



**Royal
HaskoningDHV**
Enhancing Society Together



Dynamic Mooring Analysis – Improving Port and Berth Design

We understand how important it is for port and vessel operators to have efficient, sustainable and safe mooring operations. Whether you're building a new marine facility or looking to optimise your existing mooring space and reduce vessel downtime, Royal HaskoningDHV can help.

Our team of experts has studied the dynamic behaviour of moored ships in almost 100 port developments in order to help minimise dangerous and potentially costly situations.

In recent years we have specialised in the analysis of vessel motions as a result of forces such as wind, waves and passing vessels, and we have studied the feasibility of introducing innovative mooring systems in over 20 ports around the world.

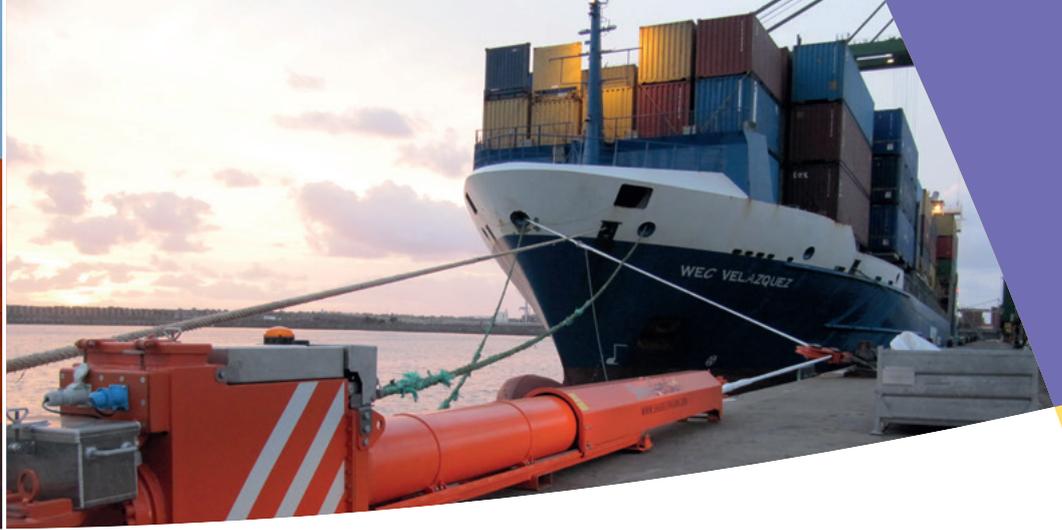
Our approach

There are a number of challenges that port operators face today. The continuous increase in vessel size makes them more vulnerable to windy conditions – wider entrance channels are also required for such vessels, resulting in more wave penetration in the port basin (including long waves). Operations are also moving offshore to more exposed conditions.

Combined with the fact that ports are getting busier, the impact of passing vessels on moored ships is only going to increase further.

Are you facing any of these challenges in your port operations?

- Low productivity of loading and unloading in windy conditions.
- Health and safety risks due to breaking mooring lines
- Excessive vessel movements due to long waves or passing vessels
- Unacceptable downtime
- Last minute requests for tug support to keep a vessel at berth



Our Dynamic Mooring Analysis (DMA) can help solve these issues by calculating and modelling the dynamic behaviour of moored vessels. It has helped achieve improved throughput figures by over 10% in some ports.

The benefits of DMA are threefold:

1. **Increased safety** – by avoiding line failure, we can ensure safer mooring.
2. **Improved efficiency** – by reducing vessel movements, downtime at the port is reduced and cargo-handling productivity enhanced.
3. **Reduced costs** – by optimising the design of the port (particularly in the case of an extension), breakwaters may be reduced or even eliminated, and overall CAPEX can be significantly reduced.

The DMA process

We first study the properties of the vessel and its mooring configuration, before studying the environmental conditions to define governing conditions at site.

We put this information into our DMA software to run numerous simulations. Based on the results we can determine the expected uptime/downtime of a facility and suggest possible optimisations of the mooring configuration.

Innovative mooring systems

Royal HaskoningDHV is proud to be the only company in the world to have integrated both the innovative ShoreTension® and MoorMaster® technology into our vessel motion software.

Our track record

We have worked on a number of high-profile projects around the world, including:

- First permanently moored LNG Floating Storage and Regasification Unit (FSRU) in the West Java Sea off the coast of Jakarta
- Operational guidelines for safe mooring of large container vessels in the port of Rotterdam, Netherlands
- Analysis of the effects of passing vessels in Newcastle, Australia



Our dedicated DMA team is ready to help you with:

- Designing an exposed FSRU mooring
- Overcoming problems with wind on large vessels
- Defining maximum passing speed and minimum passing distance for safe berthing
- Advising on innovative mooring solutions
- Uptime analysis and improvement suggestions