Compact Work Class ROVs and related Solutions for Offshore Wind Support

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The offshore wind market has seen tremendous growth and expansion over the past seven years. Since 1991, when the first wind farm was installed by Denmark in the Baltic Sea, growth has had an upward trajectory. In the first six months of 2013, worldwide capacity expanded by 20 percent. Existing fields are adding turbines while new sites are actively being developed.

There are two broad categories of offshore turbines – those with a solid foundation on the seabed and those that are floating, but anchored. While the vast majority of maintenance and repair occurs on the surface equipment, there is still a need to inspect and work subsea. Subsea tasks include: initial site survey and evaluation of the seabed, environmental impact assessment on the seabed, composition and density of sediments, monitoring of anchors/foundations, post storm inspections for scour or other damage, post earthquake inspections. There is also the potential of strikes from vessels or entanglements with marine debris that may damage anchors or foundations.

ROV Intervention

Following the lead of the work done in shallow water by the oil and gas industry, some operators have relied upon divers and small electric remotely operated vehicles (ROVs) to carry out basic inspection tasks. Jobs that involve more than visual inspection in water too deep or too hazardous for commercial divers is carried out by work class ROV systems. These ROVs are quite large; in the 100 to 200HP range, and require substantial support vessels. The compact hydraulic ROV systems built by DOER represent a solution both for the oil and gas industry and for offshore wind. These systems can be used to support a variety of support and work tasks while working from smaller dive support/supply vessels. Designed and made in the USA, these systems are robust and straightforward to maintain and operate.

DOER offers two basic sizes of these H series ROVs. The smaller size utilizes six each, two horsepower hydraulic thrusters with a ten or twenty horsepower motor. A DOER Sea Mantis five-function manipulator comes included as standard equipment with an option for a second manipulator. It may be operated with or without a tether management system. With overall dimensions of just 60”L x 39”Wx38”H, it is smaller than many of the large electric systems on the market. DOER originally designed this system to support science, film, and diving operations. However, its small size makes it ideal for diving, ADS and rig support-the kinds of tasks often done with electric systems, but with the benefits of being easier to maintain while capable of light work tasks.

The larger size H series is highly configurable and can be tailored to client needs with motors ranging from 25 to 75 horsepower. Typical dimensions are

80”Lx55”Wx58”H. Weight in air for a typical 25hp vehicle is 2700 pounds – extremely light for a hydraulic system with this much power. These systems are equipped with seven, four and five HP thrusters, all with proportional control. DOER’s five-function Sea Mantis manipulator or third party brands, including Kraft and Schilling, are capable of interfacing with DOER’s ROV systems as well. While large electric ROVs can also support dual manipulators, users must integrate separate hydraulic systems in order to do so. When starting with a hydraulic system, such integrations are straightforward and more useable payload is retained. A top hat TMS is typically used with these systems but is not required for shallow water use.

All of DOER’s ROV systems are designed for containerization and rapid deployment. The ultra compact systems can be configured to fit into one twenty-foot van. The larger H series systems are configured for two-van packing. Winches for longer armored umbilical can be containerized or shipped via flat rack. This helps owners to control shipping costs and ease logistics planning when shipping by truck, train, or commercial container ship.

Although electric ROVs have come a very long way in the past twenty years, the vast majority of offshore technical support personnel are still most comfortable with operating and maintaining hydraulic systems. Thrusters, manifolds, compensators and manipulators are all very straightforward to service by marine technicians. The electrical systems on DOER ROVs are robust and nearly all enclosures are oil filled. Connector ports allow a variety of ancillary devices to be integrated to the ROVs without opening enclosures for re-wiring. Software systems can be securely accessed via the Internet allowing DOER engineers to assist with troubleshooting or providing systems upgrades remotely. DOER systems are designed to grow with technology providing superior value over the life of the ROV system.

Seabed evaluation tools

Whether installations utilize anchor systems or a solid foundation on the seabed, it is important to understand the composition of the seabed and sediments below. While ROVs can be used to evaluate and monitor for seabed surface concerns such as scour and corrosion, there are concerns about compaction of sediments and gradual sinking of foundations and anchors over time.

ROV mounted tools such as sub bottom profiling and multi-beam sonars provide valuable information but are complemented by coring tools. Coring tools take physical samples of the sediment, providing definitive geotechnical information for use in engineering, environmental impact, and risk management. DOER has built a number of tools for collecting sediments. Our clients for these tools include environmental and geo-technical firms along with universities.

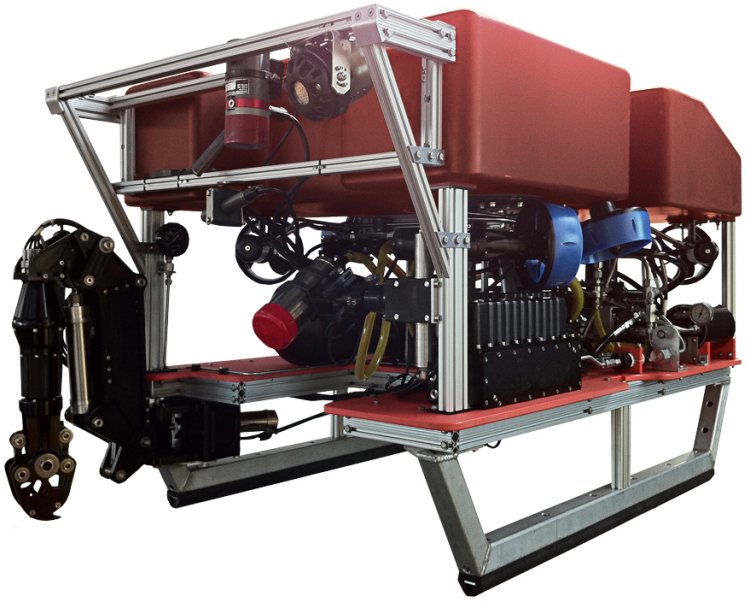
The most basic sediment tool is a push core. Typically deployed via an ROV mounted manipulator, the push core is simply pushed into the sediment and when pulled back, held by suction. Cores are collected in a sample basket on the ROV then retuned to the surface for evaluation.

Landers are another type of tool to collect samples. These can be tethered or untethered and collect sediment using multiple techniques. A combination of Box cores, push cores and grabs are the most common configuration. Sediment cameras can also be incorporated into a lander. These wedge shaped housings push down into soft sediment providing a visual profile of layers. They are useful for both biological evaluations and for recording contaminates in near surface sediment, including oil.

Deeper, larger diameter cores require more powerful collection methods. A percussion hammer that DOER built was used to obtain four inch diameter, five meter long cores in glacial till; some of the most compacted sediments known. Another client had DOER build a vibrational coring head to help obtain samples in a variety of fresh, brackish, and saltwater environments.

With the push to develop new offshore wind installations, having a variety of methods to rapidly assess site feasibility and to monitor established sites brings real value to stakeholders in the form of preemptive and preventative risk management.

The remarkable advances in materials and technology over the past ten years have allowed hydraulic ROVs and sampling tools to come down in size without compromising on capabilities. DOER works hard to ensure that raw materials and ancillary devices come from other US based B2B suppliers whenever possible. As a result, the H series ROV systems provide a solid, value added choice for commercial diving and offshore support firms wanting to better support their clients while also supporting manufacturing in the USA.



DOER H series 2000m system with one five function manipulator

DOER H Series 2000m ROV deployment

DOER H Series 25HP 6000m ROV with top hat TMS deployment

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