Alternative Powered Water Pump

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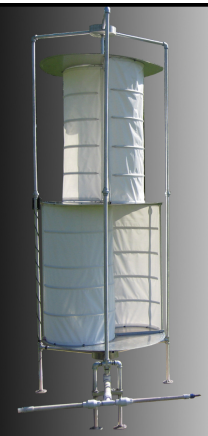
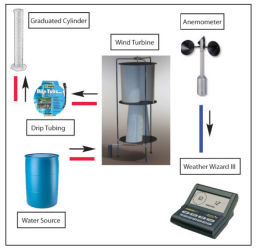


Introduction

On a recent trip to the Island of Antigua, Prof. James Scolaro observed the need for an alternative method for pumping water at remote locations. Rainwater is collected in a storage basin and is then pumped to a nearby building. The current system uses an electric pump that is unreliable. The Island of Antigua is subject to moderate to high winds for most of the year. The abundance of wind on the island led to the design of a wind powered pump.

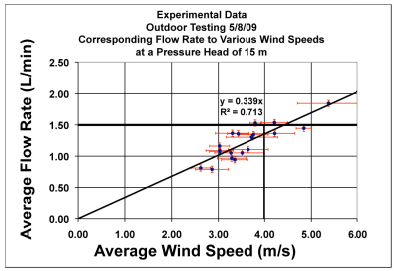
Testing Setup

Testing was conducted in both controlled and uncontrolled wind conditions. The controlled test was conducted at the Langdon Engineering Center. A large corridor was converted into an open loop wind tunnel. Four industrial size fans provided and airflow of approximately 60,000 cfm. The uncontrolled wind testing was done outside on a windy day. In both cases the volume of water pumped over a known interval of time was use to calculate the flow rate of water.



Research Highlights

To simulate pumping water to an elevation, water was pumped through a calculated amount of small tubing. The pumping system proved to be successful and pumped the necessary amount of water at a given wind speed.



Conclusions

The prototype provides a solution to Antigua's problem of water accessibility. The design is easily disassembled and weighs under 28 kg, enabling it to be carried by one person. The prototype can easily be modified for different locations and applications. It provides a steady flow rate of approximately 1.3 L/min at a pressure head of 15 m with an average wind speed of 4 m/s .

Savonius Wind Turbines

A vertical axis Savonius turbine was selected to capture wind to power a piston pump. The blades were constructed out of UV resistant Dacron sail fabric. Aluminum battens are spaced equally in the Dacron fabric to aid in rigidity and support. The wind turbine is self-yawing and capable of self-starting under 1 m/s.

PVC Piston Pump

The piston pump is a very simple design that utilizes off the shelf components. The total cost of the pump is under $30 and takes roughly half an hour to construct. It is able to provide a flow rate of 1.5 L/min at the required pressure head of 15 m.

Adjustable Transmission System

The transmission system is made of lightweight aluminum with sealed bearings . The lever arm can be easily adjusted to achieve different flow rates at various wind velocities. The transmission can be easily aligned and assembled in a matter of minutes.

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