Brüel & Kjær Vibro

A member of the NSK Group

# Brüel & Kjær Vibro field monitors watching over tons of steel production in China

Success Story

Steel

**Steel production in China is phenomenal. As the world's largest producer, almost 1 billion tonnes are produced each year, most of which is devoted to internal consumption to meet growth demands. Brüel & Kjær Vibro's small compact field monitor for advanced machine condition monitoring has been successfully monitoring the mammoth production of steel rod and wire rod at one of the subsidiary plants in southern China. (Figure 1)**

*Figure 1. Chinese steel mill plant. Steel rod shown on the right.*

*Figure 2. The VDAU-6000, previous field monitor to the VCM-3, is shown installed at one of the machine group areas.*

The Brüel & Kjær Vibro (B&K Vibro) VDAU 6000, forerunner to the VCM-3, (Figure 2) was selected by the maintenance department to monitor the rolling mill and flying shear motors and gearboxes, reheating furnace fans and water pumps at a major steel production plant in southern China. One of these machines is shown in Figure 1.

A number of measurement techniques, e.g. descriptors, are used for detecting a wide range of potential failure modes. For the critical rolling mills, these are operating at different loads and speeds for different products and

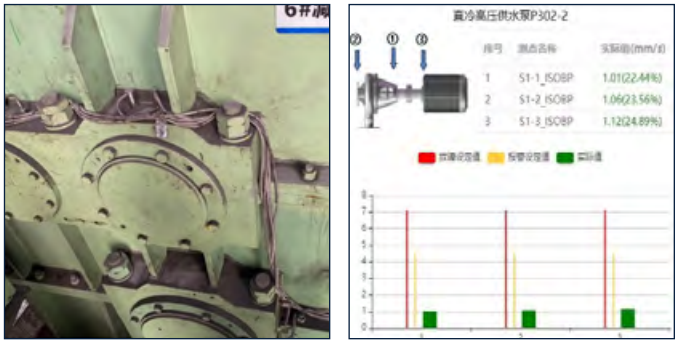

*Figure 3. (Left) Rolling mill gearbox showing accelerometer installation. (Right) SCADA screen showing ISO overall measurement values for three measurement points plus the configured alarm limits for a high-pressure water pump.*

require specialized early fault detection descriptors. For the water pumps, however, which operate at a fixed load and speed, these are monitored by simple ISO 10816 overall vibration measurements, as shown in Figure 3.

## SCADA system is utilized as the vibration monitoring server

What is unique about this steel mill monitoring application is that the field monitor raw data is transferred directly to the SCADA system via Modbus TCP for storage, trending, alarming and fleet monitoring of the assets, as shown in Figure 4. No proprietary monitoring system server or even historian was needed for this purpose, as the SCADA system was sufficient for all these monitoring functions. Moreover, the vibration data can be correlated to the process parameters monitored by the PLCs, such as motor voltage, current, torque, winding temperature, lubrication flow, lubrication pressure, etc. This improves diagnostic reliability by distinguishing vibration changes that are due to operation from those that are due to a developing fault.

*Figure 4. Clockwise from upper left: control room big screen, B&K Vibro vibration data shown on the control room big screen, various SCADA screens showing alarm status.*

## Overview of all machines' condition

There is also a fleet monitoring function provided by the SCADA system for the different machine areas being monitored, as shown in Figure 5. This function gives an overview on the condition of all monitored machines in their respective machine groups, enabling maintenance to be more cost-effectively planned. It also highlights problem machines that could require a root cause analysis to resolve recurring maintenance issues.

## Diagnostic tools for deeper insight

The measurement trends give an indication of the detected fault severity and how it is changing over time. From time to time diagnostics also has to be done in the form of spectrum frequency analysis to better identify the type of fault and its location, as shown in Figure 6. This is not done in the SCADA system, but it can be remotely done by diagnostic specialists using the B&K Vibro VibroSuite WTG Analyzer software.

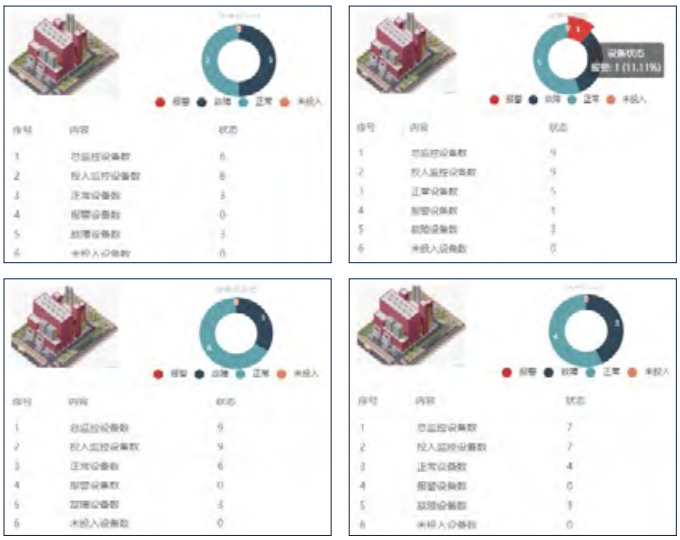

*Figure 5. Screens showing the number of measurement points in alarm, in normal condition, diagnosed faults, etc., for various machine groups.*

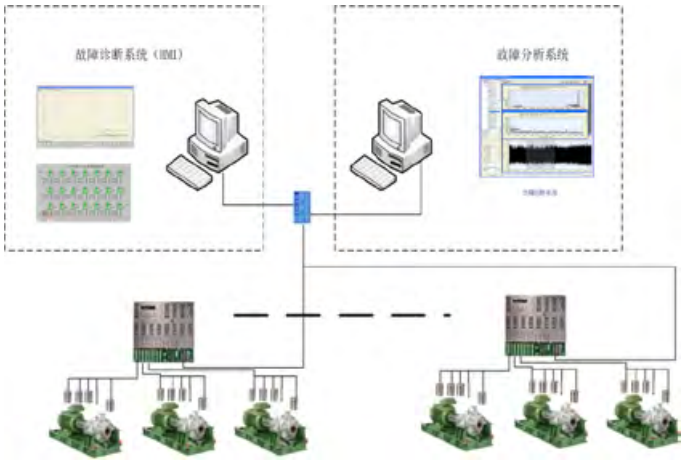


*Figure 6. Topographical diagram of the field monitor network showing alarm event handling in the SCADA system on the upper left, and frequency analysis work being done in the VibroSuite WTG Analyzer software on the upper right.*

## Conclusion

Although there are a relatively large number of machines being monitored, it was determined that still a field monitor solution would be much more economical than a rack-based system but still provide the same condition monitoring capability.

A number of successful benefits were achieved since the field monitors were installed. Firstly, the digital transformation of connecting the field monitors directly to the SCADA system reduced IT infrastructure capex and maintenance requirements since no monitoring server was required. As the process parameters were readily available, this data is correlated to the vibration data for more reliable diagnostics.

Secondly, remote diagnostics can be done at anytime to gain better insight into the detected machine faults. Lastly, fleet monitoring capability gives a better overview for making reliable operation and maintenance decisions.

The end result of all of this decreased the workload of maintenance staff, the number of inspections previously required and enabled more focus to be put on the critical equipment. This in turn gave more production uptime, more efficient and reliable production, reduced the life cycle costs of the assets, and reduced inventory of spare parts.

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## Contact Us

**info@BKVibro.com**
**www.BKVibro.com**

### 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