



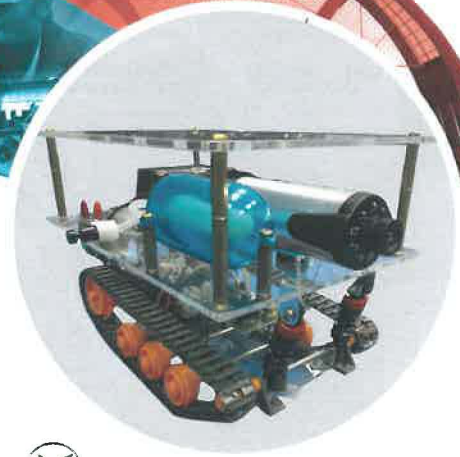
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HYDROGEN FUEL CELL POWERED ELECTRIC VEHICLE



PRODUCT DESCRIPTION

- Fuel cells (FCs) is device that utilize an electrochemical process to convert chemical energy of the fuel into electrical energy. This electrical energy can be used to power vehicles, electronic devices, houses and etc.
Hydrogen is the most common fuel in the fuel cell system, but hydrocarbons such as natural gas and alcohols like methanol are sometimes used.
This project is about developing a Hydrogen Fuel Cell Electric Vehicle (HFCEV) that run by electric current that produce from the Polymer Electrolyte Membrane (PEM) fuel cell which is being carry onboard in the vehicle.

NOVELTY

- Using Hydrogen Fuel Cell system to replace the battery function for moving of a vehicle.
Hydrofill Refueling Station is powered by the solar panel.
Using distilled water as energy carrier.

PRODUCT ADVANTAGES

- High efficiency of conservation of energy.
Hydrogen Fuel Cell system will produce zero carbon emission on environment.
Fuel cells can eliminate pollution caused by burning fossil fuels; for hydrogen fuelled fuel cells, the only by-product at point of use is water.
Reduce economic dependence on oil producing countries and creating greater energy security for the user nation.
Most fuel cell operate silently, compared to internal combustion engines and suitable in indoor application.
The maintenance of fuel cell is simple since there are a few moving parts in the system.

COMMERCIAL POTENTIAL

- Increasing amount of stack of the fuel cell so that it will produce a higher current and voltage. Therefore the vehicle is able to move in a greater speed and higher mobility.
Integrating the vehicle using smartphone to control manually the movement of the vehicle.



Hydrofill Refueling Station



Full Set of Connection of PEM Fuel with H2 Storage Tank

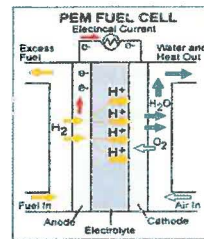
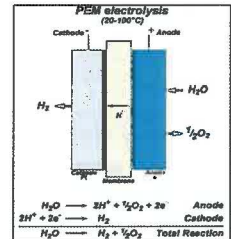
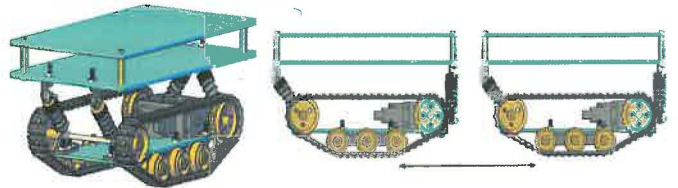


Diagram of The Fuel Cell Working System



Electrolysis Process



Calculation for Chemical Energy of Hydrogen:

Mass of Hydrogen = Density of Hydrogen (H2) * Volume of tank = 4.356 * E-8
Molar mass = Mass of Hydrogen / mol = 2.178 * E-8
Total of (Energy Carries) = Molar mass * Enthalpy of Energy H2 = 4.356 * E-8
Molar mass = Mass of Hydrogen / mol = 2.178 * E-8
Total of (Energy Carries) = Molar mass * Enthalpy of Energy H2 = 6.228 * E-3 J

Calculation for Kinetic Energy of Chassis Moving:

Kinetic Energy Formulae [Ek = 1/2 * m * v^2]
Calculate Ek = 1/2 * m * (d/t)^2 = 4.8578 * E-3 J

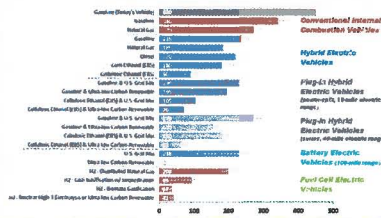
Calculate Efficiency of Conservation of Energy:

Efficiency % = E_output / E_input * 100 % = (4.8578 * E-3) / (6.228 * E-3) * 100 % = 77.99 %

The Result Show The PEM Fuel Cell is High Efficiency



Harvest Sun Energy During The Day



Well-to-Wheels Greenhouse Gases Emissions for Future Mid-Size Car (Grams of CO2-equivalent per mile)