CALIFORNIA STATE SCIENCE FAIR
2004 PROJECT SUMMARY

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S0503

Project Title
A Chemical Investigation of Water Content and Analysis of pH in Methyl-Ester Fuels using Different Washing Systems

Abstract

Objectives/Goals
We hope to quantify the amount of water in non-water wash fuels in order to determine thermal oxidation.

Methods/Materials
We weighed out 50 grams of beads on a balance and placed them into pre-weighed sealed plastic bags. Then, 100 milliliters of tap water, water washed oil, and non-water washed oil were measured out into 3 separate graduated cylinders. Coffee filters were secured on top of 3 beakers in order to filter out the beads after the liquids were poured into the 3 different beakers. All initial and final temperature readings of both liquids and beads were synchronized and recorded. After each set of beads were placed in their original bags, they were weighed on the same balance.

Results
Our test results, on average, show that our non-water wash batches contain less water compared to the water washed bio-diesel and the tap water. At the end of testing, more oil is retained and the non-water wash beads have a lower mass compared to the beads immersed in the water washed bio-diesel and water. This shows that the beads saturated in the non-water wash oil absorbs less water content than that of the beads saturated in the control and independent variable. Initial temperatures of beads saturated in water are between 89.5^o F - 90.5^o averages. The water wash#s initial temperature is on average 76.8^o F with temperatures on average of 78^o F; the non-water wash#s initial is on average of 75.6^o F - 76.7^o F. Because the greater level of water causes a faster reaction and a raised temperature, we can determine that the slower reaction and lower temperature of the beads saturated in the water washed oil is due to a lower level of water content and other impurities that could have been introduced to the oil.

Conclusions/Discussion
The water wash process used to cleanse Bio-diesel fuel was analyzed in accordance to water content. Two approaches were taken, including temperature comparisons and a weight system to quantify the amount of bead absorption. Data showed that the water wash had greater water retention and higher temperature when reacting with the beads; thus indicating that the beads had a higher absorption rate and a lower exothermic reaction with the non-water washed fuel. This shows that the non-water washed fuel had a lower water content compared to the water washed methyl-ester fuel.

Summary Statement
Our study regards the analysis of water content in methyl-ester fuels to determine thermal oxidation.

Help Received
Mr. Michael Winters overlooked our project, Dr. James Ettaro helped us to conceptualize our ideas, and Ms. Natalie Della Santina gave us materials