Abstract

What if there were an alternative fuel that could easily be substituted into today’s internal combustion engines and have similar performance to gasoline and diesel fuels? This fuel is hydrogen, it can power modern internal combustion engines, and has environmentally friendly emissions. In order to test its performance related to gasoline, I have attempted to take a single cylinder Honda engine and convert it to run off of hydrogen gas and using a dynamometer, record horsepower, torque, and rpm (rotations per minute). This data will then be compared using gasoline as a fuel source and using the same specs, horsepower, torque, and rpm.

Introduction

The world today revolves around the burning of fossil fuels. Every time a light switch is flipped to every time you start the engine in your car, fossil fuels are being burned and contaminants are expended into the atmosphere. This is an issue on a global scale one that affects every living being on our planet. The food we eat and the air we breathe is all affected by the use of fossil fuels. The problem needs solved and it needs solved in an efficient manner that doesn’t require much change to the devices already in play today. If it were necessary to modify every fossil fuel burning engine in the world it would require large sums of money and mass cooperation, but there is an easy and efficient alternative that is cheap and also environmentally friendly. There is a fuel that exists today that is one of the most abundant elements in the environment, if burned will not damage our ecosystem, and can easily power today’s modern internal combustion engines without much modification to the engines. This fuel is hydrogen; hydrogen has the ability to power internal combustion engines without much modification to the engines. This fuel is renewable, and is harmless to the environment. If it is possible to have similar performance as gasoline in internal combustion engines there is no reason that hydrogen power shouldn’t be harnessed. The difference in performance in hydrogen and gasoline is the only thing that would leave doubt on its use. If hydrogen can perform on the same level as fossil fuels hydrogen can become the green fuel that our world needs. When hydrogen is burned it reacts with oxygen and forms water molecules and can then be separated back into its individual atoms for its use in combustion again. Hydrogen can be used in many different processes, from transportation to powering electrical generators.

Methods

After attempting the electrolysis process to no avail, the next step was to obtain a cylinder of compressed hydrogen and change the delivery system to accept gas from the compressed cylinder. In the image below is the slightly modified delivery system and to the right is the cylinder of compressed hydrogen with a hose running to the engine.

• A single cylinder Honda engine was obtained to convert to run off hydrogen gas. Below is pictured the engine with gas tank and carburetor removed.

• From here the hydrogen needed to be obtained and the first attempt involved an electrolysis process using copper for my electrodes, a car battery charger for the power source, and water and salt as the solution. A system was devised to catch the hydrogen gas that would be obtained from the electrolysis. Apparatus is pictured below.

• After this an delivery system needed to be set up to send the hydrogen to the engine, the apparatus that was constructed involved various PVC tubes, fittings, and a needle valve to control the flow of the hydrogen. Below is pictured the delivery system to deliver the hydrogen to the intake of the engine.

• Hydrogen burns at a faster rate than gasoline so in order to compensate for this a bracket needed to be fastened to advance the magneto on the engine and allow the spark to fire closer to the cylinder’s top dead center. An image of the bracket is shown below, as well as a few lines of the CNC code to mill it.

Discussion

Discussion is burning hydrogen with the intent of using it as a fuel source and comparing it to gasoline. Hydrogen is a fuel that is so much potential that has yet to be tapped on a large scale. Hydrogen can easily be used in internal combustion engines without much modification, it is renewable, and is harmless to the environment. If it is possible to have similar performance as gasoline in internal combustion engines there is no reason that hydrogen power shouldn’t be harnessed. The difference in performance in hydrogen and gasoline is the only thing that would leave doubt on its use. If hydrogen can perform on the same level as fossil fuels hydrogen can become the green fuel that our world needs. When hydrogen is burned it reacts with oxygen and forms water molecules and can then be separated back into its individual atoms for its use in combustion again. Hydrogen can be used in many different processes, from transportation to powering electrical generators.

In order for the population’s lifestyle trends to continue there needs to be a fuel to power the world and this fuel is hydrogen, hydrogen has all the essentials for the changing world it is renewable, it is not harmful to the environment, and doesn’t require much modification in pre-existing engines.

Next Steps

The next steps in the hydrogen research is to effectively run the engine for a long enough period of time to obtain test results on the dynamometer. In order for this to happen the magneto needs set back and tested with hydrogen and gasoline. Plans for the continuation and completion of the project are being made and the project will continue into the school year in order to obtain results for comparison. A propane powered weed eater, is also in the stage of being converted to run off of hydrogen. Due to the nature of carburation in propane engines being designed for the delivery of a gas and not a liquid it will be simple to convert and also give the ability to test out propane, another clean fuel. An image of the weed eater can be seen below.