DESIGN OF FLOATING WATER WHEEL FOR POWER GENERATION

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Specially dedicated to my parents and friends

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ABSTRACT

Floating water wheel could harvest energy from shallow flowing river to increase the potential of hydropower. Various types of water wheels have been studied by other researchers. However, the details of the design such as ridge/blade profile, number of ridges and submerged depth of floating water wheel have not been clearly established. In this research, experiments were carried out in an aquarium to study the optimum number of ridges, submerged depth and four different ridge profiles for a laboratory-scale floating water wheel. The results showed different ridge profiles and pitches and submerged depths contribute significant effects to the rotation of floating water wheel. The result of the experiment was used as reference for prototype design and fabrication. The prototype was tested in a river and successfully produced voltage from the flowing river. The experiment shows that the optimum number of ridges is 13, the best profile is thin flat ridge and maintaining the floating water wheel at certain submerged depth is important to its performance. The prototype concept is suitable for low head flow and varying water level. It is also portable, easily assembled and maintained and able to convert the kinetic energy of the water current into electrical energy.

ABSTRAK

Kincir air terapung dapat menghasilkan tenaga dari aliran sungai yang cetek meningkatkan potensi untuk menjana kuasa hidro. Pelbagai jenis kincir air terapung telah dikaji oleh penyelidik di seluruh dunia. Walaubagaimanapun reka bentuk terperinci seperti profil rabung, bilangan rabung dan paras kedalaman kincir air terapung di dalam air belum dikaji dengan jelas. Dalam kajian ini, eksperimen telah dijalankan dalam akuarium untuk mengkaji bilangan rabung dan kedalaman paras kincir air yang optimum dan mengkaji empat profil rabung yang berbeza bagi kincir air terapung yang berskala kecil. Keputusan menunjukkan profil dan jarak antara rabung, dan kedalaman paras kincir air jelas memberi kesan yang ketara kepada putaran kincir air. Hasil daripada eksperimen ini telah digunakan sebagai rujukan untuk mereka bentuk dan fabrikasi sebuah prototaip kincir air. Prototaip ini telah diuji di sungai dan telah berjaya terapung serta menjana voltan daripada aliran sungai tersebut. Eksperimen ini telah menunjukkan bahawa bilangan rabung yang optimum ialah 13 dan profil terbaik ialah rabung rata yang nipis dan mengekalkan kincir air terapung pada kedalaman tertentu adalah penting untuk prestasi. Konsep prototaip ini sesuai untuk kelajuan aliran yang rendah dan berubah mengikut paras air. Ia juga mudah alih, senang dipasang dan diselengara dan dapat menukarkan tenaga kinetik daripada aliran air kepada tenaga elektrik.