ForWind
Center for Wind Energy Research
Bremen Hannover Oldenburg

FZK
COASTAL RESEARCH CENTRE

Leibniz Universität Hannover

ForWind Research Profile

Research Campus Wind & Wave Hannover Marienwerder

Research Campus

Wind energy research at LUH is part of ForWind, with the large research infrastructure being housed at Marienwerder we are working on the future challenges for wind energy today. Reliability and efficiency of wind turbines has increased enormously in recent decades, not least thanks to intensive research.

Support structure and component tests

Large-scale testing of support structures and components under extreme, cyclic and fatigue loads by using the sand pit and the 3-sided clamping field is performed at the TTH and in the Concrete Fatigue Research Laboratory – turbine generator tests at the GeCoLab.

Wave and current loads

With the unique Large Wace Current Flume (GWK+) and the Multi-directional Wave and Current Basin (WSBM) the natural environmental conditions at sea can be simulated on a large scale in the laboratories in the best possible way.

TEST CENTER SUPPORT STRUCTURES and GECOLAB

The Test Centre Support Structures Hannover (TTH) offers a unique test infrastructure for investigating all types of support structures and their components on a scale of 1:10 and larger. These are, on the one hand, a large-scale 3D span (9 x 18 m) and, on the other, a foundation test pit (14 x 9 x 10 m). Components can be tested for fatigue and extreme load behaviour in both uniaxial and multiaxial configurations. These facilities are complemented by specialist laboratories and workshops to fully investigate a wide range of research questions. Part of the TTH is the GeColab. It is a universal generator test bench which enables a deep investigation of wind turbines and hydrogenerators in the megawatt class including converter generator interactions. The Test-generators can be connected to an emulated grid through a converter with or without transformers. Different grid sceneries like unbalanced voltages, voltage harmonics etc. can be realized and tested.

CONCRETE FATIGUE RESEARCH LABORATORY

The Concrete Fatigue Research Laboratory has a span field with a dimension of 16.5 m x 16.2 m. In addition, there is a tensioning wall with 3 m height and 5 m length and anchoring possibilities in a 1 m grid. A force of up to 500 kN can be anchored per tension pot. Due to the large-area design of the clamping fields, various test set-ups are possible, whereby the lab is mainly used as a resonance test benches. The laboratory has two load frames. Large test specimens with dimensions of 15 m length, 2 m height and 3 m width can be tested.

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SIZE MATTERS

The Research Campus Wind & Wave at Leibniz University Hannover concentrates large-scale laboratories for onshore and offshore wind energy research and is a vital part of ForWind's research infrastructure.

Get in touch

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LARGE WAVE CURRENT FLUME (GWK+)

MULTI-DIRECTIONAL WAVE AND CURRENT BASIN (WSBM)

In 2023 the extension into the Large Wave Current Flume (GWK+) was put into operation. With 300 m length, 5 m width, 7 m depth and wave heights of up to 3 m it was already one of the largest and most important testing facilities of this kind worldwide. Thanks to the expansion, the large-scale research infrastructure now has a powerful flow facility (20 m^3/s), a deep section for investigating foundation structures of offshore wind turbines and a high-performance wave machine for generating realistic ocean waves. The conversion now makes it possible to generate waves and currents simultaneously.

Multidirectional sea states with a maximum wave height of 0.32 m can be generated in the 3D wave and current basin (test area: 30 m x 15 m) for water depths up to 1 m. This facility provides a 2^{nd} order wave generation and active wave absorption. It has a state-of-the-art multidirectional wave maker to generate nature-like long and short-crested wave spectra. A multilayer mesh screen absorber acts as a passive wave absorber on three sides of the basin. The basin allows to study the behavior of waves and their interactions with coastal and offshore structures. We model wave dynamics, test and optimize designs, analyze coastal processes, conduct environmental impact studies and develop and validate numerical models.