



Wind turbine condition management

Moventas - Wind farm

In this day and age when downtime prevention, maintenance and cost reductions are key, remote surveillance must be one of the top ways to improve all three. PES went to find out the latest developments from Moventas who have remote surveillance centres in Finland, Italy, UK and the US to monitor over 2,500 wind turbines globally.

The Moventas Condition Management System (CMA_S) gathers critical data on turbines in operation, which is analysed by a team of experts to help ward off unexpected failures. CMA_S operates on all gearbox types. Thus Moventas provides surveillance for turbines deploying a range of different gearbox brands.

A broader view of the whole drivetrain with CMA_S and its intelligent sensors

CMA_S was developed to monitor how the gearbox and other drivetrain components in a wind turbine perform. It anticipates possible upcoming failures and it guarantees the continuity of their energy yield.

Traditional condition monitoring products focused mainly on measuring vibrations from rotating components. CMA_S, on the other hand, is based on a profound understanding of the various failure modes of the drivetrain as whole. For example, it is possible for early changes in oil lubrication properties to be visible, long before they



can be measured in vibration.

CMaS technologies were also developed to efficiently monitor large numbers of wind turbine drive trains, by using sophisticated analysing methods, algorithms, and intelligent sensors. Moventas has over 15 years' experience with intelligent vibration sensors as the very first-generation vibration sensor went through prototype testing back in 2003.

Many traditional vibration sensors measure data passively, with the signal being transferred to a server based platform. The data is then processed, calculated and analysed on a separate main unit / server. Intelligent vibration sensors, used within the CMaS solution, can perform the

measurements, data processing and analysis directly, with fast on board processor technology. This keeps the data transfer volume optimised and gives more efficient performance monitoring.

Expert analysis expanded to the UK

The data CMaS produces is analysed by dedicated remote diagnostics experts at Moventas service locations whilst ensuring that the customer has complete access to all measured data from their turbines. The expertise is shared with clients.

This type of cooperative model guarantees the shortest response time for onsite service and the shortest lead time for factory

services, and also provides significant added value, when feeding back into the asset management and O&M strategy.

The addition of David Sadler, a new Service Engineer at Moventas Gears UK, in Huddersfield, has expanded the capabilities and provides local remote diagnostics expertise in the UK.

He and his colleagues around the globe analyse wind farm activities to detect and highlight potential failures before they happen, playing a key role in optimising gearbox service operations.

David will be leading the opening of the new CMaS Remote Expert Centre at Huddersfield



Moventas CMA5 on a gearbox



Moventas gears



Moventas Service car

providing fast, local and direct support to customers across the UK & Ireland.

Knowledge-driven preventive maintenance services

Moventas offers an extensive range of predictive and preventative maintenance regimes as well as up-tower repair, upgrade and replacement services. Together, these ensure the optimal mechanical and operating condition of the turbine drivetrain with a minimum down-time, throughout the lifetime O&M. On-site preventive maintenance inspections can include the following services:

- End of warranty inspections for the complete drive train
- Preventive maintenance inspections
- Troubleshooting
- Vibration measurements
- Visual (endoscopy) inspections
- Remote diagnostics
- Portable CMA5 installation & commission
- Supervision of installations (engineers and technicians)

Here is an example. CMA5 was monitoring a 3 MW wind turbine gearbox and alerted remote diagnostics experts about a remarkable change in particle levels. The customer was contacted and endoscopic inspection confirmed that one of the planet wheels was suffering from a bearing defect. The customer was not able to get a crane on site for 8 months, but with remote CMA5 monitoring the turbine was kept running at 50% power until the repair was performed.

This not only prevented the catastrophic failure of the gearbox, but also the customer was able to run the turbine and continue production while waiting for the crane. Following this, the customer ordered CMA5 units for the whole fleet and two other planet wheel bearing failures were detected and repaired while the crane was on site.

Up-tower services and upgrades extend the gearbox life while decreasing costs

Up-tower repairs can significantly reduce costs and extend the life of wind turbine gearboxes. Moventas continuously develops up-tower repair methods to remedy known failures in most common gearbox types. Standard up-tower repairs include high speed shaft replacements, high speed shaft bearings, and intermediate stage repairs and or replacements and with some gearboxes, helical stage replacements are now also possible.

Due to the configurational issues on one gear housing on a Vestas V80 turbine, some weld cracking was observed along with individual material based IMS failures. Gearboxes with these issues used to have to



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Moventas, which is part of Clyde Blowers Capital, is a new energy technology expert and service provider. The technology strives to lower the cost of energy across the lifecycle of renewable energy generation, from superior gearbox design and manufacture to extensive after sales service for most gearbox brands.

Moventas David Sadler

be transported to the factory for repair, but Moventas implemented a new method to replace the defected helical stage on site.

This procedure updates the gear unit to the latest available revision with cast housing, on the helical stage, to eliminate all known failures. Bearing configurations on the intermediate pinion and high-speed stage are also replaced with new types of bearings.

The lubrication piping also needs to be renewed when changing the housing back and renewing HSS and IMS bearing

configurations. Being able to do these upgrades up-tower means a much smaller crane can be used, thus significantly reducing the cost.

There are no freight costs incurred from transporting the gear unit to the workshop to be repaired, and no lead time from the factory to be taken into consideration.

Moventas is also addressing planet bearing failures in Winergy gearboxes in the Siemens 2.3 fleet in both Europe and North America with up-tower solutions. Upgrades

have been designed and implemented to eliminate known weaknesses and extend gearbox lifetimes.

The Moventas ExtraLife™ portfolio details the upgrades available for Siemens up-tower repairs for nearly 20 turbine platforms and over 25 gearbox models, and other platforms to expand the lifetime of the gear. This is all due to over 35 years of experience in the industry and the ever expanding track record of up-tower repairs.

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PES wanted to know a little more about David Sadler, we asked him about his new role. Here he shares his thoughts about his work on wind turbine drivetrains, condition management and his passion for the wind industry.

PES: What does your job entail?

DS: My job covers two main areas, Condition monitoring with CMaS for the UK & Ireland sites and developing up-tower diagnostics & repairs. The two roles are quite complimentary; with the CMaS I will be able to see what might go wrong and with the up-tower work I am always on the lookout for ways to plan early interventions, to minimise turbine downtime and cost, and to be able to come up with cost-efficient and reliable ways to implement OEM level repairs.

PES: What brought you into the wind energy industry?

DS: I'd always wanted to work within the renewable energy sector and wind was the best fit, following my engineering conversion. I previously worked in oil & gas and wanted to move to a much more positive industry, both in terms of environmental credentials and long-term future.

PES: What experiences helped prepare you for your current role?

DS: My previous job involved signal processing of sound waves and many of the techniques and ideas from there are relevant to the use of vibration data obtained with CMaS. The university where I studied engineering is unique in the UK because it has a dedicated gear and gearbox department. Studying there

gave me a really strong foundation in the design ideas and concepts in gearbox design, which is the Moventas expertise.

PES: What are your views in the industry for the present and future?

DS: Wind energy has seen a huge expansion within my lifetime, growing from niche projects that were not economical to being subsidy free and genuinely competitive for thermal and conventional power generation. There is a lot of momentum and possibilities in the wind industry.

PES: What motivates you?

DS: I'm looking forward to being able to point to a turbine when travelling with friends and family and being able to say that's something I designed and allowed it to carry on generating!