Structure & Health mOnitoring for Renewable Energy

SHORE Project

The objective of this project is to identify the optimal monitoring for assessing the state of health of welded mechanical structures and loosening of bolted connections, e.g. loss of pretension in offshore turbines.

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Technical and economic impacts
▶ To reduce maintenance operations costs of wind offshore structures
▶ To develop a SHM solution for metallic offshore structures

Keywords
SHM (Structure Health Monitoring) // Structural load measurements // Welded joints // Crack propagation

State of Art, selection of solutions to test
July 2018

Weld joint monitoring
February 2019

June 2018
Starting of the project

September 2018
Bolt's loading monitoring test

December 2019
End of the project

INDUSTRIAL CONTEXT

The levelized cost of electricity (LCOE) of wind energy has been declining in past decades. This is in large parts due to reduced manufacturing cost of wind turbines. However, to guarantee a further reduction in LCOE the requirement for servicing installed wind turbines should be reduced. As a key technology for tall, cost-effective towers bolted and welded connections must perform flawlessly. The loss of pre-tension in bolts has a tremendous impact on the performance of wind turbines. It is therefore necessary to understand the underlying mechanism that lead to a loss of bolt pre-tension.

INNOVATIVES FEATURES

▶ Understanding the loading conditions seen by bolted/welded assemblies of offshore wind turbines and their respective damaging mechanisms

▶ Developing an experimental setup of the assemblies and test setup/method that can reproduce the loss of bolt pretension and fatigue behavior of welds seen in some wind turbines' metallic assemblies

▶ Evaluation of monitoring system with innovative tools

INDUSTRIAL APPLICATIONS

The main market for this SHM project is the renewable energy super metal structures, however, the solutions developed will also allow the monitoring of other structural bolted and welded elements.

The results of this project will allow to better forecast and also detect issues of bolt pretension loosening and weld health (crack detection/evolution).

TRL 1 | TRL 2 | TRL 3 | TRL 4 | TRL 5 | TRL 6 | TRL 7 | TRL 8 | TRL 9

Partners
▶ IRT JULES VERNE
▶ GE RENEWABLE ENERGY
▶ IFSTTAR
▶ ESEO (expertise)

Budget
▶ 900 K€

Equipment
▶ IRT Jules Verne's Mechanical Test facility

Sales contact
business@irt-jules-verne.fr

Press contact
communication@irt-jules-verne.fr

www.irt-jules-verne.fr

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