CALIFORNIA STATE SCIENCE FAIR
2002 PROJECT SUMMARY

Name(s)

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Project Number

22846

Project Title

Optimizing Fluidynes

Abstract

Objectives/Goals

The objectives for this project are to develop a stable Fluidyne Stirling Engine that can be created bas| on simple jet-feedback designs using glass tubing, from school and parts available at hardware stores. T| design will be large and simple, allowing the engine to run as long as it has power and will be easy to adjust variables and find the most efficient configuration

Methods/Materials

Using a variaty of parts donated by my school, found in my garage and purchased at local hardwart stores, A stirling fluidyne engine was built based on previous research. A halogen light bulb was used to power the engine. A transformer was used to test the engine test its affectiveness at different power level€ for each variable to determine the ideal configuration for the fallowing variable: The amount of water i| the power column, the type of working gas, the placement of the heat source, and the use of a regenerator.

Results

The optimal configuration was found to be: Helium gas as the working air, a regenerator on the hot side | the displacer(where the teperature gradient is greatest), Minimal water in the power column, and when th| heat source is placed at least 4 cm beneath the meniscus. The engine has runs as long as it has power. | unstable operating mode was discovered when too much heat was applied to the engine.

Conclusions/Discussion

1) An engine that can run as long as heat is supplied has been created using commonly available part| proving my hypothesis correct
 a. It has run for over 9 hours straight without any performance drop
2) The engine has been adjusted to run for optimum performance
 a. Helium-filled displacer
 b. Regenerator on the hot side of the displacer
 c. Minimal water in the power column
 d. The heat source placed at least 4 cm beneath the meniscus
3) Because this Fluidyne only runs when the water is vaporized it can no longer be classified as a Stirling engine but rather a hybrid steam-Stirling engine.
4) I was wrong in following areas of my hypothesis:
 a. The engine will run better with more liquid in the power column
 b. The engine will run better when the heat is placed at the meniscus

Summary Statement

Designing and builiding a Stirling Fluidyne enigne, isolating variables that affect its performance and adjusting them to optimise the engine's performance.

Help Received

My father provided me with books and other recources about Stirling Engines. My father also helped me use Quatro Pro to create a graph based on data I collected. My science teacher, Mrs. Khalili, gave me advice for how to organize my display board.

Preliminary