



aNyMOOR.TERMSIM

Assessment of line and fender loads for moored tankers

aNyMOOR.TERMSIM is a time domain simulation program to analyse the dynamic behaviour of a moored export tanker subject to wind, waves and current. The mooring system can be a Single Point Mooring (SPM), a Multi Buoy Mooring (MBM) or a jetty terminal. The program predicts the mooring loads and tanker motions when the system is exposed to operational environmental conditions.

Moored vessels and buoys

The software contains the OCIMF tanker database with hydrodynamic data for several tankers. A selected tanker can be scaled to the required dimensions. On request the database can be extended with dedicated vessels on project basis.

Besides the hydrodynamic database, a database with OCIMF wind and current data is provided. This database contains non-dimensional wind and current force/moment coefficients for use in the calculation of wind and current loads on a tanker.

aNyMOOR GUI

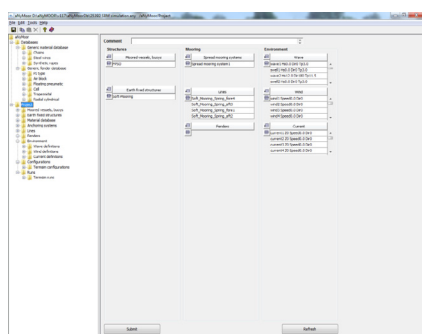
aNyMOOR.TERMSIM is part of the new aNyMOOR suite consisting of:

- 1 aNyMOOR.TERMSIM
- 2 aNyMOOR.DYNFLOAT
- 3 aNyMOOR.SHUTTLE (not commercially available yet)

aNyMOOR is basically a versatile GUI which interfaces with our in-house simulation kernel aNySIM (for more information, see separate leaflet), incorporating the knowledge gained during several JIPs (such as SHUTTLE and DYNFLOAT JIP) and feedback from clients. aNyMOOR.TERMSIM focuses on time-domain simulations for offloading, mooring and terminal design. aNyMOOR.TERMSIM is easily extended with .DYNFLOAT or .SHUTTLE functionality by installing an extended license. The modular setup of the aNyMOOR program allows for additional aNySIM functionality in future releases.

The input of data is user-friendly and is performed by the GUI in different nodes following a certain workflow. Each node can be seen as a separate building block. The input starts at the project-node where all required nodes are easily generated. At the end of the workflow all building blocks are put together in the configuration panel. By using this workflow different configurations can quickly be built. To even further speed up the project, all nodes can be copied and modified. The copy and paste action is also possible from and to Excel into tables.

The system layout is represented graphically in a schematic format to detect input errors in an early stage.



Events

The following events can be simulated:

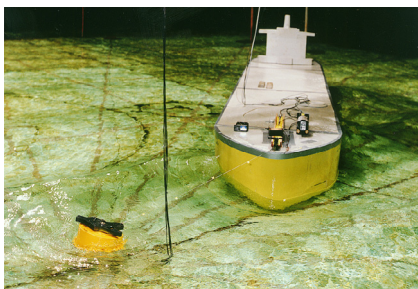
- External forces (earth or vessel fixed)
- Line failures (breaks at a certain time and/or at certain load)

Output

The output of each simulation consists of an ASCII database containing all samples of the calculated signals. The signals include the tanker motions and accelerations at CoG, mooring loads in all mooring legs and other relevant quantities for the analysis of the mooring system behaviour. The Graphical User Interface presents all generated files, statistics, time traces and a 2D (bird's eye view) animations.

Validation

In order to validate aNyMOOR.TERMSIM the three different systems have been simulated parallel with TERMSIM and aNyMOOR.TERMSIM. In case differences occurred, these were checked with model tests. A good correlation with the TERMSIM and the model tests was found.



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Material and fender database

Defining the lines and fenders is an important aspect of a mooring system. Therefore, aNyMOOR.TERMSIM is provided with a material and fender database. The material database contains a large collection of chains, steel wires and synthetic ropes. These can be combined to define multiple legs, anchor lines or hawsers. The fender database contains typical fender types such as PI type, air Block, floating pneumatic, cell, trapezoidal and radial cylindrical. User-defined material properties can be specified and imported into different projects through the drag and drop functionality.

Anchoring systems

Three types of terminals are considered:

- SPM
The SPM terminal consists of a conventional CALM buoy which is moored to the seabed by means of anchor lines. The tanker is moored to the buoy by means of a bow hawser. The CALM buoy is in this case a hydrodynamic object with all its particulars, similar to a vessel.
- MBM
In a multi buoy terminal the tanker is moored by mooring legs consisting of an anchor line, a surface buoy and a hawser.
- Jetty
For the jetty terminal the tanker can be moored by means of mooring legs and fenders. A mooring leg can consist of a number of parallel running, but equal lines.

Environment

The environmental conditions concern waves, wind and current. The waves can be defined as a theoretical spectrum (JONSWAP, Pierson-Moskowitz, Regular Wave, Gaussian or Torsethaugen), user-defined spectrum or as wave train time series. The wind can be defined as a theoretical spectrum (NPD, API, Ochi-Shin, Wills or Harris), user-defined spectrum or as time series. For each wave or wind condition a random seed can be applied. The current can be defined as fixed or changing. When fixed is chosen the current can consist of multiple layers each with their own speed, direction and depth. When changing is chosen one layer can vary in time, speed and direction. For each condition random seed can be applied.