Ben Smith wins the 2009 British Petroleum - Society for Underwater Technology (BP-SUT) award for students in offshore and subsea engineering and technology

The NEMO project has already gained national recognition through the 2009 British Petroleum - Society for Underwater Technology (BP-SUT) award for students in offshore and subsea engineering and technology, which was won by University of Southampton, Ship Science student Mr Ben Smith.

The inspiration for Ben's research is related to ideas evolved from his work experience at London Offshore Consultants group (LOC) and to an application useful for a separate EPSRC-funded programme on Nature in the Environment for Monitoring the Oceans (NEMO). At LOC, Ben was encouraged in the search for new solutions to renewable energy extraction and at the University of Southampton the successful award of the NEMO funding supplemented Ben's drive to understand how to mitigate the power density problem associated with Autonomous Underwater Vehicles through the understanding of evolution in nature.

Lessons learned from nature are very rarely applied to engineering applications. In particular it is understood that fish have the ability to alter their mode of swimming to interact with naturally produced vortices as a method of conserving energy and, in certain instances, extract energy from a flow. Ben's thesis looked at the development of a bio-inspired method of recovering energy from unsteady flow with the specific application of powering an Autonomous Underwater Vehicle (AUV) typical of those used in offshore survey and exploration, especially those used in the inspection of risers.

During the course of this investigation, the novel techniques used by fish when swimming to reduce their power consumption and in certain instances extract energy from an unsteady flow, such as that seen behind offshore risers, were evaluated; with particular emphasis on the way fish utilize vortices, namely the Kármán gait. Ben's hypothesis was that in the desire to extend operational time for AUVs inspecting risers, the adoption of a correctly sized flexible body for the AUV rather than a rigid body could allow the flexible AUV to exploit the same energy extraction seen by fish.

Ben demonstrated that by analytically modelling the body of a typical torpedo-shaped AUV as a slender flexible cylinder with tapering end pieces the resulting predictions of dynamic stability produced comparable results to published experimental observations.

With the ability to predict the boundaries of dynamic stability for flexible cylinders in a flow, Ben went on to experimentally show that by placing a correctly sized flexible cylinder in a flow behind a scaled section of an offshore riser, a similar mechanism to that used by fish to extract energy was indeed observed. In effect, the slender flexible cylinder was shown to move upstream with no power input except from the fluid flow itself.