Analyzing Generator Bearings Fault Development Rates Based on Statistic

PO.010

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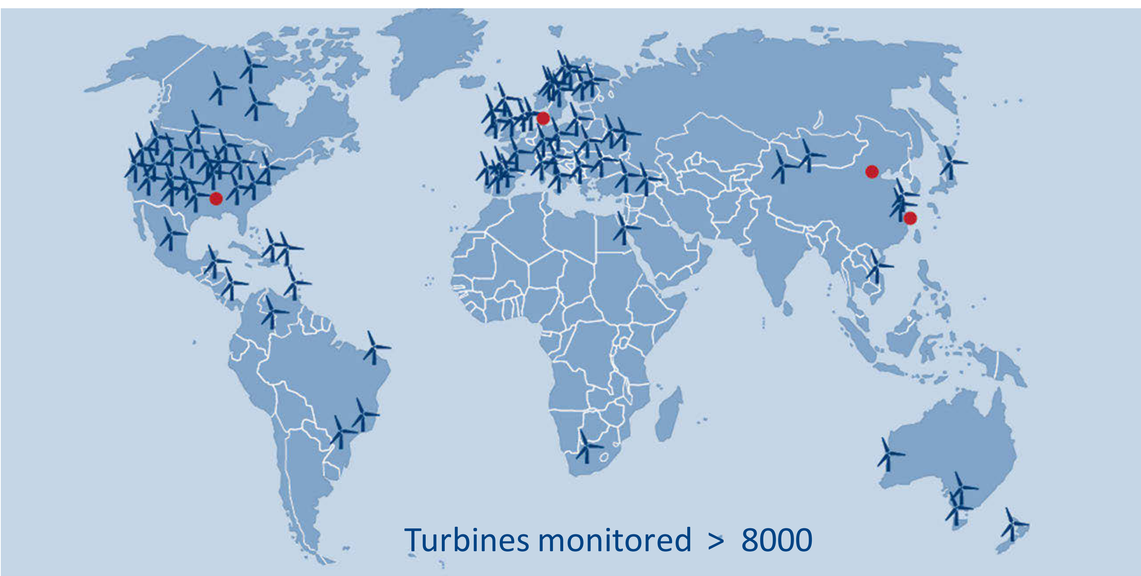
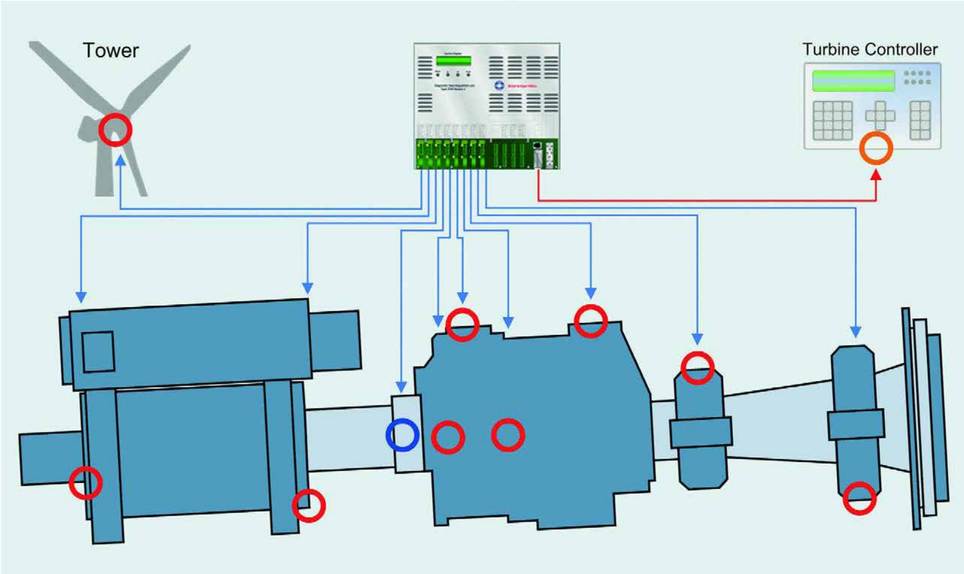
Abstract

Condition monitoring system (CMS) helps detect incipient faults early. Faults in wind turbine generator bearing are well defined, and their detection using CMS is well established. Brüel & Kjær Vibro is currently monitoring around 8000 turbines all over the world. Data of faults in generator bearings are numerous. Based on these data, how fast a fault progresses into a level where it may cause secondary damages can be analyzed. The analysis results can then be used to create fault progression models for better prognosis.

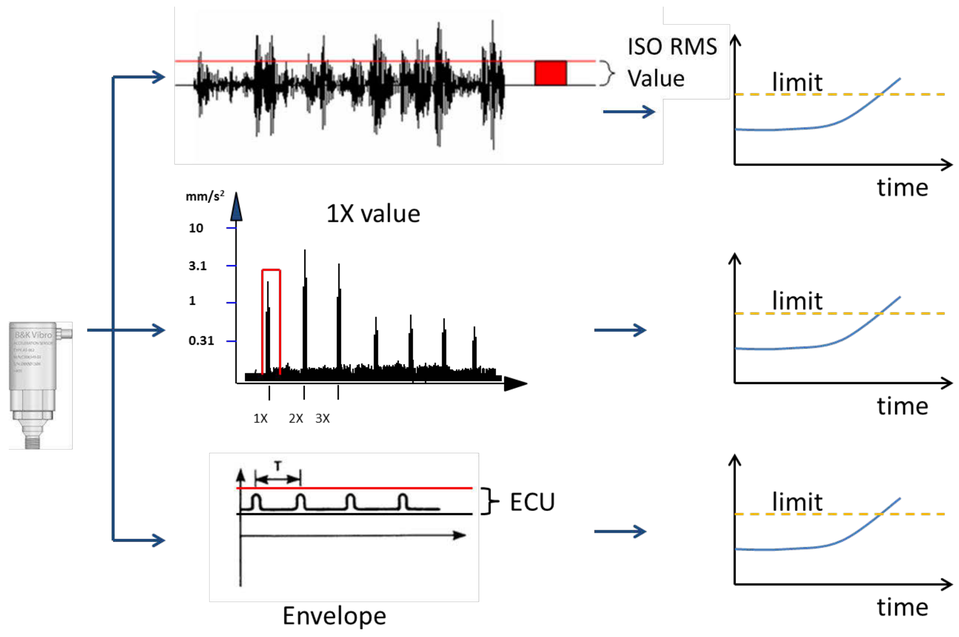


Accelerometers are installed at different parts of a wind turbine (including generator bearings)



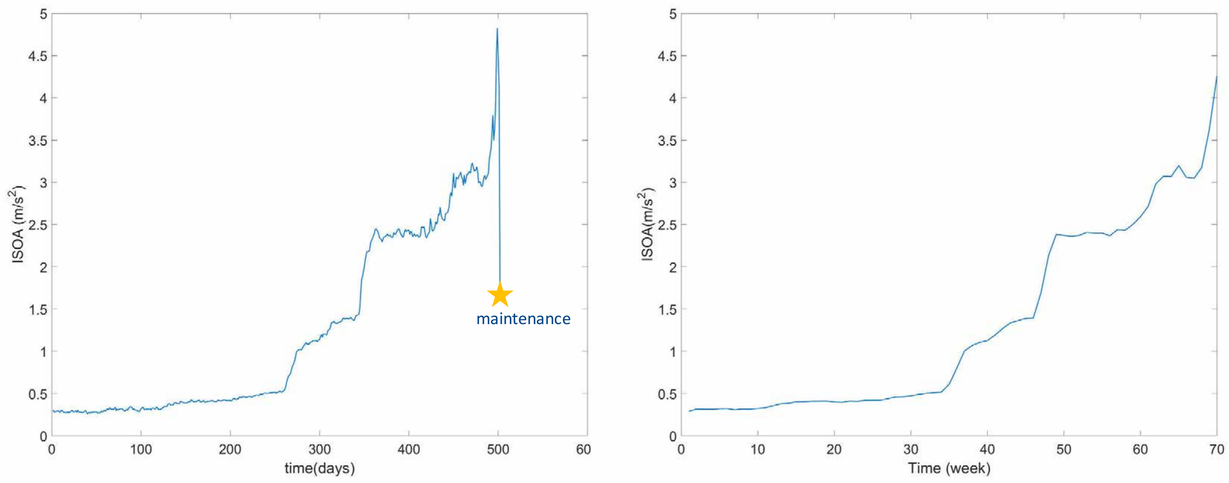
Various vibration measurements, e.g. ISO RMS are trended over time. ISO RMS indicates overall health of a generator bearing.

- Increasing rates of ISO RMS are computed from a number of turbines
- The turbines are of the same type
- ISO RMS data are collected from Generator Drive End and Non Drive End



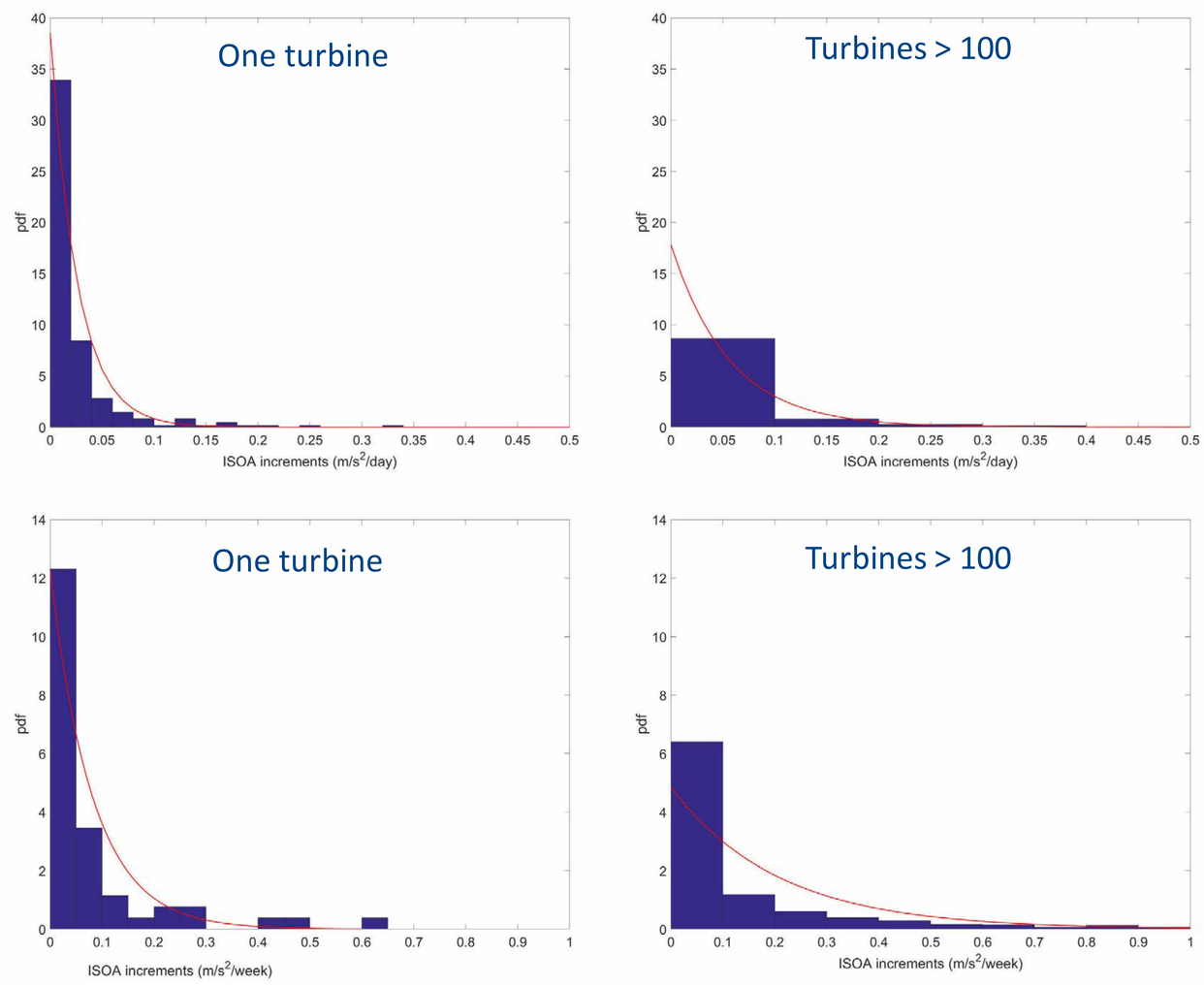
Increasing ISO RMS indicates bearing deterioration

ISO RMS data are averaged over a period of one day and one week for a turbine.



Statistical distributions reveal variations in how fast ISO RMS increases every day and every week

- ISO RMS increments vary from one to turbine to another within the same type of turbine; indicating variation in fault development.
- Variations in ISO RMS increments could be due to many things: e.g. bearing types, wind turbine locations, wind conditions, etc.
- The distributions are captured by fitting exponential distribution to the data (in red).
- Statistical representation of the distribution could be used for data-driven prognosis modeling and uncertainty quantification



Conclusions

- Each turbine has its own fault development rate.
- A turbine's fault development rate could vary from time to time.
- A general fault progression model can be developed based on statistic.
- Large data are normally needed to get accurate statistical representation.