Determine the performance of your tidal energy converter

Harvesting the abundant resource of tidal energy has shown significant potential. Over the years many different designs have been initiated which all show their own characteristics. MARIN has a track record of more than a decade on tidal turbines. We are in the position to offer services and advice on the hydrodynamic performance of your tidal turbine (project). Through state-of-the-art numerical models and model test campaigns P50, P75 and P90 energy yield calculations can be performed. These assessments will provide you adequate input to understand economic viability of your tidal turbine design or project.

Services:
- Conceptual phase: Feasibility study of tidal turbine design and/or project.
- Design phase: Design assessment and optimization through BEM and CFD
- Validation and verification:
- Model tests to verify design and validate numerical models
- Energy yield assessments: Determination of energy yield expressed as P50, P75 and P90

Conceptual phase: Feasibility study of tidal turbine design and/or project.
In the conceptual phase, a feasibility assessment can support you in understanding the energy production and limitations of your tidal turbine design for the prevailing sea state at your site of interest. Thereby interactions between mooring system, floater and turbine will be investigated (in case of the floating type). MARIN can conduct this feasibility assessment by means of numerical simulations (aNySIM time domain simulations in combination with Blade Element Momentum) to give insight into the operational envelope of your system. Various system configurations can be evaluated and compared on key performance indicators such as hydrodynamic loading on critical parts, maximum operability, CT (thrust coefficient), CP (power coefficient) and energy yield

Design phase: Assessment and optimization through Blade Element Momentum (BEM) software and CFD

Design variations such as blade design, floater design and control settings can be assessed by elaborate simulations combining Blade Element Momentum Theory, CFD simulations and time domain simulations. Through an open interface your in-house developed control system can be incorporated in our fast-time time domain simulation tool. More elaborate calculations can be performed through CFD simulations with our in-house developed CFD code ReFRESCO with accurate modelling of the wake that enhances the prediction of thrust and power coefficients. In addition effects of wake interaction with other turbines can be studied giving insight in aspects such as fatigue loading and C_T/C_P deterioration.
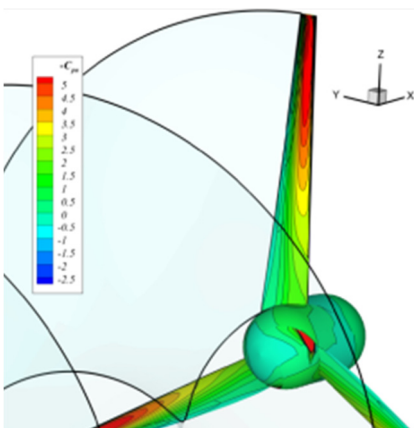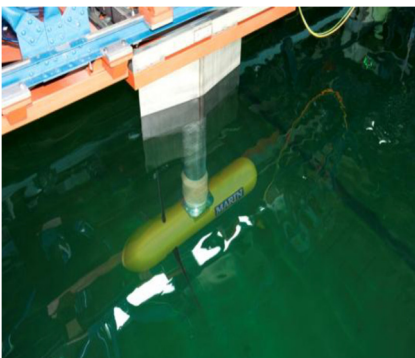
Validation and verification: Model tests to verify/validate performance

After the numerical assessment in the design phase, MARIN offers model tests in a wave/current basin to assess the tidal turbine design. MARIN can independently verify and validate the tidal turbine performance in terms of C_T and C_P and perform a check if the system meets operating requirements and specifications as set out by e.g. contractors, major certification bodies. By tuning the numerical model on the model test results the uncertainty of numerical simulations is reduced such that the numerical tools can be utilized to assist in design (optimization) tasks

Energy yield assessments: Determination of energy yield

The long term power production of your tidal turbine can be determined for your project. An energy yield assessment is routinely performed by engineers designing the tidal turbine. However, for financial risk assessment, investors and developers also require professional assessments and reporting of uncertainties related to the energy yield estimation. Through state-of-the-art numerical models and model test campaigns MARIN can provide you with P50, P75 and P90 energy yield levels.

State of the art tools

ReFRESCO

MARIN has been developing viscous flow CFD codes since the beginning of the 1990's. The philosophy behind our own CFD code ReFRESCO is "Reliable", "Fast" and dedicated to "ships and offshore constructions".

aNySIM-XMF

Developed in-house, aNySIM XMF is state-of-the-art software for hydrodynamic time domain simulations. Combined with BEM modelling of the performance motions of tidal turbines combined with floater and mooring system. This software can be interfaced with any control system modelled in Matlab Simulink.

High end model test basins

Detailed hydrodynamic assessments can be carried out in our high-end wave basins. These model tests are essential in proof-of-concept demonstration and in certification.

Expertise and experience

MARIN is an independent and innovative service provider specialising in hydrodynamic assessments and investigations. With over 80 years experience, we are fully conversant with challenging metocean conditions in Oil & Gas and renewable energy projects worldwide. MARIN offers services for hydrodynamic analysis related to ships, floaters, installations and operations offshore. Our expertise includes hydrodynamic concept validation, seakeeping analysis, slamming assessments, operability assessments, mooring and tidal turbine performance analysis.

Related products:
- O&M logistics
- O&M vessel selection
- O&M operational training
- WT landing platform alignment
- Wind farm traffic safety assessment
- Vessel seakeeping performance

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