response to the introduction of European REACH regulations, the Kielce plant has taken a number of initiatives to manage CO2 emissions, waste water and chemical treatment and to ensure clean air for the work environment. Some of these assets are the focus of this use-case.

CHALLENGES

The water treatment plant and air treatment machines play an important role in the plant, not so much from a production point of view but for maintaining healthy working conditions for the employees and minimizing emissions to the environment.



Figure 2. One unit of the water treatment installation, showing two wireless sensors on each pump.

There are two water treatment installations in the plant with three pumps each (Figure 2). One or two pumps are operating at any time for each unit with the rest on stand-by. For the very critical air treatment part of the plant, there are 10 fans (Figure 3).

Previously all these machines have been serviced at fixed maintenance intervals, but this proved to be costly.



Figure 3. The critical air treatment system where 10 fans are monitored.

A condition monitoring solution could conceivably increase the time between maintenance intervals for these machines, but a traditional monitoring system requires expertise and cost to install. Moreover, there was nobody in the plant that had sufficient diagnostic expertise to just look at data and then decide when maintenance had to be done. A simpler condition monitoring solution was needed with advanced actionable insight.

SOLUTION

Monitoring strategy Each water treatment pump included two sensors to monitor the condition of the bearings, unbalance, looseness, misalignment as well as any problems with the impellers and motor. This was accomplished with velocity and acceleration vibration signals, a high frequency crest factor measurement and temperature.

There was only a single sensor on the driven-end bearing housing of the fan's motor for the air treatment utility, but the monitoring strategy was similar to that for the pumps.

In both cases, it was determined that wireless sensors could be used, which would greatly simplify the installation. These were glue mounted on the bearing housing, so no screw holes had to be drilled and tapped. The dynamic frequency response for this sensor and mounting is sufficient for the potential failure modes to be detected.

Monitoring system The BKV Beyond platform was selected as the ideal condition monitoring solution for the air and water treatment utilities.

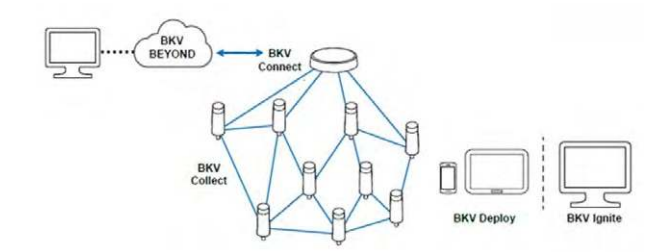


Figure 4. BKV Beyond system topography.

The primary reasons for selecting this system were:

- **Small footprint** – The only part of the system that needs to be installed on premises are the BKV Collect wireless sensors and the BKV Connect gateways. No on-site database server is needed since all data is stored off-premise and no monitoring server is needed either since all signal processing is done remotely on the data.
- **Simple installation** – No tedious wiring has to be done for the wireless sensors, and the BKV Ignite web-based software simplifies the system configuration. Once the sensors are installed, the configuration and commissioning is completed with the help of the BKV Deploy app. Here, sensor information is obtained by reading the QR or NFC codes with a mobile phone.
- **Web-based dashboard** – All necessary monitoring information on the pumps and fans can be accessed remotely - anyplace, anytime.
- **Accurate, reliable diagnostics** – An AI algorithm is used to simplify detecting measurement changes, so it is not necessary to guess what the alarm limits should be when implementing the system. Further development of AI algorithms is planned to provide actionable insights to give longer lead-time to maintenance. Whatever the application, the AI results will always be verified by specialists.



Figure 5. BKV Collect wireless sensor is shown on the left (the QR code, not visible, is on the back of the sensor). The BKV Connect gateway is shown on the right.

RESULTS AND BENEFITS

User-interface An example of the pre-configuration site survey is shown in Figure 6, and the monitoring dashboard is shown in Figure 7.

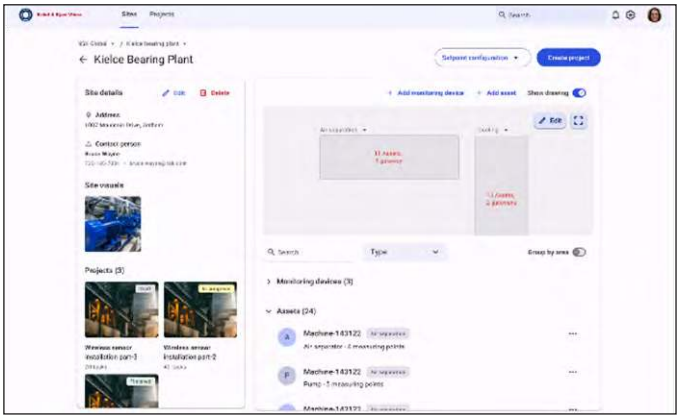


Figure 6. Pre-configuration site survey.

Installation and operation At the time of this writing, the system was just installed so there were no cases yet where faults were detected and diagnosed. Nevertheless, the benefits of the system are still evident. The entire process of implementing and operating the BKV Beyond system is a fraction of the cost for a traditional monitoring system. There is no on-premise hardware or software except for the sensors and gateways, and these can be installed by inhouse technicians.

From an operational point of view, advanced fault detection can be done remotely and as well as fault diagnostics, so there is no special requirements for customer expertise in this area. If there is an inhouse vibration analyst expertise present, their workload can be reduced so they focus on more pressing issues. The plant and machines are relatively new, but as experience is gained, the planned shutdowns can be planned further apart using input from the condition monitoring system.

Łukasz Dulemba, Manufacturing Project Engineer at NSK Europe, says “Thanks to the wireless sensors, the installation went quickly. As always, there were challenges, as for example the connectivity range around metal housings, but these were also resolved quickly. Thanks to the participation of the Brüel & Kjær Vibro professionals, everything went smoothly. As a result, we have live data and insight, which will allow us to improve our total productive maintenance (TPM) accuracy. Of course, this project is only the first step towards monitoring the condition of production equipment across a number of NSK plants, in order to improve both machine availability and production quality.”

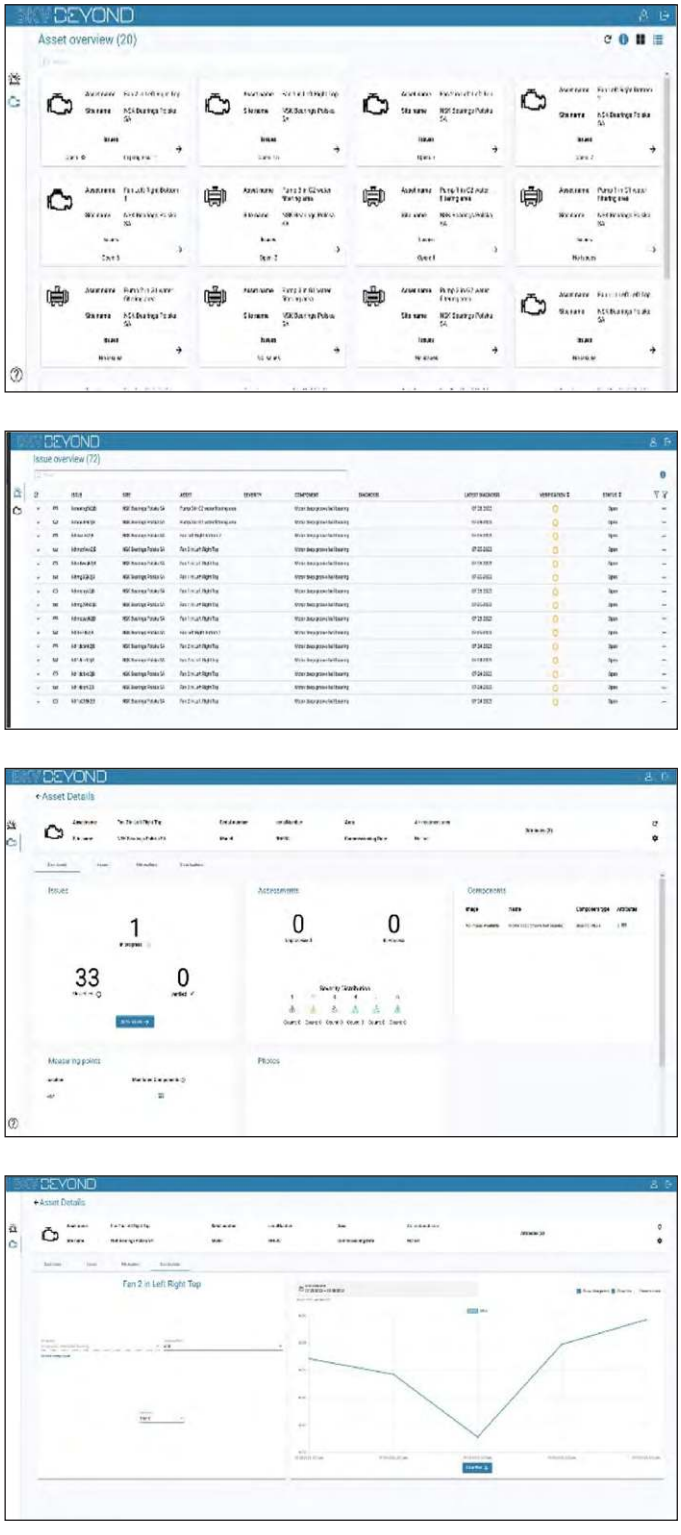


Figure 7. User-configurable dashboard showing an overview of the health assessment as well as asset details.



Plans for the Future

The NSK Kielce maintenance department has been actively using the system after a short installation and commissioning phase, and there are already plans underway to extend the monitoring system in the near future. This includes monitoring a single critical kerosene pump in the filtering station. Kerosene is used for cleaning and cooling all the machining tools, and production will stop if the pump ever stops. There are also plans for monitoring the spindle bearings on six high precision grinding machines.

These can be replaced before they affect the quality and specs of the machined components. And lastly, from a data management point of view, there are also plans to send data from BKV Beyond to the CMMS system (computerized maintenance management system) at the Facilities Management office. This will enable maintenance technicians to have immediate access to the monitored machine's condition in order to more effectively plan maintenance.

LEARN MORE AT
www.BKVibro.com

Contact Us

Germany

Brüel & Kjær Vibro GmbH
Leydheckerstrasse 10
64293 Darmstadt
Germany

Call: +49 6151 428 0
Fax: +49 6151 428 1000

Denmark

Brüel & Kjær Vibro A/S
Lyngby Hovedgade 94, 5 sal
2800 Lyngby
Denmark

Call: +45 6989 0300
Fax: +45 6989 0301

USA

BK Vibro America Inc.

1100 Mark Circle
Gardnerville NV 89410
USA

Call: +1 (775) 552 3110

info@BKVibro.com

www.BKVibro.com

BAN0093-EN-11