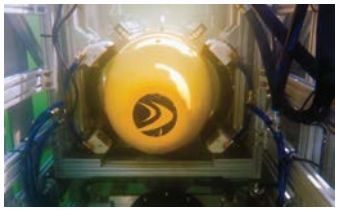
# The Battelle-developed UUV Docking and Recharging Station: Meeting Oil and Gas clients' needs



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In the fall of 2011, an undersea system demonstration in Boston Harbor marked the culmination of several years of work by Battelle and its subsidiary, Bluefin Robotics, on its Unmanned Underwater Vehicle (UUV) Docking & Recharging Station – the undersea equivalent to a filling station, where the UUV could not only have its tank filled, but also phone home. The system successfully demonstrated autonomous homing, docking, recharging, data exchange and re-launching of a UUV.

Building off this successful at-sea demonstration of its UUV Docking & Recharging Station (UDRS), Battelle recently launched an internally funded R&D project to demonstrate an enhanced undersea electrical energy transfer system. The new project will focus on improving the efficiency of an inductive power transfer subsystem, to enable increased persistence, higher reliability, and rapid turnaround time for UUVs and other subsea systems.

Work on the UDRS began in 2007 as an internally funded effort. Various embodiments of the concept had included a dock fixed to the seafloor, another that was hosted by a larger undersea vehicle, and a version affixed to a submarine. The submarine-mounted version was the primary focus, coming to fruition through sponsorship from the Office of Naval Research, and later supplemented by the Commander of Submarine Forces.

In these programs, Battelle's Bluefin Robotics outfitted one of its 12¾-diameter UUV vehicles with a device that enabled it to home in and then dock for data exchange and recharging. Once docked, the vehicle utilized a standard Wi-Fi connection to download data and upload its next mission profile. Inductive coils on the vehicle and dock transferred energy from the dock to the vehicle – an approach not unlike a counter-top charger for an electric toothbrush – and without the use of notoriously unreliable metal-to-metal contacts.

The previous demonstration yielded undersea power transfer efficiency of 74% with a charge time between 12 to 16 hours for a 12" UUV. The new system is targeting efficiency of 90% to 95%, with a charge time between four to six hours. Initial proof-of-concept results are expected during the first half of 2013, with additional development and demonstration to follow. Although initial development will focus on UUV replenishment, the system architecture will be capable of supporting a wide variety of subsea power transfer applications.

Oil & Gas companies currently use UUVs for a variety of tasks, including bottom surveys, pipeline tracking and inspection, and infrastructure inspection. In oil fields with far-flung assets spread over tens or even hundreds of miles, a docking and recharging station would allow a vehicle to be deployed from a central site, transit to the inspection area, perform the inspection, then dock at that site to recharge and offload the inspection data, before moving to the next site to repeat the operation. This technology alleviates the need for a surface support ship to tend the UUV while it works, and reduces the number of times the vehicle must be launched and recovered, which can be hazardous in high sea-state conditions.

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