

World's First Subsea Multiphase Compression System Installed in Norwegian North Sea

Statoil estimates additional recovery of 22 million barrels of oil equivalent from mature field

CHALLENGE

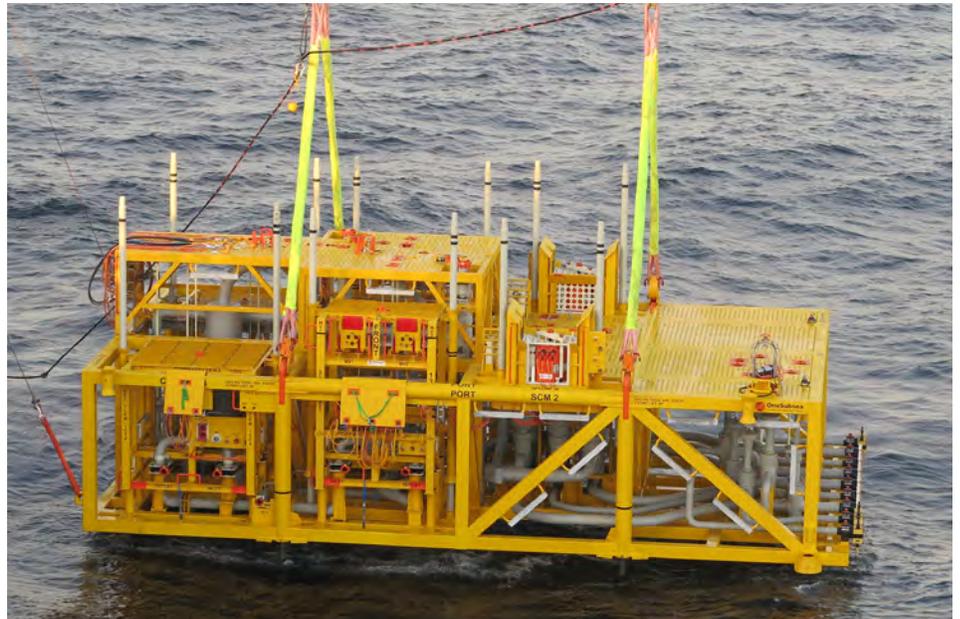
Extend the life of the mature Gullfaks South field in the Norwegian North Sea, thereby increasing total recovery.

SOLUTION

Design and install the world's first subsea multiphase compressor system, a major multi-year engineering project.

RESULTS

Engineered and installed a compact, robust system that cost-effectively will provide an estimated additional recovery of 22 million barrels of oil equivalent.



Installation of the multiphase compressor station in 443 ft [135 m] of water in Gullfaks South field.

Statoil wanted to enhance recovery from maturing asset

As field development matures, natural reservoir pressure declines, slowing production and reducing ultimate recovery. Anticipating this natural phenomenon, Statoil required a solution that would help generate enough pressure to maintain production from the South Brent reservoir in the Gullfaks South field, thus increasing recovery of the large volume of gas remaining in the reservoir.

Subsea compression can accelerate production, increase recovery, and manage flow-related challenges in a cost-effective manner. It is energy efficient because the compression system is located close to the reservoir. The reduced weight and space requirements topside result in further cost benefits.

Moreover, a subsea solution would serve as an important advancement in the development of the subsea factory and was therefore preferred.

OneSubsea developed world's first subsea multiphase wet gas compressor

Following a study phase with several industry suppliers, Statoil awarded the contract for development of the world's first subsea multiphase compressor to OneSubsea in 2009. In close collaboration with Statoil, a team of experienced engineers began working on a system that would operate as effectively and reliably as the market-leading subsea boosting technology—with an accumulated run time exceeding 2.6 million hours by the end of 2015—from OneSubsea, while achieving the customer-defined goal of an extended production plateau and higher recovery factor.

CASE STUDY: Increased recovery by estimated 22 million barrels of oil equivalent and extended field life, North Sea

A state-of-the-art hydrocarbon test loop was built to ensure that the hydraulic performance of the proposed system could be verified by an extensive test program. The high-pressure loop was designed to run live hydrocarbons at flow rates of approximately 400 MMscf/d at 65 bar [6.5 MPa] and up to 284 degF [140 degC]. The performance mapping in the flow loop comprised approximately 900 test points and overall machine run time of more than 4,500 hours.

Estimates indicated additional recovery of 22 million barrels of oil equivalent

After comprehensive and successful testing, the WGC4000* multiphase compressor was approved by Statoil. The contra-rotating machine is specifically designed to boost the pressure of an unprocessed well stream by 30–60 bar [3–6 MPa]. The compact and robust design does not require an upstream separation facility or an antisurge system, greatly simplifying subsea system requirements. It can handle gas/liquid ratios ranging from 0 to 100 and is easily installed using light well intervention vessels.

The WGC4000 compressor weighs less and occupies less space than topside compression solutions and can accommodate tieback distances of up to 62 mi [100 km], providing a cost-effective method of increasing recovery. Startup of the compressor was initiated in Q3 2015. Statoil estimates the multiphase compressor will help increase recovery from Gullfaks South field by 22 million barrels of oil equivalent.



OneSubsea President of Processing Systems, Mads Andersen, handing over the WGC4000 multiphase compressor system to Margareth Ovrum, Statoil Executive Vice President for Technology, Projects, and Drilling. Photo courtesy of Statoil.



Two 5-MW rated WGC4000 multiphase compressors.

onesubsea.slb.com/multiphasecompressor

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