Hydrogen Fuel Cell

Group members:

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Thesis

To build and test the effects of a hydrogen fuel cell on gas mileage on an average vehicle
Research

• Hydrogen gas is produced when a charge is supplied to an electrolytic solution.
• When the current is introduced to the electrolyte the water molecules are broken down into the hydrogen and oxygen.
• This gas is then fed into the air flow into the internal combustion engine.
• The hydrogen ignites slightly before the fuel, such as gasoline or diesel, and helps in breaking up the carbon chains of the fuel which causes a more efficient burn.
Benefits

• Benefits of this are increased fuel economy by means of more combustion produced with the same amount of fuel as before.

• Alternately, if you drive aggressively, you can transfer the fuel economy into power and actually burn more fuel but with an increase of approximately 10% more power.

• Because hydrogen burns carbon, you can clean up the cylinders of your engine by burning off all the carbon buildup from the inefficiency of normal fuel.
Drawbacks

• Drawbacks of this are actually related with the benefits.

• If you have a very aged engine in which the valves are covered with many years of carbon buildup, the removal of these from burning the hydrogen can cause leaks where the valves have self adjusted themselves around the buildup.

• Additionally, if you add too much hydrogen gas to your engine, the sensors of the engine will think that your engine is not properly burning fuel and actually increase the fuel to the engine thereby causing you to burn too much fuel.
How does the hydrogen fuel cell use physics?

• A chemical reaction from the battery produces an electrical current which produces a chemical reaction in the electrolyte from the steel plates to separate the hydrogen and oxygen molecules.

• This gas is then fed into the I.C.E. (internal combustion engine) which then adds to the chemical reaction that takes place when the fuel is combusted increasing the mechanical output.
# Bryce Hill’s Outcome

<table>
<thead>
<tr>
<th>Type of Driving</th>
<th>MPG before Installation</th>
<th>MPG after Installation</th>
<th>MPG Increase or Decrease</th>
</tr>
</thead>
<tbody>
<tr>
<td>Highway</td>
<td>27 MPG</td>
<td>36 MPG</td>
<td>9 MPG increase</td>
</tr>
<tr>
<td>City</td>
<td>24 MPG</td>
<td>34 MPG</td>
<td>10 MPG increase</td>
</tr>
</tbody>
</table>

Type of Car: 2004 Chevrolet Cavalier

Engine: 2.2 liter/4 cylinder
## Bryan Smith’s Outcome

<table>
<thead>
<tr>
<th>Type of Driving</th>
<th>MPG before Installation</th>
<th>MPG after Installation</th>
<th>MPG Increase or Decrease</th>
</tr>
</thead>
<tbody>
<tr>
<td>Highway</td>
<td>25 MPG</td>
<td>38 MPG</td>
<td>13 MPG Increase</td>
</tr>
<tr>
<td>City</td>
<td>23 MPG</td>
<td>30 MPG</td>
<td>7 MPG Increase</td>
</tr>
</tbody>
</table>

Type of car: 2000 Honda Accord

Engine: 2.3 liter/4 cylinder
Highline Hybrids

- We want to give a special thanks to Highline Hybrids for all of their help and donations.

Division of Labor

- Bryan Smith:
  - Project lead and coordination, field testing and data analysis
- Bryce Hill:
  - Field testing and data analysis
- Susan Brock:
  - Project coordination, Videographer and website design
- Andrew Miner:
  - Researcher
- Spencer Beck:
  - Video and audio editing
- Tyler:
  - Final PowerPoint