CALIFORNIA STATE SCIENCE FAIR
2016 PROJECT SUMMARY

Name(s)

Zachary Patton

Project Number

36073

Project Title

Squirt Power: Constructing a More Efficient Generator by Changing the Diameter of the Pipe in the Water Feed System

Abstract

Objectives/Goals

Hydroelectric power is a clean energy source, but must be made more efficient. With the drought, it is increasingly important to use the limited amount of water available in the most efficient manner.

The objective of the project is to find the increase in voltage from 3 different water channel diameters, 1/8, 1/4, and 1/2 inches. The hypothesis is, if the force of the water stream is increased by the narrowing of the opening through which the water is delivered to the turbine blades, then the turbine will produce more energy from less water.

Methods/Materials

I made a small hydroelectric generator with a voltage meter from lego pieces. 1/8, 1/4, and 1/2 inch diameter openings were used to deliver water to the waterwheel. Voltage readings were recorded and averaged for the 15 trials. I used 2 gallons of water for each test, the average amount of time to fill 2 gallons of water was also noted.

Results

In comparing the 15 trials that I did per each cap adapter, the 1/8 inch opening not only increased voltage by 248% compared to the largest opening, it used less water.

The results of my investigation on the energy output on a water wheel turbine and generator indicates that the smaller the opening for which the water is delivered to the turbine blades the more voltage output and the less water is used.

The results show that 1/2 inch diameter opening had on average 1.78 volts, 1/4 inch diameter opening had on average 3.37 volts, and the 1/8 inch diameter opening had on average 6.2 volts.

The average amount of time to fill the 2 gallon bucket showed comparable differences based on the cap opening.

The results show that there was an increase of 45% between 1/8 in. and 1/4 in. and an increase of 47% between 1/4 in. and 1/2 in. Overall there was an increase of 71% from the 1/8 in. to the 1/2 in.

Conclusions/Discussion

After completing my investigation to test if narrowing the point where water is delivered and hits the turbine of a hydroelectric generator produces more energy and uses less water, I found that my hypothesis was correct. My investigation is applicable because the turbine did increase in volts significantly as each diameter decreased in size and would serve to use less water during drought.

Summary Statement

I made a hydroelectric generator and changed the diameter of the cap size in the water feed system to learn about more efficient uses of water.

Help Received

I built the hydroelectric generator myself, but I was supervised by my grandfather to ensure safety using the voltage meter, electrical tools, and water.