EXPERIMENTAL STUDY OF A VORTEX-DRIVEN MARINE HYDRO ELECTRIC PLANT WITH ENTRAINED WATER MASS

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A Vortex-Driven body placed in a flowing fluid shows that marine energy can be extracted from flows as little as 0.3 m/s, up to 3 meters per second and beyond. Worldwide, most ocean currents flow below 3 meters per second and have the theoretical power capacity in excess of 50,000 TW-h/year[1].

Water channel experiments were conducted to evaluate the performance (power output) of a triangular bluff body mounted on a vertically rotating axis. This vortex driven bluff body is called a Vortex Power Drive (VPD). Three different configurations of the VPD prototypes were designed to determine the efficacy of the design. To ensure a consistent comparison between the VPD's, each configuration was fabricated with the same overall height, wingless, location of rotation axis, and width. The results of the water channel tests revealed that the second body (see Figure 1) showed superior performance (i.e. power generation) than the other two models under the same test conditions.

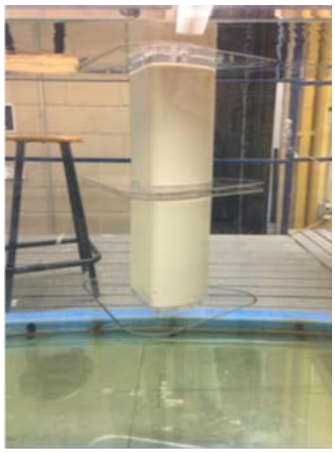

FIGURE 1. DOUBLE VORTEX POWER DRIVE.

Buoyancy mitigation is to be achieved by allowing the water to fill the internal hollow structure of the VPD. Measurements into the effect of this entrained mass on power output were performed (see Figure 2).

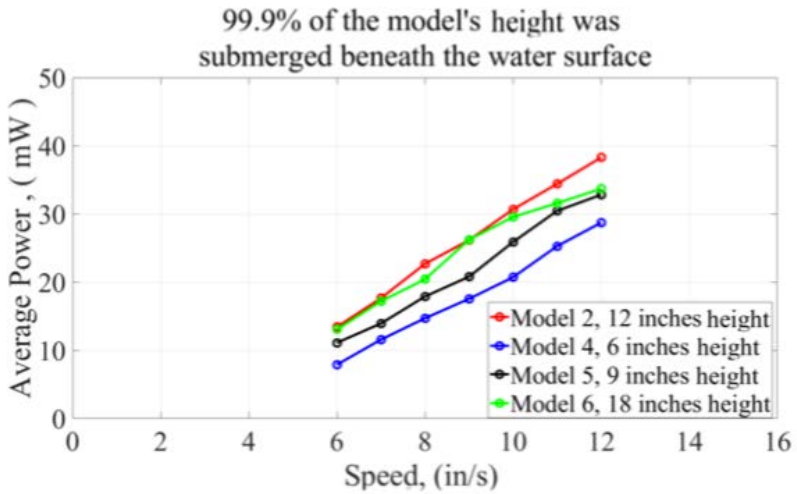

FIGURE 2. POWER OUTPUT OF MODELS WITH ENTRAINED MASS.

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REFERENCES

1 - Assessment of Energy Production Potential from Ocean Currents along the United States Coastline, Georgia Tech Research Corporation for the US government. http://energy.gov/sites/prod/files/2013/12/f5/energy_production_ocean_currents_us_0.pdf Sept 30 2014