Hybrid Testing of Composite Structures with Single-Axis Control - DTU Orbit (09/11/2017)

Hybrid Testing of Composite Structures with Single-Axis Control

Hybrid testing is a substructuring technique where a structure is emulated by modelling a part of it in a numerical model while testing the remainder experimentally. Previous research in hybrid testing has been performed on multi-component structures e.g. damping fixtures, however in this paper a hybrid testing platform is introduced for single-component hybrid testing. In this case, the boundary between the numerical model and experimental setup is defined by multiple Degrees-Of-Freedoms (DOFs) which highly complicate the transferring of response between the two substructures. Digital Image Correlation (DIC) is therefore implemented for displacement control of the experimental setup. The hybrid testing setup was verified on a multicomponent structure consisting of a beam loaded in three point bending and a numerical structure of a frame. Furthermore, the stability of the hybrid testing loop was investigated for different ratios of stiffness between the numerical model and test specimen. It was found that when deformations were transferred from the numerical model to the experimental setup, the hybrid test was only stable when the stiffness of the numerical model was higher than the test specimen. The hybrid test gave similar results as a numerical simulation of the full structure. The deviation between the two was primarily due to the response of the specimen in the hybrid test being one load step behind the numerical model.

General information

State: Published
Organisations: Department of Civil Engineering, Section for Structural Engineering, Department of Mechanical Engineering, Solid Mechanics, Section for Building Design, Department of Wind Energy, Wind Turbines
Authors: Waldbjørn, J. P. (Intern), Høgh, J. H. (Intern), Stang, H. (Intern), Berggreen, C. (Intern), Schmidt, J. W. (Intern), Branner, K. (Intern)
Number of pages: 11
Publication date: 2013

Host publication information

Title of host publication: Proceedings of the 19th International Conference on Composite Materials
Main Research Area: Technical/natural sciences
Conference: 19th International Conference on Composite Materials, Montréal, Canada, 28/07/2013 - 28/07/2013
Hybrid testing, Hardware-in-the-loop, Substructural testing, Composites, Three point bending, Finite element modelling, high-precision control
Source: dtu
Source-ID: u::8626
Publication: Research - peer-review › Article in proceedings – Annual report year: 2013