Sohar Ore Terminal

Dynamic mooring analysis & downtime estimate

Background

A new plant processing ore into pellets is under construction at Sohar, Sultanate of Oman. Therefore, a new import/export terminal for ore and pellets respectively is being developed at the Port of Sohar. The terminal will accommodate bulk carriers with a capacity between 35,000 dwt and 400,000 dwt. The ships will be (un-)loaded at an offshore jetty (extending an existing breakwater) perpendicular to the coastline, out in the open sea.

Objective

The objective of the study is to design and optimise mooring layouts for the largest and smallest design vessels at the import as well as the export side of the terminal.

Once the mooring layout had been established, the mooring loads and the downtime of the planned terminal for operational conditions (resulting from the motion response criteria for the cargo handling limit) and survival conditions (resulting from criteria for vessels to stay at berth) were determined.

Type of project	Dynamic Mooring Study
Location	Sohar, Sultanate of Oman
Client	Sohar Port Special Projects (SPSP)
Period	March 2009 – January 2010

Figure 1: Location of the Port of Sohar and the planned ore terminal (courtesy of Sohar Port Special Projects)

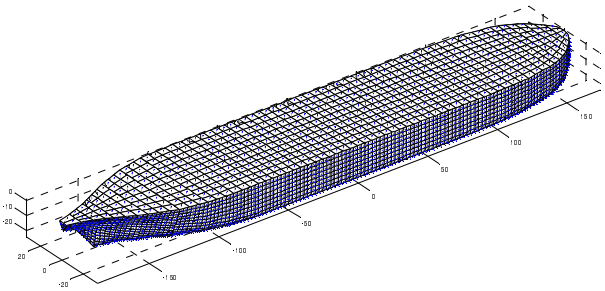
Project description

Alkyon
Hydraulic Consultancy & Research

A2324

Study approach

The dynamic mooring simulations were carried out with Alkyon's software package SHIP-MOORINGS. SHIP-MOORINGS simulates 3-dimensional movements and rotations (six degrees of freedom) in the time-domain of one or more vessels (SHIP-MOORINGS MULTI-BODY).
The dynamic mooring analysis was carried out for the largest and smallest design ships moored either at the import or at the export side of the jetty.



bulk carrier (400,000 dwt)

The hydrodynamic and aerodynamic models of the design ships were modelled in loaded as well as ballasted condition. The ships' hydrodynamics were modelled in 6 degrees of freedom by performing diffraction computations with the computer model DIFFRAC.
Figure 2: Schematisation of the loaded Chinamax

The jetty layout was schematised including the planned position of the quick release hooks and fenders. The mooring lines and fenders were schematised using non-linear load-deflection and load-elongation characteristics.

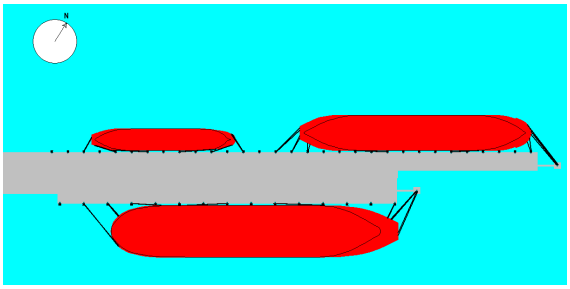


Figure 3: Terminal layout in SHIP-MOORINGS

The mooring line arrangements were developed and optimised in consultation with the linesmen from the Port of Rotterdam (KRVE).

To set-up the simulation program a matrix of (short) wave heights and periods with correlated wind and long wave conditions was defined for 12 directional sectors (each sector spanning 30°). Waves with very low exceedance probability were not included in the simulations.

Results

The simulations were analysed to determine the vessels motions and mooring forces that can be expected under the specified environmental conditions. The results were compared with criteria which were defined based on PIANC (motion criteria) and information about the safe working loads available from the manufacturers of the mooring system components (load criteria). As a result, the limiting conditions were derived and the downtime of the terminal for each vessel and loading condition was determined using Alkyon's statistical analysis tool HYDROBASE.

Applied tools

SHIP-MOORINGS
DIFFRAC
HYDROBASE

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