CALIFORNIA SCIENCE & ENGINEERING FAIR
2018 PROJECT SUMMARY

Name(s)

Madeleine E. Yee

Project Number

38658

Project Title

Computational Comparison of Laminar and Turbulent Flow Erosion

Abstract

Objectives/Goals

The purpose of this project is to numerically determine the difference between laminar (smooth) flow and turbulent (chaotic) flow erosion.

Methods/Materials

This research consists of two parts, a numerical simulation using ANSYS Fluent Student Edition and an experiment to collect data to validate the simulation results. The experimental approach was comprised of laminar and turbulent water flow in a straight pipe washing away a chocolate coating. For the numerical simulations, a model was representative of the experimental apparatus and flow conditions was created and exercised.

Results

From the simulations, the wall shear calculations were compared to the erosion rates observed experimentally. Based upon the simulation results, the shear from turbulent flow was significantly higher than that for laminar flow indicating higher erosion.

Conclusions/Discussion

The results were consistent with the experimental results and showed a computation comparison is valid and can be applied to more complicated flows.

Summary Statement

The project consisted of a comparison between laminar and tuebulent flow erosion.

Help Received

My father helped me build the experimental appratus and explained the equations used in the numerical simulations.

Preliminary