



Wireless Vibration Monitoring – improves reliability and enhances safety

Taking advantage of the ease in which new measurement devices can be introduced to an existing Smart Wireless network, our Barking Power Station is using a wireless vibration transmitter to monitor rotating equipment remotely and in real time. The introduction of this device is helping to improve maintenance schedules and prevent unexpected downtime says **Travis Culham**, Rotating Machinery Engineer.

Rotating machinery will eventually wear and require maintenance to prevent failure, but understanding when to schedule maintenance becomes all the more important when a machine is critical to operations or has a record of catastrophic failure.

Monitoring techniques for rotating machinery have improved greatly in recent years, with advanced vibration monitoring and analysis tools now able to identify even the slightest changes in the condition of an asset - as they are taking place. Online vibration monitoring can help to predict when a failure will occur and alert maintenance as to the health status of the equipment. Early warning of impending failures can prevent process shutdowns that lead to lost production. Continuous monitoring is making an important contribution to these improvements. At Barking Power many of the largest and most critical pieces of rotating equipment have vibration monitoring permanently installed: ideally, all rotating equipment should be monitored, but the cost of doing so would be prohibitive.

For smaller, lower cost and less critical assets, we perform manual monitoring to try and detect potential problems before they develop into more serious incidents that can cause unscheduled outages. Where possible, handheld monitors are used to take readings during the crucial plant start-up and shutdown phases. This can work reasonably well, especially if performed regularly and the data is carefully analysed, but sometimes it is simply not possible to perform all the manual measurements we would like.

MAINTAINING STARTING MOTOR AVAILABILITY

One of our starting motors, housed in a gas turbine auxiliary compartment, illustrates the challenge. With no available cable infrastructure in place, it was not possible to cost-effectively add continuous vibration monitoring. Instead, manual readings were taken using a handheld collector and then downloaded for analysis. When a potential problem was identified through excessive vibration, we needed to monitor the motor more frequently whilst waiting for the next scheduled period of downtime. This was important as these motors have a history of problems that can lead to total failure requiring replacement of the entire motor.

Despite the potential problem, we wanted to continue to run the motor; otherwise this affected our ability to run the related turbine, reducing our maximum output capacity by 200MW. Shutting the motor down immediately and completing a total overhaul would make the turbine unavailable for approximately 36 hours. Potentially this could cost our company as much as £50,000 in lost revenue, depending on the price and demand for power on that day.

The problem we faced was that it was essential to know if the motor was about to fail so we could take it offline before serious damage resulted. But because the vibration indicated a possible impending failure it was agreed that we would not expose any of our staff to this potential situation. Safety is our number one priority so we cannot allow personnel to enter areas like this where a potential safety situation may arise. The question therefore was how could we monitor this motor and assets like it in critical situations? An alternative solution was required - we needed to install a vibration monitoring capability on a temporary basis, quickly and cost-effectively.

IMPROVING RELIABILITY AND SAFETY

The ideal solution to our problem was provided by an Emerson's CSI 9420 wireless vibration transmitter. A smart wireless network had already been installed at the plant to collect stranded control valve diagnostic data. One of the key advantages of this type of wireless technology is the ease with which new devices can be added to the network - you simply install a new device and it automatically connects to the wireless network and starts transmitting data immediately. This could provide a very quick, easy and cost-effective solution, with the added advantage that you can position devices where and when you need them most.

We installed the transmitter on the starter motor that is located within a gas turbine auxiliary compartment, which effectively acts like a Faraday cage. The placement presents a tough environment for wireless and it was thought that a repeater transmitter would be needed to bridge back to the network. However, having installed the device during

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A wireless vibration transmitter mounted outside the turbine enclosure

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a period of downtime, it instantly joined the network and transmitted data without any problems. The smart wireless network is extremely robust and the performance in this application exceeded our expectations. This success gave us great confidence - if smart wireless technology could be applied here, then it could be applied pretty much anywhere throughout the plant.

Vibration data was transmitted from the motor, via a wireless gateway, directly into our existing Ovation™ expert distributed control system data historian. This enabled us to monitor vibration during operation, and by trending the data we were able to determine when the motor was going to fail. The wireless transmitter provided continuous visibility to the health of the motor enabling it to be run with confidence. Fortunately, there was no failure whilst the plant remained online and the motor was fixed when market conditions allowed a period of downtime for maintenance, minimising the financial impact of the outage.

This experience confirmed that the performance of the wireless vibration transmitter was as good as a portable vibration measurement device, but with additional advantages. For example, there was no need to physically obtain the readings, which was paramount for this application. Vibration monitoring of the starter motor using a handheld collector was simply not an option. Without the wireless vibration transmitter, we would have been unable to monitor the starter motor safely and would have had to take it out of service – with all the negative production impact that would have entailed. Additionally, removing the need for maintenance personnel to visit the plant floor reduced risk.

Another advantage is that the data is continuous and always available. When we used a handheld collector the data would usually be collected one day and then analysed the next. The data is now easily trended in the Ovation historian providing alerts to potential problems. This frees up maintenance resources to do other jobs.

MOBILE MONITORING

The success of this initial application encouraged us to use the wireless vibration transmitter as a mobile device to monitor various types of rotating equipment, where and when it is required. Generally the equipment we are

monitoring with the wireless transmitter is deemed less critical to the process. The assets can often be found in hard-to-reach locations and do not currently have permanent health monitoring in place, but the transmitter provides us with the opportunity to perform very accurate continuous monitoring of such assets. It can be configured for a variety of low-power accelerometer sensor input options including one accelerometer, one accelerometer with embedded temperature, or two accelerometers. This provides great flexibility.

We can now apply the vibration monitoring to problematic machinery for a period of time and trend the results, which alerts us as to when the asset is likely to fail and allows us to improve our maintenance scheduling. As another example of this, when we were concerned about the condition of one of our turbine barring

motors, we decided to install the wireless transmitter to keep an eye on it. Without this capability we would have had to take it offline immediately, even if failure was not imminent. By gaining visibility as to the actual health of the motor we were able to run it for an additional three months. This extra time enabled us to tackle more pressing tasks, and optimally schedule the motor maintenance.



Vibration sensors attached to a steam turbine barring gear box

CONCLUSION

At Barking Power we want to continue to use technology to avoid forced outages by gaining a greater understanding of the health of our machinery. The advantages are clear. We no longer need to have plant personnel make as many trips to the field, so safety improves. We receive vibration data transmitted from the motor, via a wireless gateway, directly into the existing Ovation™ expert distributed control system's data historian. This enables us to estimate when a motor is going to fail. The real-time information from the wireless vibration transmitter provides valuable insight that can prevent unplanned shutdowns and improve maintenance scheduling and reliability. ✨

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