Abstract

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MICRO HYDRAULIC TURBINE FOR POWER GENERATION IN MICRO SCALE CHANNELS

Micro hydrokinetic energy scheme presents an attractive, environmentally friendly and efficient electric generation in rural, remote and hilly areas. However, this scheme is yet to be fully discovered, as researchers are still searching for solution for the main problems of low velocity of current in the open flow channels and low efficiency of hydrokinetic turbines. This research proposes a novel system configuration to capture as much as kinetic energy from stream water current. Deploying acceleration nozzle in channels is a unique solution for increasing the efficiency of channels' current flow systems while the use of micro hydraulic cross flow turbine (CFT)/ Banki turbine is the most proper and practical solution. This system, known as bidirectional diffuser augmented (BDA) channel, functions by utilizing dual directed nozzles in the flow, and surrounded by dual cross flow/ Banki turbines. In this study, numerical and experimental investigations were carried out to study the flow field characteristics of the new system approach with and without turbines. A numerical investigation was carried out in this research work using finite volume Reynolds-Averaged Navier-Stokes Equations (RANSE) code ANSYS CFX and Fluent. Validation was carried out by using experiments, with and without turbines. The flow characteristics through channel and the performance of the twin (lower and upper) cross flow turbines were studied, and it was found that the water flow speed had been significantly enhanced due to the current BDA system in which the speed of the flow was increased by 400%. The maximum efficiency of the overall system with two turbines was nearly 55.7%. The efficiency was relatively low compared to hydraulic turbine efficiency, however, this can be considered very good in view that head available to the present system was very low. The use of this system will contribute towards a more efficient utilization of flows in rivers and channels for electrical generation in rural areas.