Vorayos Ratanamart 2014: A Simulation of Water Flow through Vertical Axis Water Turbine Using CFD Program. Master of Engineering (Mechanical Engineering), Major Field: Mechanical Engineering, Department of Mechanical Engineering. Thesis Advisor: Associate Professor Chawalit Kittichaikarn, Ph.D. 113 pages.

Hydropower is one of the natural sources of energy which has been used since human ancestor. After electric power has been discovered, the hydropower has been applied to produce electricity. In the last 4 decades, the water turbine called Water Current Turbine has been developed incessantly following the same principle as wind turbine. It is also found that many rivers in Thailand have potential to produce electricity. Therefore this research work focuses on a study and application of vertical axis wind turbine 3 meter diameter and 3 meter blade length, to be used in water flow. However the turbine was decreased to size of 1.5 meter diameter and 1.5 meter blade length according to the level of water in Nan river.

Computational fluid dynamics (CFD) program was used in this research to simulate the flow over water turbine. The computer model was created and was analysed as 2 dimensional flows. Turbulent model RNG k-epsilon was selected in this research. The validation of this model was performed by comparing with the experimental data of Rawling (2008). The simulation results show good agreement and similar trend toward the experimental data.

The simulation of Vertical Axis Water Turbine (VAWT) with 1.5 meter diameter and 1.5 meter blade length at water speed of 0.5, 0.6 and 0.7 m/s were presented. All three water speeds have maximum power coefficient of 26.2 percent at Tip Speed Ratio (TSR) of 2.0. Therefore, when reducing VAWT diameter and blade length to 1.5 meter, the impact of changing flow speed and changing Reynolds number to power coefficient is insignificant. This makes controlling of Vertical Axis Water Turbine to achieve highest power coefficient much easier.

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