

## **SPE 145581**

# Ormen Lange: Delivering Production Optimisation and an Improved Reservoir Understanding Using a New Cableless Sandface Monitoring

### **Abstract**

The big-bore, high flowrate completion design used on Ormen Lange features a high-set production packer and large bore 9 5/8 production liner. This completion design makes it impractical to install a traditional cabled Permanent Downhole Gauge (PDG) system close to the producing sandface. With separation distances of greater than 1,000 meters between the producing sandface and the PDG, and frictional pressure drops and gravity head differences to contend with, there is significant uncertainty in how the pressure measurements recorded by the cabled PDG relate to the true flowing sandface pressures. For wells operating on drawdown constraint, reducing these uncertainties allows the drawdown to be optimised, which is critical to maximising production and exploiting the field reserves effectively.

This paper presents a case history of the development, qualification and first time installation in the deepwater subsea environment, of a new cableless communication system. The system provides two-way communications between a battery powered pressure / temperature monitoring system located remotely at the producing sandface, and the onshore control room located at Nyhamna in Norway.

The cableless communications technology functions by transmitting low frequency electromagnetic (EM) signals using the steel casing or tubing of the completion, or the rock formation, as a signal path. For Ormen Lange, high accuracy and high resolution pressure and temperature data is measured at the sandface using a precision quartz crystal sensor. This data is then transmitted in real-time through the cemented large bore production liner to a signal pick-up located above the production packer. Data is then transferred from the pick-up to a seabed transceiver via a cabled link and then onwards to the onshore control room. The communication channel is two-way, thus enabling the downhole system to be reconfigured on command from the onshore control room.

Cableless gauge systems installed in several Ormen Lange wells have successfully transmitted high quality, high resolution pressure and temperature data recorded at the producing sandface, to the onshore control room and then onwards to the A/S Norske Shell internal data network. The data is being used for multiple purposes, including pressure build-up (PBU) analysis at the sandface, to determine permeability thickness and skin damage, to monitor the sandface completion efficiency and integrity, to maximise the production rate and as a diagnostic tool to determine gradient and confirm the density of the wellbore fluids during early stage well production clean-up.

This first time application of a new cableless reservoir monitoring technology is enabling wellbore uncertainties to be reduced in the Ormen Lange big-bore high-rate gas wells. This has led to production optimisation and an improved reservoir understanding, the learnings of which have been applied across the wider Ormen Lange field development, even for those wells having no cableless monitoring system installed.

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