Project Scope

Project Description

The objective of this project is to solve the problem at the NASA Nuclear Thermal Rocket test facility for the lack of temperature control of hydrogen gas into a test chamber. The design will allow for user control of incoming hydrogen temperature to more accurately simulate the nuclear heating environment.

Key Goals

This design will allow for independent control of the inlet temperature of hydrogen using a pre-heater. The aim is to have a broad range of control over the pre-heater, while allowing users to easily measure the surrounding conditions. The project is also aiming to integrate with surrounding subsystems without negative effects. Another goal is to communicate bi-weekly with the sponsor for progress updates and future direction.

Markets

Our product is being designed directly for NASA’s Marshall Space Flight Center (MSFC) Nuclear Thermal Rocket test facility, so NASA is our primary market. Industries that could benefit from our design include the following: induction heating, aerospace research labs, material processing facilities, electric appliance companies, and plastics processing facilities.

Assumptions

It is assumed that the design will not control pressure and flow rate of the hydrogen. Additionally, compressibility effects will be assumed to be negligible to make the problem simpler. It is assumed that all heat transfer into the hydrogen will occur inside the testing region and that radiation effects are negligible to reduce computational time.

Stakeholders

The stakeholders in this project are the sponsor of NASA MSFC, Michael Schoenfeld, academic adviser Dr. Kumar, senior design professor Dr. McConomy, and future operators of the design. The project sponsor has stake in the project as he is providing all funding for the design and has interest in using it. The sponsor also has control over the project’s direction. Dr. Kumar has stake in the project because he will be spending his time and knowledge in guiding the team. Dr. McConomy is the professor who will be overseeing the entire project and has invested considerable time and effort into securing sponsors for each senior design project. Operators of the design at NASA MSFC are considered to hold stake in the project, as they have interest in using it. The NASA MSFC facility directly benefits from the project. The team itself holds stake in the project because there is direct control, interest, and time investment in the project.