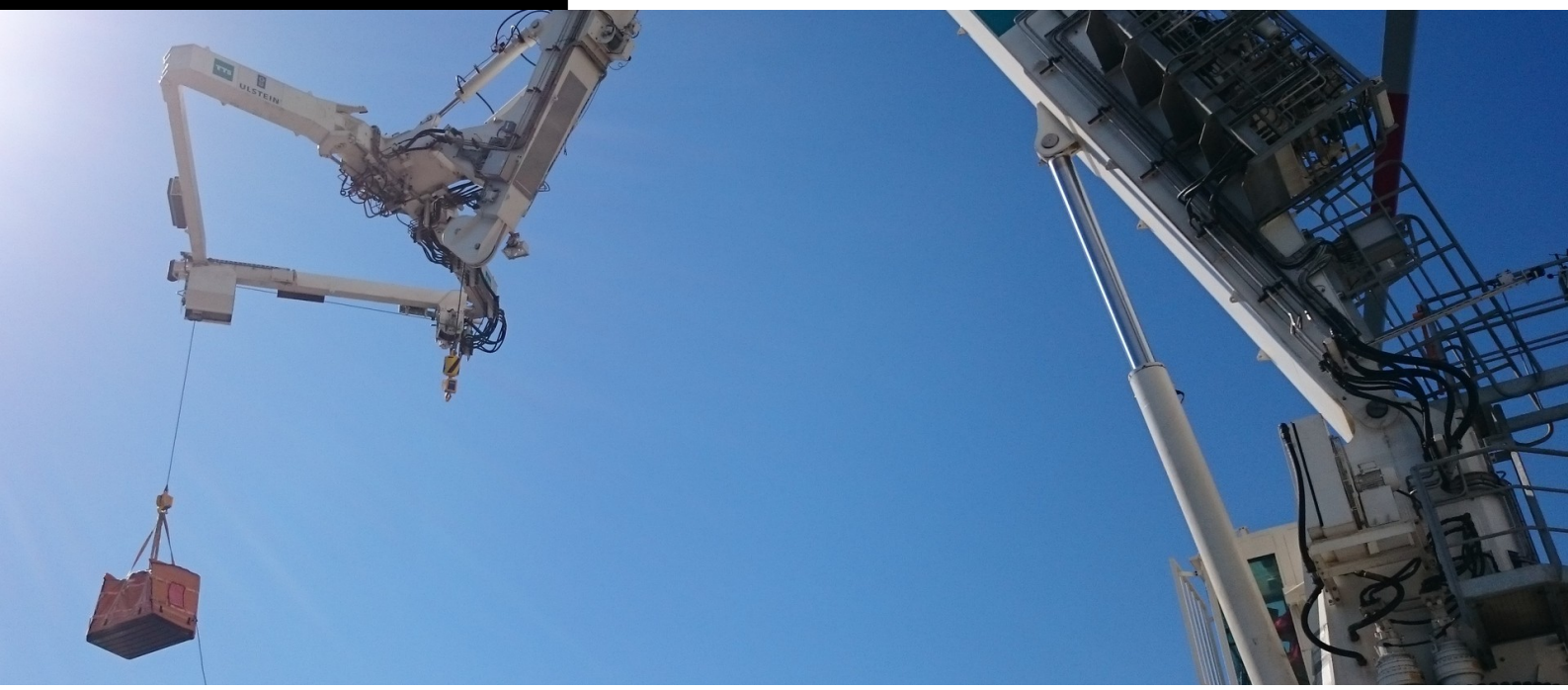
controllab | products

Motion Control



Motion Control

To compensate a crane for the motion of a ship, to steer a robot without collisions, or to make a piston pump transport fluids with ultimate precision, this all requires an accurate control of motions. Controllab has a large expertise in designing control systems for a wide range of applications.

Model Based Design

The key issue for designing a successful motion controller is a good understanding of the dynamics of the machine. Controllab therefore uses model based design. With model based design, every part of a machine that is relevant for its motion, is identified and modelled. By coupling the modelled parts, a system simulation model is created. This simulation model is then used to design a control system, that will make the machine move with the desired precision and speed.

HIL Simulation

The simulation model is also used to test the control system, when it is implemented on a PLC or an embedded system. This is called Hardware-in-the-Loop (HIL) simulation. With HIL-simulation a large number of scenarios can be tested virtually, before the machine is actually built.

Test Automation

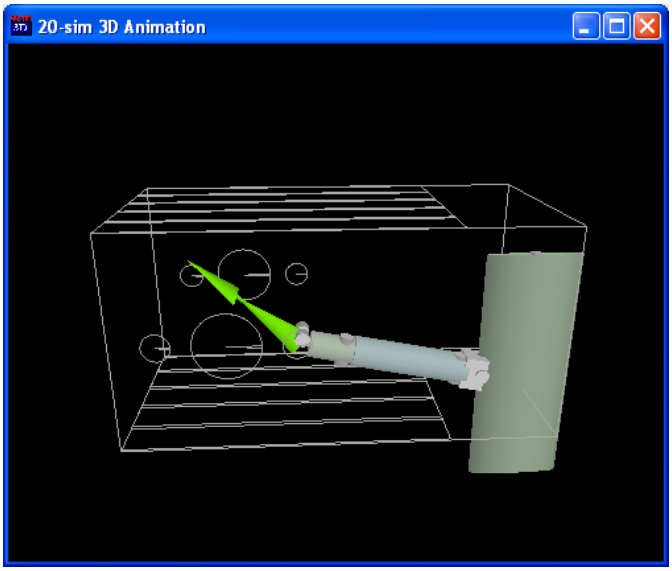
Controllab can speed up the design process, by running simulations automatically and testing the outcomes against preset requirements. This allows us to implement changes to the control systems and test them against hundreds of scenarios.

Expertise

All of these technique and over 25 years of experience, make Controllab a desired partner for developing motion control systems in the High Tech and Maritime market.

Wind Tunnel Robot

The German-Dutch Wind Tunnels (DNW) operates a high speed wind tunnel. In this tunnel an area of 2.0 m x 1.8 m is available for testing from mach ranges of 0.1 up to 1.35 and pressures ranging from 0.2 bar to 4.0 bar. A robot is used to manoeuvre models into the test area and keep them in the correct postures. For a tunnel redesign a new robot was needed with improved manoeuvring capabilities and dynamic posturing. Controllab was commissioned to test the capabilities of the designed robot under dynamic wind loads. Because this project was classified, this factsheet shows a picture of the previous robot.

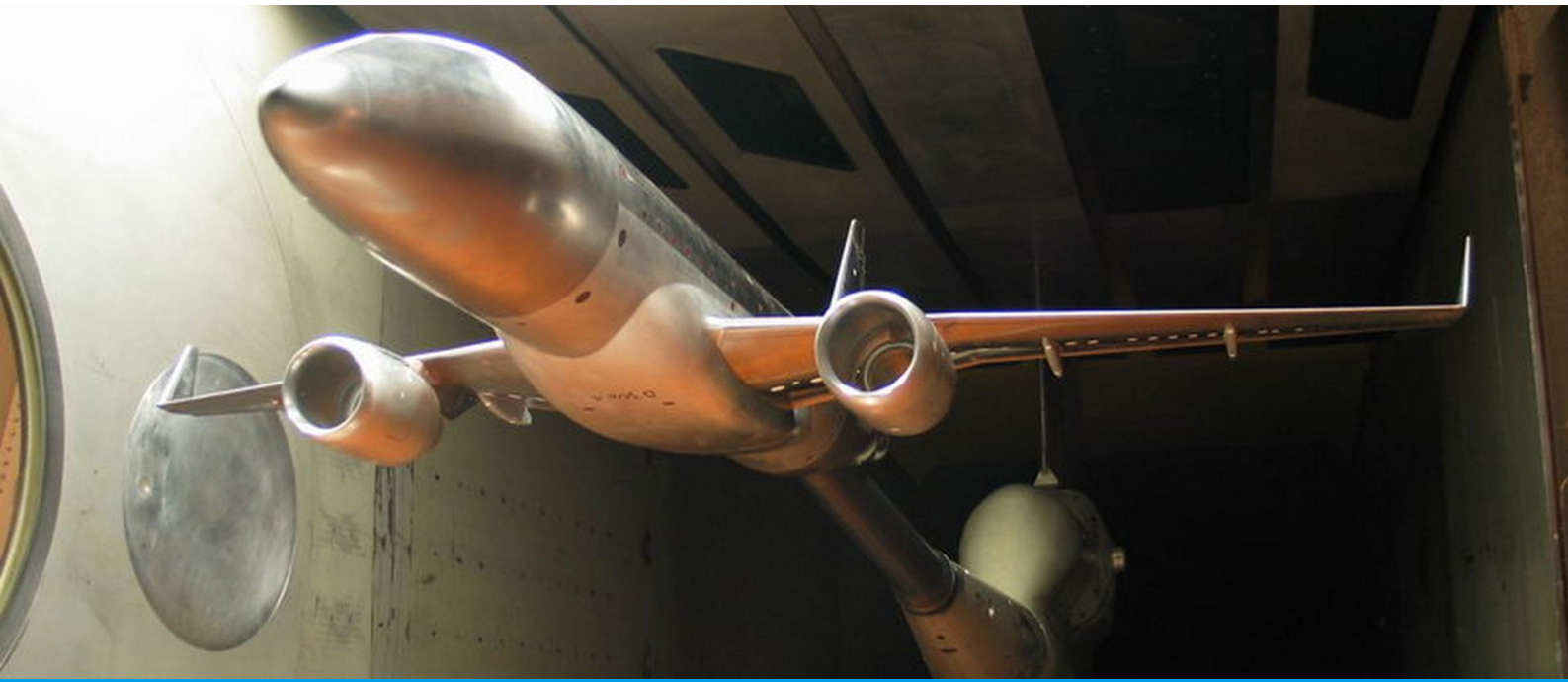


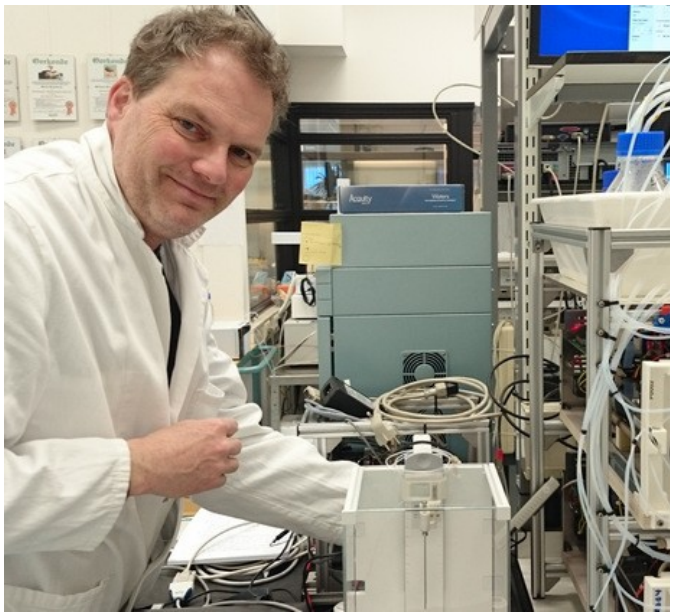
With the geometric data and physical parameters of the robot, a 3D model was created using the modelling and simulation package 20-sim. During simulation this model uses the joint torques and wind loads as input and returns the corresponding motion of the robot as outcome. The dynamic model was coupled to standard library blocks of 20-sim, describing the electric actuators of the robot, the actuator amplifiers and the connected computer control loops. In this way a digital twin was created that will mimic the forces and movements, of a real robot with a high degree of accuracy.

Ultra high pressure pump

A world-class supplier of components for analytical systems contacted Controllab to work on their ultra high performance liquid chromatography (UHPLC) pump. The UHPLC pump consists of two pairs of serially coupled piston pumps. Each of the four pumps is individually driven and controlled. This generates maximum freedom for the flow control and pulse reduction.

Controllab used their software package 20-sim to model the various components of the pump and develop an advanced control system. One of the challenges of the new pump was its range of operation. This required a dedicated servo motor controller, capable of driving a motor with an extremely constant rotation over a large ranges of speeds. A three phase servo motor model was developed by Controllab. The simulation model helped Controllab to develop an advanced servo motor controller and test it in simulation first, before deploying it on a test





bed. An automated work flow was created that allowed Controllab to export the control system as C-code and deploy it for testing on a test bed and prototypes automatically. This allowed the customer to test the prototype and develop a market ready product without any delays. The product lived up to its expectations was quickly seen as best in its market.

Boom Lock

The company High Wind (a subsidiary of DEME) has developed the Boom Lock, a tool that allows an offshore crane to install wind turbine components. The Boom Lock consists of a trolley that can travel up and down the crane boom to catch and secure the crane hook. The system is equipped with horizontal and vertical taglines to control the swinging and orientation of the load. Controllab has designed the motion control system for the Boom Lock. The control system will automatically move the Boom Lock and the taglines in such a way that the load is transported safe and stable throughout the lift.

Special care was taken with the testing of the control system. HIL simulations were carried out to test numerous scenarios, even those which in reality could potentially damage the crane. The Boom Lock system has been successfully brought into operation and is now being used to install offshore wind turbines.

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