

First complete on-line condition monitoring installed at wind park

In March 2004, a group of European wind energy companies/operators visited the Enertrag wind farm in Germany where 126 SKF WindCon systems (on-line condition monitoring) will be installed. This is the world's biggest on-line condition monitoring installation in the wind industry. The visitors saw the SKF system in operation and got very positive feedback from the German customer.

The SKF WindCon systems have vibration sensors mounted on the mainshaft bearings, the drivetrain gearbox and the generator of each turbine. By continuously monitoring vibration signals from the rotating mechanical components and taking data from the turbine control system the engineers at Enertrag can be warned of a change in turbine performance. This usually means the start of abnormal operation, which can be a transitional problem or the start of a serious fault development. By having such early warning the management of the wind park can identify the machine or component in a machine that is operating sub-optimally and can study the rate of deterioration of operation. This information allows them to incorporate any necessary inspection and repair work during planned machine stops, which means no unexpected downtime, which in turn means no unexpected costs, while maintaining optimum uptime of their turbines.

The installation and commissioning was planned to begin in Autumn 2003 and continue through 2004. In March 2004 SKF took a group of 15 European wind park operators to one of Enertrag's wind parks to see for themselves how the SKF WindCon system operates and gather some feedback from real time users of such a system.

The European wind park operators from Denmark, England, Ireland, Belgium, and The Netherlands were welcomed by Dr Konrad Iffarth, MD of Enertrag Energiedienst, and members of his team at the Uckermark wind park, near Berlin.

At the Uckermark wind park there are 20 SKF WindCon systems installed with more coming on-line in a steady stream throughout the year.

Dr Iffarth's team took the European operators into the nacelle of two of the turbines to get an idea of the positioning and robustness of the sensors and cabling around the main components of the drivetrain. Since the SKF WindCon was developed to withstand the extremely tough conditions of offshore wind parks the Enertrag people confirmed that there was absolutely no problem with robustness, weather resistance or performance of any of the sensors and associated cabling.

While their colleagues braved the wind at sub-zero temperatures and 80 metres above ground, some of vibration specialists of the European operators stayed on the ground to study the output from the SKF WindCon systems. Interfaced to the standard Enertrag computer network, the European operators saw that access to the data was possible from any PC in the network. With a Windows-like graphical user interface the key components being monitored could be seen with easy-to-recognise traffic light signs to indicate normal running, caution, or danger.

All were showing green; normal running. For a normal inspection of the turbines this is enough and judgements about machine performance can be made by non-specialist persons.

If an orange or red signal was lit a specialist vibration engineer could click on any of the sensor positions and obtain some historical data from measurements that have been taken. Using these historical trends the engineer can identify an underlying Fast Fourier Transform (FFT) and extract that for analysis. Such an FFT tells which frequencies have been responsible for high vibration levels or alarms. And this is just the kind of information that Enertrag's vibration specialist want to have and can easily work with.

The European operators were also shown how different speed classes and different point configurations can be isolated for review. This allows speed related trends to be specifically built, which is a special feature of the SKF WindCon system.

During an open discussion with Dr Iffarth a number of questions were asked concerning the philosophy of Enertrag and their decision to invest in the SKF WindCon system.

“Enertrag is company that is quite big in this region of Germany and has wind parks also in France. We intend to grow in the green energy sector inside Germany and also outside,” said Dr Iffarth. “We have taken the view that reliability and availability are key factors in the profitable production of energy from wind turbines. The SKF WindCon system will help with those two criteria by reducing unexpected breakdowns to all the 126 turbines that are to be fitted. It will give us very early warnings of any negative trends for key components in the turbine and be fairly clear about the nature of the trend. When we decide that the trend is becoming unacceptable we can plan repairs at normal shutdowns, and this will mean a fast return to full and safe operation. The data that we get from the SKF WindCon system will also allow root cause analysis, which will help to prevent reoccurring failures.”

Furthermore Enertrag will save on the very expensive costs that sudden breakdowns bring due to:

- Loss of energy production at the time of breakdown.
- Loss of energy during the lead-time waiting for spares to be ordered and delivered.
- Greater damage than a normal replacement repair.
- Longer time to complete the repair.
- High costs for unplanned manhours.
- Costs for travel and hotels for maintenance engineers.
- High costs for renting of unplanned cranes and other special tools.

In addition to all this, in Germany, we can reduce costs by a worthwhile amount by having a certified monitoring system on our turbines. The SKF WindCon system is certified by Allianz, who are a major insurer of wind turbines in Germany.

Without a system such as SKF WindCon we would be subjected to the insurance company's 'Revisionsklausel' which means we would have to replace bearings and other components every 40 000 operating hours”.

In answer to a question: “Why did you select the SKF system?”, Dr Iffarth said: “As a leading company in the Wind Energy business, Enertrag's aim is to have the best equipment available to monitor our turbines. First we surveyed what was available on the market. We then field-tested those systems that, on

paper, went some way to fulfilling our requirements. We found out that the SKF WindCon system was far and away the best performing system. And the ease of use means that we don't have to have specialists to make first interpretations of the vibration data. We were also very aware of the excellent engineering know-how that SKF has. Furthermore SKF will continue development of the system, eg more functionality, GPRS data transmission, on-line oil analysis etc, and that means we will always have an up-to-date system."

Commenting on the fact that the Enertrag turbines have so far not developed any serious problems Dr Iffarth said: "We are very happy about that but we know that over the life time of these turbines, 20 years or more, there will be problems. The variation in wind speed, direction and force, and the necessity to adjust or stop the turbines in stormy conditions means inevitable strain and wear and tear on the mechanical components. Additionally, the wind industry is a relatively new industry and there are still lots to learn. And each wind park is different!

By having the SKF WindCon system installed we can learn about our different turbine designs and how they perform in the differing conditions that they face in each wind park. This will give valuable information to enable us to maintain reliability and availability with existing designs and help to steer the designs of future turbines to be even more reliable."

For more information:

<http://www.engineerlive.com/power-engineer/it-and-automation/15360/first-complete-online-condition-monitoring-installed-at-wind-park.shtml>

<http://www.skfcmc.com/naiden2b/english/nindex.html>

<http://www.skfcmc.com/naiden2b/english/products/mascon/MasCon16w.htm>