GENERATING INCREASED WIND TURBINE LIFESPAN

Wind turbines can achieve an online availability of about 98%, giving operators approximately one week in the year when planned maintenance can be completed.

Since wind turbines were first commissioned on an industrial scale, the technology and design of the components has progressed rapidly, enabling units over 1MW to be installed with an expected working life of around 20 years. As each new design comes to market, it incorporates the lessons learned from its predecessors but also has the potential to introduce its own issues.

PLANNED AND REACTIVE STRATEGIES

Creating a comprehensive maintenance strategy for wind turbines requires considerable expertise in the various parts of rotating equipment, the systems behind the electronic control panels, as well as flexible field service teams that can provide planned and reactive repair solutions to remote areas. However, the original equipment manufacturers (OEMs) will generally only look after their own equipment, which can lead to a complex set of arrangements for each turbine.

Developing a partnership with an experienced, independent provider can deliver a number of advantages, one of which is access to their considerable experience in repairing a variety of wind turbine designs. Such an arrangement has the potential to maximise maintenance efficiency and allow all the components within an installation to be covered by experienced engineers from a single source.

SPECIALIST SERVICES

In addition, a greater breadth of experience, supported by expert design engineers, allows modifications to the original components to be introduced that will improve durability. By delivering these as part of a planned schedule, productivity can be maximised and component failures avoided.

Sulzer offers a specialist on-site wind turbine repair service that can react to unplanned maintenance issues, with a particular emphasis on generator repairs. With high turbine availability as a priority, the company has dedicated resources that can be deployed to both onshore and offshore generating facilities. In many cases this can reduce downtime and maintenance costs substantially compared to the alternatives of either a workshop repair or complete replacement.

Independent repair specialists at work on components from a wide variety of wind turbine designs

A CASE IN POINT

Take, for example, an offshore turbine generator that had failed due to a rotor earth fault. With the accumulated costs of a crane barge, a new generator and the associated labor costs, the most likely outcome would have been the decommissioning of the turbine.

However, a team of specialist Sulzer engineers visited the turbine, confirmed the original fault finding analysis and disassembled the generator for further inspection. Several new parts were installed, including slip rings and brush gear assemblies before reassembly and testing.

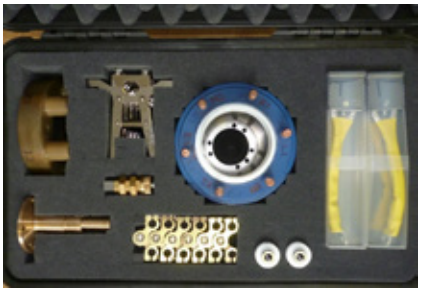
Once the turbine was reconnected to the grid, it was generating the required output and normal operation was resumed. In all, the on-site work had taken the Sulzer engineers just 20 hours but had saved the wind turbine from being decommissioned and also improved its reliability for the future.

The root cause of the fault was identified as carbon contamination, which had led to electrical tracking between phase and earth through insulated components.

This failure mechanism could have been avoided using regular, professional maintenance, which requires in-depth generator knowledge.

LONG TERM SAVINGS

Ultimately, this example illustrates how expert advice can drastically change the outcome of a situation and very often can save time and money in the long term. As wind energy continues to grow as a source of power, the



importance and requirement for a reliable repair partner that can provide monitored maintenance solutions, with an understanding of how wind turbines operate, will become more prevalent. This will especially be the case, as larger turbines evolve and their location moves further offshore.

Jason Horton
Regional Operations Director (South)
Sulzer

CONDITION MONITORING SYSTEM

fos4X has developed a fibre optic condition monitoring system for damage detection on rotor blades which has been certified by DNV-GL

With Turbine Integrity Control, a condition monitoring system for rotor blades developed by fos4X and certified by DNV-GL, damage to rotor blades can be detected at an early stage and thereby the financial impact on turbine operation can be minimised.

Turbine Integrity Control monitors the structural condition of the rotor blades and can detect small damages at an early stage before serious damage and associated higher costs occur. In addition, necessary maintenance work and inspections can be better planned and the operational costs can also be reduced for offshore turbines.

ADVANTAGES OF FIBRE OPTIC MEASUREMENT TECHNOLOGY

The great advantage of the fos4X solution lies in fibre-optic measurement technology which makes Turbine Integrity Control immune to

electromagnetic interference and damage caused by lightning strikes, in contrast to electrical systems. Due to the high cycle durability of fibre-optic sensors, a very long service life of the system is achieved. Retrofit installation is possible in less than one day per turbine.

Certification of turbine integrity control
The standard configuration consisting of fibre optic measuring devices and fibre optic acceleration sensors was installed on an 11 metre long rotor blade for the certification of the condition monitoring system. In the presence of a DNV-GL expert, several damages to the rotor blade were introduced which were immediately identified by the system.

COMPANY FOCUS

Founded in 2010 in Munich, fos4X GmbH is a specialist in innovative, fibre optic measurement technology and sensor technology, primarily in rotor blades of wind turbines, and develops intelligent solutions for blade load measurement ice detection, condition monitoring and operation optimisation.

The main focus is on the optimisation of wind turbines and windfarms with the help of fibre optic sensors. The aim is to increase both the availability of energy from wind power and the store of renewable energy.

fos4X

SCAN/CLICK WEBSITE INFO VIDEO

MEETING IMPACT-MONITORING NEEDS OF OFFSHORE WINDFARMS

Offshore windfarm structures are well-known for their sensitivity to impact from docking vessels and as a result, there are stringent impact monitoring requirements in place.

Crew transfer vessels (CTVs) are typically required to remain within a 200kN impact force limit when docking, and to operate only within certain environmental conditions — or else they run the risk of voiding their Service Level Agreements.

AUDIT TRAIL

It is therefore advantageous for CTV operators to have a meticulous audit trail for their fleets, recording and monitoring impact force as routine. This data is also hugely beneficial to the windfarm operator. By having a clear, highly-visual report documenting the force of a vessel on landing, its orientation and acceleration characteristics and other mitigating factors (e.g. rogue heavy waves), the CTV owner and windfarm operator can easily review the evidence of what happened when incidents occur. The comprehensive and highly visual performance data generated by the system can also support CTV owners' credentials when pitching for new business.

Until recently gathering this kind of data was in many ways impractical. Strain gauge technology is limited and can't provide the comprehensive picture that both the CTV and windfarm operators want.

OCEANIC DYNAMICS

UK Electronic Solutions responded to this market need with Oceanic Dynamics, a self-contained motion and impact monitoring system suited to offshore vessels. The system is designed to protect the longevity of offshore assets by monitoring vessel impact on structures, passenger comfort and safety and engine performance and reliability.

Unique in the market, the system is the first to address the complete requirement of operators and construction companies. Oceanic Dynamics uses a highly accurate Microelectromechanical System (MEMS) based orientation sensor to monitor motion and impact of the vessel as it docks, enabling vessel operators to keep in line with regulations. The system can also be linked with CCTV cameras to provide a reliable visual back up for the data.

COMPACT

Highly compact, Oceanic Dynamics is contained inside a single briefcase. This is designed to create minimal physical impact and to enable the system to be moved easily between vessels. For further flexibility vessels are encouraged to hire the system rather than purchase it outright.

Paul Rutherford,
Director, UK Electronic Solutions

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BROCHURE
VIDEO

IMPROVING RELIABILITY AND REDUCING OPERATING COSTS

Renewables are increasingly vital to the UK's energy mix as the country decarbonises and moves away from coal

With offshore wind supplying the equivalent of 97% of London, Birmingham and Manchester's domestic electricity requirements last year and with more than 30% of the total electricity generated on Christmas Day supplied by wind power it is no surprise that turbines are very much in the spotlight.

Making sure that wind turbines are working at optimum levels at all times, however, is a continual focus for operators. Implementing a remote condition monitoring system is one way that enables any potential maintenance problems to be identified quickly.

A PROACTIVE APPROACH TO MAINTENANCE

Remote condition monitoring allows operators to take a proactive approach to maintenance which improves reliability and reduces operating costs. A system such as the SKF WindCon remote monitoring solution collects mechanical data via vibration and temperature sensors mounted on the turbine's main shaft bearings, drive train gearbox and generator. The data is then analysed and issues such as unbalanced propeller blades, misalignment, shaft deflections, gear damage, tower vibrations and electrical problems, etc, can be highlighted via real-time performance updates.

The monitoring data can then be uploaded via Internet connections to remotely located diagnostics centres, operating globally 24/7, for expert analysis and reporting, as well as used by local operators.

REAL-TIME CONDITION-BASED MONITORING

By logging and tracking deteriorating component conditions in real-time condition-based monitoring allows maintenance decisions to be based on actual machine conditions, rather than arbitrary maintenance schedules.

A case in point is a UK windfarm that installed SKF WindCon. The farm was able to postpone a planned gearbox replacement as the system was able to not only register the gearbox's damage when first installed, but determine that it was stable enough to postpone the replacement until a rapid increase in the damage pattern almost a year later. The postponement enabled the windfarm to accrue interest on the money needed for the overhaul, almost earning enough to pay for the installation.

Along with the possibility that maintenance intervals can be extended, a condition monitoring system provides a powerful tool for managing day-to-day maintenance routines and consolidating high risk costly maintenance activities.

David McGaughey
Key Account Manager
SKF

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WINDCOM
CONDITIONING MONITORING

NEW INTEGRATED MAINTENANCE OFFERING

Xodus Group has formed a partnership with Green Marine to launch an integrated service for the maintenance of offshore renewable assets

LIFECYCLE APPROACH

The lifecycle approach will utilise Xodus' integrity management software tool XAMIN to capture and monitor live data from offshore marine assets with Green Marine providing the physical offshore inspection and repair services.

The one-stop solution aims to streamline an asset's performance, providing efficiencies and preventing downtime, in particular targeting offshore wind, tidal and wave energy devices, cabling and associated infrastructure.

GREAT POTENTIAL

Wim van der Zande, CEO of Xodus Group explained: *"We believe XAMIN has great potential for renewable projects as it will improve the visibility of integrity issues and the partnership with Green Marine means that any anomalies can be inspected and dealt with before they grow into a major issue. The renewables sector can learn lessons from the oil & gas industry where poor data management causes problems when identifying component condition or proving life extension."*

Green Marine (UK) Ltd operates a fleet of eight vessels and barges and provides safe installation, removal and maintenance of a wide range of wind, tidal & wave energy devices and gravity bases.

GAP IN THE MARKET

Jason Schofield, Managing Director of Green Marine commented: *"We believe there is a gap in the market for a truly joined up integrity maintenance service and our partnership with Xodus will deliver efficiencies with significant positive impacts for the management and monitoring of subsea marine assets. We can help operators gain a better understanding of their components and also reduce risk, cost and downtime."*

HOW IT WORKS

XAMIN allows operators to capture design, installation, testing, operating, inspection and decommissioning information in a single system; reducing data losses, increasing efficiency of access and improving visibility of integrity issues.

It is built around an asset hierarchy, allowing all data to be tagged to the appropriate component, which allows cross referencing. Within the operational phase XAMIN can collate all information being measured on the asset and cross reference to allow a complete picture of operability and integrity to be viewed. Once collated, data can be used to benchmark design assumptions and reduce safety margins or increase field life.

Xodus Group