

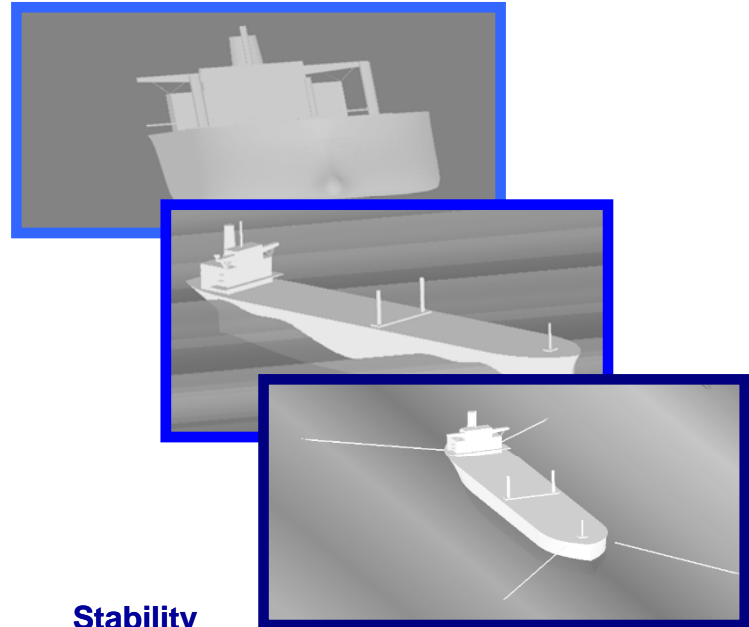
An hydrodynamic integrated software solution

Diodore™ V4 is a versatile hydrodynamic integrated software. Main applications are:

- Stability
- Seakeeping
- Mooring and berthing

It is developed and validated by Principia since 1981 in cooperation with IFP (Institut Français du Pétrole) and Bureau Veritas.

Basically it is a panel based software organised to bring to the engineers a practical tool to assess any design matter linked to hydrostatic/hydrodynamic from conceptual studies to detailed analysis.



Stability

This module addresses flotation, trim, stability, and strength calculation.

It is general purpose as the calculation of the involved loads (on the hull and tanks) is based on a panel integration.

Therefore any structure, mono-hull, multi-hull, semi-submersible, SPAR can be analysed.

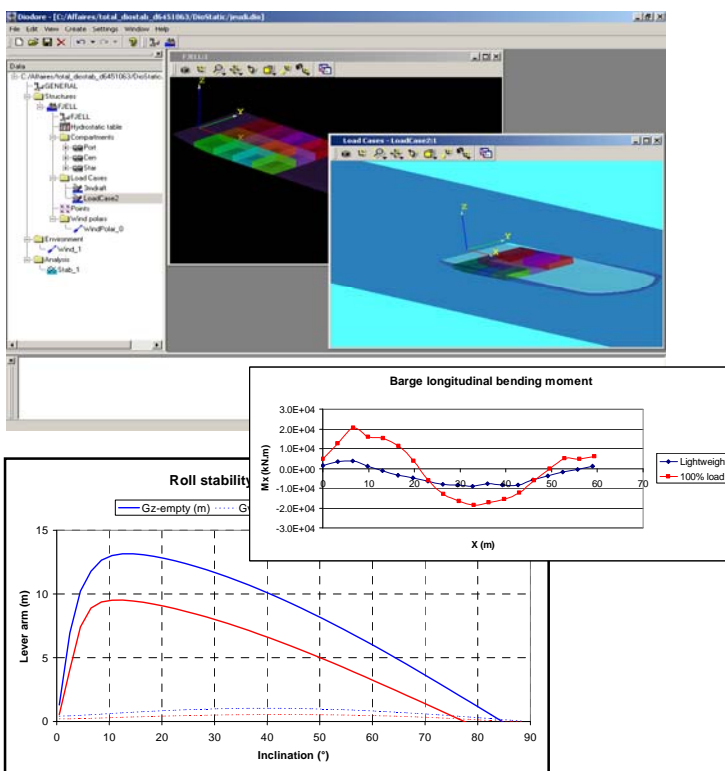
It can be handled both the Graphic User Interface or the ASCII input file.

From Gz curves and Gv curves, any criteria can be defined to permit assessing regulatory requirements from any classification societies.

Validations rely on the development of On-board applications based on this module which have been certified by Bureau Veritas.

Reference

Logiciel de calcul de stabilité embarqué fondés sur le logiciel Diodore™, N. Couty, et al. ATMA 2007



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Seakeeping

This application is based on a 3D diffraction-radiation solver.

It calculates the wave loads and motions of one or several structures, free floating or restrained by mooring systems. The program is applicable to structure with or without forward speed, from deep to shallow water.

Hydrodynamic loads

Compelling features of the hydrodynamic processor are :

- Computation of 1st order quantities: added mass, radiation damping, diffraction and excitation loads
- Multi-body interactions
- Sloshing modal analysis in tanks
- Forward speed free surface conditions (encounter frequency to full methods)
- Total hydrodynamic pressure on each panel

Motion

Motion transfer functions are the basic outputs of a sea-keeping analysis and Diodore™ computes platform motions with the following high level options:

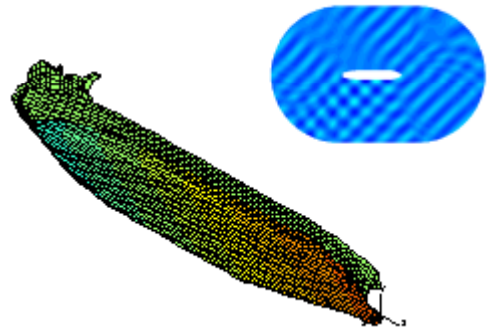
- Linear and quadratic damping
- Stochastic or harmonic linearisation of the damping
- Roll damping State of the Art formulation (ITH Ikeda, Tanaka and Himeno, rudder, stabilizers and skeg)
- Rudder and Foil control in frequency domain
- Sloshing-seakeeping coupling
- Moonpool and gap hydrodynamic models through lid technic

Strength

Global loads transfer functions and spectral response are computed for ship hull girder as well as for any element of an offshore platform (substructures)
Full coupling with FEM software such as NSO or Abaqus™ is also available

2nd order wave loads QTF

Drift forces QTF and 2nd order wave loads full QTF are computed using both pressure and Lagally methods.
The latter is recommended for its robustness and permits multi-body applications



Validation

Diodore™ was used in the FPS 2000 comparison tests within the NTN research program (Norway) along with 23 other international organizations in 1996.

Diodore was amongst the software used for the benchmark in HAWAI JIP in 2006-2007 for 1st and 2nd order wave loads (full QTF) in shallow water.

References

Validation mutuelle des différents codes de tenues à la mer, J-F Le Guen, A.R. Magee, C. Royal 4^{ème} Journée de l'hydrodynamique, 1993, Nantes
Validation of a 3D Seakeeping software, T. Coudray, J-F. Le Guen, 1994, CFD Computation, Madrid
ISOPE Roll
FPSO Roll damping prediction from CFD, 2D and 3D model test investigation, A. Ledoux, B. Molin, C. De Jouette, T. Coudray, ISOPE 2004
Coupling between liquefied gas and vessel's motion for partially filled tanks: effect on seakeeping, A. Ledoux, G. Gaillarde, M. Lynch, LNG Carrier Design and operation RINA Conference 2004

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Mooring and berthing

Diodore package includes a time domain solver to analyse the dynamic behaviour of any floating structure moored or berthed.

A major advantage is the direct transfer of the hydrodynamic model to the mooring simulation for one or several bodies.

Mooring systems

The following mooring systems can be assessed:

- Spread mooring
 - SPM (Turret or CALM buoy)
 - CBM
 - Yoke
 - Jetty (line+fender berthing)
 - Dynamic Position (Capability Plot also available)
- Lines can be modelled by elastic catenary or non-linear spring models, with contact handling for fenders.

Environmental loads

All major wave spectra are available (JONSWAP, Pierson-Moskowitz, Ochi, user defined).
Included wind spectra are API, Ochi, Davenport or Harris, squall time series can also be input.

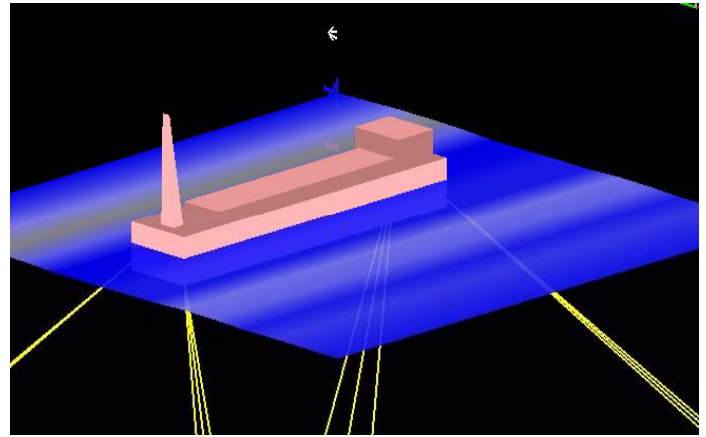
Validation

Tension and displacement are regularly benchmarked with other software such as DeepLines™...
In-situ measurement and Diodore results have been compared on a 16 lines spread moored FPSO in West Africa.

References

Hydrodynamique des structures offshore, B. Molin ed TECHNIP

Reliability and Response Based Design of a Moored FPSO in West Africa Using Multivariate Environmental Contours and Response Surfaces, E. Fontaine, A. Ledoux and S. Le Guennec, ISOPE 2007

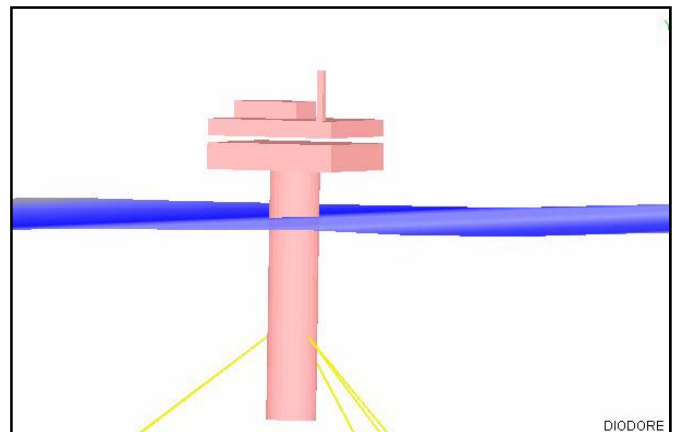
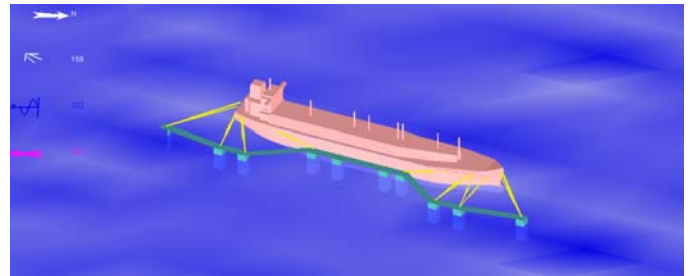


Hotline support

Hotline support is available by email at diodore@principia.fr or by phone. Experienced engineers from our technical support team will always be happy to bring timely responses to all your queries, whether you are new to the software or have complex issues to deal with.

Training sessions

This is the best way to familiarize yourself with Diodore™ and enhance your productivity. Standard or tailor-made training sessions may be organized at your convenience.



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