

Predict the future with Vibration Diagnostics



Content



4

Predict future component failures and reduce O&M costs

5

Experience the benefits of Vibration Diagnostics

6

Detection hit rates

7

Case story

7

Condition monitoring setup and data supply

8

Pythia™ - turning big data into actionable insights

9

Flexible service tailored to your needs

10

Road to Vibration Diagnostics

11

Your benefits of partnering with Siemens Gamesa

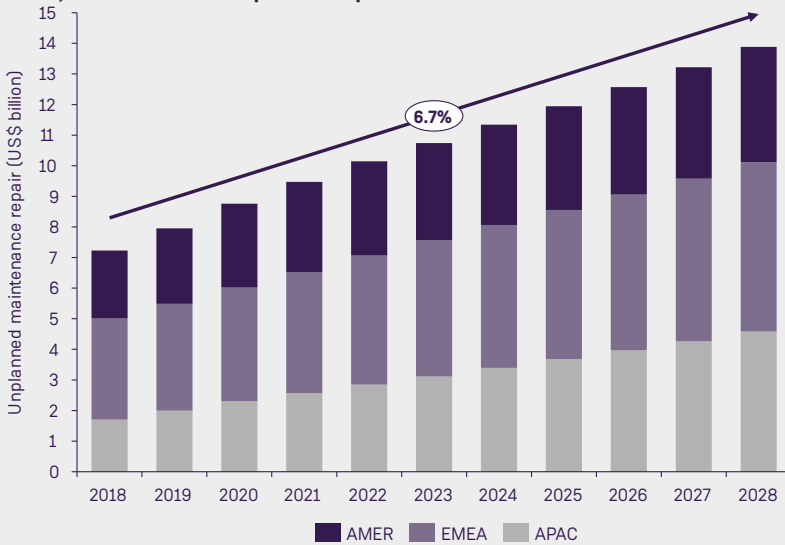
Predict future component failures and reduce O&M costs

Ensuring the health of main components through predictive maintenance of your wind turbines is a key factor in achieving an optimal energy production and reduced operational expenditures. A reliable condition monitoring solution combined with a Vibration Diagnostics service from Siemens Gamesa is your best way of achieving early detection on developing component failures within the wind turbine’s drivetrain to secure a reliable energy production.

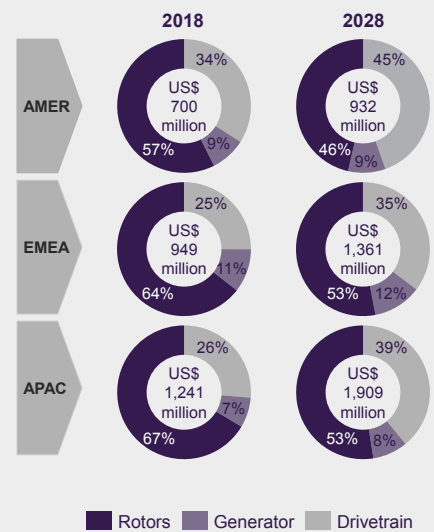
Unplanned correctives remain the largest portion of an operator’s O&M budget

Drivetrain component repairs is forecasted to increase over the coming years.

AMER, EMEA and APAC unplanned repair market forecasts



Breakdown of major repairs by component type



Major repair spends related to drivetrain components combined with an increase of unplanned correctives will become increasingly challenging for wind turbine owners in the coming years.

A Vibration Diagnostics service from Siemens Gamesa enables you to turn unplanned- into planned maintenance activates. Keeping your O&M budget under control and securing a profitable business throughout the lifespan of your assets.



Experience the benefits of Vibration Diagnostics

Monitoring Capabilities

Provides an increased monitoring on a range of additional components compared to alternative solutions, giving you a more comprehensive picture of your turbines' general performance and health.

Hit rates on detected failures

99% detection hit rate on detected failures within the drive train to significantly lower the risk of consequential damages leading to unplanned downtime of the turbine.

Longer lead times on detected failures

With the capability of predicting component failures up to three years in advance enables optimized forecast on resources requirements throughout the entire supply chain resulting in a better planning of service and maintenance activities.

Increased revenue

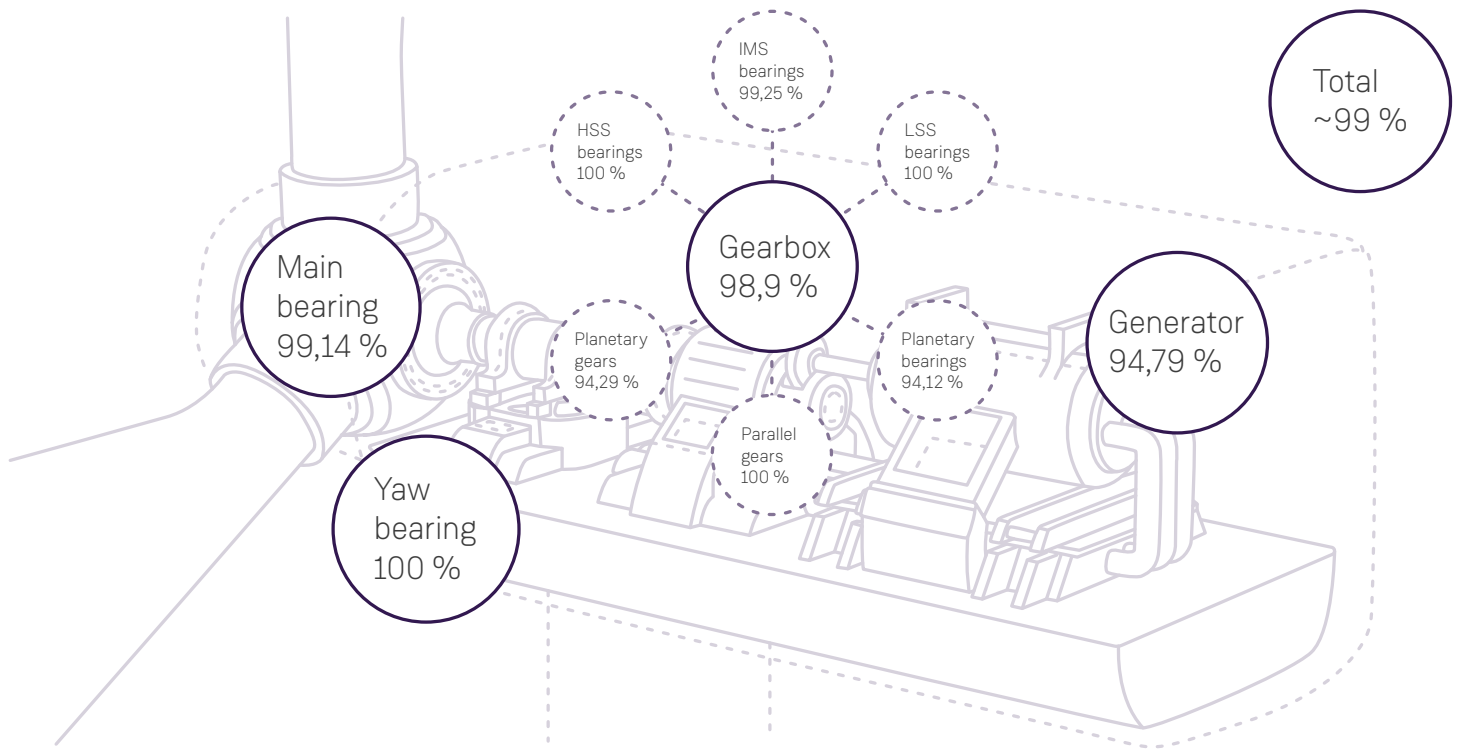
The condition monitoring solution behind Vibration Diagnostics provides an average availability of 99,7% and Siemens Gamesa provides remote fix rates in 70% of all cases. With less downtime and smarter maintenance, your turbine will perform more efficiently and generate more revenue.

Better use of data

Act smarter - Benefit from Siemens Gamesa 20 years of expertise in condition monitoring. Our advanced artificial intelligence (AI) has over 600 TB of data stored for training of proprietary machine learning algorithms, enabling you to get maximum output from your turbine data.

Less OPEX

It is often cheaper to refurbish than to replace. With more extensive monitoring, better hit rates and longer lead times, you can plan better and reduce service costs.

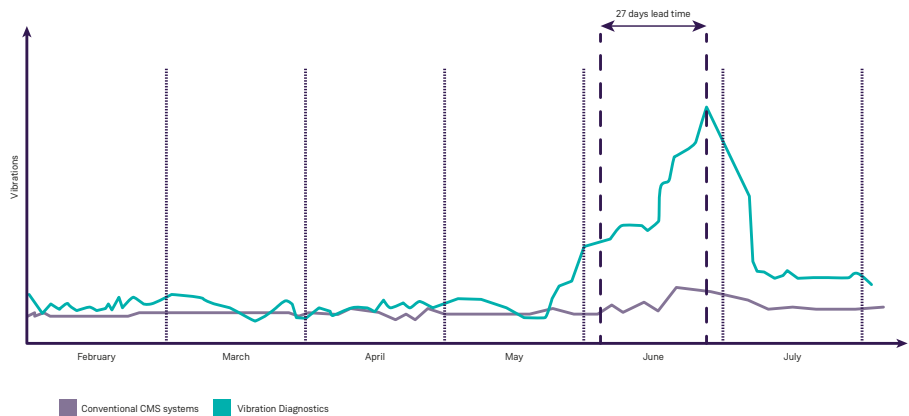


Detection hit rates

The image shows the hit rate capabilities gained by Vibration Diagnostics across a range of critical drivetrain components. By having a Vibration Diagnostics service by Siemens Gamesa the wind turbine owner will be able to obtain an average detection hit rate on drivetrain components of 99%, allowing optimal conditions for securing the wind turbines are up and running resulting in an profitable annual energy production.

At Siemens Gamesa, we don't just provide market leading detection capabilities, we even guarantee them. Together with our Vibration Diagnostics service we also offer an optional guarantee, providing compensation for those failures we do not manage to detect. In simple terms if we fail to detect, you get compensated.

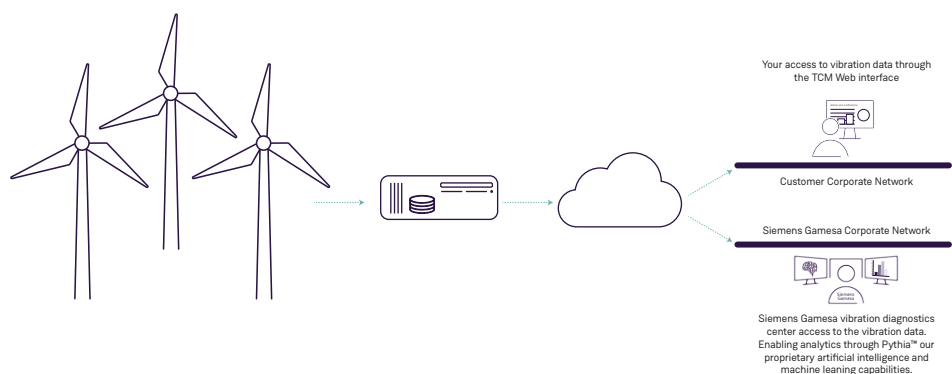
Case story:
Early detection on
a high-speed pinion
saving 300.000 EUR.



The graph shows how a Vibration Diagnostics service from Siemens Gamesa provided a wind turbine owner with a 27-day lead time on a developing component failure of a high-speed pinion within the gearbox. Cracks on high-speed pinions are fast developing and difficult for the human eye to detect during visual inspections. However, due to the advanced

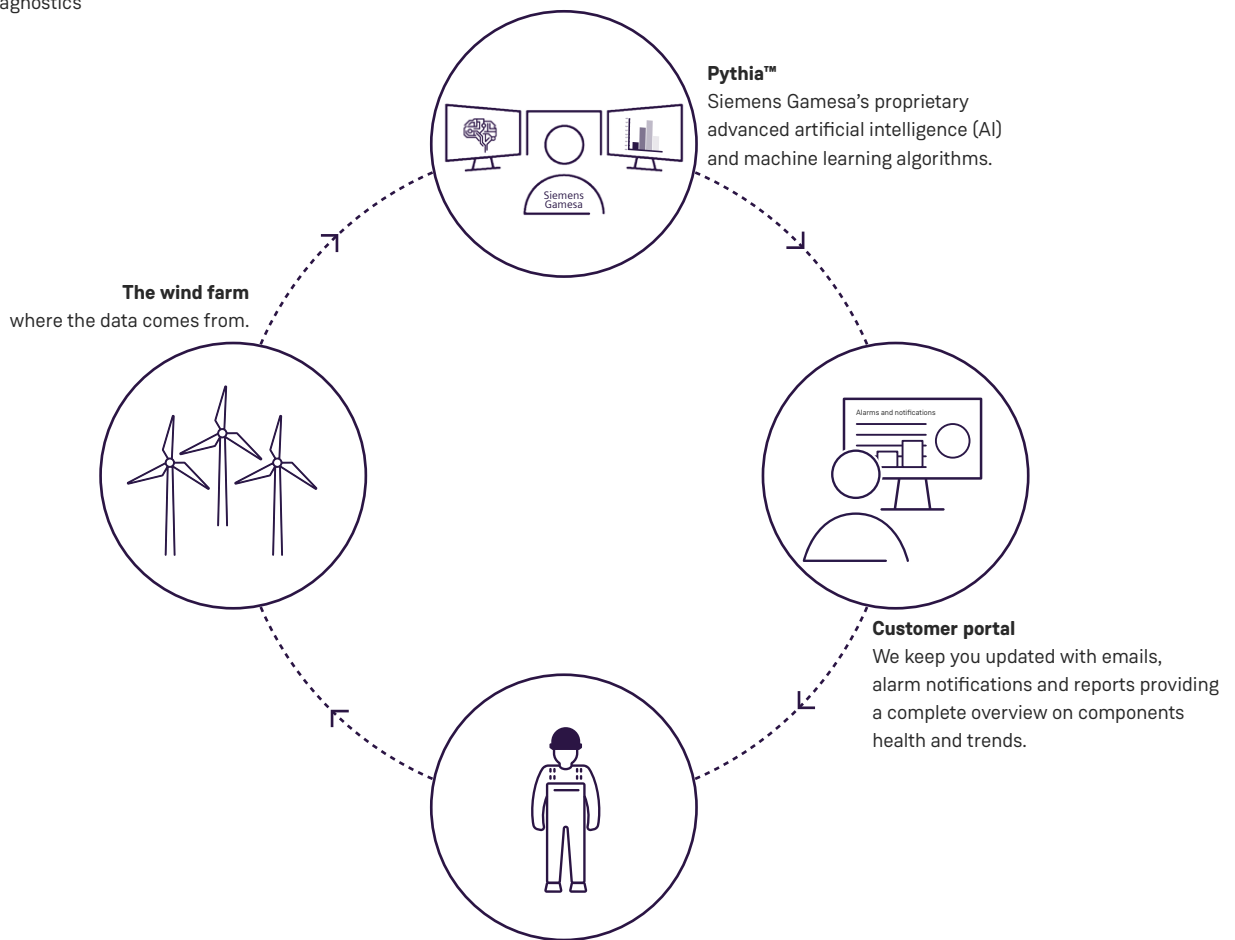
detection capabilities of Vibration Diagnostics, it was possible to advise the wind turbine owner with an early warning. The early warning provided enough time to order the necessary spare parts and conduct the repair prior to the damage evolving into a complete failure of the gearbox. A combination of these activities ultimately generated a saving of 300.000 EUR.

Condition
monitoring setup
and data supply



To complete the Vibration Diagnostics service, a market leading turbine condition monitoring system called TCM is placed in the nacelle of all the wind turbines within the windfarm. The system picks up vibration data via a series of sensors placed on the wind turbines drivetrain. The data is available and accessible on a site server installed on the substation.

The system software allows users to remotely connect via a web interface which can be accessed on a site level for further analysis. For windfarm owners with a global setup of several windfarms all data can be collected via an enterprise server which is setup within the fleet network. This allows various synergies by knowledge sharing and comparing data across windfarms enabling a centralized overview of multiple sites.



Pythia™ - turning big data into actionable insights

Predicting the future sounds like science fiction, but with a large historical database, correct methodology and advanced mathematical models it is possible.

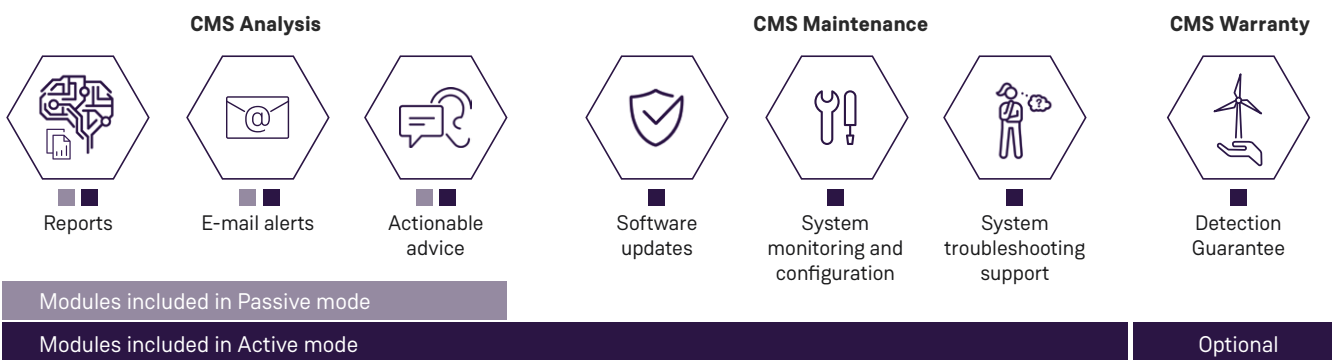
The vibration data is embedded into Siemens Gamesa AI technology and machine learning capabilities called Pythia™. It enables us to analyse the vibration data and comparing it to our vast knowledge base of more than 600 TB of captured data throughout 20 years of remote monitoring services. The results of the analysis are shared on Siemens Gamesa customer portal site providing alarms, notifications and reports on component trends and health.

Our service and expertise support wind turbine owners with accurate and actionable insights providing the necessary knowledge to perform a predictive, streamlined and effective maintenance of the wind turbines.

Pythia™ is our key to provide our customers with market leading predictive maintenance capabilities.

Flexible service tailored to your needs

Passive and Active mode to provide a flexible service tailored to your needs.



CMS Analysis: Provides you with a complete turbine condition monitoring system and reporting to keep you updated on the trends and health of the drivetrain components.

CMS Maintenance: Provides you with system notification reports, remote trouble solving and secures your condition monitoring system is updated with the newest software releases.

CMS Warranty: As an extra service to the Active mode you have the option to select a detection guarantee providing you with compensation for failed detections.



Road to Vibration Diagnostics

Upgrading your wind turbines to unlock the possibilities of Vibration Diagnostics

To enable our Vibration Diagnostics service, Siemens Gamesa offers tailor-made retrofit packages with turbine specific hardware including onsite installation carried out by qualified Siemens Gamesa technicians. Our retrofit packages can be installed on a wide range of Gamesa platforms and turbine

models. Please contact us today for more information on the retrofit package needed to upgrade your turbine and apply a state of the art turbine condition monitoring system combined with a high performance Vibration Diagnostics service from Siemens Gamesa.



Your benefits of partnering with Siemens Gamesa

Siemens Gamesa is a leading supplier of wind power solutions to customers all over the globe. A key player and innovative pioneer in the renewable energy sector, we have installed over 105 GW in 75 countries.



Your reliable energy partner:

Siemens Gamesa has a global reach and helps improve your profitability by optimizing O&M expenditures offering a modular and comprehensive portfolio to suit your requirements.



Fleetwide expertise:

Servicing and upgrading turbines throughout the entire design life regardless of technology.



Engineering expertise:

Our service engineers have a proven track record in providing industry leading turbine developments to improve the serviceability of your assets.



Operational excellence:

Covering advanced wind and energy forecasting models and securing an average fleet-wide availability of more than 98% we are your partner of choice.

Siemens Gamesa Renewable Energy, S.A.U.

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