

ABSTRACT

My experiment this year was to extend my work from last year to see if I could convert denatured ethanol into a useable fuel and verify it using a model airplane. I compared engine performance using ethanol that I dried, non-dried ethanol, and regular model airplane fuel (nitro). I chose this project because I became interested in biofuels like ethanol when my father worked with them in his business. I am doing this project in his honor.

My hypotheses were that the model airplane would not run using the dried ethanol or non-dried ethanol because of the water content.

In order to convert the ethanol into a useable fuel, I first mixed a molecular sieve with the denatured ethanol to extract the water. Then I mixed castor oil as an engine lubricant. As a comparison, I also mixed castor oil with the denatured ethanol without drying to create a non-dried ethanol.

Then I took the fuel I mixed to the airfield of the AirMasters Club of Sebastian to test it. My mentor provided an older, gas-powered, remote control model airplane. We first flew the plane using his regular nitro fuel. The plane started and ran smoothly with the nitro, with the best rpm, 11,040, and engine temperature, 50 °C. We then flew the plane using my dried ethanol. It started and ran, but produced some exhaust smoke and sputtered a little. The rpm was less, 9840, and the engine temperature was higher, 63 °C. Third, we flew the plane using the non-dried ethanol. The rpm was still less, 9540, and the engine temperature higher still, 66°C. Since the plane flew with both types of ethanol, I concluded that the converted denatured ethanol was a useable fuel.

My hypotheses were both incorrect. When I dried 473ml of denatured ethanol I believed I would extract no more than 10% of water, and I actually extracted 26%. I thought it would not be able to fly because I thought the engine would not run if there was any water in the fuel, but actually the engine could tolerate some water. Likewise for my other hypothesis, I believed the non-dried ethanol would not work at all because there was no water extracted and the engine could not run with water in it.

I also compared costs for the three fuels and found non-dried ethanol cost about the same as nitro, and dried ethanol was 8 times more.

If I were to extend this project I would try to determine the long term effects of ethanol on the performance of a model airplane engine.