STRESS ENGINEERING SERVICES INC.
an employee-owned company

Advanced Flow and Heat Transfer Simulations

for Upstream Oil & Gas Applications

The exploration and production of oil and gas involves the design, installation, and operation of complex equipment with little or no margin for error. Advanced analysis and simulation techniques are applied to overcome the design, development, and performance challenges of these complex tools. Computer-based predictive modeling and simulation tools such as Computational Fluid Dynamics (CFD) provide a way to evaluate challenging fluid flow and thermal problems.

Computer-based predictive analysis is applied to:

- Evaluate and develop designs
- Avoid intrusive and costly testing
- Perform "what-if" scenarios
- Troubleshoot problems
- Predict performance of designs
- Gain insights into fluid flow and thermal behavior
- Evaluate processes/performance in a virtual environment
- Investigate failures during testing or operation

Stress Engineering Services, Inc. applies analysis and simulation methods of varying degrees of rigor and complexity to solve complex flow and thermal problems while maximizing time and cost efficiency. At Stress Engineering Services we apply computer-based predictive analysis to reduce the amount of experimentation to design or qualify new or modified equipment.

Stress Engineering Services has the expertise and experience in applying computer-based predictive methods for:

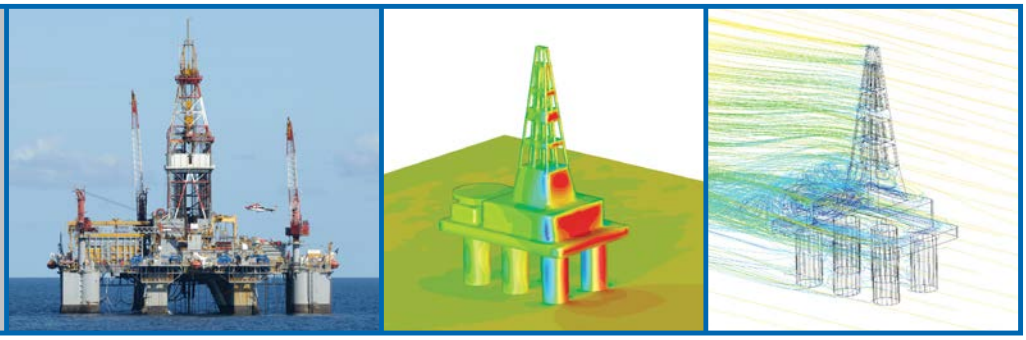
- Solving challenges associated with hydrodynamic applications
- Design and development of equipment and flow components
- Performing process safety and failure analysis
- Solving complex HPHT challenges

Determine Hydrodynamic Loading for Design, Performance and Life Predictions

Stress Engineering Services has extensive experience using computer-based predictive analysis to simulate the effect of environmental loads due to wind, waves and ocean currents on offshore structures.

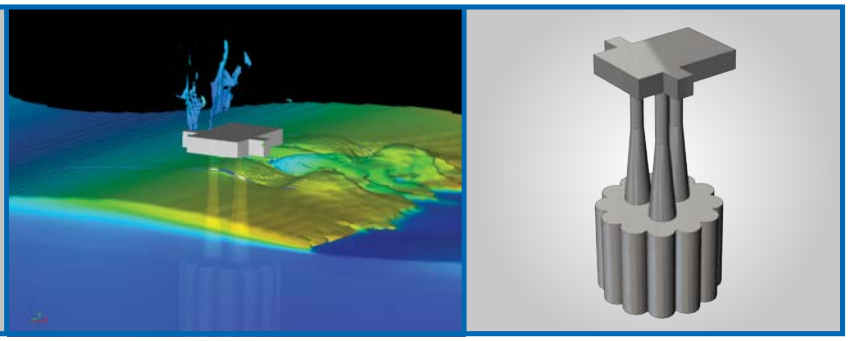
- Drag and Lift Calculations
  - Floating Platforms
  - Ship Hulls
  - Fairings
- Multi-Body Interactions
- Drag and Added Mass of BOP, Riser & Other Components for Dynamic Calculations
- Wind and Wave Loading for Offshore Structures
- Vortex Induced Vibration
- Vortex Induced Motion
- Flow Induced Vibration
- Wave Mechanics

Wind Loading



Wind induced pressure and shear stress loading can be calculated to determine the forces acting on the rig that impact stability. Pathlines are used to visualize the air flow motion around the structure to identify regions of high wind velocity and recirculations.

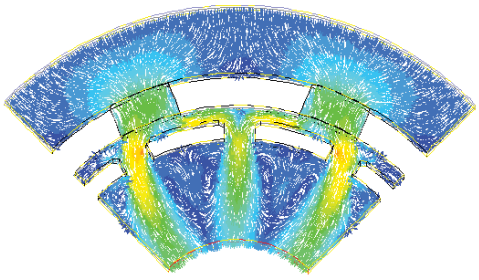
Wave Loading



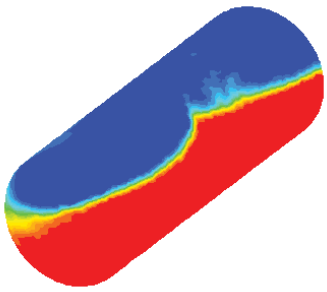
High sea wave impingement on a gravity based platform is simulated to determine the wave loading as well as green water loading on the platform. Simulation results are applied to determine regions exposed to green water loads and safe containment areas for onboard equipment.

Evaluate Design, Improve Performance and Address Failure Issues Related to Equipment and Flow Components

- Heat Transfer Analysis of Wells and Equipment
- Analysis for Thermal Management of Control Devices
- Compressor and Pump Pulsation Analysis
- Process Equipment (separators, heat exchangers, etc.)
- Computation of Sloshing Loads for Structural Integrity Evaluation
- Valve Performance
- Erosion Prediction and Mitigation
- PSV Stability



Flow through sliding sleeve valve

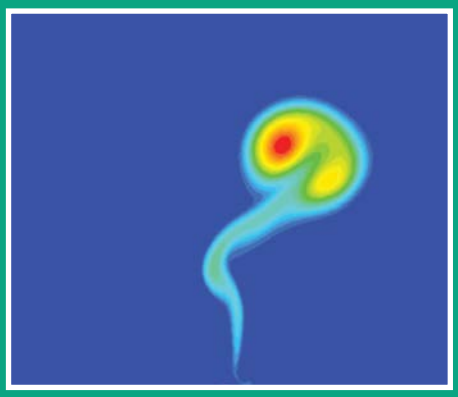


Fluid induced loads due to sloshing of liquid in a tank

Process Safety and Failure Analysis

- **Gas Dispersion** (Far Field and Local)
- **Release Source Characterization**
- **Smoke and Heat Transport from Fires**
- **Water Hammer Loads on Pipes & Supports**
- **Pool Fires**
- **Structure Fire Simulations**

Dispersion of gas plume from a burst test is simulated to determine safe working zone



Simulation of dispersion plume under cross wind conditions

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We Solve Complex HPHT Challenges

Reliability of Electronics

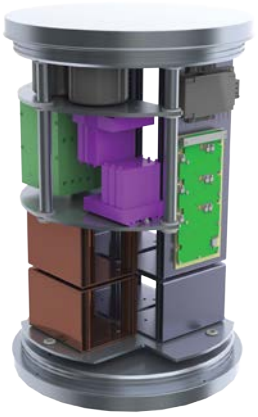
- Reliable Operation of Control Equipment
- Reliability of Seals Through Combined Analysis & Testing

Operational Issues

- Liquid Dropout and Liquid Surge
- Slug Formation
- Sphering (Pigging) Frequency

Flow Assurance

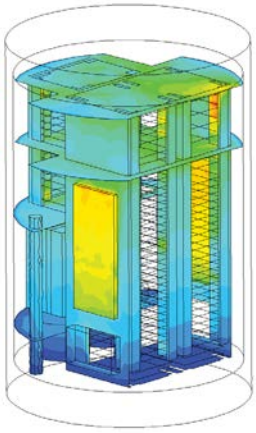
- Hydrate Formation
- Sand Transport
- Wax Formation



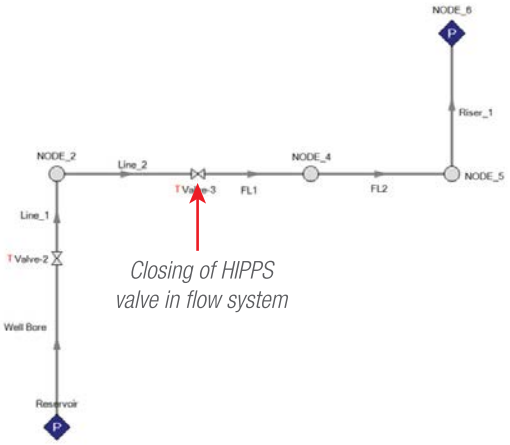
Electronic Control Unit

Safety

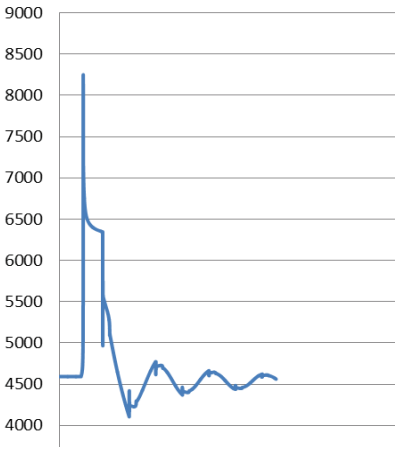
- HIPPS
- Venting of PSV



Thermal Analysis for Improved Reliability



Closing of HIPPS valve in flow system



The dynamic pressure response due to closing of a HIPPS valve is computed to determine the time lag and propagation of pressure wave inside the piping

For more information on our Flow-and-Heat Transfer Related services and capabilities, call us at 281-955-2900