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Numerical investigation on the performance evaluation of pump as turbine for small hydropower generation to overcome energy crisis in Africa

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Energy demand is increasing globally in the midst of rising fuel cost and environmental pollution. Small hydro power has appeared as an alternate energy source which can be easily connected with negligible environmental impact. Africa has very rich small hydropower resources with technically exploitable installed capacity. Small hydropower development has countless significance since it gets going the economic growth of rural areas along with getting rid of the electricity crisis due to its minimal environmental impact. This study makes available a numerical investigation on the performance evaluation of using pump in reverse mode as hydraulic turbine (PAT) for small hydropower generation. Using pump as hydraulic turbine for energy supply is one of the best alternatives for small hydropower generation. It is also one of the best options for meeting energy needs and providing electricity in remote and rural areas. Economic growth through renewable energy and sustainable energy sectors will create more employment opportunities and improve the social conditions in the country considering the technical, economic and environmental benefits of small hydro power; it makes it a very important supplier to the eradication of electricity crises, globally, especially as renewable energy resources appear to be one of the most efficient and effective solutions for sustainable energy development. The studies are conducted on centrifugal pump running in turbine mode to optimize its geometric and operational parameters such as impeller diameter and rotational speed. The experiments and numerical simulations were conducted considering a wide range of rotational speeds starting from 1250 rpm to 25000 rpm. It was found in the results that PAT operation was better at the lower speeds than that at the rated, thus falling between 1550 rpm to 170000 rpm speed. The empirical correlation is also developed for prediction of efficiency in terms of impeller diameter and rotational speed.

Biography

Daniel Adu is a PhD candidate at the National Research Centre of Pumps, Jiangsu University, China pursuing Fluid Machinery Engineering with the research direction of pump as turbine for small hydropower generation. He has done a lot of research into on how these electricity crises in Africa especially sub-Saharan Africa can be overcome any many other fields of energy. Moreover, he is interested in assessment of the pump as turbine for small hydropower generation through the use of pumps. He has also published many papers, attended a lot of international conferences as a Speaker and won several awards.

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