

A road map to safe operations with LNG vessels

Design and operations in the spotlight

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With high oil and gas prices, a shortage of energy resources and the demand for a greener environment, the production and transport of LNG is becoming more important. And LNG capacity is developing at a very high pace.

MARIN's contribution to this development focuses on the hydrodynamic and navigational aspects, for instance, the motions of the moored vessel and the approach and berthing of the tankers. For more exposed terminals particularly, the downtime when moored at the terminal or during manoeuvring, is an important consideration during the design process. MARIN's work in this area is outlined.

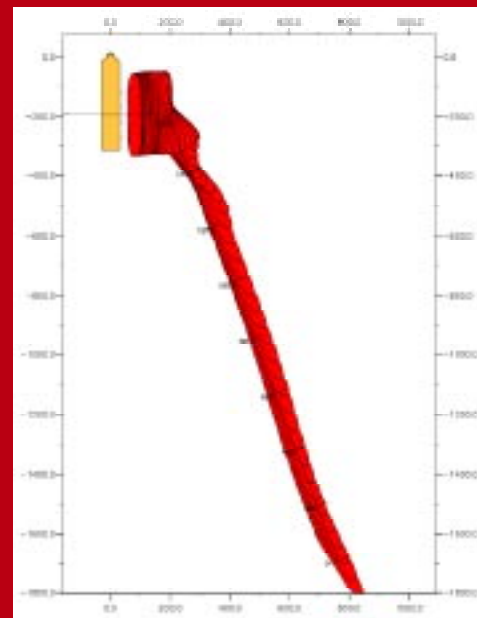
Usually, projects run from a feasibility study to a detailed design. In the feasibility phase, important factors are studied including site selection; environmental conditions; the design concept (terminal, floater or buoy), together with an analyses of the downtime.

In general, the initial phase is carried out by the client but MARIN can assist by giving some typical rules of the thumb which can be used to make the first approximation of its feasibility and downtime.

Then in a second, far more thorough phase a detailed design is done and simulation studies, workshops and a downtime analyses are carried out.

Although the detailed design is not typically a MARIN activity, the institution can contribute by giving recommendations regarding moored ship response and the procedures for the approach and berthing of the vessel.

In situations where the manoeuvring, berthing and offloading are critical processes, input from operational people is essential. A workshop with operational people gives input for the further optimisation of nautical procedures and the necessary equipment.



Approach manoeuvre to a LNG FPSO with the fast time simulation model SHIPMA.

When the design is fixed and the operations are defined a number of simulation studies can be executed to determine the downtime of the facility. Typical studies are:

- Moored ship studies: these compute the motions of the vessel during offloading;
- Manoeuvring simulations: simulate the approach and berthing manoeuvre;
- Voyage simulations: simulate the trip from the export terminal to the import terminal using different fleet compositions;
- Tug effectiveness;
- Risk analyses: quantifying the risks of accidents with other vessels or of accidents damaging the terminal.

With these results, insight is obtained into the overall downtime of the facility but also into the contribution of the various phases of the operations. A next step can be a further optimisation of the individual stages during operations or more detailed studies using model tests or real time simulations.