

E-Diesel Miscibility with Commercial Petroleum Based Diesel Fuel: A Preliminary Report

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Abstract

A series of miscibility experiments were performed on a commercially available petroleum based diesel fuel, ethanol and e-diesel, a soy based alternative fuel. The goal of these experiments was to prove that e-diesel can be used as an additive to increase the miscibility between commercial petroleum based diesel and ethanol. The experiments were performed via a wet chemistry observation method. Results indicate that the E-Diesel when used as an additive agent significantly increased the miscibility between the two compounds. These results indicate that a larger analysis on the miscibility of E-Diesel with a wide variety of fuels under more varying conditions is well worth considering.

1 Introduction

Fuel additives are greatly used in today's society. Almost all fuels used commercially have some additives. They provide a variety functions from increasing gasoline's octane rating or act as corrosion inhibitors or lubricators. There are many types of additives, antioxidants (stabilizers), metal deactivators, corrosion inhibitors, oxygenates, antiknock agents and many more. Their uses can not be understated, recently U.S. Sustainable Energy Corporation has created a new biofuel E-Diesel that show potential as being an additive for

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petroleum based diesel and ethanol fuel blends. It's role as an additive would be to increase miscibility between these compounds thus creating a better fuel blend for the eco-friendly engines of tomorrow. Ethanol currently has the support of President Bush and many alternative energy coalitions as a answer to America's foreign oil dependence. E-Diesels potential as an eco-friendly fuel miscibility enhancing fuel additive is explored in this preliminary report.

2 Experimental

2.1 Sample Preparation and Instrumentation

A 10 mL volumetric pipet, 100 mL graduated cylinder, 10 mL graduated cylinder were all that was required for the wet chemistry observation experiment. There were two types of E-Diesel, cut one light diesel and cut two heavy diesel both are soy based biofuels produced by U.S. Sustainable Energy Corporation. The commercially available petroleum based diesel was purchased on the site of the experiment. The ethanol sample used was 95% pure and is of agricultural grade.

2.2 Miscibility Measurements

Initially 60 mL of petroleum based diesel was measured out, and then diluted to a volume of 100 mL with agricultural ethanol. Simultaneously during the mixing photo records of the mixing process were taken. After a time period two minutes 10 mL of the E-Diesel cut one was added to the mixture, photo records were being continuously taken.

This same procedure was then repeated but with decreasing volumes of E-Diesel cut one until the observed mixing stopped. All the experiments were then repeated using the same volumes but with E-Diesel cut two.

3 Results and Discussion

With 2.5 mL being the lowest reported volume for full miscibility in a 60/40 mixture of ethanol and petroleum based diesel we can calculate the volume ratio for the E-Diesel additive. Once calculated the ratio turns out to 1:42.99 unit volumes. Thus 1 pint of E-Diesel could be mixed with 42 pints (5.375 gallons) of 60/40 petroleum based diesel/ethanol.

Table 1
E-Diesel Cuts One and Two Miscibility Results

Cut 1/2 E-Diesel	Petro Diesel	Ethanol	% E-Diesel
10 mL	60 mL	40 mL	9.091 %
8 mL	60 mL	40 mL	7.273 %
6 mL	60 mL	40 mL	5.455 %
4 mL	60 mL	40 mL	3.636 %
2.5 mL	60 mL	40 mL	2.273 %

4 Conclusions and Recommendations

E-Diesel as a additive for increasing miscibility was observed and indicates remarkable potential. A low percentage of E-Diesel was observed to make the petroleum based diesel and ethanol mix completely. Both cuts of the E-Diesel performed equally in regards as an additive for these two compounds. This indicates that the process that produces the different lines of biofuels does not affect the miscibility proprieties of the soy based biofuel. This could mean that further modifications to future cuts will keep this ability to become a additive for miscibility purposes. Since additives, like all fuels, are highly regulated by several agencies it could become necessary to modify the E-Diesel blend at a later date. This preliminary data suggests that the additive properties could remain unchanged.