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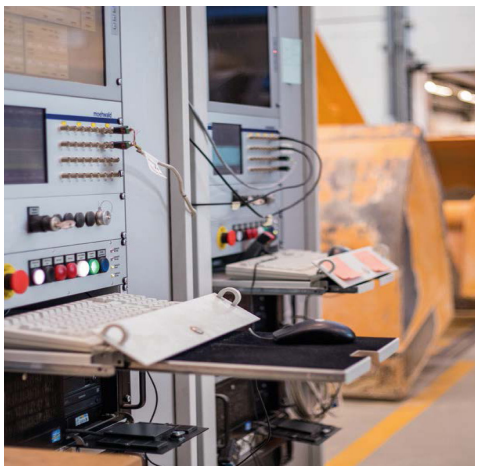
Standing against the tide

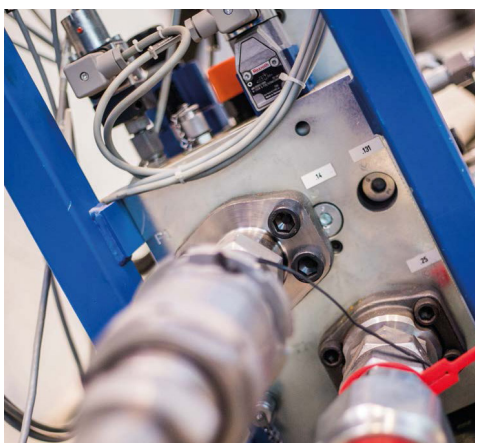
GERMAN LEIBNIZ UNIVERSITY IN HANOVER USES BOSCH REXROTH TECHNOLOGY FOR RESEARCH AND TESTING OF WIND TURBINE SUPPORT STRUCTURES

Offshore wind turbines need to be securely and durably mounted on the ocean floor. In collaboration with Fraunhofer Institute for Wind Energy and Energy System Technology (IWES) and ForWind Centre for Wind Energy Research, the Test Centre for Support Structures (TTH) at Leibniz Universität in Hanover performs applied research and testing of wind turbine support structures and components with the aim to optimize their designs and construction technologies.



TESTING DYNAMIC AND FATIGUE BEHAVIOUR

Opened in 2014, the Test Centre TTH at Leibniz Universität in Hanover is dedicated to the testing of wind turbine support structures. The custom-designed building is used for testing fatigue and extreme load behaviour of scaled wind-turbine support structures under single or multi-axial loading. The building is split into two testing areas, the first one is a test pit filled with water-saturated sand, reproducing the ocean floor, the biggest world-wide with L 14 m x W 9 m dimensions, 10 m deep, the second one is a clamping field L 18,5 m x W 9,5 m with rigid angled walls, 8 m high.



In the pit, interactions between sea ground, support and foundation structures can be simulated and analyzed under tests with static or cyclic loads, generally at low frequencies under 2- 5 Hz. On the clamping field, the fatigue and the structural behavior of structure components under single or multi-axial loads can also be tested.

To test and simulate the forces applied to these structures by different loads, waves, or wind, the system uses hydraulic cylinders from Bosch Rexroth. These range from a nominal force of 250 kN up to an impressive 2000 kN. In total, 12 cylinders were installed, which can all be individually controlled using an advanced real-time control and data acquisition system from Bosch Moehwald, partnering with Bosch Rexroth.

The cylinders were delivered fully equipped with position and force sensors, pressure safety valves, short circuit valves, servo valves and swivel joints to protect them from radial forces. For the biggest cylinders, the swivel joints are equally impressive in size. Twelve hydraulic isolating systems were also delivered, allowing an individual operation of each cylinder. In addition, Bosch Rexroth provided in a separate project the central oil supply unit installed within a container placed outside of the building on customer's demand.

BOSCH REXROTH PORTFOLIO MEETS SPECIFICATION AND BUDGET

Bosch Rexroth worked closely with the University to ensure that supplied system delivered the desired specifications while staying within the EU funded budget. Thanks to the broad cylinder portfolio, Bosch Rexroth was able to meet both the technical requirements derived from the planned testing applications and even the requirements of the given budget . High performance testing cylinders and some industry standard cylinders from 250 KN up to 2000 kN belong now to the equipment of the laboratory.
Bosch Rexroth delivered a complete drives and controls test system to the laboratory which is now offering outstanding testing services to the wind and off-shore industry

Operating since 2014, the centre enables complex questions about a structure's dynamic and fatigue behaviour under long-term cyclic loading by waves, wind, and operation to be answered. Clearly defined testing procedures under extreme loads provide reproducible results to validate simulation models and build safer and more cost-effective wind turbines.