# MOSES and 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

### Project Summary

**Organization:**
Dockwise Shipping B.V.

**Location:**
Bay of Bengal, Myanmar

**Project Objective:**
- Detailed installation design of SHWE platform jacket and topsides.
- Load-out, transportation, and launch of 22,000-metric-ton jacket.
- Load-out, transportation, and float-over of 30,000-metric-ton topsides.

**Products used:**
MicroStation
MOSES
ProjectWise
SACS

### Fast Facts

- Dockwise was the T&I contractor selected to install the record-breaking jacket and topsides in terms of weight.
- Bentley's offshore platform analysis, design, and installation software was selected for detailed design.
- MicroStation and ProjectWise were used by team members in project offices located in The Netherlands, United States, and China.

### ROI

- Efficiencies achieved during detail design saved 5,000 man-hours of the 30,000 engineering hours.
- Simulations conducted using MOSES and SACS cut the estimated topsides float-over time from four days to two days.
- Safety considerations during simulations allowed the installation to be performed without incident.

### Offshore Platform Record

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. With a fleet of 23 semi-submersible vessels and two floating super pallets, Dockwise operates worldwide headquartered in Breda, The Netherlands. 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 float-over operation of the topsides, as well as operational support for jacket and topsides load-out. Using MOSES and SACS, Bentley's offshore platform analysis, design, and installation software, helped to save 5,000 man-hours and two operation days during the project execution.

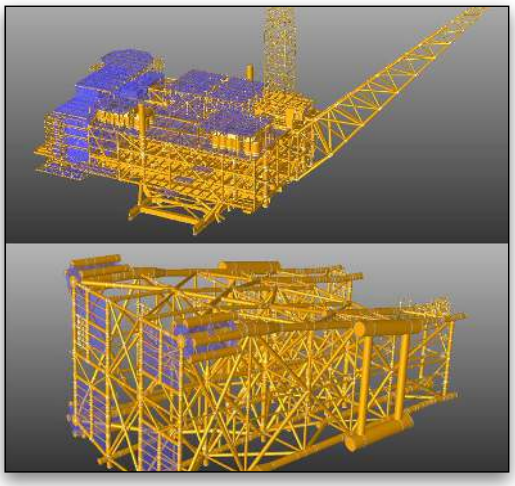
Alex Rodenburg, Dockwise senior project manager, noted: "The successful SHWE topsides installation and jacket launch marked a significant milestone for Dockwise. This further validates Dockwise's evolution into an offshore contracting partner for the transport and installation of oil and gas platforms."

### Large and Heavy Structures

Sitting in 110 meters of water in the Bay of Bengal, the SHWE platform is a central drilling, production, processing, and compression facility for exporting gas to an onshore gas terminal. Once onshore, the gas is distributed to the buyer's pipeline. Commercial production started in August 2013. The project became fully operational by mid 2014 with the production of approximately 500 million cubic feet of gas per day.

Engineering, procurement, construction, and installation contractor Hyundai Heavy Industry selected Dockwise as the T&I subcontractor for operation, engineering, and installation of the jacket and topsides. Dockwise was given about 2.5 years from the contract award to complete the operation in 2012. The installation involved one of the largest jackets and one of the heaviest topsides in the world. The state-of-the-art topsides was equipped with a hotel and restaurant to accommodate about 200 personnel, as well as apparatus for drilling and production capabilities.

With a vertical center of gravity located 48.3 meters above the keel, the topsides' stability requirements pushed the limits of the installation barge – one of only two barges in the world capable of performing this operation. The bottle-shaped barge made the float-over operation feasible because it satisfied both the stability and jacket footprint requirements. However, it created challenges for the mooring arrangement and transportation global strength needs. The short, fat, and heavy jacket also brought challenges to the launch operation.



*SACS and MOSES were used for engineering design and installation operations.*

### Bentley Software Simulations

The engineering challenges were tackled by numerous analyses and design iterations based on MOSES and SACS simulations. MOSES is Bentley's comprehensive suite of analysis software for the installation of offshore structures and the design of all types of floating offshore systems. SACS is an integrated suite of software for structural analysis

*"Our advanced and innovative use of the SACS and MOSES simulation tools 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*

**Find out about Bentley at: www.bentley.com**

**Contact Bentley**
1-800-BENTLEY (1-800-236-8539)
Outside the US +1 610-458-5000

**Global Office Listings**
www.bentley.com/contact

and design of offshore structures, including oil, gas, and wind farm platforms and topsides. The ability of SACS to dynamically iterate designs allowed the project team to perform advanced analysis, comply with offshore design criteria, and visualize complex results.

The Bentley technology improved efficiency and accuracy throughout the duration of the project. The topsides float-over analysis was a time-consuming process that required huge data transfer between SACS and MOSES. Information such as structure stiffness and static reactions were calculated from the SACS model and passed to MOSES. MOSES was used to calculate all the time-history hydrodynamic-related information such as float-over impact force and motions. All the results obtained from MOSES were fed back to SACS to make sure that the structure was adequate for all of the load conditions during the different float-over stages, which included stand-by, entry, mating, and exit. This whole process had to be updated for each mooring arrangement for the bottle-shape barge feasibility study, until the optimal arrangement was selected for the final design.

## Efficient Data Transfer

For the jacket launch analysis, the jacket was initially modeled in SACS. The jacket model was then converted to MOSES for launch analysis, which had an established reputation for simulating the launch process. After the jacket motions and impact forces were obtained from the MOSES hydrodynamic analysis, the data was output automatically into SACS format with minimum effort. The structure strength check then could be performed in SACS to ensure the structure's adequacy. Normally, 15-20 load steps during the launch process would be considered for each configuration, because in each step the contact point between the jacket and the vessel might be different.

With this complexity, the communication between these two programs was critical, including information such as geometry, member property, environmental information, and load conditions. Being able to transfer data between SACS and MOSES increased project efficiency. This enabled the project team to do extensive analysis to verify the ideas in an effective manner. Otherwise, the schedule and the cost of the project would have been adversely affected. Without SACS or MOSES, it is unlikely that the engineering for such a complex project could have been finished within the planned schedule.

## Distributed Engineering Team

Dockwise spread the design work across three office centers in The Netherlands, United States, and China. This geographic distribution allowed key team members to be available 24 hours a day to work on the pre-identified fast-track tasks and unexpected urgent requests from the field.

Data access, accuracy, traceability, and workflow became a crucial challenge, especially for the final product design drawings. The project team found a solution by producing drawings from MicroStation and managing the files in ProjectWise. The full integration of MicroStation and ProjectWise provided a natural and easy process for the drawing being transferred between different departments including operations, engineers, and designers at different locations. It also facilitated the workflow for the review and approval process. At the same time, ProjectWise provided better traceability among different rounds of analysis throughout the project life.

All in all, the combination of MicroStation and ProjectWise provided the information mobility solution that Dockwise required for such a large project executed on a global basis.


*SHWE Jacket Load-out.*

## Time-Cost Savings

The successful field operation echoed the sound engineering for the SHWE jacket and topsides T&I design. SACS, MOSES, and MicroStation helped the engineering and design group to be more efficient and, therefore, helped to facilitate the operation. Anything facilitating the field operations and engineering reduced the project cost significantly. For example, the accurate time-window prediction provided by workability analysis with MOSES reduced the risk that the float-over operation would be delayed. The planned four-day operation was actually reduced to just two days for the float-over operation.

From the engineering and design perspective, about 5,000 man-hours of the total 30,000 engineering man-hours were saved during the project execution. The cost value of 5,000 man-hours and two operation days could be attributed to the return on investment in the Bentley technology.

Safety was also a prime consideration during the T&I project. MOSES and SACS were used to simulate the float-over procedure, which provided accurate predictions for the mooring line and equipment impact forces, and verified the mooring line arrangements. These engineering activities significantly reduced the risk of a mooring line break during the operation, and so contributed directly to personal and operational safety. The Bentley products helped Dockwise to achieve its corporate commitment to a zero-accident policy. The installation was ultimately performed without any accidents.

Bentley
Sustaining Infrastructure