Undersea Power Technology

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LONG TERM GOALS

The goal of this project is to develop renewable undersea power sources for floating, suspended, and bottomed surveillance and environmental sensors and communication devices.

OBJECTIVES

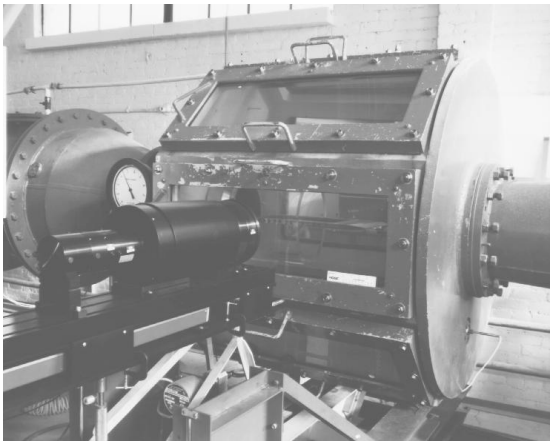
SSC-SD will provide engineering and test support to Ocean Power Technologies (OPT) in the development, testing, and evaluation of an energy harvesting electric EEL.

APPROACH

In collaboration with OPT and their academic partners, SSC-SD will (1) prepare appropriate test plans to determine EEL performance in various flow configurations; (2) operate a high-speed water tunnel in support of the defined tests; and (3) prepare data reports documenting the results.

WORK COMPLETED

Ken Rogers and Greg Anderson attended the project review held at OPT on 1 July 1999. Mr. Anderson made a presentation on the SSC-SD high speed water tunnel (figure 1) proposed for



1. Water Tunnel Test Section

advanced EEL testing. Subsequent discussions were conducted between OPT personnel and Mr. Dan Ladd of SSC-SD regarding planning for tests to be conducted in the water tunnel during the first half

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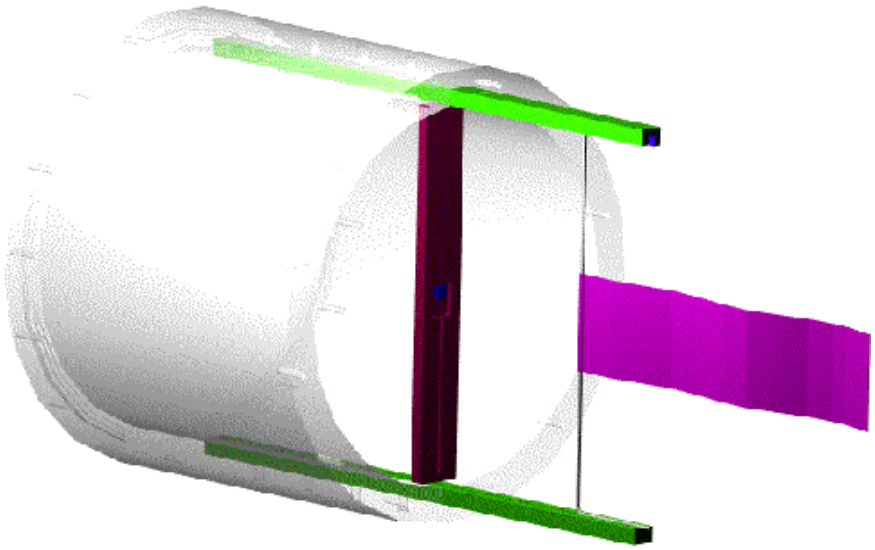
of FY2000. An Argon-Ion laser is being re-gassed in preparation for use of the Laser Doppler Velocimeter (LDV) to measure flow velocity in any (laser) accessible point in the test section. Hardware has been designed and is being fabricated to mount the test EELs in the SSC-SD water tunnel. Figure 2 is a rendering of the adjustable mount fixtures inside an existing acrylic water tunnel liner. Provisions have been made for dye ejection ports, in the upstream bluff body. Hydrogen bubble wire visualization is also possible with minor modification.



2. Rendering of SSC-SD test hardware, showing the EEL downstream from the bluff body. Flow is from left.

RESULTS

No tests have been conducted to date.

IMPACT/APPLICATIONS

Although the amount of power available in a slow-moving stream is small, modern ultra-low-power electronic sensors and instrumentation packages may eventually be operable with only a few milliwatts of power. Such power could be provided by a renewable power source such as the EEL. The advantages of a renewable power source over a primary battery may include

- Higher total energy per device volume or mass
- Longer shelf life
- Greater safety in handling and storage
- Lower cost
- More efficient packaging

Larger versions of the EEL could conceivably be built to power more conventional instrumentation requiring higher power levels. They would compete directly with advanced low-water-speed turbines such as the Gorlov helical turbine.

TRANSITIONS

A successful demonstration of an electric EEL should lead to a transition to an appropriate technology development project in undersea instrumentation or sensing.

RELATED PROJECTS

Depending on the power achievable from an advanced EEL, several current projects may be beneficiaries of this technology. These include surveillance projects in the ONR Off-board and Deployable Systems Program (321SS), as well as those dedicated to the development of long-term environmental measurements.

REFERENCES

None

PUBLICATIONS

None

PATENTS

None