Maintenance and Service Strategies for aging wind farms

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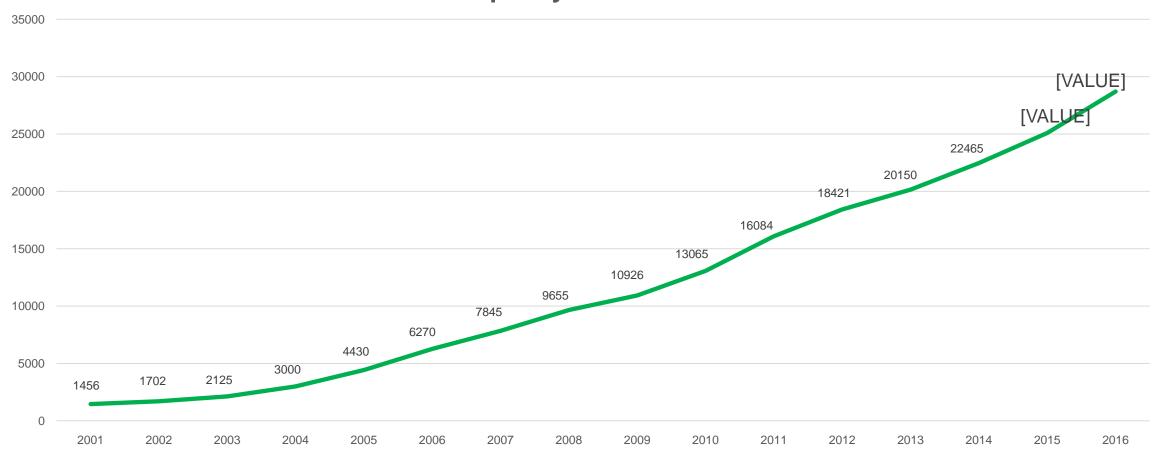
Agenda

- 1. Turbines are getting older
- 2. What can SKF do for your Wind farm?
- 3. SKF Solution Offerings for Wind Farms



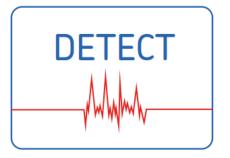
India

Total Installed Capacity of Wind Turbines in India



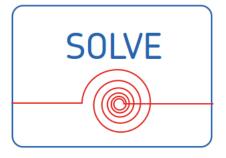


What can SKF do for your Wind Farm?



<u>Detect potential</u> <u>failures</u>

Condition
monitoring
products and
services



Eliminate underlying problems

Reliability engineering / RCA

Multi-platform solutions



Build & rebuild equipment that has already been damaged

Remanufacturing



Detect- Condition Monitoring Services

SYSTEM CONFIGURATION

The machine condition data collected, either with online or offline devices if uploaded to SKF's cloud (OGC) via the Internet



Information relating to actual operating condition of the monitored asset is hosted in cloud servers for remote diagnostics

REMOTE MONITORING





INSTALLATION HARDWARE / **SOFTWARE:**

FEEDBACK to RDC

Sensors are mounted on critical parts of the assets

monitored, typically rotating applications (bearing

housing, gearboxes, etc.

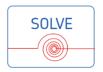


FAILURE DETECTION REPORTING TO CUSTOMER

Data analysis and reporting is done at SKF's RDCs and the information is reported back to the customer



Work Order Dispatch /Execute



APPLICATION / MACHINERY **IMPROVEMENT** Combining RCFA, Engineering



Potential wind failures in wind gearbox

cracks and/or spalls



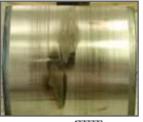
adhesive wear (smearing)

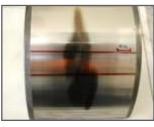
thermal damage

cracks and/or spalls







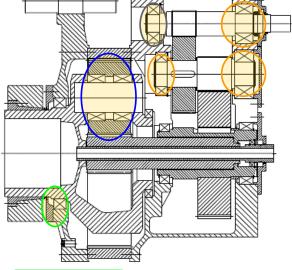




flange fracture











cracks and/or spalls

micropitting





full complement roller smearing



Black Oxidised bearings



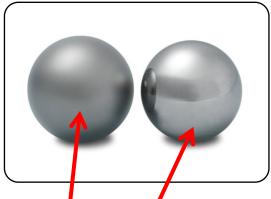
"L5B": black oxidised rollers

"L4B": black oxidised rollers and rings

- **→** Corrosions protection
- → low friction
- → improved running-in
- → reduced risk for smearing damage



Electrical erosion process - current leakage



A dull grey surface of the rolling elements can be a sign of microgratering.

Left: ball with dull gray surface

Right: new ball with mirrored picture of the ball to the left



Fluting or washboarding in a raceway caused by the passage of damaging electrical current.

Outer ring raceway of a deep groove ball bearing



Fluting or washboarding in a raceway (Cylindrical roller bearing) caused by the passage of damaging electrical current.



SKF INSOCOAT® bearings

The Offer:

- VL0241 electrical insulation layer on the outer ring
- VL2071 electrical insulation layer on the inner ring







VL2071



Hybrid Bearing



Bearing grade silicon nitride (ceramic) rolling elements

Bearing grade steel rings

- Safe Electrical Insulation
- Higher Speed Capability
- Extended Grease Life
- Extended Wear Resistance



Re-manufacturing

Bearing before remanufacturing



Bearing after remanufacturing



- Cleaning and inspection
- Defect and root cause analysis
- Polishing rollers / raceways
- Raceway grinding, if needed
- Cleaning and rework of the cage, if needed
- New rollers, if needed
- Preservation
- Repackaging
- Return





