



**CALIFORNIA STATE SCIENCE FAIR  
2007 PROJECT SUMMARY**

<b>Name(s)</b> <b>Paul C. Deardorff</b>	<b>Project Number</b> <b>J0906</b>
<b>Project Title</b> <b>Effects of Adding Denatured Alcohol to Unleaded Gasoline on Emissions from a Small Internal Combustion Engine</b>	
<p style="text-align: center;"><b>Abstract</b></p> <p><b>Objectives/Goals</b> Small internal combustion gasoline engines contribute significant amounts of exhaust pollutants into the environment. These include such things as polycyclic aromatic hydrocarbons (HC), nitrous oxide (NO), carbon monoxide (CO) and carbon dioxide (CO<sub>2</sub>). Many of these pollutants are known to contribute to health problems and global warming. Fuel additives, such as ethanol, have been tested in automobiles and result in a decreased level of these harmful emissions. This study tested the effect of adding denatured ethanol (DE) to unleaded gasoline on the production of pollutants in the exhaust of a small internal combustion engine. DE is inexpensive and readily available at any hardware store and the engine was similar to what might be commonly used in lawn equipment</p> <p><b>Methods/Materials</b> Various fuel mixtures (0%, 15%, 25%, and 35%) of DE and gasoline were tested by a certified technician using a gas emission analyzer. The test was run for High and Low RPM conditions.</p> <p><b>Results</b> It was found that levels for all pollutants measured (HC, NO, CO, and CO<sub>2</sub>) decreased as the concentration of DE in the fuel increased, for both RPM levels.</p> <p><b>Conclusions/Discussion</b> The study concludes that adding a small amount of DE to unleaded fuel results in decreased emissions. The discussion points out that adding a small amount of DE to each tank of gasoline has the potential to significantly decrease emissions from small internal combustion engines such as those used in lawn equipment. Directions for future research include testing under laboratory conditions, determining the most cost-effective amount of DE to add to the fuel, and the effects of adding DE on engine performance and longevity.</p>	
<b>Summary Statement</b> The project determined whether adding denatured alcohol to unleaded gasoline lowered harmful emissions from a small engine.	
<b>Help Received</b> My father drove me to the SMOG testing station and took pictures of me throughout the project. My parents and science teacher helped edit my research report. My mother helped with some of the poster board construction.	