DIGITAL SOLUTIONS

SESAM™
For moorings and risers

Improving safety and performance of deepwater floating systems

Sesam is a proven software solution for deepwater floating systems, marine operations and SURF (subsea, umbilical, riser, flowline) analysis. It is known in the offshore oil and gas industry for its efficiency, speed and accuracy, with the mooring and riser systems of many recently installed platforms having been designed and/or verified using the software.
The methods used in the software have been extensively validated and include unique multi-body capabilities for complex field layouts involving several floaters, including side-by-side moored systems.

A complete software system for mooring and riser analysis
Sesam’s capabilities in this area range from riser and mooring design to analysis of marine operations. In addition, the system supports design and fatigue analysis of umbilicals, which sets Sesam apart in the market.

Sesam has been designed to predict the extreme response and fatigue damage to mooring and riser systems under wave, wind, and current loading conditions, automatically taking the coupling effect and other important non-linearities into account.

Also supported is efficient simplified riser design approach (uncoupled) as well as mooring analysis in the frequency domain.

Fast, accurate solvers
Sesam is known for its market-leading speed and accuracy. Multi-core computers are supported and the fast, robust solvers (the Sesam modules Riflex and Simo) give the designer the necessary tools to undertake design iterations. The graphical modelling of risers and moorings is quick and efficient. All of these attributes contribute to saving users significant man-hours. Included functionality enables quick estimates (based on regular waves) prior to detailed analyses, thereby saving time and resources.

Coupled and uncoupled analysis
As uncoupled analyses can only partially account the effects from the mooring and riser systems, e.g. the static restoring forces as a function of floater offset, coupled analysis approach becomes increasingly important in a time-domain floating system analysis. A coupled analysis can accurately account for current forces, damping due to dynamics, inertia forces from the dynamics of the riser and mooring systems, effects of sea-floor friction and effects of riser-hull contact.

Sesam is capable of automatically including the coupling effect from mooring and riser systems on the global response of the floating vessel itself. Coupled and uncoupled analysis can be integrated in the Sesam module DeepC, and it is easy for users to switch from one to the other. A time-domain air gap analysis can be also performed based on either coupled or uncoupled analysis, which might provide more confidence when low frequency motions are of concern, such as for semi-submersible platforms.

Coupled simulations in combination with model basin tests are a prerequisite for new deepwater projects. When model basin tests are conducted with a truncated mooring/riser system, the coupled analysis becomes indispensable as a tool for verifying the system performance at the real water depth.

Riser design
Sesam offers fast and reliable riser design, computing riser
motions, stresses and fatigue life as well as performing code check of the risers. Riflex is the market’s fastest solver for riser analysis. For the deep and ultra-deep water scenarios, a steel catenary riser design adopting prescribed displacements from coupled analyses will provide more realistic and optimum results, compared to a more traditional uncoupled analysis.

**Umbilical design**
Sesam also offers umbilical design, including detailed cross section fatigue analysis. The module Helica is an umbilical design program offered as one of the Sesam packages for risers and moorings. It uses the global analysis response to carry out detailed fatigue analysis and capacity check for each individual component in an umbilical cross section. Helica enables engineers to do non-linear cross section analysis within hours, increasing the precision level in the bidding process as well as in the detailed engineering phase.

**Mooring analysis**
The time domain coupled analysis in the DeepC module provides a comprehensive and accurate analysis for mooring systems. With abundant components, different types of mooring systems, such as spread mooring, single point turret mooring, and Soft Yoke system (which is quite widely used in some shallow water areas) can be properly simulated in an efficient way. With deeper knowledge of the solvers, thrusters and dynamic positioning (DP) systems can also be simulated and analysed simultaneously with other slender structures.

“As the oil and gas fields get deeper, the installations of deepwater platforms become more challenging. The coupling effects between a floater and its moorings become more pronounced and more important. Sesam is an excellent tool for analysing the interaction between hull, moorings and risers.”

Andy Kyriakides, Project Manager, MODEC International LLC

In addition, a traditional but efficient frequency domain approach is supported, available in Sesam’s mooring and riser module Mimosa. The program is a market leader in mooring analysis and offers a variety of options such as calculation of the vessel’s wave-frequency and low-frequency motions and mooring line tensions.

Several options are available for analysis of mooring systems and individual mooring lines. Mimosa is up-to-date with calculations required by the Norwegian Maritime Directorate (NMD) and the American Petroleum Institute (API) for approval of positioning systems.
Sesam modules for mooring & riser analysis
Sesam offers modules for coupled analysis (DeepC, Simo and Riflex), riser analysis (DeepC and Riflex), umbilical analysis (Helica) and mooring analysis in the frequency domain (Mimosa only). Simo, Mimosa and Riflex are owned, developed and maintained by MARINTEK. These products are commercialized and marketed by DNV GL as part of Sesam.

THE GOOD REASONS FOR CHOOSING SESAM
1. Fast and accurate results give flexibility in design
2. Advanced and accurate computational methods
3. Covers the range from riser and mooring design to marine operations
4. Unique multi-body capabilities for complex field layouts
5. Supports design and fatigue analysis for umbilicals
6. Options for analysis of mooring systems and individual mooring lines
7. Covers the range from riser and mooring design and analysis to design of umbilicals
8. Designed to predict extreme response and fatigue damage to mooring and riser systems
9. Quick and efficient graphical modelling of risers and moorings