nabla
wind hub

AGEING MANAGEMENT PLAN

more info at www.nablawindhub.com

INTRODUCTION

The **Ageing Management Plan** consists on a deep analysis in order to identify in detail the ageing models and effects of an specific component.

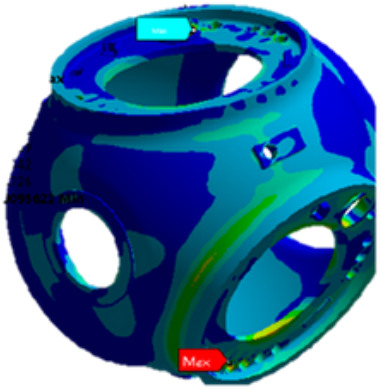
CONCEPT

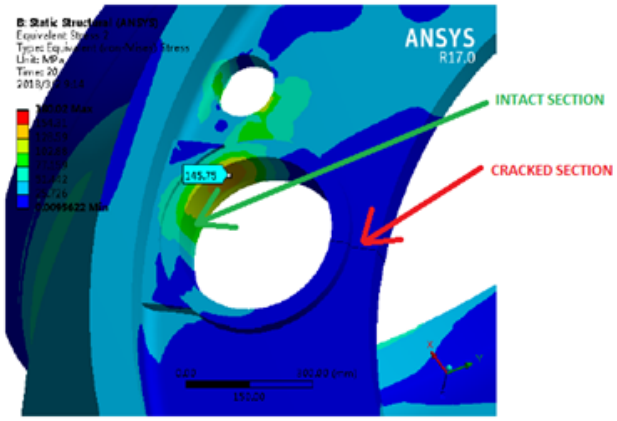
The aim of Ageing Management Plan is to determine how to adapt the maintenance protocols in critical components in order to reduce risks and costs.

The critical components refers to those whose Life Expectancies are below the standard.

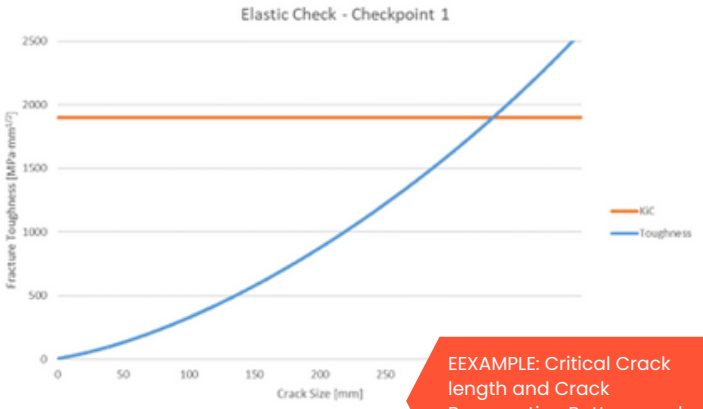
METHODOLOGY

A detailed **AMP** will consist in the following tasks:





- **FEM – Finite Element Modeling** of the component (requires FEM Modeling Inspections and/or drawings (e.g. Foundations)).
- **FEA – Finite Element Analysis** for the component, making use of the detailed realistic site specific loads calculated in the P90 Life Analysis, carrying our a detail structural analysis calculating the stress levels at the component and deriving the Extreme Margins of Safety and Fatigue Reserve Factors per component, obtaining a very refined Structural Life Expectancy.
- **Damage Tolerance Analysis:** analyzing per stress concentration point or damaged point (e.g. corrosion between tower segments) the effect in the structure of cracks nucleation and propagation, calculating:



EEXAMPLE: Critical Crack length and Crack Propagation Pattern analysis (example on Gamesa G47)

- Critical crack length (both elastic and plastic checks)
- Crack Propagation Pattern
- Leading to the build-up of the risk evaluation criteria for cracks, determining, given a certain crack and its length, how this crack will propagate and when will it become critical.

- **Adaptation of Maintenance Protocols**, reducing risks and costs based on the AMP, leading to:
  - Specific inspections and test to be done.
  - Inspections Frequency.

- And **detail definition of the reinforcements to be applied for extending the structural life of the component** (when necessary). The scope of the repair definition is done once the FEA and the Damage Tolerance is completed.

OUTCOMES

Nabla wind hub will deliver the Finite Element Model of the component with its specific report including the findings detected in terms of Extreme Margins of Safety and Fatigue Reserve Factors, and defining a very refined Structural Life Expectancy.

REFERENCES

nabla wind hub is an independent technology platform that delivers asset redevelopment projects for the wind industry worldwide. End-to-end & one-stop-shop partner for SPVs and Porftolios revaluation, through Life Extension, Performance Improvement and Maintenance Optimisation; based on state of the art technologies, such as top-accuracy aeroelastic models, in-house rerotoring components, and advanced monitoring solutions.

600 wind farms assessed

1200 sensors installed

2000 blades installed

+250 Wind Turbines monitored

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