



**CALIFORNIA STATE SCIENCE FAIR
2009 PROJECT SUMMARY**

Name(s) Eric C. Huppert	Project Number S0208
Project Title Investigating Biodiesel Feedstocks: How Does Cooking Time Affect the Viscosity of Cooking Oil?	
<p style="text-align: center;">Abstract</p> <p>Objectives/Goals Because of our dependence on fossil fuels, there has been significant interest in the potential of biodiesel as an alternative fuel. Researchers have suggested using used vegetable oil as a feedstock for biodiesel. However, one major concern is the high viscosity of used vegetable oil. When vegetable oil is heated, fatty acids break down causing it to become more viscous. This is a potential problem because viscous biodiesel can cause engine problems. In this two part project, I assessed how the cooking time of vegetable oil affects its viscosity.</p> <p>Methods/Materials In the first phase, I cooked oil at home for varying periods of time, and in the second phase, I used oil collected from local restaurants. To calculate the viscosity, I dropped a sphere through the vegetable oil and found its terminal velocity. I also calculated the density of the fluid. Then, I used the Stokes formula to calculate the viscosity of the fluid.</p> <p>Results In the first phase, a step-down analysis of variance (ANOVA) test showed that the pure oil was significantly more viscous than the cooked oils ($p=0.0056$), which was somewhat surprising. The viscosity of the other three vegetable oils increased with cooking time, but this data was not statistically significant. In the second phase, I found that the viscosity of the vegetable oil increased with the cooking time. A second ANOVA test showed that oil cooked 5 hours was significantly lower than the other phase II oils ($p<0.001$) and the vegetable oil cooked for 35 hours was significantly higher than the other cooked oils ($p<0.001$).</p> <p>Conclusions/Discussion This information can be used to decide the allowable cook times for vegetable oil to create biodiesel with the appropriate viscosity.</p>	
Summary Statement The goal of my project is to find a correlation between the cooking time of vegetable oil, a feedstock for biodiesel, and its viscosity.	
Help Received Sisters helped design procedure; Parents helped edit my report; Teacher helped me acquire necessary materials.	