



SNS COLLEGE OF TECHNOLOGY

(An Autonomous Institution)

COIMBATORE-35.



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DEPARTMENT OF AUTOMOBILE ENGINEERING

COURSE NAME : 19AUT202 - HYBRID ELECTRIC & FUEL CELL VEHICLE

II YEAR /III SEMESTER

Unit 5- Fuel Cell Components for Automotive Applications

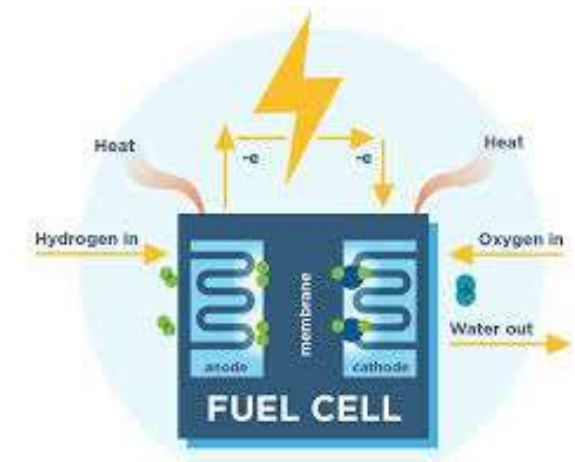
Topic : Fuel Cell Based Vehicle



INTRODUCTION



- In the world presently there is some scarcity for fossil fuels and in future there will be no more fossil fuels.
- In order to overcome this problem many research are going to replace fossil fuel powered IC Engine.
- One of the new advanced method is the use of fuel cells instead of IC Engine.
- Fuel cell plays a vital role in the field of an automobile.





HYDROGEN FUEL POWERED VEHICLE



- In hydrogen powered vehicle, the conventional IC engine is replaced by the fuel cell.
- The vehicle run based on the electricity produced by the fuel cell.
- The starting of the vehicle is run by battery, after sometimes fuel cell takes charge.





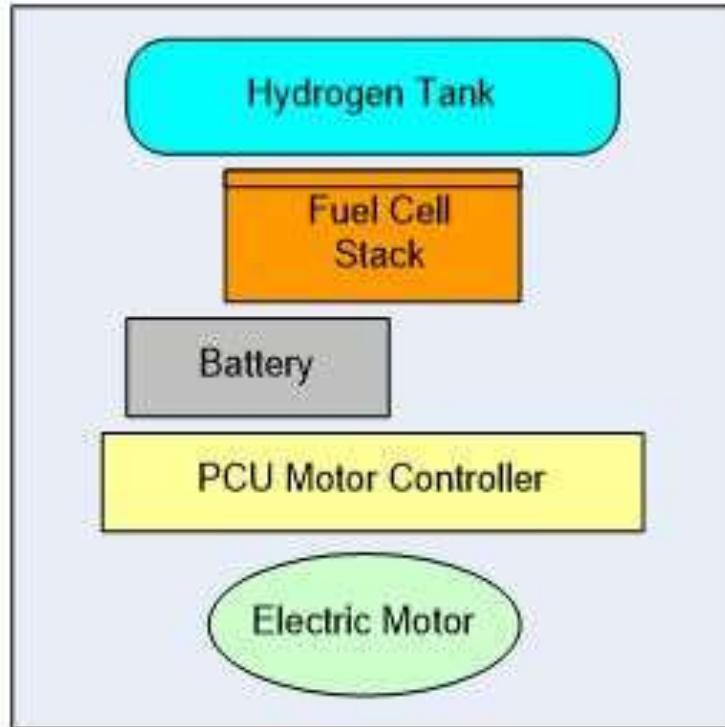
HYDROGEN FUEL POWERED VEHICLE



- Fuel cell vehicles (FCV) use fuel cells to power the vehicle's electric motor.
- Many FCVs use a fuel cell **combined with a battery and super capacitor to efficiently start-up, power, and utilize the best energy source for constant and peak power**
- In FCVs, the fuel cell uses **oxygen** from the air and compressed **hydrogen**. These vehicles only **emit water and heat as byproducts**.
- The major reason for developing automotive fuel cell technology are their **efficiency, low or zero emissions, and fuel production from local sources** rather than imported sources.
- The starting of the vehicle is run by **battery, after sometimes fuel cell takes charge**.

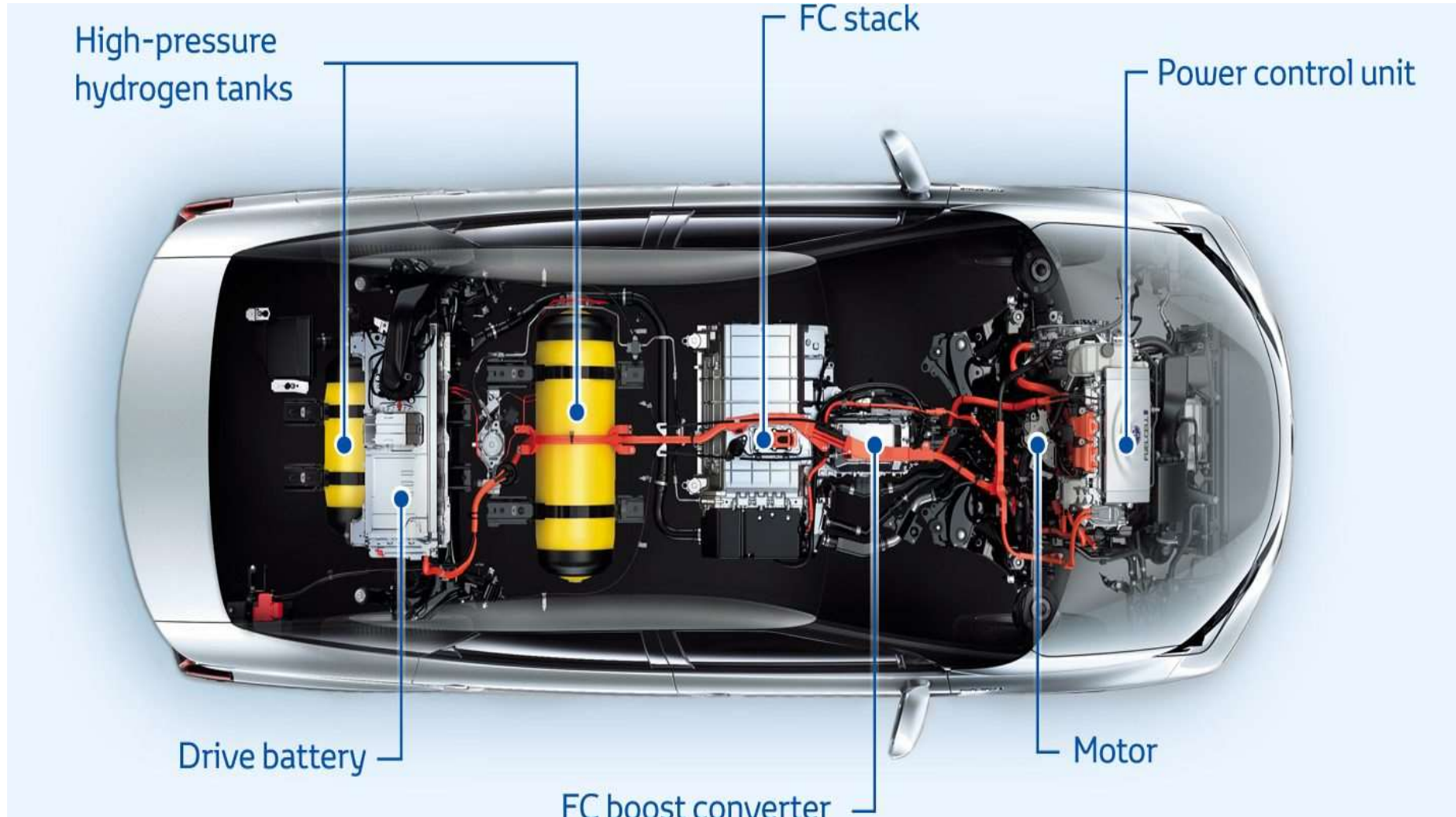


HYDROGEN FUEL POWERED VEHICLE





LAYOUT





LAYOUT



Fuel cell vehicles with onboard processors present several issues:

- The vehicles do not have zero emissions.
- **Reformed hydrogen is not pure**, and therefore decreases the fuel cell's efficiency.
- **Onboard reforming increases the complexity, size, weight**, and cost of the entire system.
- The long-term effects of fuel impurities on the fuel cell stack.



FCV's



Vehicle	Production
Toyota Mirai	2015 - present
Honda Clarity	2016 - present
Hyundai Tucson Fuel Cell	2014 - present

\$49,500





COMPONENTS



- Battery
- Fuel stack
- Electric motor
- Boost converter
- Power control unit
- Hydrogen Tank



CONSTRUCTION



- The **hydrogen tank** is placed at the **rear of the vehicle** and the hydrogen tank is connected to the fuel opening of the fuel cell.
- The fuel cell **produced electricity** is send to the **booster** and from there it is send to the electric motor.
- Battery is connected for the purpose of **initial running condition**.
- Power control unit controls all the **operation of the vehicle**.
- The charging is also done side by side.



WORKING



- The initial running of the car is achieved by the use of battery.
- After sometimes the fuel cell starts working for running a car .
- The Hydrogen fuel is introduced to fuel cell, there the chemical reaction takes place and hence the electricity is produced.
- The produced electricity is transferred to the electrical motor to the wheels.
- The Boost converter is used in between the fuel cell and electric motor line to boost up the current.
- The power control unit takes full control of the car working.



VERY LOW LOAD CONDITION



- In very low load condition the car is operated by the use of battery.
- The fuel cell remains stationary at the time of very low load condition.
- The Starting of the vehicle is not possible to operate with the fuel cell.
- The Charging of battery is not done in this stage.



LOW LOAD CONDITION



- In low load condition the car is operated by the use of Fuel cell.
- The Battery remains stationary at the time of very low load condition.
- The vehicle is powered completely by fuel cell at low load condition.
- The Charging of battery is done in this stage.



HIGH LOAD CONDITION



- In high load condition the car is operated by the use of both fuel cell and battery.
- The vehicle requires more power at high load condition so both the battery and fuel cell will power the energy.
- The Charging of battery is not done in this stage.



ADVANTAGES



- Fuel cells have a higher efficiency than diesel or gas engines.
- Silent in Operation.
- Fuel cells can eliminate pollution.
- Fuel cells do not need conventional fuels such as oil or gas etc.



DISADVANTAGES



- There is a chance of explosions.
- On-board storage is a major issue, as hydrogen tank would currently be too large for a car.
- It is a very flammable gas (think of the Hindenburg), which further adds to the on-board storage problems.



HYDROGEN POWERED VEHICLES



- 2007 - Honda FCX Clarity - hydrogen fuel cell
- 2010 - Mercedes-Benz F-Cell
- 2014 - Hyundai Tucson FCEV
- 2015 - Toyota Mirai - production version of the FCV concept car
- 2016 - River simple Rasa
- 2016 - Honda Clarity Fuel Cell



CONCLUSION



- The use of fuel cell is a growing renewable source for automotive application.
- The production of Hydrogen fuel car is increasing day by day in the world.
- In India the **use of hydrogen fuel car is in developing stage.**
- In future the use of fuel cell will increase more and more.



REFERENCE



➤ <https://www.youtube.com/watch?v=LSxPkyZOU7E>



THANK YOU !!!