CALIFORNIA STATE SCIENCE FAIR
2013 PROJECT SUMMARY

Name(s)

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Project Number

J1114

Project Title

Investigating Whether Atmospheric Conditions Affect Emission/Dispersion Rates and Levels of Ash Particulates

Abstract

Objectives/Goals

Determining the validity of two hypotheses using the best type of wood to burn and the worst type of wood to burn as concluded in the 1st year study: 1. If the atmospheric conditions change naturally (temperature/humidity), then the dispersion rate/level of ash particulate will decrease. 2. If humidity levels are increased in a controlled environment in temperatures exceeding 100 degrees Fahrenheit, the the dispersion rate/level of the store bought wood ash particulate will decrease because of the inversion layer that is created.

Methods/Materials

A controlled study was performed, and a study using enviromental conditions over three different temperatures and humdity levels was performed using ash from two types of wood. The controlled expermiment was done in temperatures exceeding 100 degrees using a humidifier near the top of the plexiglass cylinder. The other study was done in temperatures exceeding 100 degrees, in the 70s and in the 30s (10 trials each using the 2 types of wood determined in the first year experiment to be the best for the environment (Douglas Fir) and the worst to burn (store bought). How far each type of wood ash traveled and how long it stayed airborne in the clear plexiglass tube was measured in centimeters and seconds. The results were then averaged after each of the ten trials.

Results

The hypothesis using natural conditions was partially correct. Both types of wood had a decreased emission/dispersion rate with respect to how far the ash particulates traveled in cool temperatures with increased humidity. The inversion layer created in cold weather kept pollution from rising. The controlled experiment hypothesis was correct. Because of artificial humidity, the amount of time the ash particulate remained airborne decreased by about 40% when compared to the airborne time during the actual weather related trials. The time the store bought ash was airborne in the controlled experiment was close to the time that the Douglas Fir had remained airborne in the weather related trials because of the direct inversion layer created from the humidifier.

Conclusions/Discussion

It is clear that temperature/humidity play a significant role with respect to wood ash pollution as the numbers from the 1st year study and the 2nd year study vary greatly. Even with cooling temperatures, it is clear that there is still a pollution problem that needs to be reduced year round with efficient wood burning.

Summary Statement

This project determines whether atmospheric conditions play a role in the efficiency of wood burning and related pollution levels.

Help Received

My mom helped type the report.