Name(s)	Project Number
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Project Title
More Effective Hearing Protection

Abstract

Objectives/Goals
In America, one out of every three people over the age of 65 have hearing loss. Sixty percent of those people worked in a noisy environment. People with hearing loss are more likely to be depressed because they have a harder time participating in social interactions. There is no doubt that it is important to have appropriate hearing protection for the American workforce. The objective of the experiment is to develop a more effective and affordable hearing protection headphone than what is currently available.

Methods/Materials
My experiment works by having two pieces of Acrylic to form a semi-sphere shape. I used a vacuum pump to create a low pressure pocket, which prevents sound from traveling through. I tested my headphone by exposing it under 500 Hz, 1000 Hz, and 1500 Hz sounds. I had a speaker facing the headphone on a stand, and an Arduino with sound sensor module measures the sound level. The speaker was 1 cm away from the headphone. The Arduino sensor was directly against the headphone. I also used PLX-DAQ application to transfer my results to Excel.

Results
I found that the more air you remove from the headphone, the more sound the headphone blocks. I achieved these results as a result the more air of medium you remove, the harder it is for the sound to travel through the headphone. This is because there are less air particles for the sounds to travel, so the energy of the sound wave deteriorates faster. In the best case, headphone with 57% air pocket blocked 73% of 500 Hz sound, 53.4% of 1000 Hz sound, and 39.7% of 1500 Hz sound.

Conclusions/Discussion
Overall, I found that the more air I removed the more effective the headphone worked. I could improve my product by using to use a better vacuum system, so more sound could be blocked by the low pressure pocket. The lower the pressure, the more sound would be blocked. While 60% of the 500 Hz sound was blocked by Acrylic, only 10 % to 15% percent of the sound was blocked by the vacuum. It was due to some of the sound goes around the headphone then gets detected by the Arduino sound sensor. In conclusion, the best case is 500 Hz at 57% air, because the headphones blocked an incredible 73% of the sound, which is 3% better than industrial standard.

Summary Statement
I created a more effective and affordable hearing protection headphone that uses a vacuum to block up to 73% of the sound.