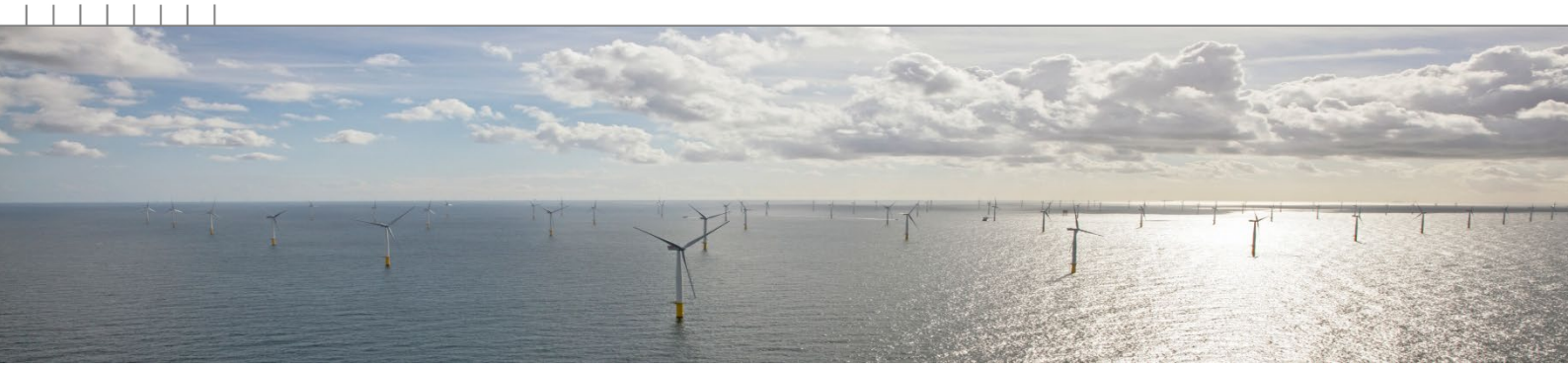


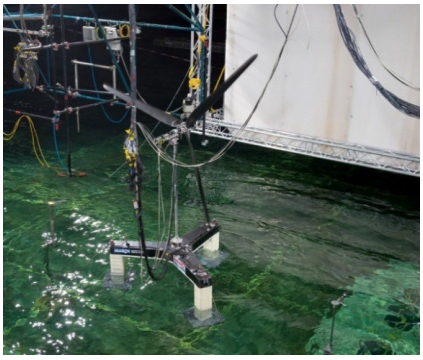
Offshore wind by MARIN

Maritime and offshore engineering expertise for companies and authorities

The use of offshore wind has brought a variety of technological solutions that need to be explored to leverage efficient, scalable, sustainable and profitable initiatives. MARIN has supported public and private sectors world-wide understanding and overcoming their local needs. As an independent Dutch institute, we join our clients with an open and collaborative mind set, aiming at exploiting the full potential of our facilities, software and knowledge.

We provide services for:

- Wind farm developers
- EPC contractors
- Turbine manufactures
- Vessel designers and owners
- Floater designers
- Equipment manufactures
- Control system suppliers
- Start-ups
- Ports and harbours
- Regulators
- Governments



Context

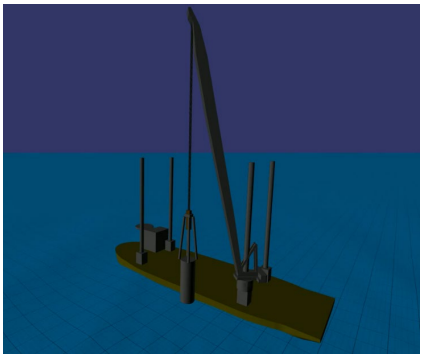
MARIN is immersed in the centre of the offshore wind industry. Driven by short- and long-term investments for the energy transition, for more than a decade, MARIN has initiated consortiums and joint industry projects, joined partners in subsidy projects and executed a variety of contractual research focused on innovative concepts applied to the offshore wind industry.

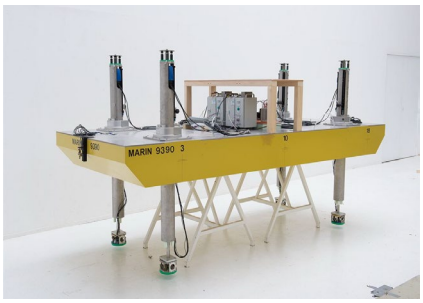
In addition, MARIN is active in other development areas, such as floating solar, fishery, aquaculture, infrastructure, and efficient shipping. Such a multi-disciplinary involvement grants MARIN a wide perspective of the future of the maritime and offshore sectors, which is used to guide our internal research.

A brief overview of possibilities

By means of experimental tests, numerical simulations, computational fluid dynamics calculations, full scale monitoring and modern techniques such as software-in-the-loop and data science, MARIN can support and advise clients in a variety of situations. Concerning offshore wind, a brief overview of possible studies is given below:

- Performance evaluation and optimization of vessels and wind turbines.
- Transport of wind turbine components and related parts, such as gravity-based foundations, towers, nacelles or blades.
- Assessment of the installation (mounting), maintenance and decommissioning of bottom fixed and floating wind turbines.





We apply our expertise in:

- Conceptual exercises
- Feasibility studies
- Design optimization
- Validation studies
- Workability analysis
- Bridge simulations
- Full-scale measurements
- Procedures and regulations
- General advice

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- DP assisted operations including motion compensated equipment, such as active cranes, gangways or pile grippers.
- Assessment of jack-up vessels.
- Wind farm logistics and traffic safety.
- Definition of procedures and training of personal for coordinated operations.

Watch a short demonstration video **here**.

From concept to operation

Based on its wide range of services, MARIN can support clients along the whole life cycle of their projects, from concept to operation. A typical project approach involves the use of numerical models in early project phases, validation and calibration of these models based on model tests or CFD, training of personnel in our next generation simulator centre and full scale measurement for monitoring of performance and fatigue, for instance.

In addition, when reliable metocean data is available, workability analysis can be performed early in the project to estimate the up/down-time of a certain operation on a specific site. Such an analysis can be translated into strategic and financial data that may support investment decisions.

The institute

MARIN is an independent and internationally renowned Dutch institute specialized in maritime and offshore engineering. With more than 90 years of experience, the company has evolved from a traditional model testing facility to a service provider that integrates its advantageous experimental capabilities to modern software, data and visualization technologies. Currently, MARIN counts more than 400 employees, including specialist in the fields of hydrodynamics, aerodynamics, mathematics, control, numerical modelling and simulations, model testing and data science. For a complete overview, visit www.marin.nl.