

Blade Wedge Connection 1

Publieke samenvatting / Public summary

Aanleiding

Blade connections in wind turbines are one of the critical elements during the installation of a wind farm. Currently, these connections, called the blade root joints, comprise of a bolted arrangement whereby a stud is connecting the blade root to the pitch-bearing in the hub. In one of the two dominant applied technologies, the so-called T-bolt system, these studs are connected to barrel nuts integrated in the blade root (Figure 0-1). Alignment of the blade with studs to pitch-bearing in the hub during offshore installation is complex, and this type of connection is prone to fatigue when preload on the bolts is lost. In addition, blade movements during installation can lead to damages to the blade root and/or studs and the pitch bearing. The C1 Wedge Connection could provide a solution to address these challenges.

Doelstelling

The general goal of the research project is to get a better understanding of using an innovative technique, such as the Wedge Connection, to connect wind turbine blades to the blade bearings in the hub. The following goals are defined:

- Obtain knowledge of the behaviour and performance of the connection by using FE Analysis and find an optimised required thickness for the composite blade root.
- Obtain knowledge of the capacity of a wedge connecting by means of fatigue load testing whereby one part comprises of a steel flange and the counter part of a composite flange – both laminated and regular composites.

Korte omschrijving

Projectinformatie / Project information

Projectnummer / Project number

HER+22-02-03437721

Subsidiebedrag / Grant amount

€ 390.013,00

Algemene informatie / General information

Penvoerder / Secretariat

C1 Connections B.V.

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In Work Package A, TNO will develop a numerical model that incorporates the Wedge Connection design that will be provided by C1 Connection, based on ULS and FLS load case defined for a next generation wind turbine. The FE Analysis will be used to determine the behaviour and performance of the Wedge Connection compared to traditional blade connections and find an optimised blade root design. In Work Package B, TNO will perform fatigue tests. Several coupon (segment specimen) tests will be executed at a TNO lab. For these test, each segment will comprise of a steel flange, a composite flange - with and without steel lamination - and a fastener. T

Resultaat

Via execution of this research project knowledge will be obtained for using a C1 Wedge Connection as the primary connection between a wind turbine blade and the hub of the nacelle. The general goal is to set a first step to understand how to reduce installation time, improve workability on blade installation, and reduce the risks of fatigue and bolt damage during installation via this application. Specifically, the following results are expected: • a full understanding of the behaviour and performance of the C1 Wedge Connection compared to traditional connections under load cases defined for next generation wind turbines, • a tested and workable solution to integrate the holes for the C1 Wedge Connection directly into a composite blade root, • the ultimate and fatigue performance of the wedge connection when using a combination of steel and composite flanges. • the improvement in ultimate and fatigue performance of a wedge connection using fiber metal laminated composites compared to regular composite.

De data in deze applicatie is afkomstig van de Rijksdienst voor Ondernemend Nederland (RVO) en wordt in samenwerking met de Topsector Energie ontsloten.

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