

# Innovation in Control JIP

## Improve performance by novel control systems

Offshore operation vessels become more and more advanced with multiple control systems installed on board. These control systems consist of DP systems, motion compensated gangways, motion compensated cranes, motion compensated grippers, etc. What is currently lacking is a structured, well-defined and broadly accepted methodology to test and evaluate the performance of these systems when integrated on board. Such a methodology would allow systems to be tested, optimised and compared from the design to operational stage, and used as contract evaluation method for acceptance tests. The objective of the Control JIP is to develop, validate and document such methodology with and for the maritime sector. The streamlined methodology will accelerate time to market of novel control systems and lower development costs.



### Stakeholders

- Vessel designers
- Vessel operators
- Motion compensation system developers & manufacturers
- DP system developers
- Classification societies

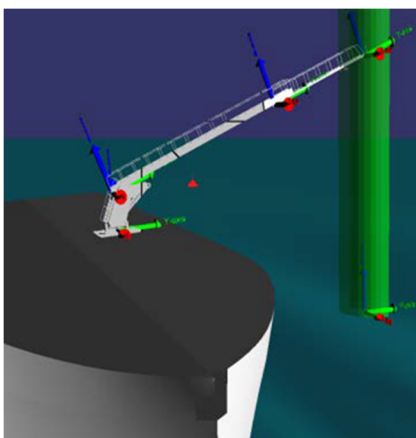
### Background

Novel controller applications are more and more applied on board offshore operation vessels to enhance operability and safety. Time to market, energy efficiency and performance are key elements for the design of new systems. The development and evaluation of such systems can be a long and fragmented track. Eventually systems have to proof themselves on board in different conditions. However, onboard evaluation is costly, sensitive to many parameters and environmental conditions cannot be controlled. A stepwise, hybrid development and evaluation method will speed up the development. System designers, manufacturers and operators of motion compensation systems will benefit from the availability of a common design approach, toolboxes and evaluation procedure.

### Objectives

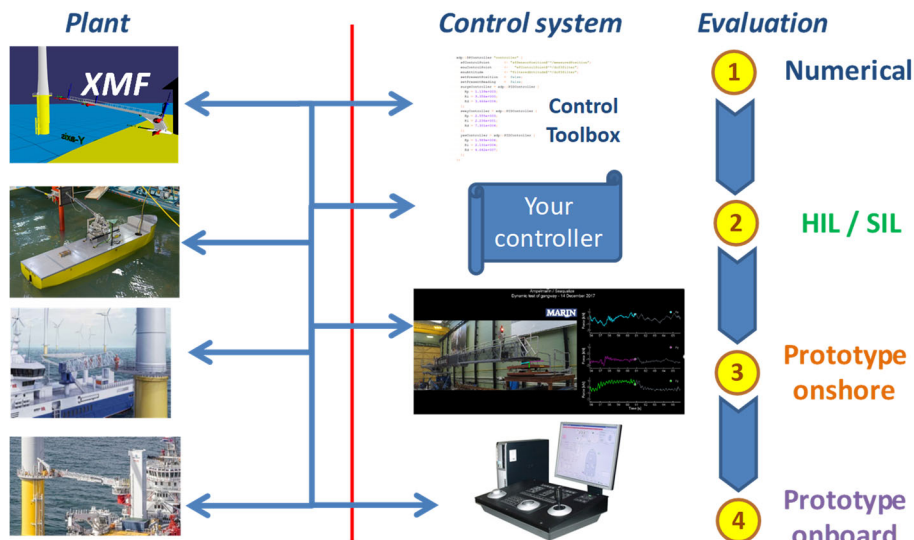
The objective of this project is to jointly develop a streamlined methodology for the development and evaluation of control systems, including:

- Conceptual numerical design and evaluation
- Extendable software framework for coupling of external controllers
- Hardware-In-the-Loop (HIL) & Software-In-the-Loop (SIL) evaluation
- Onshore and onboard prototype evaluation.
- Key Performance Indicators (KPIs) for smart requirement specification and validation.



## Deliverables

- Standardized methodology for the development and evaluation of control systems from concept to operation
- Testbed for integration and evaluation of (external) control systems.
- Numerical and physical controller test centre
- KPI's for smart requirements specification & validation
- Standard for operability evaluation from concept to operation



Step-by-step, streamlined controller evaluation method from concept to operation (top to bottom)



## Partner contributions

- Integration of existing control system evaluation methods in the testbed.
- Use cases for evaluation of your control system according to the streamlined evaluation method. Depending on the present status of your development, use cases can be numerical control systems, physical prototypes or both.

## Scope of work

The scope of work is split up in the following work packages:

- Development of a testbed for evaluation of controllers. The testbed allows to interface with external numerical controllers as well as fully developed hardware components. The objectives of the testbed are to develop, optimise and evaluate the controller algorithms, to determine the operational performance limits, and to perform a FMECA in a safe way prior to the installation on board. The testbed facilitates interfaces with industrial standard modelling frameworks and communication protocols. Hardware components can be interfaced to evaluate their actual functionality by Hardware In the Loop (HIL) testing.
- Standard control system design toolboxes will be facilitated in the testbed. Numerical toolboxes speed up the concept development of your control system. A physical toolbox, consisting of standardized control components, will be facilitated for cost efficient model testing of control systems at model scale.
- Evaluation of your control system within the testbed. JIP partners can test their own use cases following the developed methodology. The Intellectual Property (IP) of the use cases remains property of the partners.
- Development of standardized performance evaluation methods, KPI's and tools for the integrated systems. The evaluation methods and tools allow to determine the operability of the vessel including its control systems and relevant sub-systems. The evaluation method and tools are standardised from design to operation. This guarantees a continues step-by-step evaluation approach, which eliminates double work, speeds up the development and results in standardised trustworthy definition of performance.

For more information contact MARIN:

Jorrit-Jan Serraris

T + 31 317 49 32 99

E [j.w.serraris@marin.nl](mailto:j.w.serraris@marin.nl)