Effect of Inclination Angle and Motor's Speed on an Archimedean Screw Pump's Output Volume Flow Rate for Pumping Stagnant Water

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Abstract

Archimedean Screw Pump is a mechanical device utilizing helical screw rotation to transfer water from the lower water level to the upper water level. This screw pump was able to pump stagnant water into a clogged irrigation area. In this paper, the effects of the inclination angle and the screw pump's motor rotation speed were investigated to determine the output volume flow rate. First, a simulation of the screw pump was performed. It was found that the screw pump's optimum design was with two blades and an angle of inclination of 40° to produce the highest average water volume flow rate. From the simulated design result, a 3D printing process was performed to print the screw pump utilizing filaments. Experimental data shows that the maximum water volume flow rate recorded under the 30° angle of inclination and speed of the motor of 210 rpm is 172.33 L/hr. An analysis of variance technique was performed on the two variables and parameters from the data

obtained. The inclination angle and motor speed were significant factors for the optimum water volume flow rate at the outlet. Therefore, the work shows that a small-scale Archimedean Screw Pump was able to pump stagnant water from a clogged irrigation area. © The Author(s), under exclusive license to Springer Nature Singapore Pte Ltd. 2025.

Author keywords

Angle of inclination; Archimedean screw pump; Rotation speed; Stationary water; Water flow

Indexed keywords

Engineering controlled terms

Machine design

Engineering uncontrolled terms

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Engineering main heading

Screw pumps

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