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The Atlantis OBS Project: Developing and Building the OBS Node Technology

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Abstract

Close communication among the engineering, manufacturing, and operations groups at Fairfield Industries led to the concept of developing ocean bottom seismic (OBS) with autonomous nodes as receivers to meet the need for a highly reliable, more cost-effective OBS acquisition technique. When the idea was communicated to a major oil company, BP, the concept evolved to meet a growing industry requirement: acquiring better seismic data from deepwater subsalt reservoirs, in this case, the Atlantis field in the Gulf of Mexico. The Atlantis OBS project became a reality when BP and Fairfield agreed to share the risk of developing this new technology. Fairfield undertook the manufacture of the over 900 nodes required, which included assembling 25,000 battery packs and 30,000 circuit boards. Ideas for process improvements from the manufacturing team were incorporated while construction was in progress and contributed to the successful manufacture of over 900 nodes in nine months. The application of quality assurance processes resulted in a high degree of node reliability, with only two failures in the first 900 deployments.

Introduction

Seismic data and its ability to image potential reservoirs has long been an extremely valuable tool in determining the location of oil and gas wells. As seismic images have improved, so have drilling success rates. As the oil and gas industry is driven into more difficult environments, such as deep water, to find reserves, the cost of drilling wells and producing hydrocarbons has risen tremendously. This high cost of drilling and production calls for newer seismic technology to help reduce these costs.

Working in close conjunction with BP, we were able to successfully develop and bring to market a new ocean bottom node technology for acquiring seismic data from deepwater prospects. The development of this new technology depended on technological factors as well as human factors. Technologically, the challenge was to take advantage of the advances that have been made in acquisition methods to create a cost-effective system. In considering human factors, the benefit of cross-discipline and cross-company communication was seen at all stages, from inception to deployment. Another key human factor was the willingness of the companies involved to take the risk of trying this new technology. A successful sea trial provided critical evidence that the system would fulfill its promise and would justify the risk.

This paper traces the progression of OBS nodes from an idea to a manufactured system. Additional information on the project can be found in papers that discuss the overall project from the BP perspective[1-3] and papers that describe the implementation of the OBS node system.[4,5]

Background

Historically the oil and gas industry has been a cyclical industry as evidenced by looking at the price per barrel and price per million cubic feet of gas over the last twenty five to thirty years. Prices have ranged from under $10 per barrel of oil to upwards of $70 per barrel. The price per Mcf of natural gas has ranged from $1 to over $14 per Mcf. The seismic industry is no different from the rest of the oil and gas industry. In fact, usually it is the seismic industry which starts the swing in a cycle because oil companies use the seismic data to develop the drilling locations, but nevertheless it is very cyclical.

The key force in helping the seismic industry stay economically viable during all phases of the cycles is technology. In the past thirty years, probably the two most significant advances in the seismic industry have been the move from analog recording to digital recording and the evolution from 2D seismic to 3D seismic. The tremendous amount of data arising from these advances made the seismic industry one of the main drivers in the dynamic growth of computing power and number crunching. Along with increased computing power came new algorithms to help manage and derive the information needed for seismic imaging to advance. Within the seismic industry, new technology in one area in turn drives another area to grow and develop.

This new processing power helped to ramp up the acquisition side of the seismic industry, allowing new and better acquisition systems which, in turn, utilize new and evolving technologies. It is the acquisition side of the seismic industry which is where the big dollars are spent because of the physical requirements for people and equipment such as trucks, helicopters, and vessels. In terms of project cost, the acquisition portion of a survey can easily range up to 95% of