

Selected Results on the Development and Testing of Smart Blades Technologies for Wind Turbines

Zhuzhell Montano*, **Steffen Opitz***, **Johannes Riemenschneider***, **Edgar Werthen***, **Yves Govers****, **Janto Gundlach****, **Martin Pohl****, **Vlaho Petrović†**, **Róbert Ungurán†**, **Lars Neuhaus†**, **Piyush Singh†**, **Claudio Balzani††**, **Michael Wentingmann††**, **Ayan Haldar††**, **Raimund Rolfes††**, **Moritz Bätge††‡**

* German Aerospace Center (DLR)
Institute of Composite Structures and Adaptive Systems
Lilienthalplatz 7, 38108 Braunschweig, Germany
e-mail: Zhuzhell.MontanoRejas@dlr.de,
web page: <https://www.dlr.de>

† ForWind – Center for Wind Energy Research
Carl von Ossietzky University of Oldenburg
Küpkersweg 70, D-26129 Oldenburg, Germany
e-mail: vlaho.petrovic@uni-oldenburg.de,
web page: <https://www.forwind.de/>

** German Aerospace Center (DLR)
Institute of Aeroelasticity
Bunsenstr. 10, 37073 Göttingen, Germany
e-mail: Yves.Govers@dlr.de,
web page: <https://www.dlr.de>

†† ForWind – Center for Wind Energy Research
Leibniz University Hannover
Appelstr. 9A, 30167 Hannover, Germany
e-mail: claudio.balzani@iwes.uni-hannover.de,
web page: <https://www.forwind.de/>

‡ Fraunhofer Institute for Wind Energy Systems IWES
Am Seedeich 45, 27572 Bremerhaven, Germany
e-mail: moritz.baetge@iwes.fraunhofer.de,
web-page: <https://www.iwes.fraunhofer.de>

ABSTRACT

Within the frame of the Smart Blades [1] and the SmartBlades²¹ projects, different technologies for developing smart rotor blades for wind turbines have been developed and are still being studied and tested. These cover the three following technologies: bend-twist coupled rotor blades; rotor blades with trailing edge flaps and rotor blades with leading edge slats. In addition, cross-technology topics that need to be considered for successfully implementing all three technologies as well as for evaluating their performance within a wind turbine system are being studied.

This paper will present an overview of the results of the project focusing in the following:

- Rotor blades with geometrical bend twist coupling: summary of the blade design and manufacturing processes, summary of the results of modal tests, and selected preliminary results of field tests (on a turbine) with an introduction of a specially developed blade tip sensor for the measurement of the torsional deformation angle at the blade tip.
- Rotor blades with trailing edge flaps: summary of the concept and design of the demonstrator as well as fatigue tests, summary and highlights of the controller design activities, overview of the possibilities for upscaling as well as for developing alternative concepts.
- Rotor blades with leading edge slats: summary of three different concepts and the available results regarding wind tunnel tests as well as controller development with an emphasis on an active and a passive concept.
- Introduction to the evaluation method that will be used for evaluating the different technologies.

REFERENCES

[1] J. Teßmer, C. Icpinar, A. Sevinc, E. Daniele, J. Riemenschneider, M. Hölling and C. Balzani, “Schlussbericht SB: Smart Blades : 01.12.2012-30.04.2016“, Deutsches Zentrum für Luft- und Raumfahrt e.V. in der Helmholtz-Gemeinschaft, 2016

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