ELECTRICAL HIGH-SPEED DIRECT-DRIVE SOLUTION FOR OFFSHORE PRODUCTION PLATFORM

Credit: Jan Arne Wold Woldcam - ©Equinor

MARTIN LINGE, NORWAY

CHALLENGE

Martin Linge is an oil and gas field located in a water depth of 100 to 120 m in the northern part of the North Sea, about 150 km off the coast of Norway. It was discovered in 1978 and is estimated to contain around 190 million barrels of oil and about 26 billion standard cubic meters of gas.

A limited carbon footprint was one of the main constraints requested by the Norwegian authorities for a platform to be allowed to operate there.

The Martin Linge platform is a new concept of electric offshore platform. It is sized to 55 MW, powered from shore via a 163-km subsea cable and remotely controlled with minimum manning offshore. Only electrical motors drive the rotating equipment such as the compressors and the pumps.

The gas is exported by pipeline to the on-shore terminal. Compared to traditional platforms using gas turbine for power generation, the electric platform reduces by 200,000 tons each year the CO_2 emissions, equivalent to emissions of 100,000 cars.

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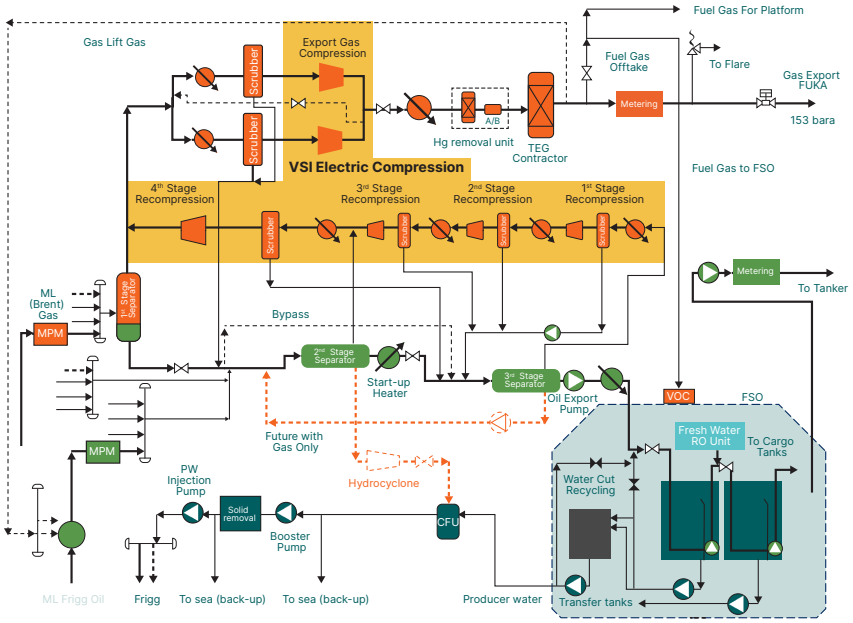
Solution

Power Conversion was selected to supply four high-speed 2-pole induction electric motors, controlled by Variable Speed Drives, directly driving the compressors.

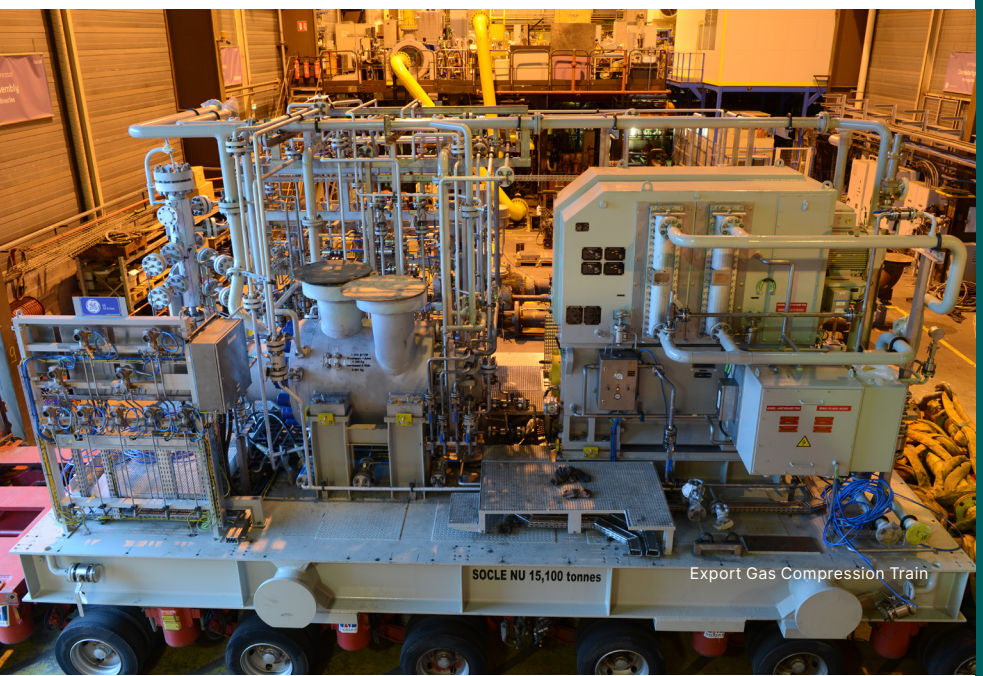
Gas Export #1 and #2



Step-Transformer: 9,000 kVA - 100 kV - 4 × 1400 V
Converter: DFE-VSI - 18 MVA - 6 kV
Motor: 2-pole induction - 6,898 kW - 4,350 V - 13,210 rpm

First, Second, Third Stage Re-compressor
Step-Transformer: 5,150 kVA - 11 kV - 4 × 925 V
Converter: DFE-VSI - 4 MVA - 3.4 kV
Motor: 2-pole induction - 1,732 kW - 2,600 V - 13,488 rpm

Fourth Stage Re-compressor
Step-Transformer: 9,000 kVA - 11 kV - 4 × 925 V
Converter: DFE-VSI - 9 MVA - 3.7 kV
Motor: 2-pole induction - 3,598 kW - 2,900 V - 13,735 rpm



Export Gas Compression Train

Benefits

- The entire drive train is suspended by magnetic bearings, removing the need for the oil system and associated auxiliaries.
- This system architecture brings with it substantial reduction in weight and footprint, factors that helps reduce the size of the topside structure and its associated cost.
- A weight ratio of 4 tons of foundation per ton of installed base with a typical cost ratio of 10 to 20 k$ per ton of installed base is the usual expectation.
- Replacement of mechanical drivers by variable speed motors strongly improves the trains efficiency and the availability.

Looking at the future

Power Conversion is continuously developping new solutions to support the electrification of offshore industries:

- Introduction of the Active Front End rectifier technology for a better control of resonance and reactive power generation by the AC subsea cable;
- Qualification of integrated compression system for upstream applications, reducing footprint, weight and removing dry gas, auxiliaries, gas flaring for a better operability.

Transformer efficiency
99.6%

Drive efficiency
98.4%

Motor efficiency
96.4%

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TO GO FURTHER:

- Selection of Power From Shore for an Offshore Oil and Gas Development
- Selection and Tests of Innovative Variable-Speed Motor–Compressor Solutions for a 55-MW Full Electric Offshore Platform Maximizing Availability and Efficiency With Better Environmental Impact

About Power Conversion, a GE Vernova business

GE Vernova's Power Conversion business provides energy conversion technologies, systems, and services across the power and energy intensive industries, driving the electric transformation of the world's energy and industrial infrastructure.