The offshore industry works closely together to resolve common challenges. Here is an update on new and running Joint Industry Projects. Participants are still welcome to join, feel free to contact the project leaders below.

Sharing knowledge, experience and costs through joint R&D

ComMotion

To numerically predict extreme wave loads on offshore structures the offshore industry has been working together with MARIN and the universities of Groningen and Delft in the development of the CFD method ComFLOW. Over the last few years many aspects have been studied such as sloshing, air entrapment ("cushioning"), wave run up, deck impacts and the influence of realistic dynamic mooring line and hoisting line modelling.

The ComMotion JIP aims to further increase functionality and efficiency of the ComFLOW Code. The effects of structural response on impact loading will be addressed by including hydro-elastic models and simulations with multiple interactively moving bodies will be possible. Additionally, because any reliable wave impact simulation starts with a realistic modelling of the incoming wave, algorithms for deterministic, steep irregular wave generation will be further developed. The ComFLOW Code will be made available to all the participants, including extensive code validation, bench-marking and developments that were made in previous JIPs.

Contact: Joop Helder, j.helder@marin.nl

VIM

Floating Offshore structures such as production semi-submersibles and spars can exhibit significant in-line and transverse motions under current conditions. Such motions are generally called Vortex-Induced Motions (VIM) and they could have a strong impact on the fatigue life of mooring and riser systems. For multi-column floaters much less is known with respect to VIM behaviour compared to spars, which is largely due to the many possible geometric design variations.

The aim of this JIP is to increase the insight into the physics behind VIM for multi-column floaters in order to improve the concept design and to better understand possible differences between model-scale and full-scale VIM behaviour. To address the objective, the JIP plans to focus on model testing, theoretical and CFD studies. The VIM JIP is running until the summer of 2016. Participants so far include: MARIN, USP, Petrobras, SBM Offshore, Aker Solutions, BP, Granherne/GVA/KBR and ConocoPhilips.

Contact: Arjen Koop, a.koop@marin.nl

BreaKin

BreaKin (from BREAKing waves and their KINematics) is a new joint research initiative addressing wave impact loading on offshore structures. The objective of the BreaKin JIP is to determine the occurrence of breaking waves, to model the associated water particle kinematics and to describe the different types of wave loading that results. This research will provide improved predictions of the breaking wave loads acting on offshore structures, including scale effects, and it will help define the probability of occurrence.

Contact: Jule Scharnke, j.scharnke@marin.nl

Wind Jack

The objective of the Wind Jack JIP is to be able to understand and predict the impact loads between the seabed and legs of jack-up type wind turbine installation vessels during the moment of touch down and lift off. These are considered as the critical phases in the operational cycle of wind turbine installation vessels and as such limit the uptime.

Within the Wind Jack JIP a numerical tool was developed to determine the seabed impact loads on the legs of wind turbine installation vessels. The tool consists of a soil reaction force module developed by Deltares coupled to MARIN's existing hydro-dynamic time domain analysis program aNySIM-xmf. In 2014, the tool was finalised and validated by hydrodynamic model tests performed in MARIN's Shallow Water Basin. Furthermore, the tool has been incorporated in a workability analysis tool which makes it possible to determine the uptime of wind turbine installation vessels depending on soil type, scatter diagram and user defined operational criteria.

Contact: Jorrit-Jan Serraris, j.j.serraris@marin.nl

Windload

Wind loads are important for installation, operational and extreme design loads for floating offshore structures and ships. However, despite their importance there is surprisingly little industry guidance about wind loads.

MARIN believes that wind tunnel tests will remain the main tool for wind load predictions in the near future. If not, alternative methods may be needed earlier in the project such as CFD. Though here too, guidance with respect to the set-up and execution of those computations is missing. Another issue is the lack of common guidance on the vertical velocity profile and associated turbulence intensity for the designs.
The first task of the Wind Load JIP is to test a scale 1:230 FPSO wind tunnel model in three different wind tunnel facilities. This exercise will then be repeated for a semi submersible. The JIP completes end 2016.

Contact: Jaap de Wilde, j.dewilde@marin.nl