



# The new look of offshore production

GE's new subsea compressor provides a reliable, cost-effective alternative to traditional platforms



## What it is

Subsea oil and gas production modules offer a more economical alternative to high cost platforms for the extraction of oil and gas from offshore deposits, including marginal or deepwater fields. These units supply gas separation and compression capabilities to deliver natural gas to onshore processing facilities via underwater pipelines or to re-inject co-produced gas as part of the process of producing or enhancing the production of oil from subsea wells.

## How it works

Gas compression is the heart of the subsea production process and the key to success is extreme reliability. The subsea unit must be capable of running continuously without maintenance for years. To meet this challenge, the unit – which consists of the compressor and variable speed electric drive packaged in a subsea production module – requires an extremely robust design and validation through rigorous testing. The compression unit receives power from an umbilical originating on shore or from a central platform that supplies numerous underwater units.

## Exploitation of marginal offshore oil and gas fields becomes an economic reality

To date, production from marginal subsea or deepwater fields has been hampered by high investment costs. Now a revolutionary, next-generation technology, subsea compressor developed by GE Oil & Gas offers a viable alternative for extracting resources that were previously not economically recoverable. This new subsea production system makes the development of numerous offshore gas fields profitable by eliminating the need for new platforms.

Subsea units will be connected directly to shore – or even to distant platforms – through subsea flowlines. Installation of subsea gas boosters or re-injection compressors close to the wellhead manifolds will allow operators to enhance productivity and maintain plateau production for an extended number of years.

### The high-tech answer to economical offshore oil and gas production

The desire to unlock marginal subsea oil and gas resources has driven considerable investment in new production technology. A GE R&D qualification program has developed a subsea compression module that is key to economical offshore oil and gas production.

### New Subsea compression module – the heart of a revolutionary technology

The compression module consists of a centrifugal compressor driven by a gas-filled, high-speed electric motor stacked in a vertical orientation and packaged in a single sealed housing designed to withstand the surrounding hydrostatic pressure.

The significant technical challenges associated with highly reliable operation of an unattended compression module have been resolved through a number of creative engineering solutions, including the elimination of dry gas seals through the use of a gas filled motor and the selection of materials and design procedures specifically developed for this application. Compression modules will be available in a power range up to 20 MW. The pressure and flow ranges are the same as for conventional natural gas compression applications.

The qualification program is now entering the final verification phase which will culminate in the installation of the subsea compression module in an actual subsea field.

Facilitates low-cost development of marginal fields

Up to 20 MW

High Speed Oil Free

Packaged system featuring high reliability compression technology

Eliminates high-cost platforms

State-of-the-art Centrifugal Compressor Rotating Equipment

GE services and support



## A vision of the future

GE Oil & Gas began its subsea equipment development program in 1990, with the construction of an 850 KW compression module tested in a water-filled tank. Although the test results were positive the market was not yet ready for this new product.

Since that time, GE Oil & Gas has continued development of its subsea compression technology and has succeeded in achieving the following fundamental goals:

- 1992** First subsea compressor module built and tested
- 2002** 850 KW subsea compression module test bed qualification
- 2003** Completion of conceptual design for 2.5 MW subsea compressor
- 2004** Launch of new generation, high-speed subsea compressor up to 20 MW
- 2006** Qualification program underway for installing the first subsea compressor at approximately 900 meters below the ocean's surface

Commercial availability of subsea compression modules from GE Oil & Gas is now a reality. So get ready to stretch the limits of your offshore capacity with the new revolution in subsea production.

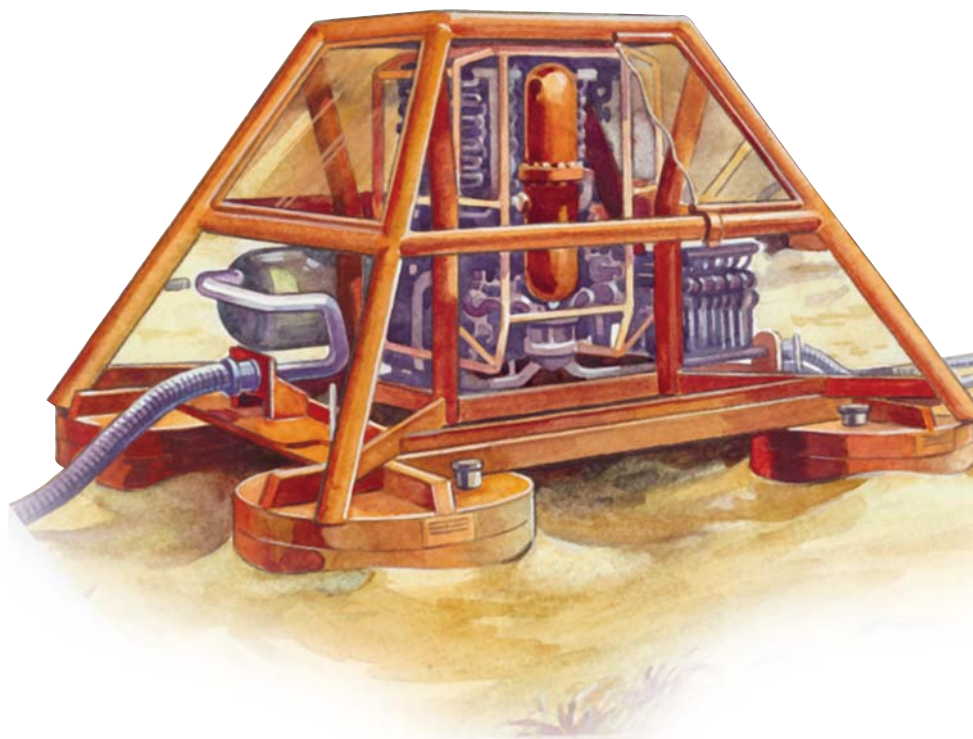
## Project update

GE Oil & Gas and AKS signed a Cooperation Agreement in 2003 for the technology and product development of the Subsea Centrifugal Compressor Modules.

On July 10, 2006, Norsk Hydro awarded Aker Kvaerner SubSea a total contract for the Subsea Compression Pilot for Ormen Lange, which includes the 12.5 MW subsea compressor designed by GE Oil & Gas.

This will be the first subsea compression module ever made and the Pilot is identical to one of four trains on the proposed full-scale subsea compression station to be installed at approximately 900 metres water depth, as an alternative to an offshore platform.

# Turn marginal subsea resources into energy and profits



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