CALIFORNIA SCIENCE & ENGINEERING FAIR
2018 PROJECT SUMMARY

Name(s)
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Project Number
J0212

Project Title
Can an Inline Hydroelectric Turbine Save Homeowners Money on Their Electric Bill?

Abstract

Objectives/Goals
If an inline hydroelectric powered turbine is used for residential homes, will it create enough power to lower a homeowner's energy bill? The objective was to take the incoming water pressure (psi) from residential homes and convert it into usable energy for homeowners, testing the savings on residential energy bills. This project would be a more affordable, alternative energy source to solar power.

Methods/Materials
Engineered the design for the hydroelectric turbine for use in residential homes. Engineered a small scale model to be used as the testing subject. Tested water pressure (psi), tested voltage using a DROK digital volt meter, and tested amperage using an auto-ranging multimeter. Analyzed average water usage for residential homes and compared to national averages. Met with Water Engineer to discuss mathematics and design. Used the hydro potential formula to find needed wattage. Completed mathematics to convert alternative energy into savings on residential homeowner's electric bill.

Results
The inline hydroelectric turbine that I engineered could produce an annual savings of $281.68 due to the higher tiered pricing in California. The average residential homeowner in the United States would save $140.84 annually. The optimal levels of efficiency for my small scale model hydroelectric turbine produced 12.8 volts with an entering water pressure of 58 psi into the turbine and an exit water pressure of 30 psi, creating .157 amps. I also found the more water used by residential homes measured in gallons per minute, would result in more savings per home.

Conclusions/Discussion
Even though I've proven you can use a hydroelectric turbine to create energy in residential homes using a municipal water source, the annual savings needs to be increased to compete with solar power. There is reduced water pressure after the water travels through the turbine, but the placement of the turbine on the main valve will be critical to gaining the water pressure back to acceptable levels. Engineering the turbine in place of water pressure reducers could be critical in the design. I've also learned that taking this idea into the agricultural field where there is greater volume of water for longer periods of time and exit water pressure (psi) is not as relevant, can save farmers a considerable savings on their electric bill.

Summary Statement
I engineered an inline hydroelectric turbine that uses residential water pressure to generate electricity that will save homeowners money on their electric bill, eventually being an alternative source to solar energy.

Help Received
I designed, built, and tested the inline hydroelectric turbine myself. I got help in understanding the mathematics and design issues with the exit water pressure from Jim Wegley from Keller & Wegley Engineering.