MONITORING THE VESTAS V47 WIND TURBINE

Prior to the year 2000 most wind turbines would have come from the OEM with very limited health monitoring capability, usually only consisting of a SCADA (supervisory control and data acquisition) system which provides data at 10-minute intervals

This data, although essential for providing key information on the turbine's operating status, doesn't provide enough detail to allow the wind turbine operator to make well-informed maintenance and repair decisions. For this reason wind turbine owners and operators of these older wind turbines are looking to 3rd party condition monitoring system providers to add the functionality needed to allow these decisions to be made.

In-line continuous oil monitoring system

Condition monitoring systems (CMS) consisting of a range of sensors and acquiring data at sampling rates typically above 50 samples per second are able to provide key insights into machine health including the remaining useful life (RUL) of key components.

CASE STUDY

Turner Iceni, a Glasgow based company, have recently added a Vestas V-47 wind turbine located in central Scotland to their portfolio of assets being monitored by their M-HAS (Machine-Health Assessment System) condition monitoring system. The owner of this wind turbine was looking to install a low-cost condition monitoring system which provided sufficient information to allow maintenance or repair action to be taken and major failures of key components to be avoided.

Based on the owner's requirements and the type of wind turbine to be monitored Turner Iceni opted to monitor the health of the wind turbine using vibration and in-line oil analysis - the versatility of the M-HAS allows a system to be configured with a variety of off-the-shelf sensors which are best suited to the wind turbine to be monitored.

ANALYSIS

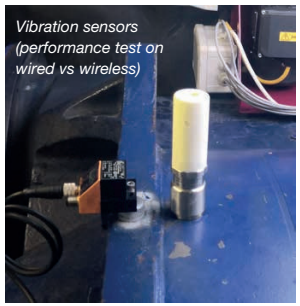
Analysis of vibration data is becoming common practice for monitoring wind turbine drivetrains. For this specific application Turner Iceni have installed wireless Bluetooth accelerometers which have the advantage of reducing installation and turbine downtime.

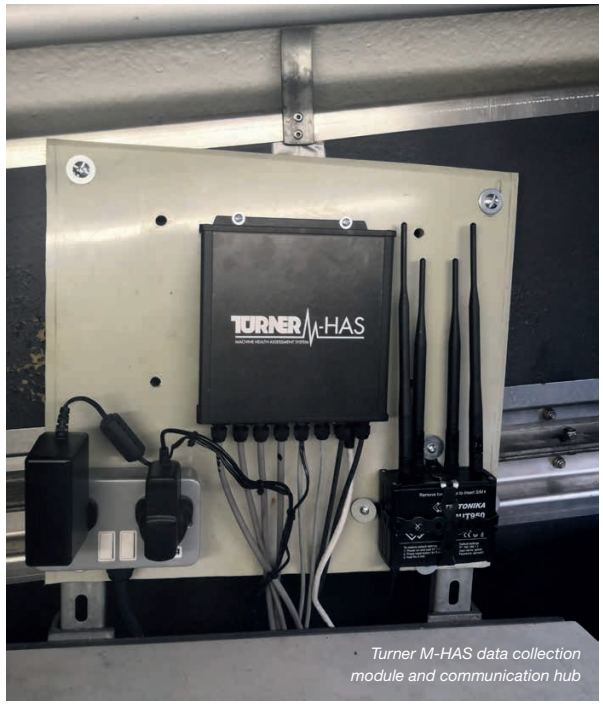
By analysing the data from these sensors in the frequency domain, frequencies related to specific components can be isolated. As a fault develops, it is possible (following selective filtering) to detect the presence of sidebands around these key component frequencies which increase with fault severity.

The in-line oil particle sensor will monitor the progressive increase in wear metal particles (ferrous and non-ferrous) as they increase in count and size. This will give an indication of the health of the gearbox and allow impending faults to be detected by sudden increases in particle count and size. Having an in-line sensor monitoring the oil continuously will allow a decision to be made as to whether a more detailed endoscope inspection is required.

ADDITIONAL INFORMATION

In addition to the data captured from vibration and oil sensors, M-HAS also logs SCADA data (power output, wind speed, rotational speed, and others) to allow the wind turbine's operational state to be included in the analysis. Due to the stochastic nature of wind turbines it is essential to know what operating state the wind turbine is in when looking at sensor data – particularly vibration data.


Vibration sensors (performance test on wired vs wireless)



Turner M-HAS data collection module and communication hub

Utilising both CMS and SCADA data is a cost-effective way of carrying out condition monitoring by using the already available data and reducing the CAPEX on new equipment.

The output from a CMS must allow the wind turbine operator to make maintenance and repair decisions by providing 'useful' information. The useful information is most commonly known as the RUL. Real time measurement combination of vibration and oil analysis data with historical fault information will allow a value of RUL to be determined. This value can then allow the cost implications of maintenance or repair actions to be calculated.

USER-FRIENDLY WEB-INTERFACE

All of the data acquired by the M-HAS is displayed on a user-friendly web-interface. Within this interface the user is immediately informed of the wind turbine's health status and is notified if any alarms have been raised. These alarms can be set by the user and are in addition to the more complex algorithms in place within M-HAS.

The M-HAS system can automatically generate status reports for the scheduling of scope inspections, requirement of parts and servicing and the requirement for a replacement gearbox and lead time for the likely replacement.

SCAN/CLICK SERVICES LOGIN WEBSITE

Turner Iceni