Research Experiences for Teachers and Young Scholars in Advanced Self-Powered Systems of Integrated Sensors and Technologies (ASSIST)

3D Printing Sensor Casings and Packages

Erika Voyzey[1], Alex Tellado[2] and Dr. Thomas Jackson[2] (mentors)

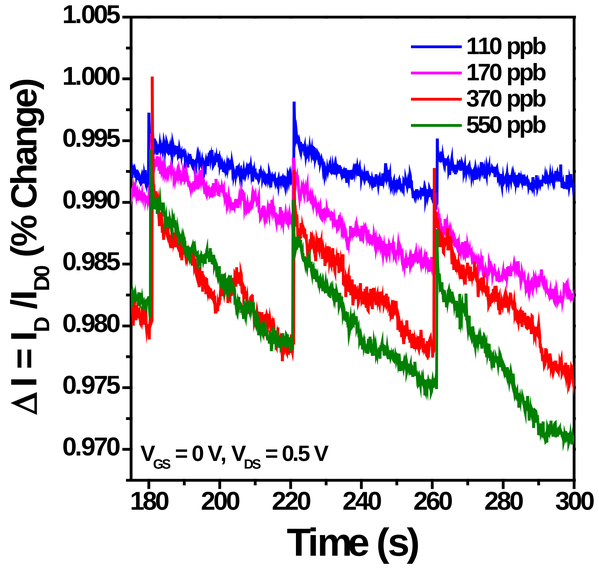
[1]Tyrone Area High School, Tyrone, Pennsylvania; [2]Department of Electrical Engineering, Penn State University

Overview

Ozone sensors are critical components for the ASSIST self-monitoring system. The goal of creating new ozone sensors is to monitor ozone in parts per billion in the atmosphere around health patients, especially asthmatics, and eliminate a battery powered source to improve productivity. In earlier work low-powered ozone sensors have been used and created, but now, there is a need to create and package ozone sensors. The Da Vinci 1.1 Plus 3D Printer uses ABS plastic to print custom designs for ozone sensor cases.

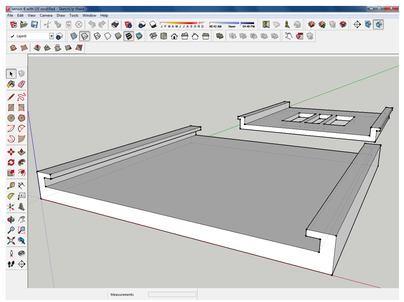
Improvements to Ozone Sensors

The graph below shows how the new ozone sensor operates. A pulse of ultra violet light from a light emitting diode (LED) is used to reset the sensor. The variations in the sensor current indicate the amount of ozone present. Our task was to design packages for the ozone sensor that would fit the test chamber, hold an Ultra Violet LED, secure and hold the sensor, and allow sensor flex cables to enter and exit the chamber.



Designing Process

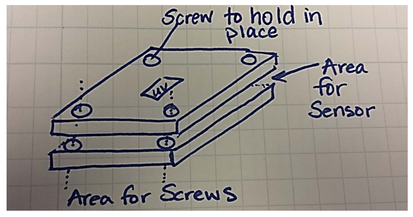
We used the program SketchUp to make custom package designs. This allowed us to rapidly vary package designs and dimensions.



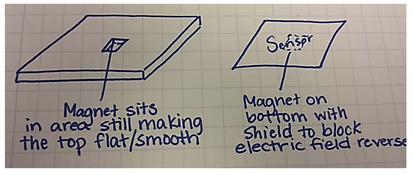
Creating Multiple Designs

Once the basic dimensions of the sensor case were established to fit the test chamber, a brainstorm wall was used to find the ideal design.

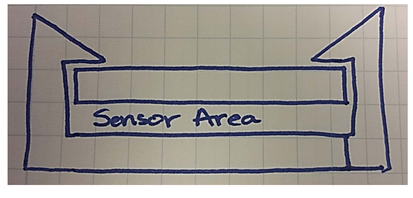
x A screw-in top would not work because the miniature screws would be a pain for users.



x Placing a magnet on the sensor and holder would most likely switch the magnetic field and cause the sensor to fail according to one mentor.



x A clip to hold a the lid and bottom together would fail after a few uses because ABS plastic that small is brittle.



✓ The slide-in top worked the best and was hassle free.

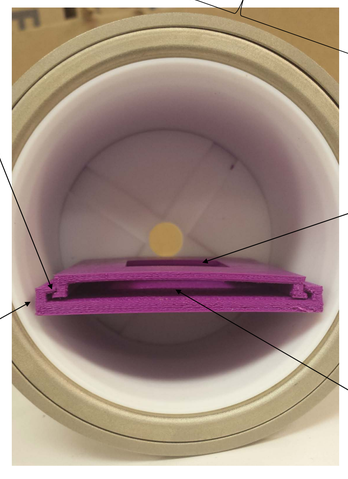
Printing

The picture on the left shows the printer in action. It takes 48 minutes to print a 60mm x 60mm x 6mm casing. The design must be bottom heavy because it prints from the bottom up.

Finished Product

Slide-in design makes case easy to dissemble

60mm x 60mm casing so it touched the sides of the chamber and doesn't flip.



Future Events

This casing is an original idea used to package and test ozone sensors created for the ASSIST Program. It will be shipped to North Carolina State University to be used as a test bed and to be used for continued research. We hope this sensor and casing will be found in a prototype of ASSIST's first wearable device.

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