

Motion Compensation



photo: courtesy of SMST

Motion Compensation

Bringing people from a vessel to a wind turbine has been the key driver for the development of motion compensated access bridges. These machines measure the motion of the vessel and actively move the tip in such a way it is at standstill with respect to the wind turbine. This allows easy docking to the wind turbine platform and a safe walk over the bridge. Since the development of the first motion compensated bridge in 2007 by Ampelmann, motion compensation has gained a widespread interest. It is now used by the key players in the industry, and expanding to other machinery like cranes, pile grippers and dredges.

Complex Control

To compensate for the motion of a ship, an accurate measurement of the ship's position in 6 dimensions is required. Based on this position, an inverse position of the machine (crane, access bridge, pile gripper) is calculated that compensates exactly the deviation of the ship. This requires serious mathematics and makes control system design for motion compensation extremely difficult, a job that Controllab excels in.

Controllab is the only independent supplier of motion compensation control systems in the offshore wind industry. We supply controllers for access bridges, cranes and pile grippers for key players in the industry such as SMST, Ulstein and MacGregor. Controllab has the tooling and experience to deliver motion compensation control systems within time and within budget, from the initial design to the commissioning on the vessel.

Approach

Model based design is the core technology that we use for the design of motion compensation control systems. With our models we can simulate the complete machine and control system. The simulations allow us to assess the accuracy of the motion compensation and the performance requirements of the actuators.

We use Hardware-in-the-loop Simulation (HIL) for testing the PLC's. With HIL simulation, a simulation is coupled to the PLC, replacing the real machine. We know from experience that this method of testing, for motion compensated systems can save up to months of delay on commissioning time.



SMST

SMST provides a range of passive access bridges. The challenge for SMST in 2014 was to develop a motion compensation control system for their medium sized bridge that could be re-used for other types of bridges. Controllab was asked to help SMST with the development of this control system, to introduce model based design in the control department of SMST, and to provide tooling and training. With model based design, a simulation model is used to design the control system of the bridge. This allows a large set of destructive and non-destructive scenarios to be simulated to test the performance and safety of the control system.

After the control system was designed and successfully tested using simulations, it was to be exported as C-code to the PLC and coupled with the safety and communication modules. The resulting PLC was again tested by coupling it with the simulated bridge. This allowed a problem free commissioning and record time implementation on the ship.

The TAB can be operated by vessel's crew, doesn't need large generators and is inexpensive to operate. Due to these key assets, SMST access system is widely used by multiple offshore operators.

TTS Offshore Solutions AS

The TTS Colibri™ is a double arm unit that can be placed on top of a knuckle boom crane to provide motion compensated cargo lifts. The tip of the Colibri compensates in the horizontal plane while the winch takes care of the vertical motion.

The Colibri is also equipped with an anti-sway controller. This controller uses the horizontal motion of the crane to actively damp cargo swing. Controllab provided the motion compensation control system and anti-sway controller for the Colibri and helped TTS with the commissioning and ship acceptance test.

The Colibri is now successfully used on a wind-farm support vessel.

Track Record

Controllab is the only independent supplier of motion compensation control systems in the offshore wind industry. We have worked for all of the main companies in the offshore wind industry. Please contact us if you want to know more on motion compensation.

Contact Us

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