CALIFORNIA STATE SCIENCE FAIR
2016 PROJECT SUMMARY

Name(s)

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Project Number

36484

Project Title

All About That Bass: The Effect of Different Frequencies against Isopropyl Alcohol Fires

Abstract

Objectives/Goals

The purpose of the experiment was to locate the frequency the frequency that controlled and extinguished the fire the best. It was hypothesized that if low frequencies were played towards a fire, then the fire would be extinguished because the low frequencies create bigger areas of high and low pressure, which would affect the fire by altering the atmosphere around the fire, separating heat from fire, and eventually, taking it out. This project expands our knowledge on the nature of sounds and how we can apply them to our daily lives.

Methods/Materials

Rubens Tube experiment: Construct a Rubens Tube/ speaker, computer w/tone generating software, lighter. Two frequency ranges were used; 30Hz # 60Hz and 200Hz # 500Hz. Frequencies were played and areas of high/low pressure and wavelengths were created, observed, and measured. Extinguishing Fire experiment: speaker, 4 aluminum cookie pans, isopropyl alcohol 70%, lighter, timer/phone, and computer with a tone generator. Low frequencies attempted to extinguish a fire. The alcohol in the pan was lit using the lighter and fire was given 5 seconds to develop. Then a frequency was played towards the fire and a timer started. Once fire was out, from burning fuel or being extinguished, the frequency, time, and observations were recorded. Process was repeated from 30Hz # 60Hz in increments of 5Hz each trial.

Results

Rubens Tube experiment: low frequency range had longer wavelengths/larger areas of high and low pressure. High frequency range had shorter wavelengths/smaller areas of high and low pressure. Sound Extinguishing Fire experiment: low frequencies played towards a fire. 50 Hz: frequency quickly extinguished the fire by pushing it towards the corner, making flames small, and disturbing the surface of the fuel, which affected the burn rate. Flames almost immediately blue when frequency was played toward the fire.

Conclusions/Discussion

Frequencies were visually displayed through the Rubens Tube and the low frequencies were put to the test in the Sound Extinguishing Fire experiment. high frequency: short wavelengths and small/close areas of high and low pressure. low frequency: long wavelengths and large/far areas of high and low pressure. Data showed that while the low frequencies had larger areas of high/low pressure and longer wavelengths, there was an apex point in the range. The hypothesis was both supported and rejected through these two experiments.

Summary Statement

I showed that certain frequencies had different effects on isopropyl alcohol fires, their areas of high and low pressure, and how there was an apex point to which the fire was effected by sound waves efficiently.

Help Received

My father helped me construct the Rubens Tube and supervised the Sound Extinguishing Fire Experiment. My science teacher supervised testing of the Rubens Tube and gave me access to a gas supply in the school sic lab.

Preliminary