

A Review on Future Applications of Hydrogen Technology

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Abstract: Today, we employ petrol, diesel engines, and electric cars for transportation. As a result, there is increased air pollution, hence in order to stop it, Pick transportation technology that is completely pollution-free and sustainable. One of the best technologies to combat this issue is hydrogen technology. We have seen that the quality of life in the modern world is deteriorating. Since it is impossible to stop climate change, research organisations are developing alternative energy sources that can power automobiles without emitting pollutants. The current situation is focused on EV (Electric Vehicle) or CNG technology, for example. However, the use of these technologies and their energy supply is constrained and not environmentally friendly. Transportation that is completely pollution-free is necessary, as well as readily available electricity and hydrogen fuel cells.

Keywords: Hydrogen Tecnology ,Hydrogen Engine ,Hydrogen fuel cell.

I. INTRODUCTION

The ability to move about and access goods and services, as well as to move around, makes life easier. Until now, we have relied on cars, buses, and ships for transportation.

aircraft, etc., and these release additional harmful gases. Vehicles release air pollutants into the environment, including carbon monoxide, nitrogen oxides, particulate matter, and volatile organic compounds. This explains why approximately 181,000 deaths worldwide are considered to be of a very mature nature, accounting for roughly half of all deaths. Utilising hydrogen technologies to prevent and reduce global emissions

A) hydrogen engine, B) A hydrogen fuel

Cavendish made the discovery of hydrogen in 1766, and it is now the first element on the periodic table. Since hydrogen is the element that is most abundant worldwide, it is necessary for live. The most explosive gas, hydrogen is also the lightest.

When hydrogen and oxygen combine, energy is created that can be used to create heat or electricity. We regulate the emission of transportation, energy, and other sources with the use of hydrogen fuel cells or hydrogen engines.

The majority of businesses, including Toyota, GE Aviation, Yamaha, Reliance Industry, etc., are currently working on hydrogen technology.

II. HYDROGEN CHEMICAL SEPARATION AND COLLABORATION

In comparison to petrol, diesel, compressed natural gas, etc., hydrogen has a high calorific value. Hydrogen has a calorific value of 120 to 140 MJ/kg and is widely available in the environment.

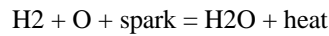
It is the least dense and most explosive gas. When hydrogen and oxygen combine, energy is created that can be used to create heat or electricity.

Heat Generation:-

Hydrogen combustion in an engine is nothing more than the production of heat using hydrogen gas. Like gasoline engines, hydrogen engines function similarly. when hydrogen and air are combined,

There is a spark generator next to the combustion chamber, which causes hydrogen and oxygen to react, resulting in an explosion.

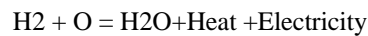
Rocket engines also use technology based on hydrogen. The interaction between hydrogen and oxygen produces thrust for rocket engines.



Electricity Generation:-

Everyone is familiar with the lithium-ion batteries used in electric vehicles. However, lithium has significant drawbacks. After a certain number of kilometres, it discharges, and we must re-charge them, and the charging process takes too long, therefore our next excursion is restarted. However, hydrogen fuel cells recharge quickly, taking just a few seconds to refill $\text{H}_2 + 2\text{e}$.

The hydrogen gas atom is divided into a proton and an electron when it passes between anode sheets. Electrolyte sheet structure is such that it only permits proton flow from cathode to anode or from anode to cathode. When the load is applied, electrons move through the load, creating potential differences in the load that lead to the production of electricity.



III. HYDROGEN CELL

Why is using a hydrogen fuel cell necessary?

Lithium-ion batteries are utilised in electric vehicles (EVs), which are the rage right now. Everyone believes lithium. Everyone believes that pollution isn't a problem because of lithium-ion batteries or cells, but this is untrue. Lithium ion cells need electricity to charge, and thermal power plants are the source of the harmful gases that affect both the environment and people. We also mention that renewable energy can be used to produce electricity, but that it also has some limitations. So that you are aware of the hydrogen fuel cell as the future of energy. This hydrogen fuel cell is highly efficient, cost-effective, and environmentally benign.

What process of chemistry powers hydrogen fuel cell technology?

The development of hydrogen fuel cells is depicted in the figure showing one electrolyte separation membrane, two electrodes, one of which is an anode and one of which is a cathode. The anode electrode is supplied with hydrogen gas.

Protons and electrons are separated from hydrogen atoms. Through the electrolyte separation membrane, proton is moving.

Hydrogen Engine:

Due to pollution and climate change, transportation is becoming more and more commonplace. Diesel engines produce a lot of gases each year, including 4.6 metric tonnes of carbon dioxide, which depletes the ozone layer and raises global temperatures by about 1 to 2 degrees each year. These toxic gases also have negative effects on human health, such as asthma and breathing issues, so we must switch to hydrogen energy to solve all of these issues. Because a hydrogen engine produces steam, or hot water, instead of harmful gases,

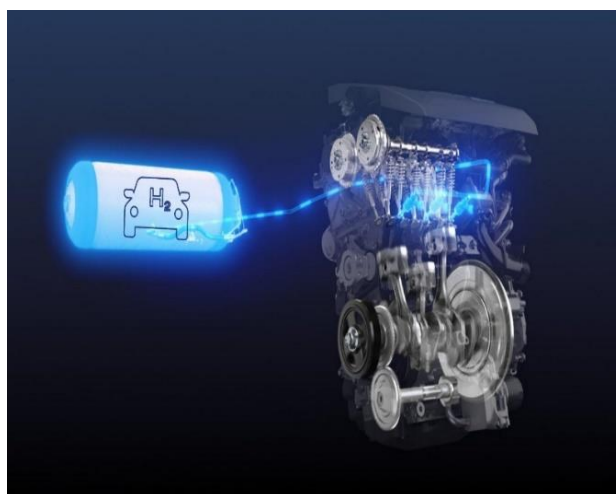


Fig. 1. Hydrogen engine

Working of hydrogen engine?

- A. The operation of a hydrogen engine is comparable to that of a four-stroke gasoline engine. The first stroke of a hydrogen engine is suction, followed by second stroke compression, third stroke expansion, and fourth stroke exhaust.
- B. When the inlet valve opens and the pistons descend, a mixture of clean air and hydrogen is drawn into the cylinders.
- C. The space above the piston is sealed off when the inlet valve closes. Compression of the hydrogen and air is caused by the piston rising. After compression, the spark plug starts a spark, which results in the power output.
- D. Due to the explosion of H₂ gas in the power stroke, both the inlet and exhaust valves are closed, and the pistons travel downward.
- E. Because hydrogen combines with oxygen to form steam, the process of generating electricity in a hydrogen engine doesn't produce any poisonous gases.

H₂ + Air + spark → H₂O + explosion + Other gas

F. During the exhaust stroke, steam and other gases are discharged into the atmosphere from the combustion chamber. The exhaust stroke, which is the last one, happens when the intake and exhaust valves are both closed. Steam from the exhaust is released into the atmosphere via piston movement.

IV. CONCLUSION

1) HYALURON TECHNOLOGY GLOBAL GROWTH:

To fulfil its goal to eliminate hazardous gases to the environment, India altered its energy system. The best option to reduce pollution is hydrogen technology or hydrogen fuel cells. Low carbon emissions from hydrogen fuel and a lack of viable carbon emission reduction techniques.

2) HYDROGEN INFRASTRUCTURE SETUP:

The Indian government is embracing hydrogen fuel cell technology and supporting the establishment of new hydrogen infrastructure. Because hydrogen gas is cheap, accessible, and emission-free, plants.

3) HYDROGEN SAFETY AND STANDARDS:

Because hydrogen is the most combustible gas in the atmosphere, managing it safely is of utmost importance. For this reason, operating hydrogen facilities requires experienced engineers

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