Model tests at your fingertips

GreenLab

Introduction

The computer program GreenLab is the result of the Joint Industry Project "JIP on F(P)SO Greenwater loading" which focussed on the subject of green water loading on Floating Production Storage and Off-loading (FPSO) vessels. The goal of the project was to provide designers and users with information about the green water problem for their specific F(P)SOs.

The output of the project is the evaluation tool 'GreenLab', which stands for 'Greenwater Laboratory'. This expert system with full graphical user interface makes the results of the JIP directly available. Operators, designers, shipyards, classification societies and research institutes are now using the tool for their design evaluations.

The program has two complementary features: a 3D visualisation of the ship and wave motions and a design tool which makes the results of the JIP (drawn from extensive model tests) directly available for use in design evaluations.
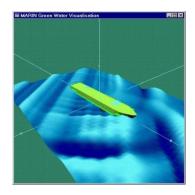
3D visualisation

The 3D visualisation tool is included in GreenLab for an initial evaluation of problems with respect to green water. The time domain visualisation of linear diffraction analysis shows the user where green water may be expected on the vessel. For this purpose, the freeboard contour of the vessel can be included in the program.

The program makes use of a database containing linear transfer functions of ship and wave motions. The diffracting and radiating waves resulting from the wave reflection and ship motion can be visualised. It is possible to interactively choose the viewpoint and select the wave direction and current speed.

Design tool

Once the problem areas have been identified using the 3D visualisation tool, the design tool can be used for a detailed evaluation of the green water at the bow, stern or side of the vessel.

The interactive design tool can be used to study the effect of design parameters (bow shape, bow flare angle, freeboard height, main dimensions, etc.) on green water occurrence and loading. The program provides predictions of non-linear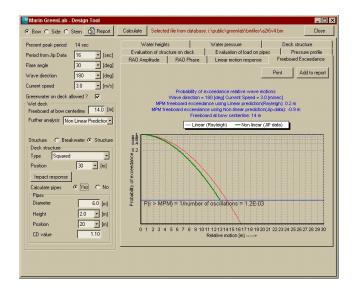 relative wave motions, required free-board heights for dry decks, water heights on deck, pressures on deck, water velocities over the deck and impact loads. In addition, the load on pipes on deck and the efficiency of protecting breakwaters can also be evaluated.

Database

GreenLab makes use of a large database of transfer functions of the ship and wave motions obtained by linear diffraction analysis (18 different hull shapes, 13 wave directions, 4 current speeds).

This database-approach makes it unnecessary to perform detailed diffraction analysis for each individual design, although it remains open to the user to include his own diffraction calculation results or transfer function of the relative motions of a particular vessel. The program is only available for project participants.

Participants

The JIP was supported by ABB Offshore Technology, Bluewater Engineering, BP, Chevron, Conoco, Exxon, FMC Sofec, Germanischer Lloyd, the Health & Safety Executive (HSE), Maersk Contractors, MARIN, Mobil, Samsung Heavy Industries, SBM / Gusto Engineering, Shell and Texaco.

MARIN does not take any responsibility for the validity, accuracy or applicability of any result obtained from the GreenLab computer program. Suggestions and comments on the program and documentation are welcome.

References

- Buchner, B., 'A New Method for the Prediction of Non-Linear Relative Wave Motions', OMAE98, Lisbon, June 1998.
- Buchner, B., 'Green water from the side of a weathervaning FPSO', OMAE99, St.Johns, July 1999.
- Buchner, B. and Voogt, A.J., 'The Effect of Bow Flare Angle on FPSO Green Water Loading', OMAE2000, New Orleans, February 2000.

(This software is for MARIN internal use only)

For more information please contact the department Maritime Software Group.

T +31 317 493 237
E Support@marin.nl