



Big data on one platform

The use of technology, and advanced analytics is opening up new possibilities for the wind sector, leading to better and more informed decision making. PES discussed the benefits of multiple data streams and single platforms for analysing turbine health with Dr. Violetta Di Napoli, Regional Team Leader at ONYX Insight.

PES: A warm welcome back to PES Wind, it's lovely to catch up once again. ONYX Insight will be a familiar name to many of our readers, but for those who may be new to it, could you tell us how you fit into the industry?

Dr. Violetta Di Napoli: ONYX Insight is an independent, flexible, predictive maintenance solutions provider. We bring leading and unbiased predictive analytics, underpinned by real-world engineering expertise, to owners and operators of renewable energy assets via seven global offices.

Our approach is a combination of advanced analytics, sensing and engineering solutions working collaboratively with our customers. We can assist our partners at every stage of the asset life-cycle to provide efficiency driven, cutting edge solutions across thousands of wind turbines, optimising asset performance whilst minimising downtime.

PES: And your role in particular Violetta?

VDN: I am the Regional Team Leader for the monitoring team in Europe for ONYX Insight. I joined ONYX two years ago. Prior to this I did a PhD in mechanical engineering at the University of Nottingham.

PES: With the main focus of your work being around wind turbine monitoring, how has this been developing recently? You have reached 10,000 turbines that you are monitoring worldwide, is that correct?

VDN: Yes, we just hit 10,000 turbines that we monitor globally, as well as taking part in over 75GW of due diligence projects. This is a big number, representing a huge amount of turbine data we can access to inform our customers helping them to make better O&M decisions to future proof their predictive maintenance strategies and is an exciting place to be.

It means we can benchmark wind farm data and provide visibility of multi-brand portfolios to empower owner/operators to have confidence in scaling their portfolios, whilst future-proofing their turbines with accuracy. Often for newer turbine models there is a limited track record. We can use our extensive engineering knowledge coupled

with our database to provide insights to give long-term visibility over assets health.

Last year, we launched AI HUB, a single platform that holds all data for a wind fleet. Using one platform is hugely beneficial. It means you can simplify operations, easily view, and interpret large amounts of data, working agnostically with different hardware. This means giving owner/operators flexibility and access to their data to ultimately optimise their turbine performance and make them more profitable.

PES: How many countries do you work in?

VDN: We have seven offices around the world, but we currently work in over 30 countries. I monitor turbines in the UK, Spain, Italy, a big proportion of Europe, as well as recently where we have seen a growth in condition monitoring in South America in Brazil and Chile.

PES: What kind of things do you monitor?

VDN: Traditionally our team's focus has been on monitoring drivetrain components for main bearings, generator bearings and the whole gearbox, but increasingly we are seeing more investigations and solutions in pitch, blade and tower monitoring.

PES: How are you seeing technology and the ability to remotely monitor turbines developing?

VDN: The use of technology and advanced analytics is opening up the possibilities for wind turbines. We can use it to help us make better decisions. Multiple data streams can provide information on the overall health of your turbine and the components within it. For example, SCADA and vibration data can provide analytics on lost energy production, enabling owners/operators to be aware of and to fix common failures, which over time will lead to a significant loss of energy and a loss of energy means loss of production.

More data streams, especially centralised, can empower decisions, and save hundreds of thousands of pounds, specifically in the offshore wind market where unscheduled maintenance time and costs can be



Dr. Violetta Di Napoli

significant. I believe predictive maintenance will play an increasing role in the offshore wind market, lowering the cost of energy and supporting wind to stay competitive and a crucial part of the renewables mix in the energy transition.

PES: What are the benefits around this?

VDN: There are many benefits in monitoring and in predictive maintenance in general. We have to look at things from two different perspectives.

For failures that progress slowly with time, such as certain failure modes that usually characterize drivetrain bearings, we are able to monitor the fault progression over time, periodically acknowledging the turbine owner/operator about the status of their asset. This way, the owner/operator can plan inspections, maintenance actions and ultimately the replacement of the component in due time, avoiding downtime.

On the other hand, for fast progressing and critical damage, such as sudden gear cracks, we are able to immediately detect the failure from the vibration data. The turbine owner/operator is promptly informed through a vibration report where we recommend to derate or stop the turbine and perform



immediate inspection to assess the damage. In fact, the debris caused by the liberation of a broken gear tooth could compromise the whole gearbox leading to catastrophic failure. This way, the owner/operator is acknowledged of the risk and is able to have a cost-effective up-tower replacement of the gear instead of a replacement of the whole gearbox which would imply significantly higher costs and extended downtime.

PES: How do you work with different companies?

VDN: The monitoring service relies on the presence of a condition monitoring system (CMS) on the drivetrain of the turbine, or other components of interest. If the assets already have third-parties' hardware installed, ONYX is completely flexible and technology agnostic, meaning that we can transfer the vibration data from the existing CMS to our monitoring platform, i.e. fleetMONITOR software, and provide the monitoring service. However, if the turbine is not fitted with any CMS hardware, ONYX also offers the installation of the ecoCMS hardware based on MEMS technology, delivering extremely high quality vibration data.

The type of service can be different. Clients sometimes have an inhouse team who do the monitoring themselves or we can analyse their vibration data for them, working closely with their teams. There are two different approaches. Sometimes we have a 'one-off' or short-term reporting period, which can be anything from six to eight weeks. In this case, we get a picture of the health of the assets in that 'moment'.

If we take the second approach, continuous monitoring gives a longer-term view of the turbines, which can be safer, and provide earlier feedback from the turbine data which can support optimal turbine performance. Others want 'shadow monitoring' for a second look at their data. We can deliver reports with the feedback and recommendations for the future.

PES: As wind farms move increasingly offshore, do the challenges of monitoring change at all and if so, how does ONYX Insight help?

VDN: When we consider offshore, predictive maintenance is crucial, due to the level of complexity and costs in replacing components in the sea. It's essential that there are systems that allow predictive maintenance to avoid significant costs, of which predictive maintenance plus any activity that will simplify the amount of data will be key.

PES: Monitoring is important to maximise performance throughout a turbine's lifecycle of course, and presumably this factor becomes even more important as the industry itself ages and grows?

VDN: The approach to monitoring is the same, but as the turbines age, it's important to have a proper picture of what we are analysing, and it can be useful to take into account historical data to be able to understand the complete picture of turbine health.

PES: What new technologies are you working with at the moment?

VDN: We can use vibration data to look at rotor imbalance, imbalance within the blades, coupling and misalignment between the generator shaft and the coupling between the two. Recently, we developed technology to capture early detection of pitch bearing failure. We also detect problems in towers

and foundations, which delivers significant extra value to our customers.

PES: The industry is growing rapidly and must have changed quite a bit from when ONYX Insight first started?

VDN: The market is increasing and I think that owner/operators are understanding the importance of CMS and investment in their turbines and the need for constant investment as their assets scale, with more consolidation in the global market.

It's now considered a fundamental part of O&M to use this data to use the past picture of turbine health to inform the future, to give confidence in future decisions, and better decisions. Today, there are not many who do not see the importance of CMS in a predictive maintenance strategy.

PES: What do you think the future holds? If you had a crystal ball, what would the wind industry of 2030 or even 2050 look like?

VDN: Even last year there were uncertainties around whether the industry could monitor pitch bearings, for example, and now we can, so the progress is huge, we are able to develop new innovations to monitor other components, which right now are still under investigation, so this is definitely a step change. We are monitoring an increasing number of pitch bearings equipped with ONYX's ecoPITCH hardware, and we expect this trend to keep increasing as pitch bearing failures become more prevalent.

We also see more turbines being retrofitted with CMS, particularly smaller turbines. In the past, the economics of CMS did not stack up for these small machines, but ecoCMS is now enabling us to deliver a monitoring solution and keep these turbines running effectively late into their design life.

<https://onyxinsight.com/condition-monitoring-services/>



The condition monitoring team at ONYX Insight's Nottingham HQ