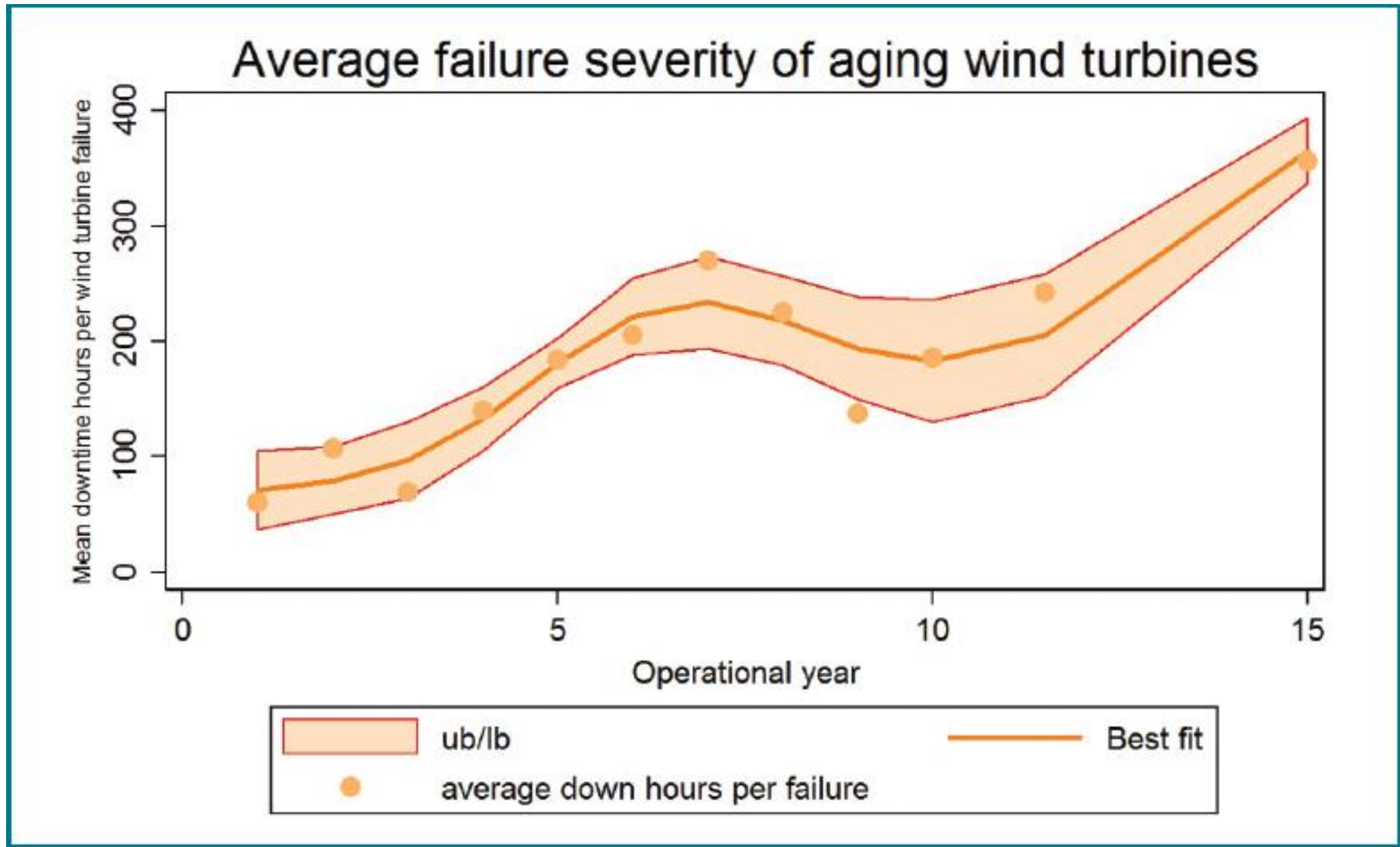# Effective inspections rely on knowing **when, how and which** wind turbine components fail

Case Studies in Onshore Wind Turbine Component Reliability and Failure Analysis

N. Kumar, D. Rogers, P. Besuner

Average failure severity of aging wind turbines

Failure analyses

Ultrasonic examinations of anchor bolts, showing strong echo from bolt end, typical of undamaged bolts (top), weak echo (center), and no echo, typical of bolts with vertical flaws (bottom)

Photograph of a race from a failed blade pitch bearing, sectioned through a bolt hole; "beach marks" typical of fatigue crack growth are evident

WindAware Asset Performance Management software from Intertek

Intro

As wind turbines age, the average downtime per failure increases. Performance management can optimize asset life, considering degradation mechanisms and trending data from scheduled, appropriate inspections.

Asset management

- Evaluate baseline condition
- Determine potential degradation mechanisms
- Inspect and trend data

Causes of failure

- Unique environment
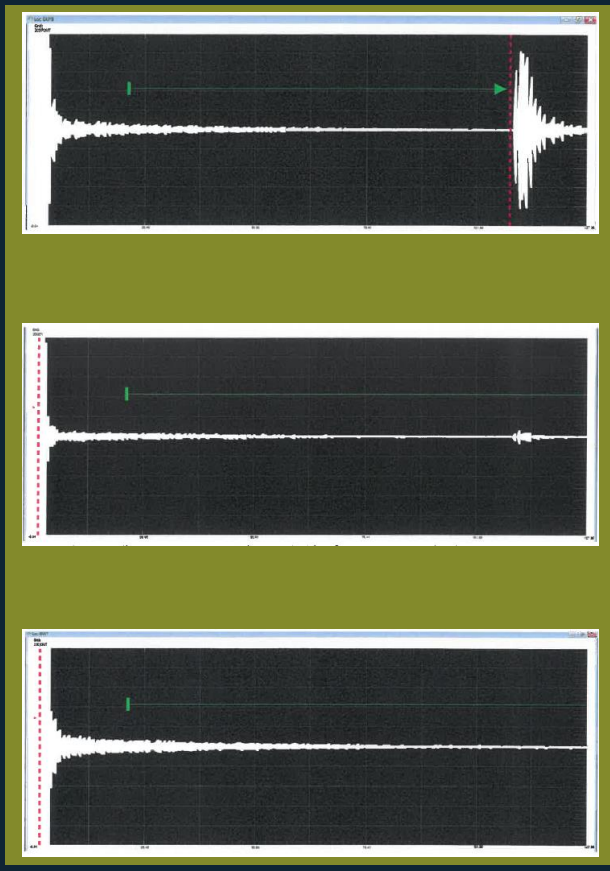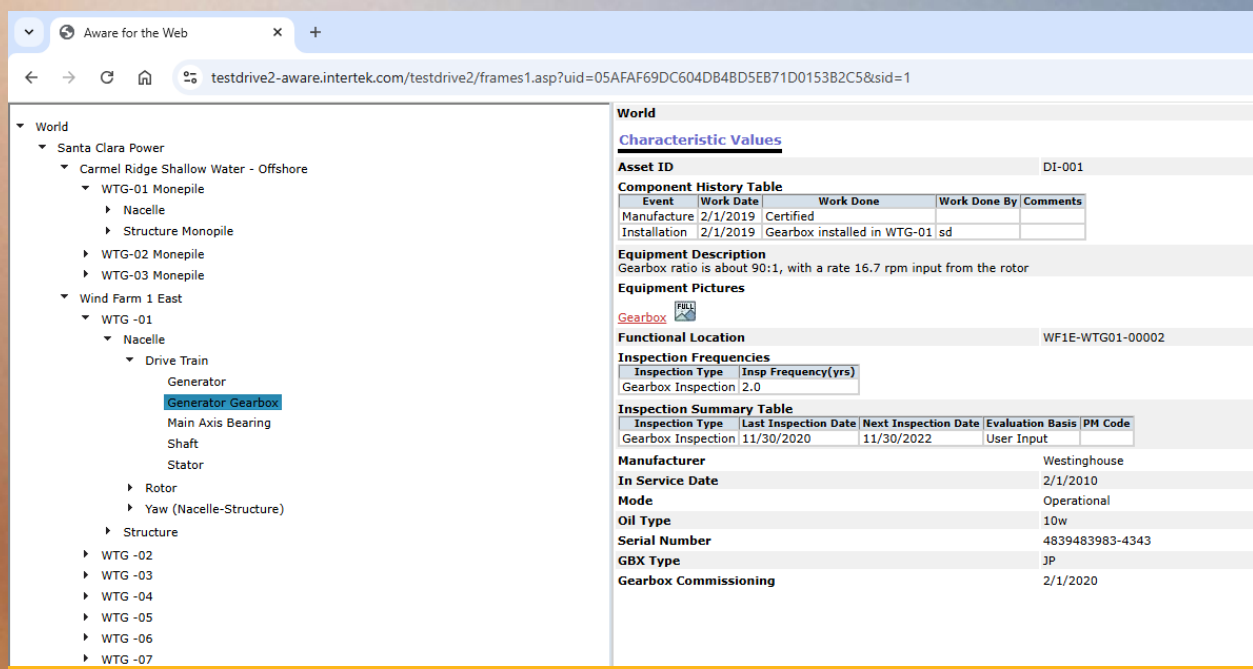- Cooling / sealing (ground)
- Delamination
- Fatigue

Inspection techniques

- Visual (drone)
- Volumetric (UT, PAUT)
- Surface (MT, PT, PMI)

Intertek solutions

- WindAware
- Field NDE & metallurgy lab
- Failure / root cause analyses

"Asset Integrity Management for Wind Turbines" (*Windtech International*, April/May 2017)

https://www.intertek.com/aim

For more details about Intertek's wind energy services: