Improving Efficiency by Using a Single High-Capacity Multi-Purpose Vessel for Ocean Bottom Node (OBN) Surveys

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Introduction

In smaller OBN surveys, mobilising multiple vessels often contributes to a considerable portion of the overall cost. A cost-effective approach is the use of a high-capacity multi-purpose vessel (MPV) capable of deploying and retrieving nodes, as well as operating seismic sources. The primary advantage of this approach lies in the vessel's ability to operate as both a node and source vessel, thereby eliminating the need for multiple dedicated vessels and associated mobilisations. This method was successfully applied in a recent deep-water survey, where a single MPV was used to deploy and retrieve over 670 nodes and acquire over 62,000 seismic shot points.

Compact and Lightweight Nodes

Nodes designed for lightweight portability, extended battery life, and efficient operation (Hager et al., 2022), are key to enabling single-vessel surveys. Their compact size and low weight make it possible for remotely operated vehicles (ROVs) to carry a significant number of nodes onboard using a skid (Figure 1), reducing the need for frequent reloading or emptying, thus optimising survey time and increasing efficiency (Figure 2).

Figure 1 Portable and lightweight nodes (right) positioned in the skid (left) transported by the ROV for node deployment and retrieval.

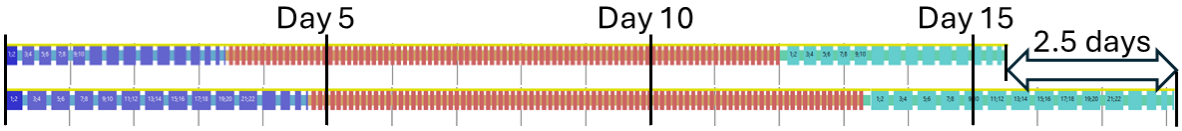

Figure 2 Modelled survey durations using skids with 27 and 120 node capacities. The time required for node deployment is indicated in blue, acquiring the shot points in red, and node retrieval in cyan. The difference in modelled survey durations is 2.5 days, greater than 15%.

Multi-Purpose Vessels

MPVs are versatile vessels capable of carrying and deploying/retrieving nodes, for example by ROVs, operating seismic sources, and, in some cases, seismic streamers. The use of a single MPV for a OBN seismic survey significantly alters the practical and economic dynamics of the operation. For example, with the ability to lay out all node positions without needing to roll receiver lines, the vessel's productivity is maximised, and the operational costs minimised.

Mobilizing a Single MPV for Deep-Water OBN Survey

In a recent deep-water survey, a single MPV was mobilized to deploy nodes, retrieve them, and operate triple air-gun seismic sources. The vessel was equipped with dual ROVs to handle node deployment and retrieval, as well as the required seismic source operations. The key survey parameters are summarized below:

Water depth	700 – 2200 m
Source area	154 km^2
Nodes deployed	670+
Source points	62,000+

The survey was completed within 26 days, from vessel arrival to the retrieval of the final node, with no recordable incidents. This successful execution highlights the efficiency of using a single MPV for smaller scale surveys.

Conclusion

Mobilising a single high-capacity MPV for OBN surveys offers significant potential to reduce both operational costs and risk exposure. This approach is particularly advantageous for smaller surveys where all required node positions can be covered by a single node layout. By leveraging the capabilities of the MPV to carry and deploy large numbers of nodes, as well as operate seismic sources, the need for multiple vessels can be eliminated, resulting in a streamlined, cost-effective survey process. The successful deployment of an MPV for a deep-water survey demonstrates the tangible benefits of this approach for reducing survey time, cost, complexity, and with reduced emissions.

References

Hager, E., Combee, L, Jaavold, V. and Husom, V., “The Making of a Node”, First Break, November 2022.