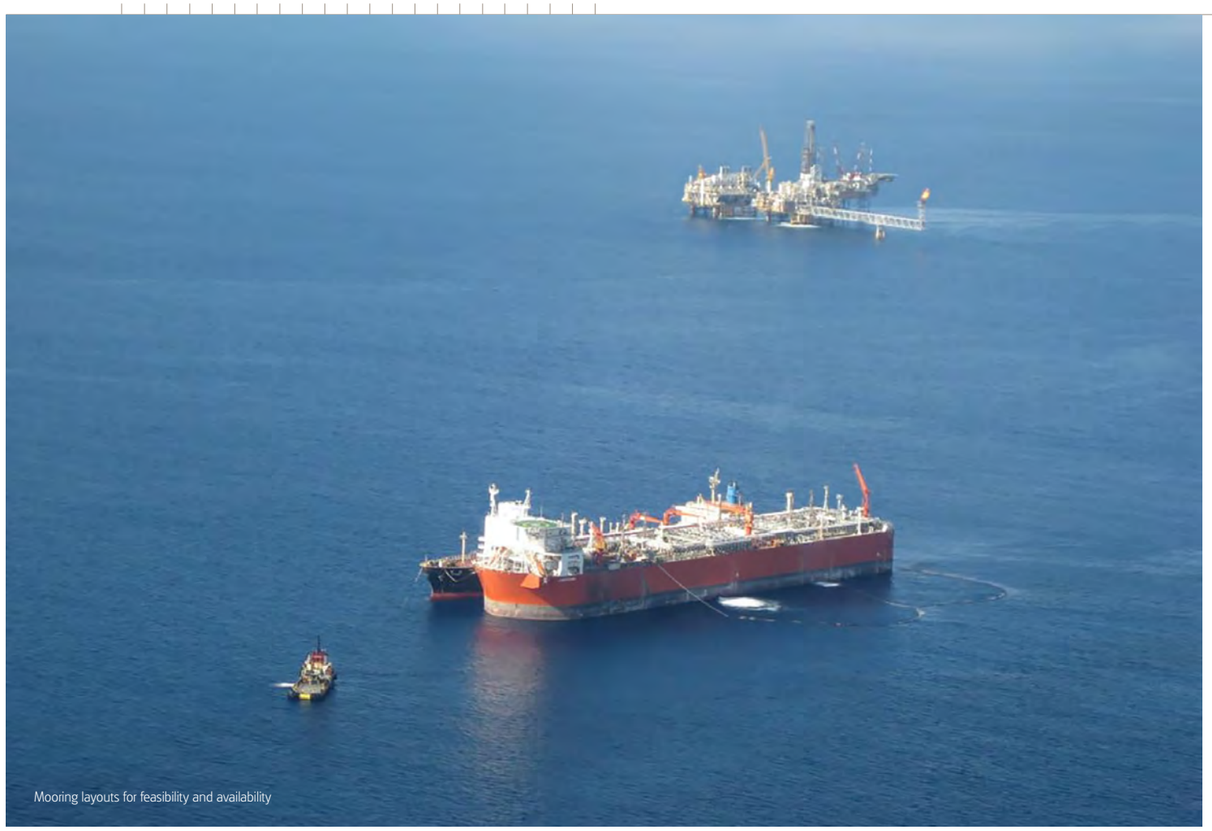

Mooring layouts for feasibility and availability

MARIN USA works closely with offshore clients during the concept phase of their projects as ideas are turned into reality.

Desktop studies turn new offshore initiatives into safe and efficient solutions

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Houston added two jobs for every job lost in the downturn of 2008. With so much activity going on, new projects and initiatives are generated continuously in the 'capital' of the offshore industry. Specialised desktop studies help to direct and accelerate these ideas towards safe and efficient floating solutions.

Many offshore developments require a floater of some kind. The pros and cons of existing floaters are well known. Complex decisions' matrices help companies navigate to a preferred solution but where can they find independent evaluations for new floater inventions? Meanwhile, production moves to deeper water and more hostile conditions such as the Arctic and this move calls for more advanced analysis tools and many one-off verification studies. Through direct and close contact with clients in Houston, MARIN USA helps define a study approach to enable clients to reach their objectives. Report highlights three typical examples.

Hull optimisation for non-moving structures – literally thinking 'out of the box' or at least 'away from the box'

With ITTC procedures and many decades of experience, designing for speed, is a well-established 'industry' but hull optimisation for offshore applications is a relatively new practice. For many years the offshore structure shape was mainly driven by functionality and the cost of production. Improved and faster numerical tools now allow design enhancement of the offshore structure's hull to improve overall motion and to reduce the risk of green water and wave slamming. These studies assist the design evolution and provide analytical evidence for hull shape optimisation. A typical scope consists of heading analysis and frequency domain calculations on a large variety of hull shapes, leveraging results from model tests and previous work. Based on the operational profile, thrusters can be sized appropriately and heading strategies are thought out right at the start of the project. Undoubtedly, the industry can expect to see fewer box shaped structures.

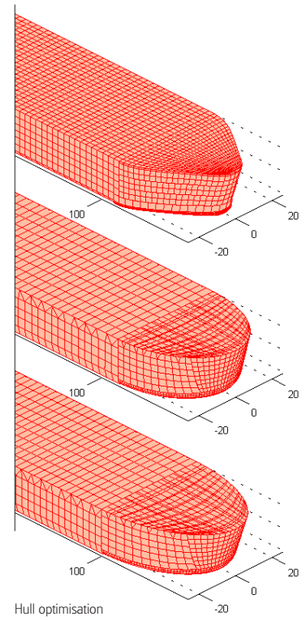
Mooring layouts for feasibility and availability

Offloading of LNG for floating production or regasification often considers a side-by-side vessel arrangement. Desktop studies can be used to help select the optimum heading and mooring layout, maximising terminal availability. These studies define weather limits and show the duration of bad weather events. Comparing the histograms and exceedance probability curves facilitates a discussion on storage buffer and vessel size requirements. A typical study starts with an Excel sheet to evaluate the total mooring and fender system stiffness and continues with thousands of time domain simulations using a large network of computers to predict the relative motions and mooring loads. If instabilities show up they are discussed with operations to consider any necessary mitigation strategies. Here, it is likely that there will be more operational input in designs.

Revolutionary ideas; new solutions require creative analysis

Most numerical tools are developed with a clear application in mind but how do you evaluate a greenfield structure? Without prior experience it is sometimes difficult to predict what phenomena need to be included in the analysis. Since all MARIN's software is developed in-house with a flexible modular approach, it's possible to connect the dots and discover the dominant phenomena. Some new inventions compete with existing solutions so engineering firms cannot be asked to analyse these inventions. However, our independent studies can verify their feasibility and the 'tested by MARIN' label can then be added.

The examples above show the large range of studies possible in the concept phase of a project. MARIN is dedicated to using its experience from large model test basins and from full-scale monitoring programmes to develop and validate analysis tools. These highly specialised tools can help validate inventions and optimise concept development.



Hull optimisation
for non-moving structures

Revolutionary ideas; new solutions require creative analysis