Is There a Correlation between Hydropower Efficiency and Flap Arrangement?

Worley, Craig

The purpose of this research was to determine if flap arrangement on a hydropower turbine would change the efficiency of the turbine. The reason this experiment is important to the public is the result of more clean energy being produced, and consequently lessen our dependence on fossil fuels. In my hypothesis, I stated the Fibonacci Turbine, utilizing a flap sequence off a pineapple, would be the most efficient, compared to the Standard Turbine that is currently used, and the Golden Mean Turbine, which exploited the natural pattern found in plants. To test my hypothesis, I built a scaled version of a hydropower plant and the turbines out of PVC rod and Plexiglas. I ran each turbine through thirty tests, which lasted thirty seconds apiece. This allowed me to get a good statistical analysis of my results, which ultimately led me to the conclusion that the Golden Mean Turbine, not currently used, is the most efficient turbine. The Golden Mean Turbine produced an average of 16.74 watts, while the Standard Turbine's average of 13.69 watts, and the Fibonacci Turbine produced an average of 11.45 watts. This results in the Golden Mean having an efficiency of 122.28%, while the Fibonacci Turbine had an efficiency of 83.64% compared to the Standard Turbine. The turbines are statistically different based on the results of my t-tests and my one-way ANOVA. If the Golden Mean Turbine were implemented in hydropower plants, we would produce more energy cleanly and hence lessen our dependence on fossil fuels.

Awards Won:

Second Award of $2,000