**MHK Turbine Theoretical Design**

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**Abstract**

 Different types of marine hydrokinetic turbines were researched and an axial flow design that was presented in a paper by A.S Bahaj, W.M.J. Batten and G. McCann was selected for a theoretical installation at a location around the Hawaiian island of Oahu. This site was selected based upon the availability of surface velocity data, optimal current velocity for turbine operation, relative proximity to the shore, and location in the United States. The experimental Coefficient of Performance ($C\_{p}$) and Coefficient of Thrust ($C\_{t}$) curves were compared with the theoretical calculations performed in the software package AeroDyn that was provided with the software download. A point was selected that provided the maximum $C\_{p}$ before the onset of cavitation and was used in conjunction with the Tip Speed Ratio (λ) and Coefficient of Performance to scale the turbine to an outer blade diameter of 18 m. Our results were compared with the scaling done in the paper by Bahaj, Batten, and McCann. A theoretical power output and turbine RPM were obtained at a flow velocity of 1.9 m/s and compared with RPM values in various other papers for aquatic sea life safety. The turbine design is bare (no duct) and is a floating design to capture the higher current velocities near the top of the boundary layer.

This mini project was done to fulfill the requirements of MCE 530 – Applied Fluid Mechanics.