Meet SACS™

Empowering innovation

Bentley®

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The Challenges of Offshore Structural Design

Offshore structural engineers are faced with a host of unique challenges that require an acute attention to detail, innovative solutions, and reliable designs. Harsh and complex marine environments necessitate designs that can withstand extreme forces exerted on structures that experience dynamic loads due to waves, wind, and currents, as well as material degradation due to the corrosive nature of seawater.

Offshore structural engineers' challenges include:

Producing high-quality designs on time and under budget

Reducing material costs

Optimizing software to deliver accurate, safe, reliable, and compliant designs

Performing analyses to test structures against harsh marine environments

Managing logistics of installing and maintaining offshore structures

Preparing strategies for environmentally sustainable decommissioning

Powerful Offshore Software Solutions

To combat the unique challenges in designing offshore structures, engineers must leverage best-in-class technology. As the leading comprehensive software solution, SACS is designed for the structural analysis and planning of offshore structures, covering oil, gas, and wind. SACS features specialized workflows tailored to the industry, cutting-edge analysis solvers, and unmatched design capabilities. It empowers engineers to efficiently generate models, conduct analyses, and design offshore structures, ultimately reducing engineering time and material costs to a minimum.

Key features of SACS include:

- Improving offshore structure design, analysis, safety, and reliability
- Analyzing offshore structures under a broad range of operating conditions and capabilities
- Automating workflows to make it easier to manage multiple analyses
- Ensuring compliance automatically with built-in code checking

Powerful Offshore Software Solutions

To adapt to the unique needs of each offshore project, the SACS Offshore Structure package offers three flexible SACS options, as well as add-on modules that can further the application's technologies for comprehensive offshore capabilities.

SACS Pile Structure Design permits nonlinear soil-pile-structure interaction analysis of fixed offshore structures with multiple pile supports using the PSI program module.

SACS Fatigue Ultimate contains the modules required to perform any dynamic simulation, including seismic analyses, deterministic, time history, or spectral fatigue analysis.

SACS Collapse enables advanced nonlinear plastic analyses for simulations, such as ship impact or pushover analysis.

Case Study

ZADCO Uses SACS to Reinstate Ship-impacted Wellhead Platform, Saving USD 2.6 Million in Restoration Costs

Zakum Development Company (ZADCO), responsible for developing the Upper Zakum oil field offshore Abu Dhabi, faced a critical situation when a 1,600-ton marine vessel collided with an operating wellhead platform in the field. The ship's collision impacted the deck leg, causing a 6.6% loss in platform strength, and halted oil production, which meant substantial daily losses for stakeholders.

Following the collision, ZADCO had the challenging task of assessing and repairing the platform quickly to minimize losses while ensuring safe startup and avoiding environmental pollution. Structural analysis became complex due to the absence of a current SACS model and unreliable vessel speed data. Moreover, the nonlinear soil-pile interaction in the platform's weak-to-hard rock foundation posed additional challenges. ZADCO overcame these obstacles by utilizing various SACS modules for a rapid, iterative boat-impact analysis, including SACS Precede for platform modeling, SACS PSI for pile and soil property modeling, and SACS Collapse for non-linear boat impact analysis and result verification.

ZADCO used SACS for in-house ship impact analyses and subsequently outsourced detailed engineering, successfully reducing project time and costs totaling USD 2.6 million, representing 70% of the total project cost. Subsea inspections by divers were reduced from 134 days to 34 days—a 75% savings of inspection time and a USD 850,000 savings in project costs. Additionally, only the repairs required to reinstate structural integrity were performed, reducing inspection and repair costs from USD 3.75 million to USD 1.15 million. The faster project completion also facilitated the early release of the platform for operation, and the technical documentation generated from SACS simulations supported the insurance claim, further saving significant costs for the operator.

SACS software and its tailor-made enhancements are very useful tools for structural integrity engineers to use when a quick and workable solution is required in the shortest possible time.

– Wilson John, Structural Integrity Engineer, Zakum Development Company

Case Study

SACS Simulations Help Dockwise Cut Topsides Float-over Time in Half

Dockwise Achieves Schedule for Transport and Installation of World's Heaviest Topsides Using Bentley Technology

Dockwise, a wholly owned subsidiary of Royal Boskalis Westminster N.V., develops innovative solutions for heavy transport and installation (T&I) in the maritime infrastructure sector.

As part of the USD 1.5 billion SHWE field development project in the Bay of Bengal, Myanmar Dockwise set a weight record with installation of the nearly 22,000-metric ton jacket and 30,000-metric ton topsides with deck support frame for the SHWE platform. Dockwise performed the engineering design for the T&I contract, as well as provided transportation and launch operation of the jacket and transportation and floatover operation of the topsides, along with the operational support for jacket and topsides load-out.

Using SACS alongside MOSES,™ Bentley's offshore platform analysis, design, and installation software, helped to save 5,000 resource hours and two operation days during the project execution. The simulations conducted for the project using Bentley's offshore software cut the estimated top-sides float-over time in half from four days to two days. With Bentley's advanced simulation safety considerations, Dockwise was able to perform the installation without incident. By conducting their advanced and innovative use of SACS and MOSES simulation capabilities, Dockwise evolved into an offshore contracting partner for the transport and installation of gas platforms.

> **Our advanced and innovative use of the SACS and MOSES simulation capabilities that we have been pioneering for many years supports our evolution into an offshore contracting partner for the transport and installation of oil and gas platforms. Dockwise has established the standard procedure for jacket launch and topsides float-over installation by taking advantage of using SACS and MOSES.**
>
> – Wenjie Wu, Senior Structure Engineer, Dockwise

Surge in Renewable Energy Projects

Across the globe there is a growing shift toward renewable energy. In the offshore sector, the increasing demand for greener energy requires the development of more efficient and resilient offshore structures, particularly with offshore wind energy. Many countries are investing in offshore projects in efforts to transition to cleaner energy sources.

Solutions for a Sustainable Future

Engineers who are innovating offshore renewable energy structural designs need sophisticated and comprehensive software that is reliable, comprehensive, and efficient. Conveniently bundled with SACS, OpenWindPower is offshore wind turbine analysis software with variations for both fixed foundation and floating platform capabilities. It delivers safe, cost-effective offshore wind farm structural designs.

Case Study

Keystone Engineering Cuts Installation Costs by 20% on First Offshore U.S. Wind Farm

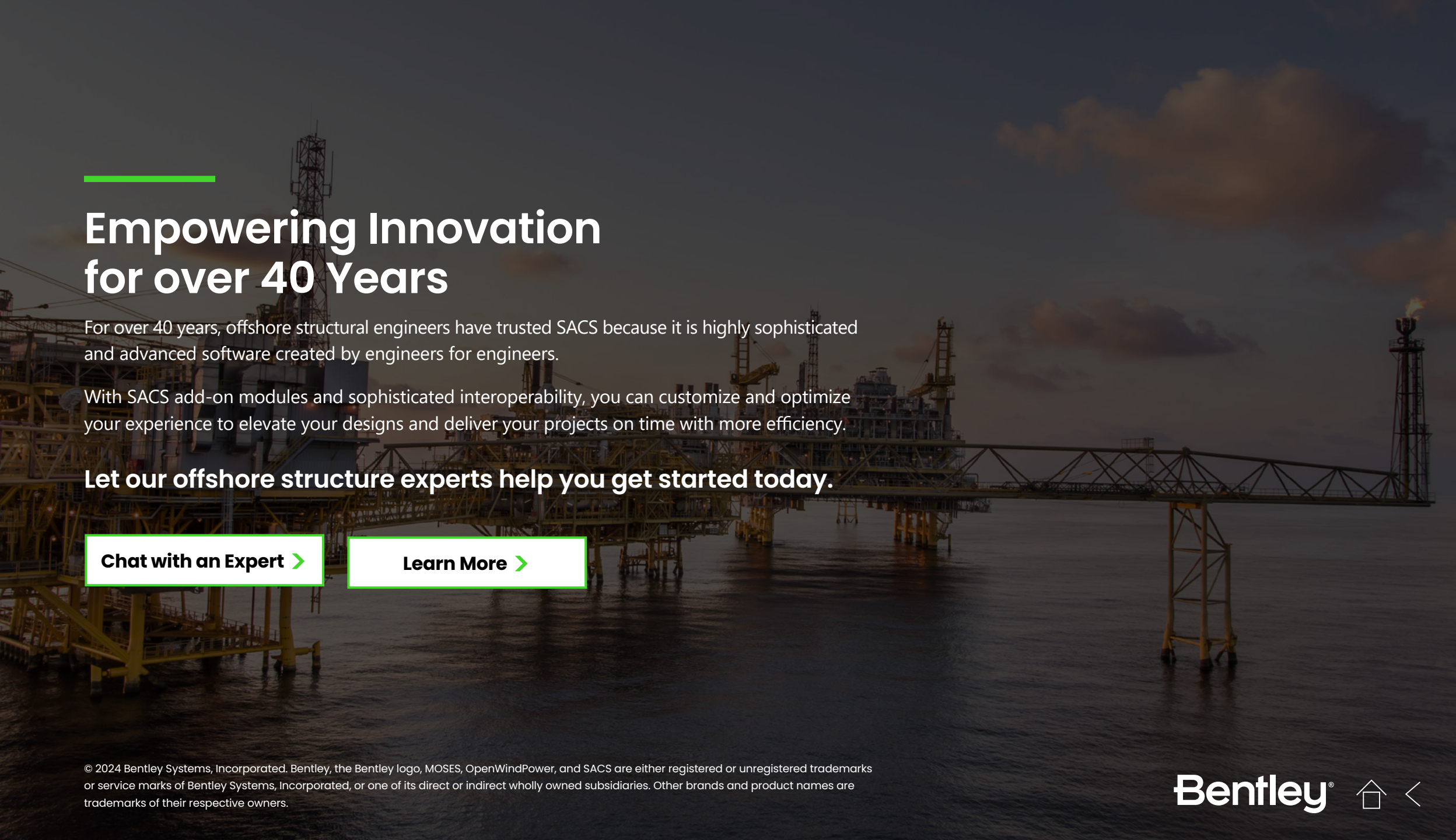
OpenWindPower® Shortens Design Time and Optimizes Steel Jacket Foundation Design

Deepwater Wind, a prominent offshore wind developer based in Providence, Rhode Island, embarked on the Block Island Wind Farm project with a budget of USD 290 million. This project aimed to provide cost-effective power to residents and marked the debut of the first commercial wind farm in the United States. Demonstrating the viability of offshore wind as an alternative energy source for U.S. coastal cities, Keystone Engineering was enlisted to design jacket-type structures for five 6-megawatt wind turbine generators.

Utilizing Bentley's OpenWindPower software, Keystone streamlined communication with the generator designer, modeled complex aerodynamic and hydrodynamic loading profiles, and optimized substructure design. The interoperability and advanced capabilities of this powerful software shortened the design cycle by 50%, made the desk and jacket 15% lighter, and optimized the amount of steel needed for the foundations, saving the client 20% in installation costs. Overall, this offshore wind farm project will reduce energy costs for Block Island residents by 40% and reduce harmful emission to the environment while leading the United States into the future of environmental sustainability.

OpenWindPower's Wind Turbine module allowed us to streamline the analysis process, thereby reducing the design cycle time, the cost to the client, and the risk of errors in managing the tremendous amount of data needed to perform over 3,000 time-domain simulations.

– Zachary Finucane, P.E., Project Manager, Keystone Engineering Inc.



Empowering Innovation for over 40 Years

For over 40 years, offshore structural engineers have trusted SACS because it is highly sophisticated and advanced software created by engineers for engineers.

With SACS add-on modules and sophisticated interoperability, you can customize and optimize your experience to elevate your designs and deliver your projects on time with more efficiency.

Let our offshore structure experts help you get started today.

Chat with an Expert >

Learn More >

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