



OTC 17979

The Atlantis OBS Project: Node Handling and Deployment

J. Thompson, Fairfield Industries Inc.; D. Fraser, Canyon Offshore; and R. Fyffe, Fairfield Industries Inc.

Copyright 2006, Offshore Technology Conference

This paper was prepared for presentation at the 2006 Offshore Technology Conference held in Houston, Texas, U.S.A., 1–4 May 2006.

This paper was selected for presentation by an OTC Program Committee following review of information contained in an abstract submitted by the author(s). Contents of the paper, as presented, have not been reviewed by the Offshore Technology Conference and are subject to correction by the author(s). The material, as presented, does not necessarily reflect any position of the Offshore Technology Conference, its officers, or members. Papers presented at OTC are subject to publication review by Sponsor Society Committees of the Offshore Technology Conference. Electronic reproduction, distribution, or storage of any part of this paper for commercial purposes without the written consent of the Offshore Technology Conference is prohibited. Permission to reproduce in print is restricted to an abstract of not more than 300 words; illustrations may not be copied. The abstract must contain conspicuous acknowledgment of where and by whom the paper was presented. Write Librarian, OTC, P.O. Box 833836, Richardson, TX 75083-3836, U.S.A., fax 01-972-952-9435.

Abstract

Our objective was to build and operate the first node management system for the deployment and retrieval of autonomous ocean bottom seismic (OBS) nodes on the sea floor in the deepwater Atlantis field area of the Gulf of Mexico. Nodal OBS systems collect wide-azimuth seismic data to provide improved imaging of subsalt reservoirs. The system was to operate across the Sigsbee Escarpment, an area of rugged topography with depths ranging from 1,200 to 2,300 m. The final node management system consisted of surface and subsurface operations. Surface operations employed a gantry crane, controlled from a raised operator stand on deck, for maneuvering nodes onto the deck of a marine vessel and into storage and charging containers. A robotic manipulator arm, also controlled from the operator stand, was mounted to allow access to both an ROV system and a node storage basket. The manipulator loaded the nodes onto a multi-conveyor deployment skid that fit under the ROV. When the ROV reached the sea floor, the robotic manipulator planted the nodes in succession. The ROV later returned to the node site, and the manipulator retrieved the nodes. Using two ROVs allowed the operation to proceed continuously. The use of 3D terrain profiling software, images from a camera mounted on the manipulator arm, and an enhanced inertial navigation system aided in precisely locating deployment and retrieval positions. Modeling and physical testing of the system and its components ensured that the system would be safe and would operate as expected.

Introduction

This paper is one of a group of papers that collectively describe the development of a novel deepwater ocean bottom seismic (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.

The ocean bottom seismic (OBS) acquisition survey of the Atlantis field, deepwater Gulf of Mexico, represents the first use of autonomous nodes to collect seismic data from a deepwater environment. Autonomous nodes are seismic recording units, placed in an array on the sea floor, to collect wide-azimuth seismic data for improved imaging of subsalt reservoirs.

As an integral part of this pioneering project, the task of managing the OBS nodes offered opportunities and challenges in developing new equipment or using existing equipment in new ways and, most particularly, combining equipment components into a workable and safe operational system.

The OBS node management system includes both surface and subsurface handling of the nodes. Fairfield took responsibility for designing and developing the surface handling system. Canyon Offshore supplied the vessel, the remotely operated vehicles (ROVs), and took responsibility for designing, developing and implementing the subsurface handling system.

Surface handling comprised physically transporting the node system from the manufacturing facility to the vessel, maneuvering the node baskets on the deck of the vessel, operating deck equipment on the vessel, and placing the nodes into and retrieving them from the ROV deployment skid. Challenges of the surface management system are portability, maneuverability, and stabilization of the system components.

Subsurface handling includes transporting nodes from the deck of the vessel to the sea floor, deploying the nodes in their target locations, and retrieving the nodes from the sea floor. Challenges of the subsurface management system are many and include operating ROVs across 450-m transits over extreme topographic variations, working from a vessel that is in constant motion, and dealing with the buoyancy shifts of the ROVs as nodes are deployed or retrieved.

This paper describes how the goal of creating a safe, cost-effective environment was achieved in the back-deck layout (**Figure 1**).