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Archimedes screw turbine as an energy conversion device for a run-of-river micro-hydropower plant

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Despite the increasing popularity of Archimedes screw turbines for micro-hydropower plant applications around the world, its current status in the Philippines remains underdeveloped. The researchers investigated the potential of utilizing an Archimedes screw turbine for energy generation in the country.

The design of a scaled-down Archimedes screw turbine for testing site parameters was based on the works “The Turn of the Screw: Optimal Design of an Archimedes Screw” by Chris Rorres and “Modeling and Experimental Results of an Archimedes Screw Turbine” by Rohmer, Knittel, Sturtzer, Flieller, and Renaud, where the researchers came up to use a 3-blade screw turbine. All the calculations and considerations, important parameters were defined and used in a CAD (computer-aided design) software. An expected power output of 212 W was calculated. Material selection and acquisition came after the design. Then, fabrication of the screw turbine and the assembly of the micro-hydropower plant were done.

The testing procedure for the constructed Archimedes screw turbine run-of-river system micro-hydropower plant was conducted and an actual output peak power of 198 W was obtained. The researchers were able to conclude the validity of the aforementioned works, and the design of a 5-kW Archimedes screw turbine was obtained for the power plant site in Laiban river located at Laiban, Tanay, Rizal.

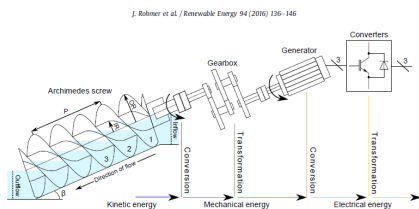


Figure 1: Schematic diagram of an Archimedes screw turbine hydropower plant (Rohmer, Knittel, Sturtzer, Flieller, & Renaud, 2016).



Figure 2. CAD Blade design



Figure 3. Forming of blade into its desired pitch.



Figure 4. Fastening of blade to the PVC pipe.



Figure 5. Turbine-generator assembly.



Figure 6: Actual testing process of the Archimedes Screw Turbine

Biography

Jizelle P Bauyon is a BS Mechanical Engineering student in the University of the Philippines Diliman. She has an interest of pursuing a career in line with power plant engineering, heat, ventilation, air conditioning and refrigeration (HVAC-R) and/or machine design. With a hands-on approach, leadership and engineering skills, hone by her experiences in and outside of the university, she facilitates knowledgeable and technological processes that help improve existing processes and systems, and achieve sustainable goals for communities through designing and developing new and more efficient systems and machines.

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