Purdue School of Engineering Technology - TEAM 26

SOLAR WIND PUMP

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PURDUE UNIVERSITY
Polytechnic Institute

OBJECTIVE

This project team has been tasked with making a small-scale model of this water pump, with the objective of using solar and wind energy to power the pump. This small-scale model will then be sent to officials in Peru for the large-scale model.

CUSTOMER PROBLEM AND BACKGROUND

A spa is being constructed in the Colca Canyons in Southern Peru along a hiking trail for tourists. Peru officials aim to provide water to the spa by pumping up water from a nearby hot spring. This pump will be powered by solely renewable energy, and this project team aims build a small-scale model here on campus to simulate the water pump as powered by solar and wind energy. The large scale pump requirements include a height of 150 meters, a flow rate of 5-10 GPM, and power of 1864 Watts.

CONCEPTS AND EXPERIMENTATION

Power Calculations:

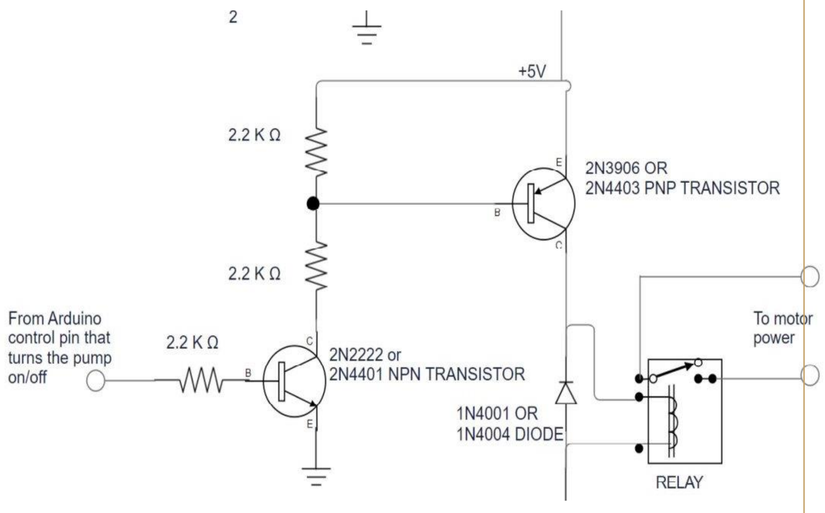
The amount of power needed to transport water to the customers specified height of 500 feet is 2.5 HP. This is calculated using the flow rate of the system and the pressure that the pump has to overcome. There is 0.433 psi per 1 foot of water in a pumping system.

Scaled-down System Power:

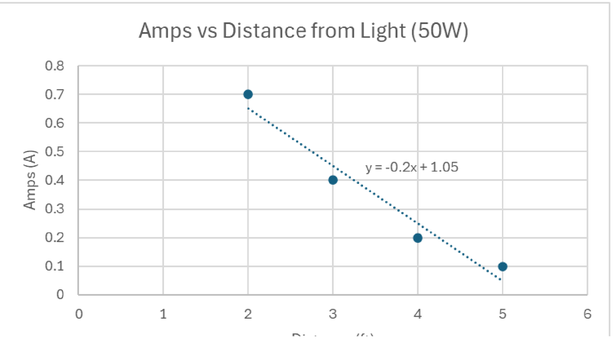
$$Power = \left(\frac{10\ gpm \cdot 2.6\ psi}{1714 \cdot 0.5}\right) = 0.03\ HP\ or\ 24\ Watts$$

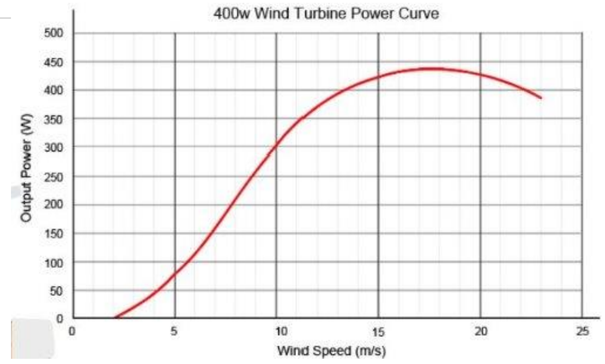
REQUIREMENTS AND FINAL DESIGN

This system solution includes the pump power control circuit, which shows how the power supply moves through voltage regulators, transistors, resistors, and the Arduino circuit. Power will be supplied to the motor depending on the given temperature of the water.



TESTING RESULTS





CONCLUSION AND RECOMMENDATIONS

This project team has made great progress with the mechanical frame of this project, as well as the electrical and software work. With a working pumping control system, this project is now ready for RS-45 integration for the small-scale prototype.