



JORNADA DE OPERACIONES 2025

Condition Monitoring of Blade Bearings: Detecting Cracks and Damages Analysis

eolotec bearing technology **Blade Bearing Monitoring BBG+** Senvion Vordex **GE 1.** Offshore 5MW SGRE Is that all? Vestas Acciona Enercon **GE 2.3**

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2025



BBG+ World-leading blade bearing monitoring system

- Launched in 2016
- Protected & patented product
- Proven & tested
- The only certified blade bearing monitoring system worldwide in accordance with the DNV CM guideline





→ Tested and certified CMS system with many years of field experience

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BBG+ in Figures



100 Wind parks









in operation

→ 900 blade bearings



over 240 BBG-Systems

Delivered & Install



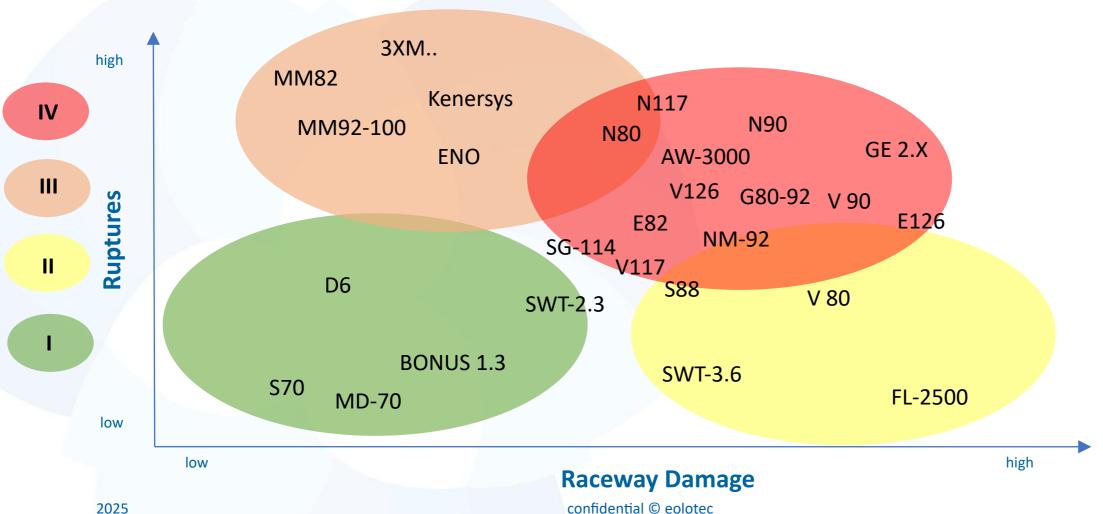
3,4 GB monthly & 3,7 TB total



19,4 Mio. daily measurement points & 300.456 monthly measurements



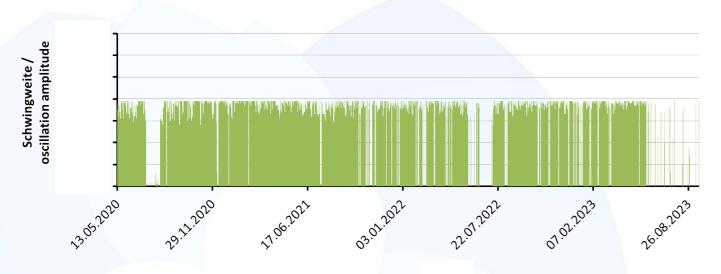
Risk Portfolio / Frequency



Blade Bearing Monitoring BBG+ D - ENERCON



Results: Enercon E82 / Long-term Measurement



Example for stable bearing

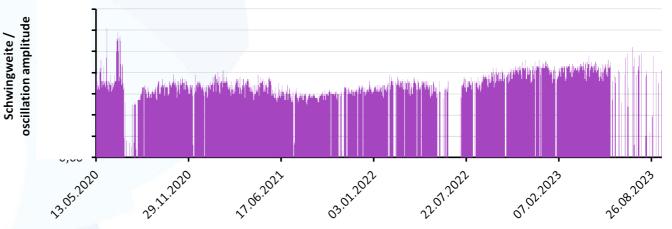
Oscillation remains the same

No trend visible

→ Stable bearing condition over years

Example for a suspicious bearing
Oscillation increases
Trend to higher Oscillation visible

→ Clear wear & damage progression



Blade Bearing Monitoring BBG+ ENERCON

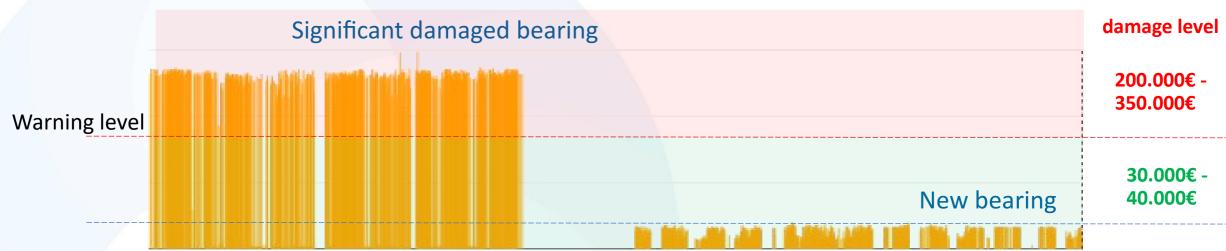


Costs due

BBG+D/I Enercon / Rotor Bearing Monitoring

Monitoring system is used to track rotor movement

Increasing movement is a clear sign for wear or fading pre-load



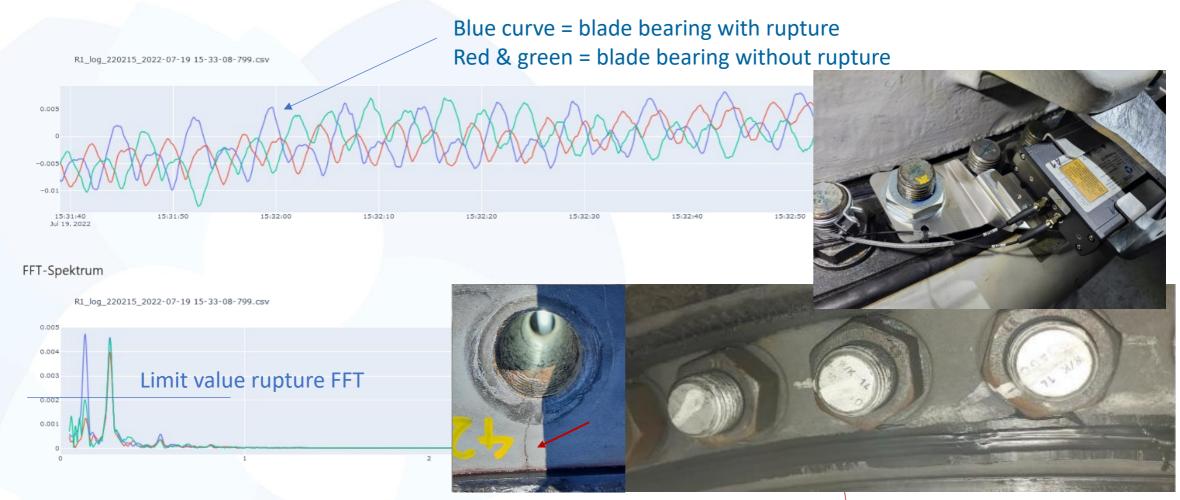
BBG+ rotor bearing monitoring ensures the possibility for a favourable up-tower repair of the bearing set.

With a BBG+DI, the blade bearings and rotor bearings can therefore be reliably monitored in one hardware at low cost. This means that all of the bearings in an ENERCON are covered.

Blade Bearing Monitoring BBG+ SENVION



Example: BBG+R rupture detection SENVION

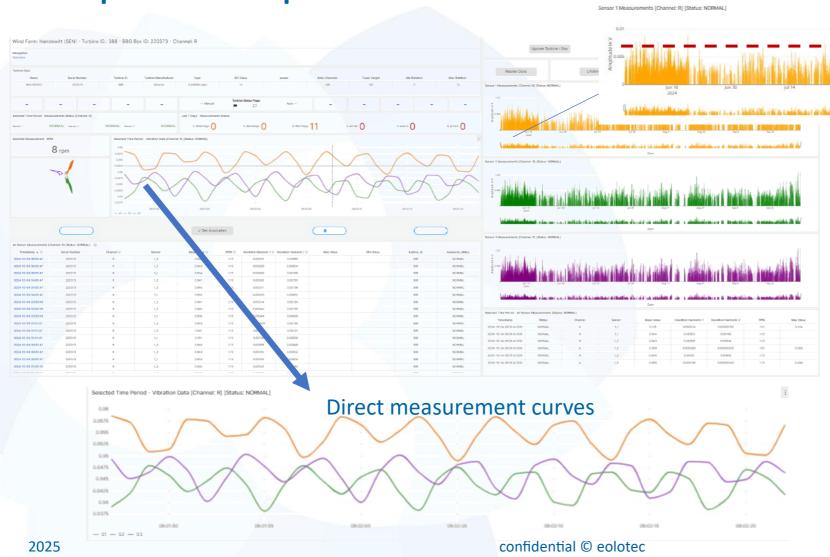


Blade Bearing Monitoring BBG+ R - SENVION



Limit value rupture FFT

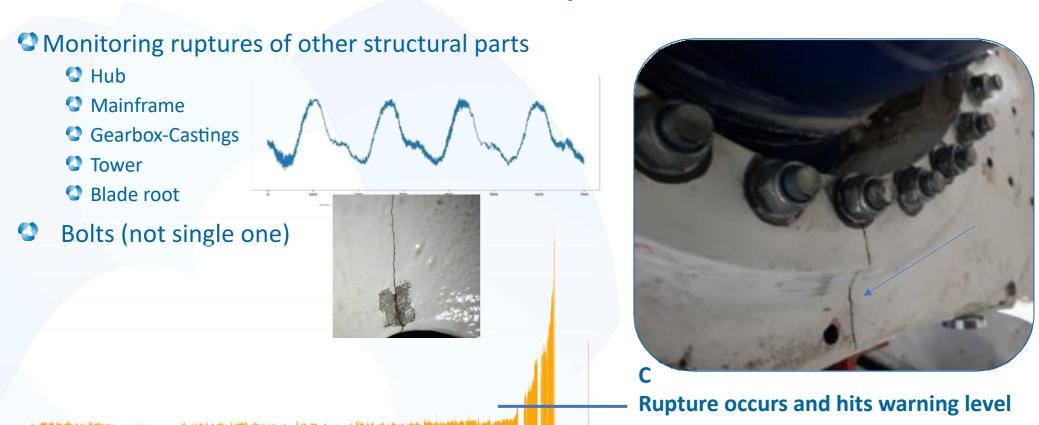
Example: BBG+R rupture detection SENVION



BBG platform monitors all turbines and triggers an alarm if significant limit values are reached



What else offers BBG+ for a safe turbine operation?

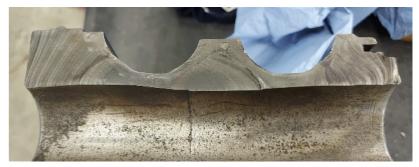


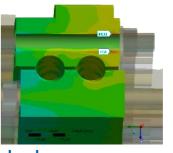
→ BBG offers a bunch of monitoring options for other structural parts!

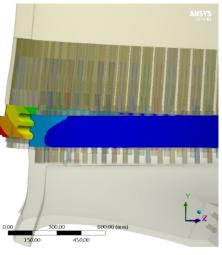
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Conclusion

- Technology:
 - Tested, patented and certified system
 - Reliable detection of damages & ruptures
 - Easy installation and independent of SCADA
 - Direct access to measurement data on BBG+ platform
- Risk & costs:
 - Blade bearings do not have to be an incalculable risk
 - Rotor blade accidents can be easily & safely avoided
 - Blade bearing replacement can be planned or partially avoided
 - Continued operation over 20 years possible even for problematic turbines
 - Payback of BBG-Investment is guaranteed







→ Investing in monitoring systems pays off very quickly, because the risk is absolutely real!

Thank you for your attention Questions & discussion!?





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