IHS Petrodata Offshore Field Development Monthly
Incorporating *The Aquanaut*

Simplifying subsea installation

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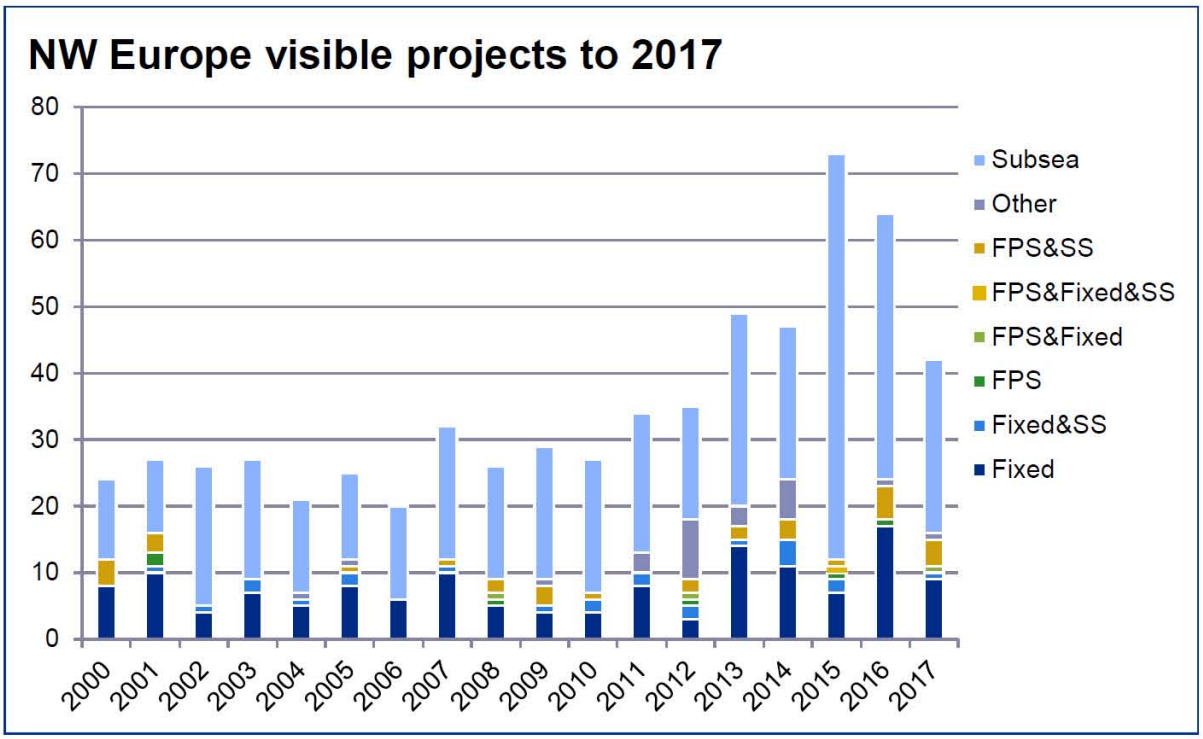
Good ideas are often the most straightforward ones. For business partners David Paul and Arnbjorn Joensen, who have around 50 years of experience in the oil and gas industry between them, their 'eureka' moment came in 2008, when they co-founded Subsea Deployment Systems to develop a simple, low-cost method of installing large and heavy subsea structures.

The idea was borne out of frustration – and the belief that there was an easier, safer and ultimately cheaper way of meeting increasing industry demand for the installation of heavy subsea equipment without the use of an expensive heavy lift vessel.

Northwest Europe is already at the forefront of the subsea industry, with an increasing proportion of smaller subsea tie-back projects on the cards in the next five years. According to the IHS Petrodata *FieldsBase*, this year a total of 29 subsea projects are under construction and due to come online, while in 2015 over 60 subsea projects are in the visible pipeline and could come on stream.

However, it is not only Northwest Europe that is placing increasing pressure upon the subsea sector. Undoubtedly, in the years to come, the global industry will face unprecedented demand for floating and subsea projects, driven by the large number of deepwater discoveries being made. Back in 2006, only 25% of discoveries were in depths of over 1,000 msw. However, in 2012, this figure had more than doubled to 51%, driven largely by new deepwater areas opening up in Brazil and East Africa.

Demand, therefore, for installation of large subsea structures such as manifolds, templates, pumping stations and new technology such as subsea gas compression units is set to increase significantly. Already, Statoil's Asgard subsea gas compression project has required the use of expensive vessels such as the Saipem 7000 and the North Sea Giant, while the new subsea boosting pump station at Shell's Draugen Improved Recovery project is likely to require a heavy lift vessel as well. Meanwhile, the removal of subsea equipment causes just as many, if not more, problems. Recently, Hess was forced to call in the services of Heerema's heavy lift vessel Hermod to retrieve a 500-tonne production manifold from the Rob Roy field in the UK sector, which is currently being decommissioned.



With heavy lift vessels such as those in Heerema's fleet routinely charging day rates of USD 1 million and above, there is, then, clearly a gap in the market for subsea lifting and removal work – one in which only Dutch contractors Jumbo Shipping and SAL Shipping have so far managed to compete.

Subsea Deployment Systems offers an alternative solution – and one which allows the use of a much smaller vessel. The partners' patented concept utilises a subsea development vessel (SDV – see image

below), which consists of solid buoyancy modules mounted on structural steel frames. Load-out of the subsea structure onto the SDV takes place at dock-side, and the SDV and its load are then towed, submerged, out to the construction site, with vessels equipped with even just a 100-tonne crane able to be utilised. The final set-down process is based upon the principle of pushing, rather than lowering the structure to the seabed. Although still at the conceptual stage, a model of the SDV has been fully tank-tested. The design is fully scalable, to cope with the installation of structures from 100 to 1,000 tonnes, in depths between 100 to 3,000 msw.

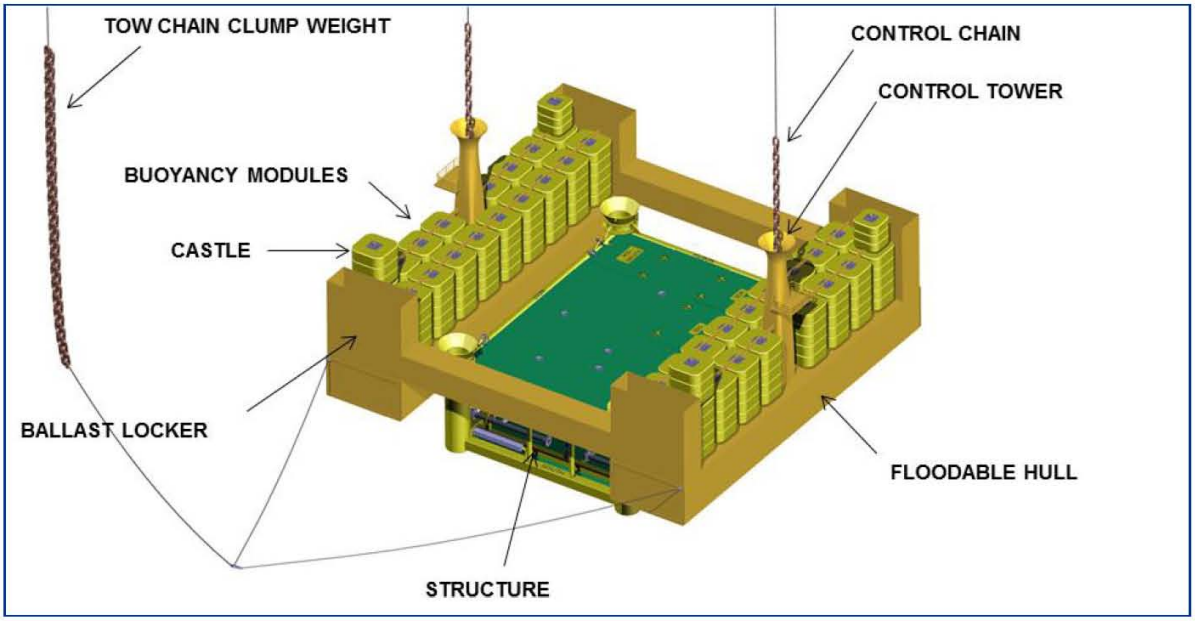


Image courtesy of Subsea Deployment Systems

Once load-out takes place on the dockside, if in shallow waters the SDV can be towed out in Shallow Draught Surface Tow Mode until it reaches a suitable location for flooding the hulls. When in suitable water depths, the SDV is ballasted down by flooding the hulls, and it is then towed in Deep Draught Surface Tow Mode, with only the castles and control chain towers breaking the surface.

When the water depth is suitable, the tow vessel will pay out the tow wire and tow chain clump weight. The tow chain clump weight will cause the SDV to submerge. On approach to the construction site, the tow vessel will slow down and adjust the tow wire to keep the tow chain clump weight off the seabed until in a designated parking area. As the SDV has been submerged since leaving port, the difficult 'splash zone' encountered during traditional subsea installation operations is avoided. The tow vessel will then pay out the tow wire until the clump weight rests on the seabed. The SDV and structure will now be 'anchored' and float above seabed.

The SDV will be positioned by means of two control chains suspended from the installation vessel and lowered into the chain towers, with the height of the module adjusted by raising or lowering the chains, and its position and orientation adjusted by moving the installation vessel and/or the crane. Once in the correct position and orientation, the structure will be landed by lowering the control chains. The control chains will then be fully lowered into the chain towers and temporarily disconnected. The control chain connector will be located on the top of the chain tower ready for reconnection after ballasting.

Ballast weight will be added to the ballast chain lockers by the surface vessel crane to balance the weight of the structure, with the ballast deployed in several small batches to suit the installation vessel crane's capacity. The SDV will then be slightly negatively buoyant and will rest on the structure. The SDV will then be disconnected from the structure. During the float off phase, the installation vessel re-connects with the control chains, and raises them until the SDV is neutrally buoyant. The SDV is then manoeuvred clear in a near-reverse of the installation procedure.

Cost comparison studies carried out by Subsea Deployment Systems have shown that when compared to utilising a traditional heavy lift vessel, the system can offer potential cost savings of 60% on multi-structure installations and up to 80% on single structure installations.

The system is also suitable for use in costly decommissioning or salvage projects, and will allow for the recovery of subsea equipment without the need to lift it onto the deck of a vessel. The SDV could also be 'parked' on the seabed for a prolonged period in all weather conditions. As only a small subsea vessel is required, the system is also suitable for regions that are difficult to access, such as the Caspian Sea.

While the system remains at the conceptual stage, Subsea Deployment Systems has garnered interest from major operators and completed case studies for two major projects. With the ever-tightening heavy lift market facing increasing demand, it is likely only to be a matter of time before a straightforward subsea installation method is adopted.