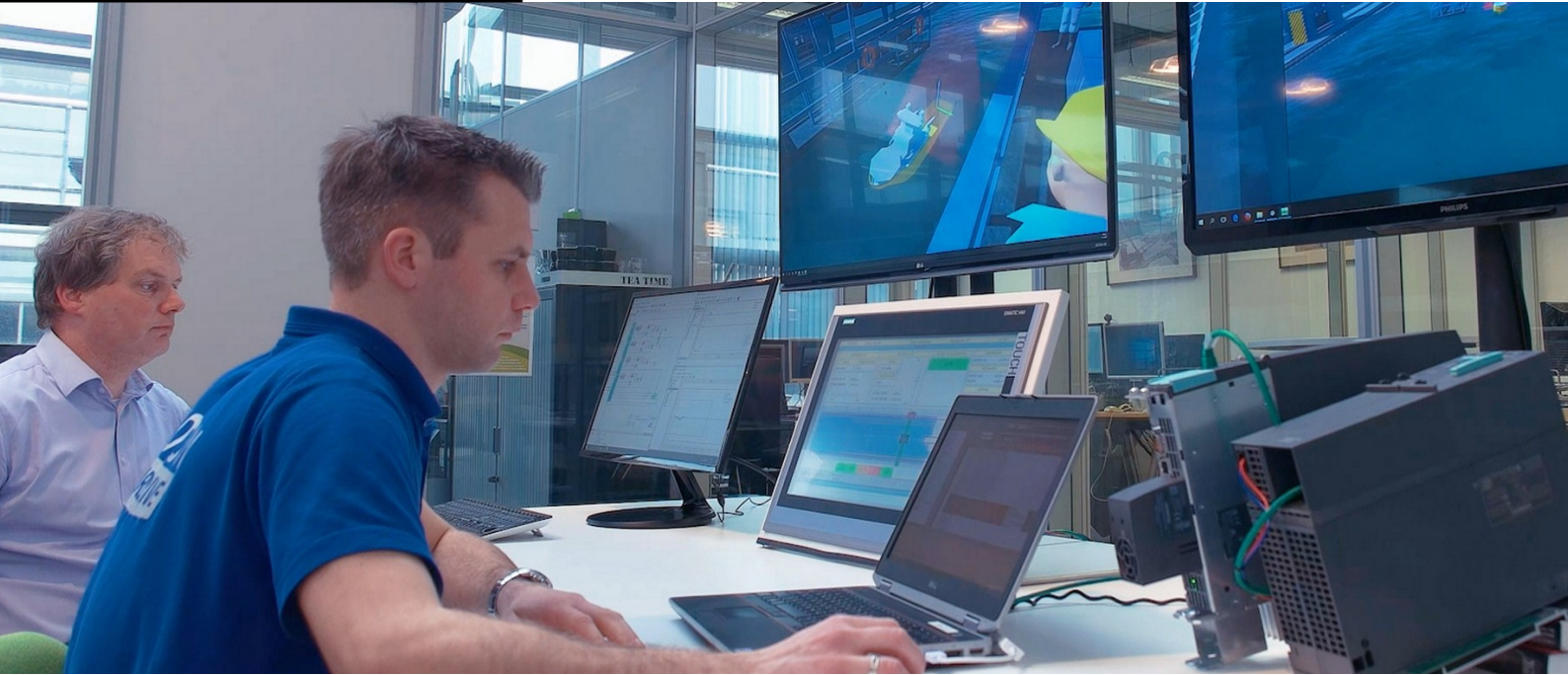
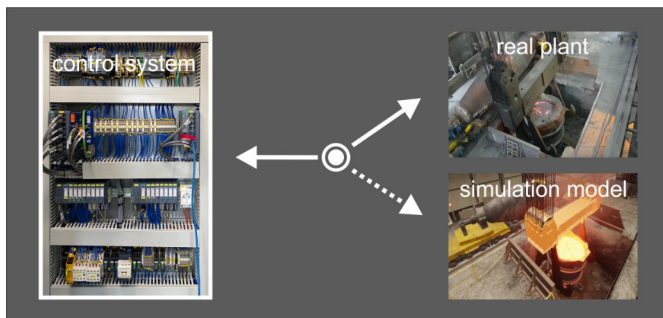


## HIL Simulation



### HIL Simulation

Hardware-in-the-Loop (HIL) simulation is a technique that is used for the development and testing of complex control systems. With HIL simulation the physical part of a machine or system is replaced by a digital twin: a simulation model of the real system.



Controllab is specialized in model based design and HIL simulation. We have many years of experience in building digital twins and carrying out HIL simulations. Using this technology we have tested control systems successfully for many applications.

### Benefits

We have found that HIL simulation offers serious benefits:

- Increase safety: Running tests that would be potentially dangerous on a real machine.
- Save costs: Running tests that are expensive to do on the real machine.
- Save time: Finding errors early during the design saves a lot of time.
- Enhance quality: Finding errors early means that there is time to find good solutions.
- Human in the Loop: Testing how humans interact with the system.

### Technology

Computer controlled machines have a physical part or plant, that is connected with the control system, through actuators and sensors. With HIL simulation the plant is replaced by a simulation model. If the HIL simulator is designed well, it will accurately mimic the real plant, and can be used to test the control system.



photos courtesy of SMST

A pure HIL simulator will mimic the plant at the IO level and allows all wires to be switched from the plant to the HIL simulator IO. This is very costly and therefore in practice HIL simulators will be connected at the fieldbus level. This reduces the simulator IO to a bus driver and reduces cost significantly.

## Towing Carriage

The Seakeeping and Manoeuvring Basin of MARIN allows model ships to run independently in waves, followed by a towing carriage containing measurement equipment. The carriage has been refitted by VSE with a state-of-the-art control system. Controllab has tested this control system using its Hardware-in-the-Loop (HIL) simulation technology.

Controllab developed an accurate simulation model of the carriage, which was coupled with the control system running on a Siemens PLC. This allowed VSE to solve errors and increase the quality of its control system. It also allowed VSE to run scenarios that would potentially damage the real carriage and see if the control system would prevent this. Using HIL simulations, 90% of the FMEA could be carried out. This enabled VSE to perform the actual refit in a two weeks window and return the towing carriage in good order before deadline.

## Access Bridge

SMST provides a range of Telescopic Access Bridges (TAB) that can transfer personnel safely to an offshore structure or the quay side. For the TAB, Controllab has developed a HIL simulator.

For the HIL simulator of the TAB, Controllab coupled the control system PLC to a simulation model of the bridge. By adding a 3D animation of the bridge a good overview of the simulation was presented. This allowed a large set of destructive and non-destructive scenarios to be simulated to test the performance and safety of the control system.

As a result the bridge was commissioned and sent to the ship in a record breaking time, where it performed flawlessly. Convinced by this success, SMST has fully adopted HIL simulation to develop a whole range of motion compensated access bridges and cranes.

Two of the HIL simulators have been equipped with 3D visualization and represent the plant so well that they are now used as training simulators.

## Contact Us

Controllab has been active in HIL simulation in the High Tech Systems and Offshore market for more than 15 years. We have excellent tooling and experienced engineers to develop HIL simulators for a wide range of applications.

## Contact Us

Controllab Products B.V.  
Hengelsestraat 500  
7521 AN Enschede

controllab.nl  
info@controllab.nl  
085 773 18 72