

Offshore / Deepwater

For more than 35 years, Stress Engineering Services has been a leading provider of floating systems solutions. Our extensive industry experience, technical distinction, and advanced software programs uniquely position us to successfully optimize the performance, reliability, and safety of your floating system.

At the core of our floating system analytical capability is our proprietary in-house dynamic analysis program, RAMS (Rational Approach to Marine Systems). Unlike other analysis tools, it performs fully coupled dynamic analysis of floating production systems with the mooring, risers, and floating host platform all connected in a single model. The capability of RAMS – combined with our renowned expertise in testing, riser design/analysis, reliability, and materials – uniquely positions us to provide a comprehensive range of services.



Project Phases:

Concept Evaluation/Selection
Front-End Engineering Design (FEED)
Execution / Fabrication / Installation

Systems Design/Analysis:

Floating Hosts (Marine/Hydrodynamic, Structural)
Monitoring Systems
Mooring
Risers (Production, Drilling, Water-injection, Export, Top-Tensioned, Catenary)
Riser Support Structures
Tendons
Tensioners

Analysis Capabilities:

Coupled Global
Drive-off/Drift-off
Dynamic Positioning/Station Keeping
Engineering Criticality Assessment (ECA)
Finite Element Analysis (FEA)
Flow Induced Vibration (FIV)
Frequency-domain Dynamics
Hull Hydrodynamics (WAMIT)
RAO Determination
Riser Strength and Fatigue
Seismic
Signal Processing
Stability and Ballast
Structural Strength and Fatigue
Time-domain Dynamics
Vessel Motion
Vortex-induced Vibration (VIV)

Services:

Component/Equipment Specification
Fitness-for-service Evaluations
Lifetime and Short-term Instrumentation
Third-party Verification
Certified Verification Agent (CVA) Services
Monitoring System Data Interpretation
Mechanical and Thermal Laboratory Testing
Vibration Measurement and Analysis

COMPONENT DESIGN AND ANALYSIS

Stress Engineering Services has performed design and analysis work on almost every type of component that makes up today's deepwater production and drilling systems, including several downhole components.

The nature of our component design and analysis work is very project specific, but the one key attribute common to all of these projects is our client-focused approach. Whether performing detailed finite element analysis (FEA) to determine suitability of a certain design geometry or sitting with the client to discuss conceptually their particular needs for a new component, our commitment to getting you what you need is paramount.

The close relationship between our analytical staff and our test labs is a key to our component engineering success. Our component design and analysis specialists spend a significant amount of time in the test labs and understand what works in the real world. They have testing and analytical experience reaching back forty years, and real first-hand knowledge of what has and has not worked in the past. This level of information is not learned in a classroom, nor can it be quickly obtained. There is no substitute for experience.

We have extensive experience in the design and analysis of the following components:

- Threaded and Coupled (T&C) Connections
- Weld-on Riser Connectors
- Flange Connections
- Dog-type Connections
- Wellheads
- Steel and Titanium Stress Joints for Risers
- Tensioner Joints and Load Rings for Top-Tensioned Risers
- Steel Catenary Riser Baskets and Porch Structures
- Riser Tensioner Systems
- Mooring Components
- Drilling Derricks/Masts

RISER SYSTEMS ENGINEERING

Since 1975, Stress Engineering Services has been providing quality riser design and analysis services to clients around the world. Our extensive structural, mechanical, and materials experience, in combination with our proprietary in-house riser analysis tools, allows us to fully address complex riser design and analysis issues and deliver the most effective solutions within our clients' scheduling constraints.

Our renowned expertise centers on the design and analysis of production, drilling, combo (combined production and drilling), export, water-injection, and completion riser systems. We have design experience with a variety of riser configurations, including top-tensioned risers (TTRs), flexibles, hybrid risers, steel catenary risers (SCRs), steel lazy-wave risers, as well as a variety of other less mature concepts.

Production, Water Injection, and Export Risers

Production and export risers are typically deployed for 20 years or more. They are therefore exposed to a high risk of very extreme environmental conditions as well as smaller-amplitude daily loading over a very long period of time. These extreme and fatigue-damage causing loads (together with potentially high pressure and temperature for production risers) must be accommodated by the riser systems' components, including tensioners and hang-off structures. Top-tensioned production risers consist of a set of tubes, one inside another, which contributes additional complexity to the engineering of these systems. Understanding how to address the composite action of the multiple tubes under dynamic loading is an important aspect of top-tensioned production riser analysis.

Drilling Riser Configuration Optimization

We specialize in determining the best riser assembly for a given rig, mud weight, water depth, sea state, current, tensioner system, hook load limit, and riser joint inventory. Our focus is to assure that the riser system and floating host vessel stay within proper load and motion limits and that the riser system is capable of safely enduring any fatigue or corrosion damage that may occur.

Drilling and Completion Risers Operating Limits

Risers used to drill and complete wells in deep- and ultra-deep water are typically deployed from MODUs (mobile offshore drilling units) or drill ships. Each of these host vessels has its own particular set of characteristics that affect the loading on the drilling riser and the subsea wellhead to which it is connected. While these risers are not deployed for long periods of time, their deployment poses unique risks to the well and to the environment. We perform a variety of analyses to determine safe operating envelopes that drilling and completion operations must remain within, including:

- Weak Point Analysis
- Operability Envelope Analysis
- Riser Recoil Analysis
- Drilling Riser Tensioner Analysis
- Wave Fatigue Analysis
- Hang-off and Deployment Analysis



INTEGRITY MANAGEMENT

Stress Engineering Services is an industry leader in Integrity Management for deepwater oil and gas operators. Integrity Management, as it applies to deepwater floating and subsea systems, provides assurance that the infrastructure, facilities, and equipment are operating properly and efficiently without compromising personnel safety or damaging the environment. Additionally, deepwater Integrity Management is concerned with maintaining informational readiness to address needs for facilities expansion, modifications, and regulatory compliance.

Development of a reasonable yet robust Integrity Management program requires both a depth and a breadth of understanding and experience. Good execution of an Integrity Management program requires a strong management commitment to proper implementation throughout the entire life cycle of the asset.

Whether you are developing a comprehensive Integrity Management program from scratch or expanding on your existing program, our substantial expertise—in Floating Systems, Subsea Systems, Fitness for Service, Materials & Metallurgy, Process Technology, and Forensic Engineering—positions us well as your partner in developing or expanding your Integrity Management program. We can provide the engineering support you need to meet your needs, including satisfaction of existing and potential future regulatory requirements.

INSTRUMENTATION AND DATA

Measured data contains a lot of valuable information about the performance and integrity of an offshore system. Accelerometers, angular rate sensors, strain gages and Global Positioning Systems (GPS) can be used to characterize the response of an entire Floating Production System (FPS) in various weather conditions. Some of these instruments can also be used to record the behavior of subsea or subsurface equipment, such as risers, jumper, manifolds and pipelines in cyclic loading environments. Additionally, anemometers, wave radar, current meters and pressure transducers can be used to measure the environmental or internal loading conditions.

Our extensive expertise in these areas was the basis behind the development of our Riser Fatigue Monitoring System and ROV-deployable Subsea Vibration Data Logger.

