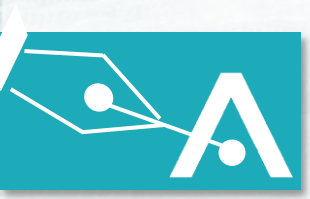
INALIA

Structural Health Monitoring solutions

> Our monitoring turnkey projects are based on physical data measuring and digital twins (both structural and hydrodynamic) to provide added value to the data.

- predictive maintenance
- failure diagnosis
  fatigue analyses
- repowering
  life extension
- working anomalies
- commissioning,
  validation,testing

Lifecycle monitoring turnkey projects



Structural health monitoring design

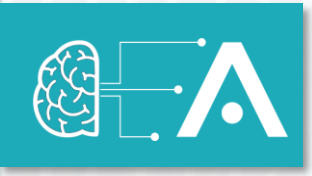
Measurement strategy and technology selection.

Instrumentation and data acquisition

Real-time operational data acquisition of structural stresses, accelerations-vibrations, sound footprint, etc...

Digital twin. Data interpretation and analysis

Descriptive analyses that relate the data to the operational physical magnitudes. Real time alerts system.



Machine learning algorithms

To evolve the monitoring to a predictive maintenance tool.

SIME WIND: Integral structural health solution for floating windturbines

DYNAMIC MODULE

BOLTED JOINTS MODULE

MOORING ANCHORS MODULE

TOWER MODULE

HEAVE PLATE MODULE

FLOATER MODULE

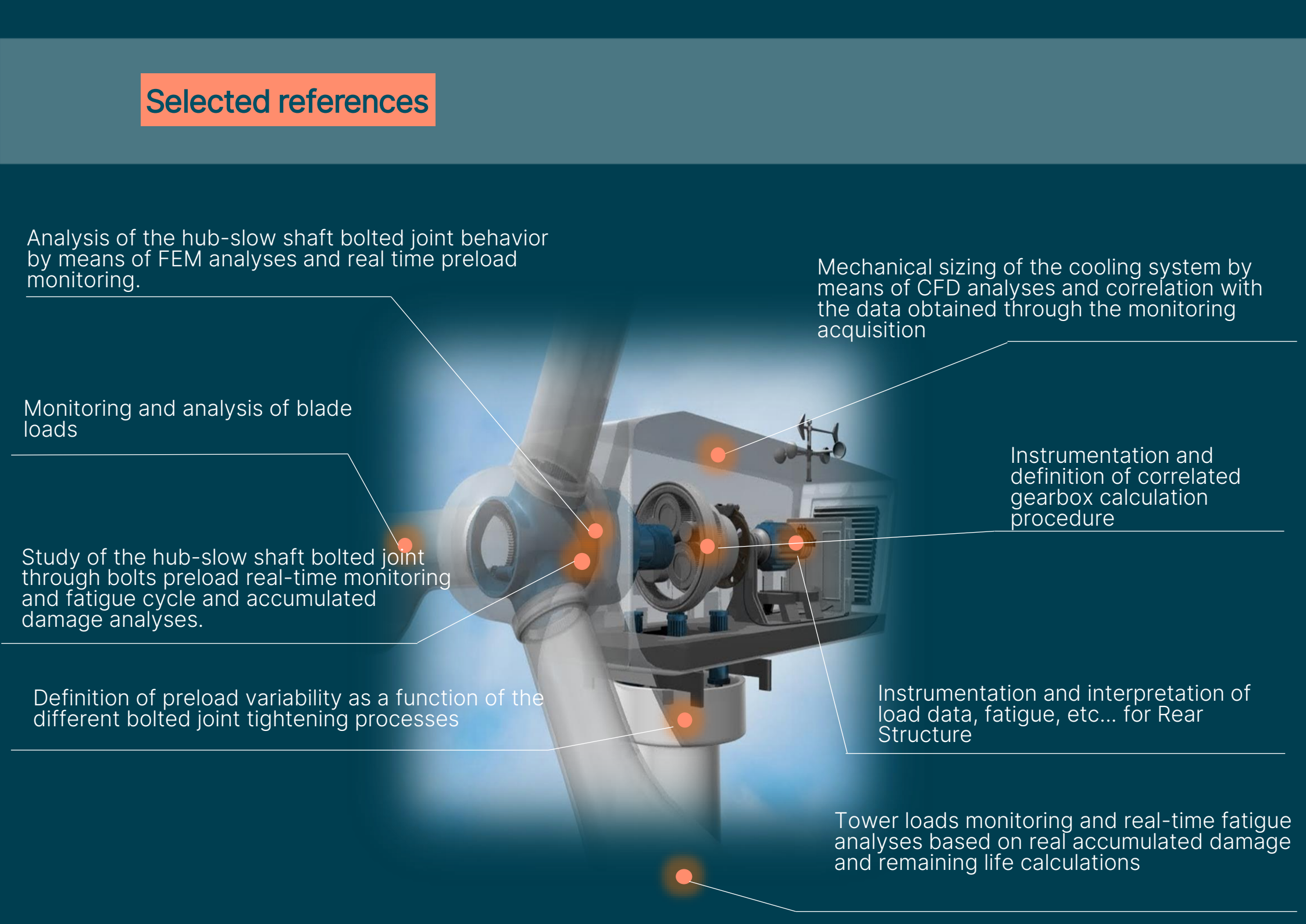
Selected references

Analysis of the hub-slow shaft bolted joint behavior by means of FEM analyses and real time preload monitoring.

Monitoring and analysis of blade loads

Study of the hub-slow shaft bolted joint through bolts preload real-time monitoring and fatigue cycle and accumulated damage analyses.

Definition of preload variability as a function of the different bolted joint tightening processes



Mechanical sizing of the cooling system by means of CFD analyses and correlation with the data obtained through the monitoring acquisition

Instrumentation and definition of correlated gearbox calculation procedure

Instrumentation and interpretation of load data, fatigue, etc... for Rear Structure

Tower loads monitoring and real-time fatigue analyses based on real accumulated damage and remaining life calculations

turnkey monitoring solutions

Instrumentation

- strain gauges
- fiber optic sensors
- accelerometers
- LVDT
- in-house sensors

Acquisition

- comercial equipment
- comercial loggers
- in-house equipment

Visualization

- data
- SCADA integration
- in-house platform

Digital twin

- structural FEM analysis
- dynamic / hydrodinamic analysis
- fluidodynamics FEM analysis
- and other physical models

AI

- supervised & non supervised learning
- deep learning
- statistics
- on-the-edge

zones & components monitoring

bolted joints

welded joints

critical points

drive train, bearings

hydraulic equipment

interfaces, flanges

blades

critical components gearbox, yaw/pitch system...

> Monitoring solutions that learn and predict structural health.

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