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# Clair Field: Reducing Uncertainty in Reservoir Connectivity During Reservoir Appraisal - A First Time Application of a New Wireless Pressure Monitoring Technology in an Abandoned Subsea Appraisal Well

### **Abstract**

Reservoir connectivity is a key uncertainty when considering field appraisal and development options. Reducing this uncertainty can provide significant benefits in optimising the field development plan. Through the application of new wireless telemetry technology (Expro CaTSTM), a fully abandoned subsea appraisal well has been cost effectively converted into a valuable reservoir monitoring asset.

Clair Ridge appraisal well 206/8-13Y was drilled in 2006 and located some 8km from the existing Clair production platform. The well was the first step in an appraisal programme designed to confirm the next stage of development of the Clair Field. Reservoir connectivity and the risk of compartmentalisation are key uncertainties for development of the Clair reservoir (ref.1). On completion of testing operations, the well would typically have been permanently abandoned and of no further value for reservoir monitoring purposes. By installing a battery powered, wireless pressure monitoring system in the well at the time of final abandonment, it was possible to monitor for any fluctuations in the reservoir pressure in the Clair Ridge resulting from production / injection events on the Clair platform. This newly emerging wireless telemetry technology transmits data from the reservoir to the seabed using the well casing as the communication path and advantageously, the signal is not attenuated by the presence of cement or bridge plugs in the wellbore. The reservoir pressure and temperature data that is transmitted up the casing, is collected and stored by a CaTS subsea receiver located on the seabed. The stored data can be recovered, on demand, by a supply vessel located overhead using well established through seawater acoustic communications.

The use of a wireless gauge enabled a downhole well abandonment to be performed. The traditional method for converting subsea appraisal wells for pressure monitoring has utilised a gauge and cable system (ref.2). This approach requires a relatively complex and costly semisub rig workover for final well abandonment. With the CaTS system, the well can be left fully abandoned downhole to UKOOA category 1 at the end of appraisal drilling. The remaining abandonment liability is just for recovery of the seabed receiver and final severance of the wellhead using a diving support vessel. This paper demonstrates that advances in wireless telemetry technology now enables critical reservoir data to be obtained from suspended/abandoned subsea wells or zones, where previously there was no cost effective means to do so. By monitoring the reservoir pressure variations in the abandoned Clair Ridge appraisal well, clear evidence of reservoir connectivity to the existing Clair platform reservoir area was demonstrated. This world first successful application of new wireless telemetry technology in a UKOOA category 1 subsea abandoned well marks a milestone achievement in advancing technologies that can cost effectively reduce uncertainty in reservoir connectivity at the field appraisal and development stages.

### **Introduction**

The Clair field was discovered in 1977 and is estimated to have >4 billion bbl overall STOIIIP, making it one of the largest discovered hydrocarbon resources on the UKCS. The field is located 75 km west of Shetland in water depths of up to 140 m and extends over an area of approximately 220 km<sup>2</sup>. Composed of fractured sandstones of Devonian age, it is the largest naturally fractured reservoir developed in the UK. Production from Clair began in February 2005 through the Phase 1 platform. This is a waterflood development specifically targeting reserves in the Core, Graben and Horst segments in the southern part of the overall Clair reservoir. The undeveloped field area is expected to hold considerable further reserves, but it is relatively un-appraised. The structurally elevated Ridge segments were identified as potentially the most prospective and a multi-well appraisal programme was developed. This programme also included extension of the original ocean bottom cable (OBC) seismic survey that was shot for development of the Phase 1 area.

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