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SpiceRack™: An Autonomous Underwater Vehicle for Efficient Seabed Seismic Acquisition

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ABSTRACT

It is generally accepted within the seismic industry that seabed receivers deliver superior seismic reflection measurements and consequently excellent seismically derived images. However, seabed receiver surveys are currently not widely used because of the higher acquisition costs. In general, seabed surveys are only considered for the most challenging geophysical objectives such as reservoir management projects and imaging complex geologies where high repeatability and full azimuth measurements are required, respectively. In recent years, there have been significant engineering efforts related to more efficient receiver deployment and retrieval to address this cost differential, and thus open seabed receiver acquisition techniques to a wider range of exploration and development challenges. These engineering efforts include the use of autonomous underwater vehicles (AUVs) which navigate from and to the deployment location. The goal of this innovative acquisition technology is to automate nodal seafloor acquisition operations so that they will match wide azimuth towed streamer costs and turnaround times while at the same time retain the technical advantages of the Ocean Bottom Node (OBN) systems. It is strongly envisioned that the introduction of robotics in seismic acquisition activities will significantly reduce costs and minimize human intervention and, consequently, HSE risk. In this presentation, we will focus on the development of an autonomous robotic sea bottom node, a game changer in the seismic seabed acquisition. Using time and motion modelling tools we will evaluate the potential uplift in OBN acquisition efficiency and show the results from test data recorded to measure the geophysical integrity of this autonomous “flying” node. Finally, we will show results from a field trial specifically designed to demonstrate the command and control of a swarm of the nodes - deployed simultaneously, the positional accuracy achieved by the nodes relative to their pre-plotted destinations and examples of the consequently recorded seismic data.