



**CALIFORNIA STATE SCIENCE FAIR
2014 PROJECT SUMMARY**

Name(s) Ezra B. Creighton	Project Number 34750
Project Title Engineering an HHO System to Safely Run a Four Stroke Engine with Water (HHO), Part 3	
Objectives/Goals The world needs a clean, renewable source of energy that will fuel our existing four stroke engines. I've proved before that HHO can safely run an engine without gasoline. Producing HHO requires electricity and space, not practical for use in a vehicle. The answer is a portable storage tank of HHO. I manufactured the HHO by using electrolysis to split the water molecules (H ₂ O) into hydrogen and oxygen(HHO). The project is separated into four units: the production unit (where the HHO is produced), the compressor unit (where the HHO is compressed), the storage unit (the tank that stores the compressed HHO), and the engine unit (safeties that the HHO must pass through going to the engine). A lawn mower engine was used for testing. Abstract The world needs a clean, renewable source of energy that will fuel our existing four stroke engines. I've proved before that HHO can safely run an engine without gasoline. Producing HHO requires electricity and space, not practical for use in a vehicle. The answer is a portable storage tank of HHO. I manufactured the HHO by using electrolysis to split the water molecules (H ₂ O) into hydrogen and oxygen(HHO). The project is separated into four units: the production unit (where the HHO is produced), the compressor unit (where the HHO is compressed), the storage unit (the tank that stores the compressed HHO), and the engine unit (safeties that the HHO must pass through going to the engine). A lawn mower engine was used for testing. Methods/Materials Prototypes of each unit were modified, until they met the design criteria. The storage unit was connected to the compressor unit and filled with 30 psi of HHO from the production unit. The storage unit was then placed into a 3x3x3ft hole in the ground with a metal box positioned over it (this was in case the tank ruptured). Then, I sent a spark to the tank with an igniter so it would explode. This test ensures the tank would be safe should a flame reach it. After successfully completing that test, the storage unit was filled to same amount of HHO and connected to the engine unit. I then release the HHO into the engine while pull-starting it, and record run time. Results The first prototypes of the production unit were remodeled until prototype #4 could operate properly and rapidly. A few prototypes of the compressor unit were developed and prototype #3 functioned properly. The storage unit was filled with HHO and tested to see if the safety would work. Prototype #1 of the storage unit did not work properly and failed, so prototype #2 was made to work properly at 30 psi. The storage unit was filled again to test if it could run the engine. The engine unit had several problems initially and prototype #4 of the engine unit operated correctly as the engine was able to run successfully. Conclusions/Discussion My tests prove an HHO system can be engineered to run an engine safely! Therefore HHO could be used to replace gasoline. HHO can be produced for free if solar panels are used. When HHO is combusted in the engine, it turns back into water. If HHO was used to replace gasoline we would save money, fuel, and reduce emissions, therefore saving the environment.	
Summary Statement This project proves a homemade HHO system can be engineered to run an engine safely with water (HHO).	
Help Received My brother-in-law worked with me on my project. My sister helped me proofread my work. My Dad helped me get the pieces and let me use his engine and tools.	