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Design and Experimental Evaluation of an Archimedes Screw Hydro Turbine (ASHT) for Rural Sustainable Energy Application

A significant portion rural Africa still lack access to affordable, sustainable and modern energy, causing a knock-on effect on the development of education, agriculture, healthcare, business and transportation, ultimately lowering the rural quality of life. Towards a sustainable solution in meeting the rural Southern Africa energy demand, there is a need for indigenous development and implementation of suitable technologies. In this context, we present on the design and experimental evaluation of an Archimedes Screw Hydro Turbine (ASHT) prototype fabricated using recycled plastic for rural sustainable energy application. Being a device, that works mechanically to produce electrical energy from the flow of water with low head and flow rates, ASHT is suitable for use in water bodies such as running streams and rivers common in rural Africa as well as with irrigation channels, all representing a renewable energy source. Design consideration for optimised turbine performance included among other variables, the pitch of the screw, inner diameter of the screw, number of screw blades, angle of the screw, rotational speed, water flow rate and head. ASHT offer several advantages to include low maintenance, simple installation and maintenance, and operation at low head and flow rate. We envisage ASHT application in hybrid configuration in combination with solar technologies.

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