MRI-Compatible Smoke Delivery System

Overview
Our sponsor wants to study the effects nicotine has on the brain in an MRI. In order to do this accurately, a person must be able to smoke while completely still in an MRI. We must create a device that allows the person to smoke the cigarette in the MRI that contains no ferrous materials, evacuates all smoke from the building, and fits within the constraints of an MRI scanner.

Objectives
To design an MR compatible smoke delivery system that can be implemented in the 3T MRI facility located in Penn State’s Chandlee Laboratory. This system will allow researchers to study the effects that inhaled nicotine can have on the brain.

Approach
- Discussed customer needs with sponsor and Chandlee Lab faculty
- Generated multiple design concepts and selected the one that best fit customer needs
- Patent search was performed-no relevant patents exist
- Met with sponsor weekly to discuss design progress
- Fluid analysis performed to determine flow rates
- Created a CAD model of design
- Created multiple prototypes
- Tested proof of concept and planned for MRI testing
- Put in a testing plan upon approval of MRI facility
- Results obtained will be MRI images of the brain with and without nicotine exposure

Outcomes
Finally, list the outcomes for this project making sure to clearly convey their implications for the sponsoring company:
- Sponsor will only need to spend between $80.00-$100.00. The costs include E-cigarettes and tubing
- Less than 20 minute set up in MRI room
- Minimal manufacturing required.
- Created a safe and effective way to smoke an electronic cigarette in an MRI scanner