Scaling-up Digitalization Of Critical Components in OFFshore wind turbines (DOCC-OFF)

Circular Design For The Sustainability Of The Offshore Renewable Energy Sector

22nd of June 2021

With the contribution of the European Maritime and Fisheries Fund of the European Union

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Global Context

- The *EU Strategy to harness the potential of offshore renewable energy for a climate neutral future (Brussels 19.11.2020)* declares that "*technological and physical potential of offshore renewable energies is crucial if Europe is to achieve its carbon emission reduction targets for 2030 and become climate neutral by 2050*". It has established "***the objective to have an installed capacity of at least 60 GW of offshore wind by 2030, with a view to reach by 2050 300 GW***", starting from today's installed offshore wind capacity of 12 GW.
- With the crisis generated by the COVID-19 pandemic, **digitalization and renewable energies**, specifically **wind power**, are positioned as technologies to **drive the economic recovery.**
- The expected high growth of investments in Marine Renewable Energies in Europe and globally represent **significant market opportunities which can boost a leading European manufacturing industry**.

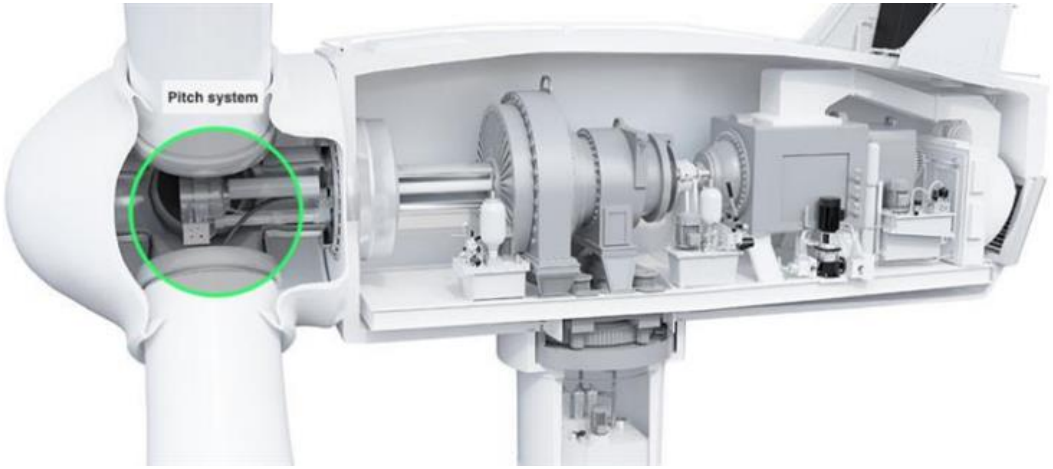
Challenge

- **European wind turbine component suppliers for wind farms are under great pressure of cost reduction** from their customers: wind farm developers and wind turbine OEMs. For that reason, they are exploring innovative and added-value strategies for differentiation and niche competitive advantages.
- **One of the main optimization challenges that offshore wind faces is the cost of Operation and Maintenance activities**. The Offshore wind industry normally incurs costs categorized as CAPEX and OPEX, with each category comprising different elements that correspond with the life cycles of offshore wind farms. OPEX is + 30% of the total cost in bottom-fixed offshore wind farms.
- **Digitalization of wind turbine components and systems as a main source of relevant competitive advantages** is being envisaged. Advances in digitization, communications and data analytics, both in terms of functionality and cost reduction, are making possible to deliver **solutions that allow extracting data from operations and generating business value from them.**

Determining and understanding offshore wind turbine failure rates is vital for modelling and reducing O&M costs

Objective of DOCC-OFF

To identify the failure modes of a **pitch/hydraulic system** and to develop data-based analytical solutions



As a subsystem, the **hydraulic pitch system** is responsible for:

- Wind power control via blade pitch angles
- Load reduction
- Emergency brake of the wind turbine
- Auxiliary systems such as yaw brake, rotor brake, etc.

Project partners

4 partners from Spain and Belgium are joining force to optimize the design, improve the performance and reduce costs of the pitch hydraulic system by making use of big data analytic tools with the operating data.

Coordinator.

Cluster Energía
BASQUE ENERGY CLUSTER

Data management and CM and software development.

xabet

Validation in testing site.

sirris
driving industry by technology

OWI lab

Design and manufacturing of the hydraulic pitch system.

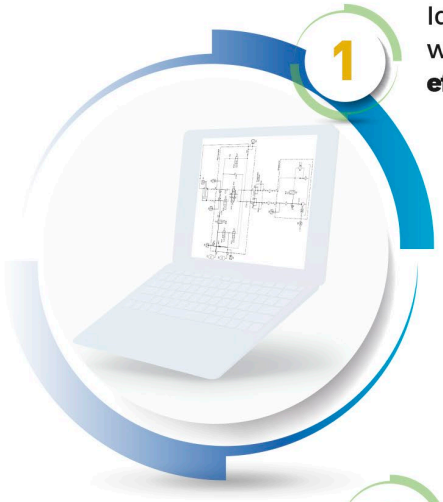
HINE
INNOVATING IN HYDRAULIC SOLUTIONS

Technological approach

Objective: to identify the failure modes of a pitch/hydraulic system and to develop data-based analytical solutions

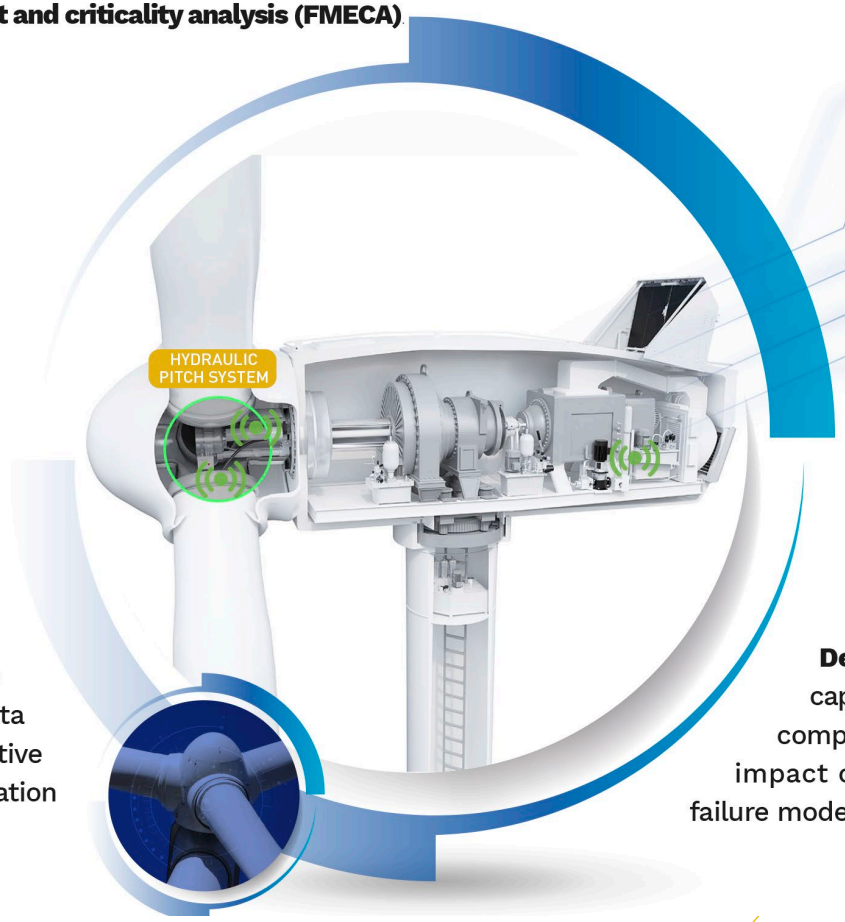
1

Identification of specific condition monitoring opportunities within a typical hydraulic pitch system, via a **failure mode effect and criticality analysis (FMECA)**



2

Selection of the key parameters to be monitored in order to detect the failure modes identified in time, and **development of a hybrid process** where synthetic and real operation data are combined to obtain a representative data set and to improve the classification outputs of failure diagnosis.



3

Development of the digital platform that will capture and manage data from the monitored components, with the objective of reducing the impact of the identified hydraulic pitch system failure modes on the wind turbine's design load cases.

DOCC-OFF: integration of offshore wind technologies with digitalization

Offshore renewable energy is among the renewable technologies with the **greatest potential to scale up**, with offshore wind energy playing a crucial role in meeting the EU's emissions and fossil-fuel reduction targets.

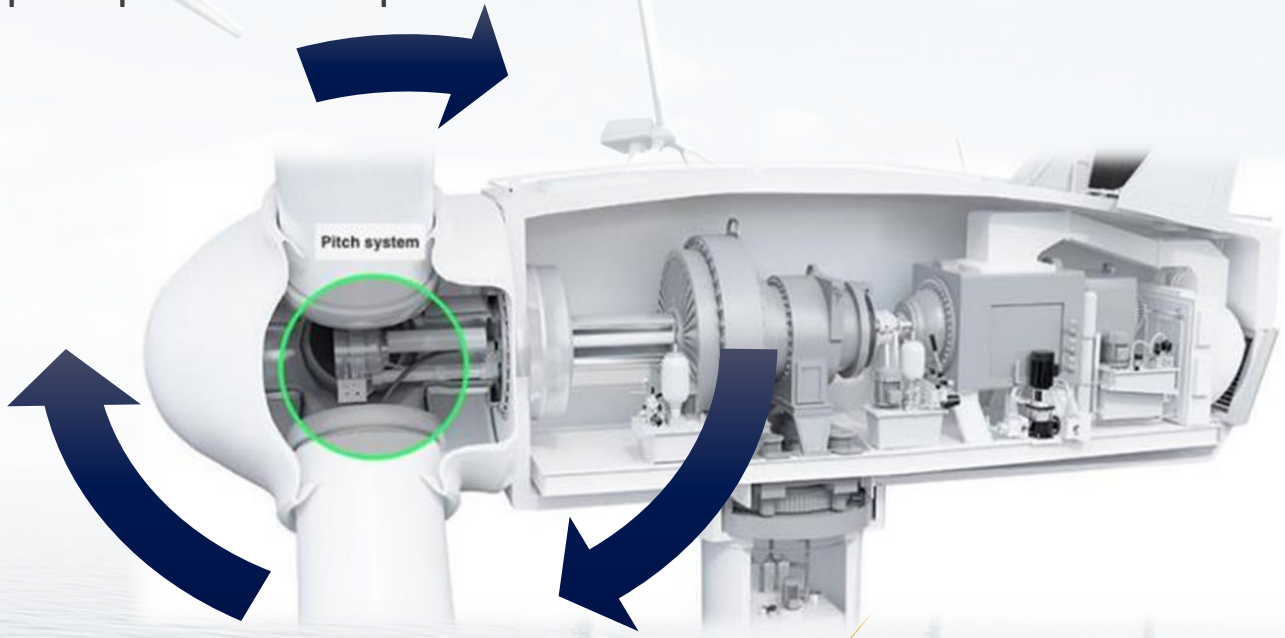
The EU's **offshore renewable energy strategy seeks an increase of 25 times** the current offshore wind energy capacity by 2050. This will require a new wave of construction and significant material resource needs such as steel and difficult to recycle composites.

Digitalization of wind turbine components proposed in DOCC-OFF is therefore essential to come up with new abilities and to increase the resource productivity and overall sustainability of the whole offshore wind installations throughout their lifecycle.

Contribution of DOCC-OFF to Circular economy principles

DOCC-OFF project is contributing to circularity in the offshore wind energy sector since the results of the project will make possible the following improvements:

- **Optimization of the design of components**: reduction of materials and improvement of manufacturing techniques
- **Implementation of predictive maintenance programs**: higher production of renewable energy and reduction of spare parts and replacements due to fewer failures



Thank you

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