

Remote Monitoring Solutions from Hosokawa Micron Provide the Smart Answers To Reliable Milling Plant Operation

With advances in sensor and communications technologies related to the Industrial Internet or 'Internet of Things' machinery manufacturers and suppliers can now remotely monitor the operation of their machinery at production sites.

For companies where experienced engineers are responsible for operating more than one production system, particularly when in remote locations, the benefits of being able to see control screen information, at another location are tangible. However, increasingly, the capability of this type of monitoring technology is seen as having the potential to deliver much more.

The installation of Hosokawa Micron's Remote Monitoring Solution on an ACM, Air Classifier Mill size reduction system provides manufacturers with a real and practical insight into the Hosokawa Micron monitoring system's day to day functionality, benefits, market advantages and potential for getting the best from existing plant and equipment.

Condition monitoring for preventative maintenance is a popular use of many remote monitoring systems and whilst the Remote Monitoring Solution from Hosokawa offers this it delivers much more besides – including on-line diagnostics for improved plant availability, analytics designed for improving product quality and remedial workflow instructions that can minimise downtime.

Hosokawa Micron's Remote Monitoring Solution was retrofitted to a powder milling plant with processing steps controlling the feed-rate of raw material and additives, mechanical grinding and classification then filtering of the exhaust air and bagging of product materials.

Measurements connected to the data logging module included the status, speeds and current for each of the electric motor drives and the system air flow and pressure measurements. These were supplemented by two additional sets of measurements from the milling plant and connected to the data logger to provide improved condition monitoring and plant operation. Firstly measurements of vibration and temperature were added to the main bearing housing of the mill to help provide an assessment of condition of the bearings and secondly an online particle size analyser using laser diffraction technology was fitted to the product line to provide a continuous measurement of the D10, D50 and D90 particle sizes. All the measured values were uploaded to the Cloud every 2 minutes via the GSM connection of the data logger.



Figure 2.

Figure 2 shows an example user interface display from the milling facility which runs as a native app on most common mobile devices. Both live values and historical trends of data can be accessed. Condition based alerts are sent to users in the event of a pattern in the incoming data indicating either a developing problem or an abnormal operating issue. An important aspect of the alerts is

that they take into account the operating conditions on the mill and the duration of time they are active before being sent. Predictive Analytics are used to provide an estimate of the expected values of key variables such as vibration levels and drive currents for different products and grades.

Remote Monitoring Benefits

The full expected benefits of installing the system at the production site, combined with remote technical support provided by Hosokawa equipment experts are from the following areas:

Reduction in unplanned shutdowns

Potential causes of unexpected shutdowns of powder processing equipment range from failure of mechanical components such as bearings or belt drives to operating problems such as blockages or clogged filters. An example of how a problem developing in the main mill rotor drive bearing can be detected by remotely monitoring the vibration level of the bearing housing shown in Figure 3.

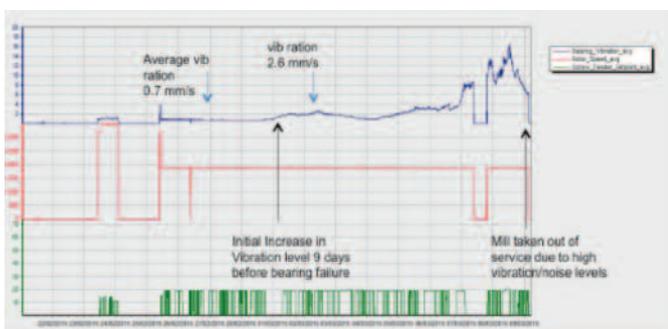


Figure 3.

In this case an unexpected increase in the level of vibration occurred 9 days before high vibration and noise levels resulted in the mill being taken out of service. Inspection of the mill internals indicated high bearing wear due to failure of and internal rinse air flow rate. Early warning of a mechanical failure allows operations to schedule plant maintenance with minimal disruption to production schedules and also minimises the likelihood of off spec product due to incorrect machine operation.

Fewer Site Visits

Site visits to inspect the condition of equipment are typically scheduled at regular time periods or to some operating problem with the machinery. The issue with servicing at regular time periods is that it does not necessarily reflect the actual level of use: the machine may be in operation for a different number of hours or with different materials and loading. Remote monitoring allows these factors to be continually monitored by keeping track of the operating hours of key equipment items such as motor drives and the time spent processing different materials so that maintenance visits are made only when warranted.

Site visits to diagnose operating problems typically involve observing the values of local measurements along with the physical examination of equipment. Our experience with remote monitoring on the processing plant is that many problems can be diagnosed remotely by detailed analysis of the trends of key measurements in conjunction with input from end users at the site. To assist end users in diagnosing problems a knowledge base of common problems and the relevant checks to determine their root cause has been developed. An example of this could be troubleshooting guidance for problems such as low airflow or the mill absorbing more power than expected. Remote monitoring can potentially shorten the time to rectify problems by days or weeks compared to the time it may take to get qualified personnel to a remote site.

Improved Equipment Performance

In addition to providing an early warning of developing equipment problems remote monitoring can also be used to highlight where there is an opportunity to improve performance in areas such as minimising energy consumption and/or increased throughput. For example the analyser on the milling plant for measuring particle size distribution allows an advisory notification to be generated when a significant level of overgrinding is taking place in the mill. Similarly where there is an objective to maximise production an advisory notification can be issued to the end user if there is spare rotor load capacity or if air flow rate should be increased. This type of opportunity for improved performance which may be caused by changes in feed material quality or changes to machine operating characteristics may be missed by local production staff but can be detected by the continuous monitoring of the Cloud based system.

Increased visibility of operations

An additional benefit from installing remote monitoring on the milling plant is the greatly increased visibility of the operational performance of both the plant staff and the staff working away from site or available on standby. Previously operating information was only available via a manual shift log. Now as well as the displays of live values, trends and alerts a report summarising key production indicators for the previous day is automatically emailed to all site management. The report tracks running hours, active diagnostic warnings and average values for measurements during the course of the previous 24 hours of operation. The daily production report has resulted in improvements in scheduling of production runs particularly around shift changeovers and provides a record of the machine performance and settings for each batch production run.

For manufacturing companies cautious about allowing any external access to their site based automation and control systems it is worth confirming that Hosokawa Micron's Remote Monitoring system is kept completely separate from any existing control systems.

The data logging module transfers real time measurement values at regular intervals to a Cloud based server via a GSM connection (standard mobile network data connection). Incoming data to the Cloud server is continuously monitored for patterns which may indicate a developing equipment problem using a combination of rules based expertise and predictive analytics.

Site personnel and/or a remote support team can access a combination of live values, trends and condition based alerts via either a secure web portal or secure mobile apps running on iOS or Android devices. The type of data accessible to different users, such as which measurement values can be viewed and over what time period, can be restricted in order to maintain the privacy of sensitive data.

