Investigation of Physical and Numerical Model of Archimedes Screw Turbine

Archimedes screw turbines have been developed as they work with a low head with high efficiency, where flow energy can be exploited in small rivers, streams, regulators and others. The power can be produced using Archimedes turbines and depends on some parameters including the number of blades, flow, and angle of the shaft inclination and the length of the pitch. A physical and numerical model has been developed to determine the performance of the Archimedes turbine on the Ramadi Dam in Iraq. The physical model was made of stainless steel with the following parameters (length 1000 mm, pitch 70 mm, diameter ratio 0.536, inclination angles 30˚, 35˚, 40˚, 45˚). Work was carried out on different flow rates and inclination angles. The experimental results showed that the highest efficiency was 81.4% at 35˚ inclination angle and a flow rate of 1.12 l/s; the maximum power of 9.03 watts was at a 45˚ inclination angle and a flow rate of 2.065 l/s and 72% efficiency. Also, the impact of the pitch and the number of blades were studied. The results show that torque is increase with an increase in the pitch length, and torque is decreased with increase in several blades. The numerical results showed that the using of two blades led to a greater power produced. The comparison of the numerical and experimental results showed a good agreement, also the comparison with the published data showed a good agreement. As a final result the Archimedes screw has many positive points making it a good potential candidate. The results that emerged show the possibility of using this type of turbine in the Euphrates River in Anbar Governorate—Iraq, as the province is characterized by the presence of many regulators on the river in which turbines can be employed.