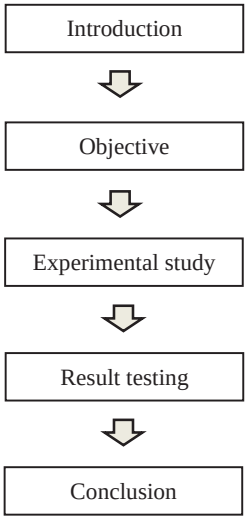
INVESTIGATION ON THE EFFECT OF DRIVE TRAIN SYSTEM FOR ARCHIMEDES SCREW TURBINE

A.Nurul Suraya 1[a,*], J.Ummu Kulthum [a], N.M.Muhammad Ammar [a]

[a]Faculty of Mechanical Engineering, University Malaysia Pahang,
26600 Pekan, Pahang, Malaysia.
*Corresponding author: surayanurul@gmail.com

Graphical abstract



Abstract

Nowadays, the Archimedes screw turbine has become one of alternative in generating electricity. It is low in terms of cost and sourceful as the Earth is covered more than 70% of water. The objective of this study is to investigate the effect of the drive train system that may influence, power generated from the Archimedes screw turbine. This paper focused on studying the relationship between drive train system and rotational speed. An experiment was conducted with two different types of drive train system to compare the rotational speed of the turbine at the same flow rate range from 0.012 m^3/s to 0.016 m^3/s (diameter of driver Pulley A is 102mm and diameter of driver Pulley B is 150mm). By increasing the diameter of the driver pulley up to 150mm, the maximum power generated of 0.444 Watts at low rotational per minutes (RPM) of 70. In conclusion, increase the diameter of driver pulley requires low RPM to produce maximum power output.

Keywords: Archimedes screw turbine; rotational speed; experimental study

Abstrak

Archimedes turbin skru menjadi salah satu alternatif untuk menghasilkan tenaga elektrik. Ia mempunyai kos yang rendah dan penuh sumber kerana permukaan bumi mengandungi lebih daripada 70% air. Objektif kajian ini adalah untuk mengkaji kesan sistem 'drive train' yang boleh mempengaruhi kuasa yang dijana daripada turbin skru Archimedes. Kertas kerja ini memberi tumpuan kepada mengkaji hubungan antara sistem 'drive train' dan kelajuan putaran. Satu eksperimen telah dijalankan dengan dua jenis system 'drive train' yang berbeza untuk membandingkan kelajuan putaran turbin pada pelbagai kadar aliran yang sama dari 0.012 / m^3 s kepada 0.016 m^3 / s (diameter pemandu Pulley adalah 102mm dan diameter pemandu Pulley B adalah 150mm). Dengan meningkatkan diameter takal pemandu sehingga 150mm, kuasa maksimum yang dihasilkan adalah 0.45 Watts, iaitu pada RPM yang rendah (58RPM). Kesimpulannya, meningkatkan diameter takal pemacu memerlukan RPM yang rendah bagi menghasilkan tenaga yang maksimum.

Kata kunci: Archimedes turbin skru; kelajuan putaran; kajian eksperimen

1.0 INTRODUCTION

Recently, renewable energy has become a major concerned due to the growing of fossil fuels demand which is estimated to decline by 2020 [1, 2]. Several types of renewable energy that are commonly are wind, wave, solar and hydro energy. Hydro energy is currently demanding in developing countries as it is environmentally safe. The energy is not depleted throughout time. In general, hydropower plants can be classified into a numerous category, such as large, small, mini, micro and Pico which can contribute more than 100kW, 500 to 1000kW, 100 to 500kW, 5-100kW and 100W to 5kW respectively [3-5].
The Archimedes screw turbine is one of the potential selections due to its maintenance costs, environmentally friendly and good efficiency for high flow rates and low head [6, 7]. This Archimedes turbine is classified as reaction turbine as the ratio of static pressure drop across the rotor to the static pressure drop across the turbine state [8, 9]. The primary features of the Archimedes screw