

PROJECT REPORT

800xA Simulator

Full-scale simulation for Troll A



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01 Troll A platform.
Image courtesy
of Equinor.

About Troll A

In 1996, the Troll A platform set the Guinness World Record for largest offshore gas platform.

Located 80 kilometers offshore northwest of Bergen, Norway, it is the tallest and heaviest structure that has ever been moved across the surface of the Earth.

Troll represents a cornerstone of Norway's offshore gas production with 40 % of Norway's gas reserves and 30 % of its gas exports and is one of the largest oil fields in Norway. Equinor operates the Troll A, B, and C platforms.

Simulator System Configuration

ABB delivered an 800xA Professional Simulator with Infi90/Harmony and AC 800M High Integrity Soft Controllers for the Troll A production platform. The system combines the 800xA Simulator architecture with the Harmony Training Simulator (HTS) and AC 800M Soft Controllers.

The high fidelity process model is delivered by Kongsberg with K-Spice software which stimulates the 800xA Simulator with process values and dynamics.

Troll A is a majestic construction, 472 meters high, with an underwater concrete structure to 369 meters depth and a dry weight of 656 000 tons.

All control logic runs in Soft Controllers within a Windows environment, which requires a minimum of hardware and reduces costs. The simulator is running the real operator HMI and same control logic as on the plant, i.e. not emulating HMI and control logic.

The 800xA Simulator also synchronizes the alarm and event handling and provides a common interface for I/O exchange and simulation commands for the process model and instructor station. The simulated scope today utilizes 2 600 tags with 3 operator workplaces.

The next step is to simulate ESD system with CAP panel (Critical action panel) with touch screen. Troll A simulator is successively extended with remaining SAS process systems. It is important that all systems are simulated for the best use of the simulator as a lifecycle tool.

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01-02 Phase three project. Courtesy of Equinor and Aker Solutions. The Troll phase three project includes a subsea production system consisting of two manifolds and nine trees.

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03-05 Generic simulator room in Sandslivegen in Bergen. Courtesy Equinor. Operators are trained, and new processes and subsystems are designed, engineered, corrected and tested in the 800xA Simulator before they are integrated into the main control system.

Simulator use areas

For Troll A, Equinor has a strong competence team for simulator training, consisting of 3 simulator instructors. The team has developed several areas to improve simulator competence inside the organization, such as a learning program for new control room operators in the generic simulator room in Bergen. A collaboration web site for Equinor and suppliers is used for following up actions.

Equinor is regularly conducting a 2-days course for the trainees at the Equinor's simulator center in Stjørdal. The operators train on working in a control room developing cooperation and communication skills, stress management, reacting in an emergency, as well as process understanding.

Due to the stable nature of operation on the plant it is particularly important to be able to train control room operators in a simulated setting.

Additionally, the simulator is being used for testing the control logic changes. By uploading new data and equipment on the simulator the user is able to test out the sequence and control logic changes. During 2019 an HMI upgrade on Troll A was tested out on the simulator first before implemented on the plant.

Continuous evolvement

The initial field development of Troll A was carried out in two phases. The first phase of development involved the recovery of gas reserves from the Troll East structure through the Troll A facility.

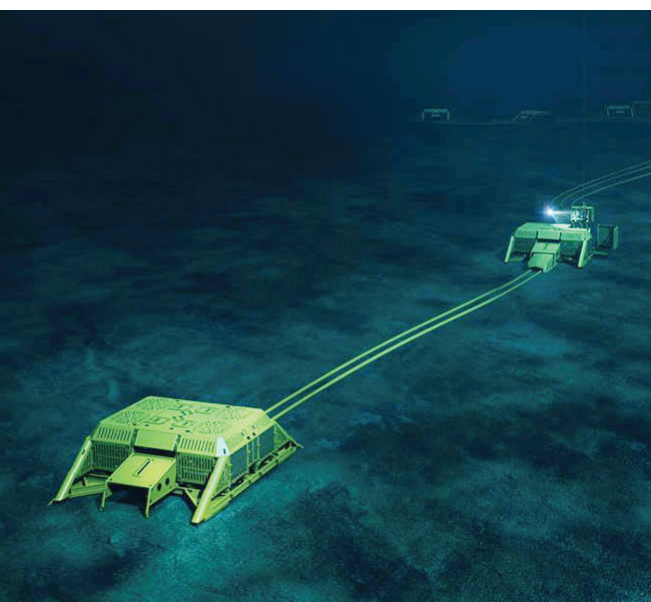
Phase two of the development included recovery of oil reserves from the Troll West structure via the Troll B and Troll C platforms.

A large amount of gas resources still lays in the western part of the field, which is to be recovered via the planned Troll phase three development. The concept includes the construction and installation of two subsea templates, drilling of 8 production wells, laying of a 36-inch pipeline and installation of a new processing module on the Troll A platform. Production from phase three is scheduled to begin in the first half of 2021.

The existing simulator covers the scope for phase two and will be further extended to cover scope for phase three. The simulator has an active role in the modification projects. With help of 800xA Simulator, Troll A will be able to execute necessary testing of control logic changes before being implemented live on the plant.

Additionally, the simulator will provide an opportunity to train the operators for half a year before the production will start from the new wells.

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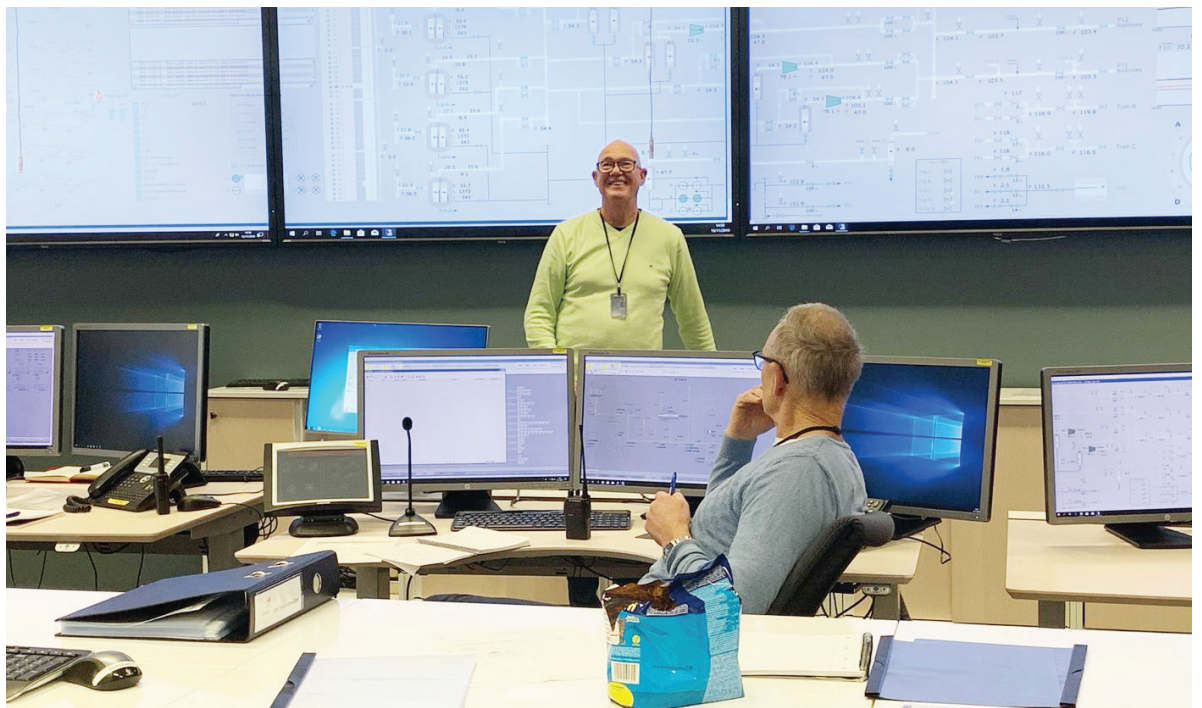
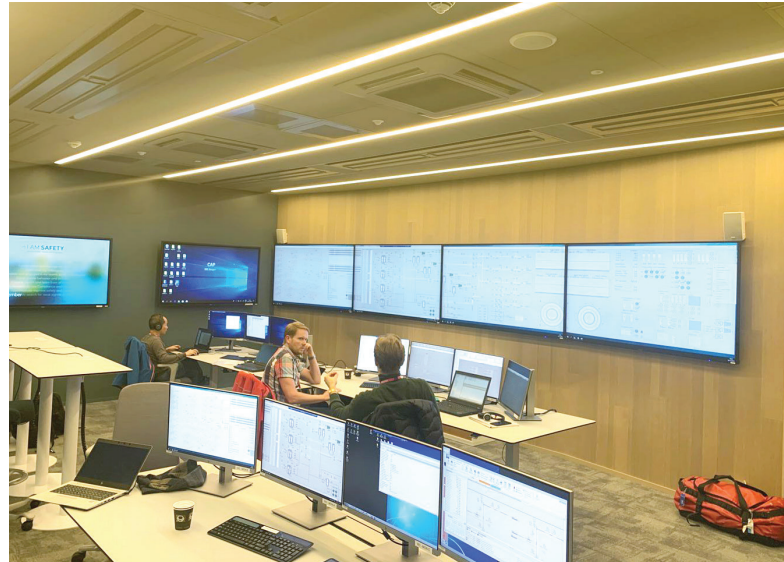
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"By using Simulator we have been able to achieve considerable cost reduction by being able to test the changes in the system before trying them out live.

Simulator is playing a big role in the new Subsea Project (Phase 3). The system allows us to make the necessary testing and find system faults before going live with the changes in the control system. This provides us with tremendous savings and risk minimization."

Gunnar Kolstad (simulator responsible Troll A)





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