Case Study:

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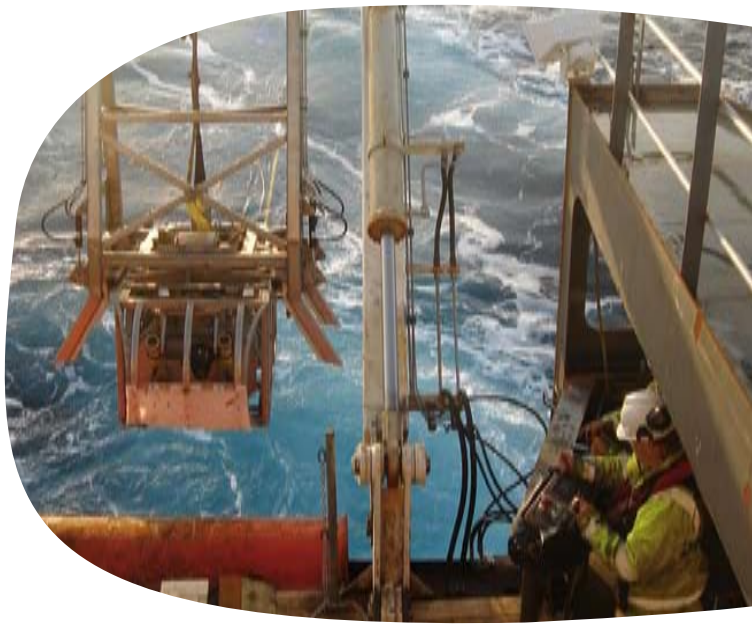
SWOP –

developing controlled-source electromagnetic imaging for shallow water applications

Aberdeen-based Offshore Hydrocarbon Mapping (OHM) plc, is a leading provider of remote electromagnetic (EM) sensing services designed to detect resistivity variations that can be related to the presence of offshore oil and gas. Coupling its technology with its engineering expertise, OHM has transformed the way exploration is undertaken in shallow waters.



The Requirement:

The marine controlled-source electromagnetic (CSEM) sounding method is rapidly gaining acceptance as an exploration tool for detecting and delineating hydrocarbon reservoirs. Whereas seismic surveys can detect the structures that may contain hydrocarbons with great accuracy, distinguishing hydrocarbon fluids from water within these structures is more problematic. As a result, less than a third of exploration wells result in a commercial discovery. CSEM bridges the gap between 3D seismic data and exploration drilling by providing information on seafloor resistivity structure which can be indicative of the presence and distribution of hydrocarbons. The CSEM method was originally developed as a deep water (greater than 1km) application. However the majority of fields, particularly in the UKCS are in water depths of 300m or less.

The Solution:

In 2003 ITF launched a Joint Industry Project (JIP) with support from 6 major operators to develop and test methods for applying the CSEM method in shallow water in the UKCS and elsewhere. The project developed threoretical approaches to applying CSEM methods, in shallow water, and these were subsequently tested in the field during a follow-on project.

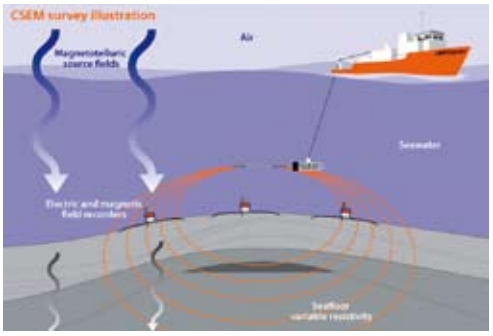
The Method:

OHM's CSEM survey method transmits a low frequency signal from a dipole source towed close to the seafloor. The resulting signals are measured by an array of receivers on the seafloor and the data processed to provide information on the subsurface resistivity structure. Because hydrocarbon accumulations are generally more resistive than the surrounding water saturated sediments, the presence of high resistivity features coincident with seismic traps can be used to indicate the presence of oil and gas and can detect and map the edges of such accumulations.

CSEM methods can be applied at several stages in the oil field life cycle. During exploration the results of CSEM surveys can be used alongside seismic and other data to rank prospects and improve drilling success. During appraisal, when the presence of hydrocarbons has already been confirmed, CSEM can be used to determine the extent and properties of the reservoir, especially when integrated with well and seismic information.

Implementation:

With support from ITF, the initial theoretical phase of the JIP concluded in 2004. In response to the success of this phase, a second phase which involved a field trial was sponsored by the original members of the consortium. This second phase demonstrated the results from the initial theoretical analysis by acquiring data over a known gas field in the UKCS.



The proof of concept survey demonstrated that CSEM data could be acquired and interpreted to provide information on sub-seafloor resistivity in water depths as shallow as 115m. Since this initial proof of concept, OHM has routinely been operating in water depths of less than 200m, and in many cases 100m or less.

The Outcome:

The programme which was completed successfully demonstrated that the CSEM technique can be applied in waters as shallow as 100m or less, and this has led to successful commercial applications both in the UK and globally. A separate project to investigate the integration of well log, seismic and CSEM data is also now underway with support from industry and the UK Government.

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