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The Atlantis OBS Project: Managing the OBS Node Development Evolution

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Abstract

BP initiated the Atlantis ocean bottom seismic (OBS) project to acquire high-quality wide-azimuth seismic data from deepwater subsalt reservoirs. The project, focusing on the Atlantis field in the Gulf of Mexico, represents the first large-scale commercial use of autonomous nodes as receivers. Prior to implementing this large-scale project, BP sponsored several sea trials. Conducting the sea trials accelerated the application of the technology to deepwater E&P, avoiding the long initial period of shallow-water implementation that has been the rule for much of today's deepwater technology. The primary goals of the sea trial were to validate hardware designs and operating method, develop budgetary production survey cost estimates, and record and assess the quality of the seismic data in the various seabed conditions.

The critical decision in the planning for the sea trials was the selection of the node technology. A node from Fairfield Industries that combined the sensors and a recorder in a single pressure vessel was chosen for the sea trials. Investigations of deployment methods followed, with the requirement that the method would need to deploy the nodes efficiently and safely in the rugged topography of the Sigsbee Escarpment.

With limited time available, the sea trials were able to perform both seismic tests and tests of the methods. Seismic tests included the effect of soil shear strength on seismic quality, a comparison of OBS node seismic data to existing towed streamer seismic, vector fidelity, PZ summation, and the quality of hydrophone data gathered at the sea floor. Tests of the method included node deployment and retrieval and some deck operations.

From the sea trials, we concluded that the single pressure-vessel node is a successful design for collecting OBS seismic data, and that new generation navigational techniques can provide accurate positioning, well within the requirements of the survey. The lessons learned from the sea trials directly benefit at-scale projects using OBS node technology, providing insights not only into improving the methodology, but also into project management techniques for large complex projects.

Introduction

This paper is one of a group of papers that collectively describe the development of a novel deepwater ocean OBS acquisition technology that has been successfully applied at a commercial scale over the Atlantis Field in the Gulf of Mexico. Taken together these papers present a case history in how a staged development process, rigorously managed, can substantially accelerate the pace of E&P innovation. This case history records the development of this technology from definition of the problem to execution of an "at-scale" field trial.

OBS nodes are autonomous seismic recording units that are placed in an array on the sea floor (**Figure 1**). They will record seismic data continuously as seismic sources near the ocean surface shoot into them from any desired direction. These two characteristics, autonomy and the recording of seismic data from all directions of the compass, are the critical capabilities required to enable the solution of an urgent industry problem in the appraisal and development of deepwater subsalt reservoirs.

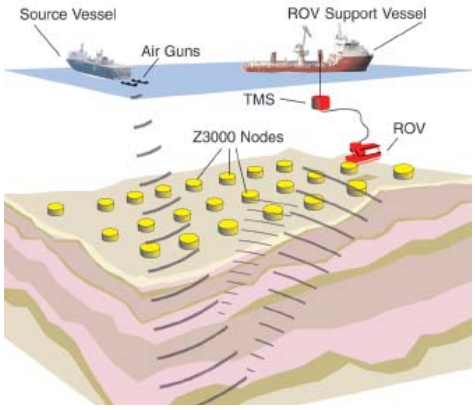

Figure 1: Schematic illustration of an OBS node array. Image courtesy of Fairfield Industries (TMS = Tether Management System).

Many of the new deepwater subsalt Gulf of Mexico developments are challenged by illumination "holes" caused by the complex nature of the salt overburden. Current risks to well placement and efficient reservoir development can be reduced by combining the emerging technologies of wave-field imaging and wide-azimuth seismic acquisition to achieve a significantly higher quality of reservoir imaging. The