



## Full Scale Testing of Riser Components

SES offers full scale testing of riser components, including static testing for strength evaluation and dynamic testing for fatigue. For fatigue testing, our facilities can accommodate samples from 4" to 32" in diameter, in lengths up to 70', at rates up to 2.5 million cycles per day. Static testing can incorporate combinations of tension, bending and pressure. SES can perform tension-only tests up to 10,000 kips. Cyclic testing capabilities include 4,000 kips tension at 1.33 seconds per cycle, rotary fatigue up to 80,000 ft.-lbs., and bending at 250 RPM.

## Expertise that Bridges the Gap

Since 1972 we have continued to build our staff of highly qualified personnel and equip them with the best analytical and testing tools available. SES engineering disciplines include Mechanical, Civil, Electrical, Metallurgical, Marine and Chemical. Using this inter-disciplinary team we are able to solve your problems in many areas, including material science, failure analysis, finite element analysis and systems integration.

Our facilities for full scale testing include both static and cyclic load frames with capacities ranging up to 10,000,000 lbs. (4535 metric tons) tensile. Coupled with analytical tools including RAMS, DERP and others for riser analysis, and STARR for analysis of riser recoil following an emergency disconnect, we strive to bring you the best analytical solutions. As always, the key to providing the best possible solution for your deepwater problems will be found in the skills of the most qualified and experienced people available in industry. This describes the SES team.

**For more on how SES off-shore design, analysis and testing experience can help you reduce cost and risk, call us at 281-955-2900 today.**

Visit our web site at [www.stress.com](http://www.stress.com)

Houston 281-955-2900 • Cincinnati 513-336-6701  
Denver 303-530-0525 • Atlanta 770-449-7887 • New Orleans 504-828-4066

# STRESS ENGINEERING SERVICES, INC.

Houston 281-955-2900 • Cincinnati 513-336-6701  
Denver 303-530-0525 • Atlanta 770-449-7887 • New Orleans 504-828-4066

## Off-Shore In Deep Water... Experience Is the Safest Investment

### Leading Edge Technology From A Proven Leader

With a reputation built upon a steadfast commitment to technical excellence, SES has been supplying design, analysis and testing services to the gas and oil industry for decades. Our expertise has been proven on numerous projects worldwide.

SES offers extensive experience in both up- and downstream segments of the industry, with qualified experts to assist you every step of the way. Our multi-disciplinary staff includes more than 85 engineers and technicians. The average experience factor is 15 years, and 75% of our engineers hold advanced degrees. Areas of the E & P market in which SES routinely provides service include:

- Riser design & analysis
- Third party evaluation
- Crane testing & design review
- Component design and analysis
- Conceptual studies of field developments & concepts
- Field instrumentation & data acquisition
- Fitness for service evaluation
- Tubular testing & analysis
- Full scale component & system testing
- Evaluation of coil tubing for oilfield application
- Materials technology
- Failure analysis



## RAMS is a Powerful Design Tool

RAMS is a powerful tool for design of floating systems. The system can be modeled to as much detail as is available at any stage of design. Integrated models allow conceptual designs to be tested for feasibility. Design changes can be incorporated and the impact on the whole system assessed quickly. Modeling progresses as the system design is developed, all the way from conceptual design to detailed design of components to final design verification. The design check includes an as built model that can be used for investigation of future modifications. RAMS reduces cycle time during design and provides a smooth path from concept to installation.



## RAMS Provides Fully Coupled Time and Frequency Domain Analysis

RAMS is state-of-the-art software for fully coupled time and frequency domain analysis of deep water drilling and production systems. RAMS was developed jointly by SES and a major oil company. Coupled analysis accurately captures the interaction between the floater and mooring and risers, including damping from mooring and risers.

RAMS provides efficient analysis of floating systems, including detailed modeling of all mooring lines and risers. Floaters can be Tension Leg Platforms, Spars, semisubmersibles or ships, modeled using WAMIT or WINTCOL. Finite element models of mooring lines, steel catenary risers, top tensioned risers and TLP tendons may be included in a single model.

## Introducing...RAMS Rational Approach to Marine Systems

### Key RAMS Features That Reduce Cost & Save Time

- Fully Coupled Analysis of rigid bodies, mooring lines and risers
- Frequency Domain or Time Domain using the same input data
- Extensive verification against analytical and other numerical results
- Rigid bodies to model floaters, buoys or other large bodies
- Finite elements to model mooring lines and risers
- Improved statistical linearization of velocity squared drag for frequency domain
- Seafloor model including variable elevation and slope
- Model of a tensioner
- Model of a "guide tube" for modeling the interaction between a riser and a Spar
- Model of a flex joint, either at the end or along the riser
- Wave forces on floaters (both frequency and time domain) through interfaces with hydrodynamics programs WAMIT and WINTCOL
- Multi-body modeling, including hydrodynamic interaction
- Mean current, wind and drift forces on the floater
- Low frequency wind and slow drift loads
- Generalized Morison model for hydrodynamic loads on risers and mooring lines
- Large set of load cases in a single run
- Response statistics, extreme value estimates, and fatigue damage estimates
- Can be run on a PC or workstation

## RAMS Simplifies Modeling of Large Systems

Development of deepwater fields requires large, complex systems for production and export of oil and gas. A unique feature of RAMS is its ability to model complex systems using a building block approach. This is accomplished by creating a detailed model containing full representation of components such as the mooring and production risers and then representing them as a superelement that produces the same dynamic behavior as the original. The superelements can then be used when conducting time-consuming analyses such as fatigue analysis for a steel catenary riser.



## RAMS Gives Designers New Power and Versatility

Leveraging 25 years of SES experience in the riser design and analysis business, RAMS focuses on producing results needed by designers, including detailed analysis of key variables. RAMS' efficiency permits detailed modeling and large sets of load cases, such as scatter diagrams, even for preliminary design. The software may also be readily updated to include modeling for new or novel systems as they are developed in the future.