CALIFORNIA STATE SCIENCE FAIR
2015 PROJECT SUMMARY

Name(s)

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Project Number

S0311

Project Title

Increasing Efficiency in Turbine Blades

Abstract

Objectives/Goals

The main objective of this project is to test the efficiency of different design aspects in single stage turbine blades.

Methods/Materials

Six turbines of varying blade length, angle, and curvature are compared to a flat control blade of average length. All turbine blades are 3D printed using ABS plastic. A 6 liter air tank with release valve is used to regulate air volume. A metal C.N.C cut housing allows the blades to rotate freely. A non-contact tachometer records the max rotations per minute of the turbines.

Results

The turbines that were symmetrical from top to bottom were able to achieve the highest rotations per minute. More specifically, the turbine with blades of average length and a drastic curve was able to archive the highest rotations per minute.

Conclusions/Discussion

The turbines with longer blades and the turbines with non-symmetrical blades tended to wobble in the turbine housing causing more friction. This ultimately resulted in them slowing and even stopping before they could reach high speeds. The turbines with symmetrical blades were able to stay stable, but the turbines with shorter-symmetrical blades did not have enough surface area to reach as high speeds as the turbines with medium length blades.

Summary Statement

With the use of multiple forms of manufacturing, this project shows how different design aspects affect the efficiency in single stage turbine blades.

Help Received

Mark Terryberry from Haas Automation mentored throughout the manufacturing of the turbine housing; Jim Earman from Jimani Inc. allowed use of his 3D printer; Michael Sessa from Sessa Mfg. Mentored throughout the construction of pneumatic system.