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COMPLETE CONTROL COMMUNIQUÉ

Your local guide to building automation

WHAT'S IN THIS ISSUE

WHAT IS HYDROGEN ENERGY?

Hydrogen is the most abundant element in the universe and has the highest energy content by weight, which makes it a very attractive form of energy. Because of its highly reactive state, Hydrogen is found only naturally on Earth as pairs with other elements, like hydrocarbons and water (H_2O). For that reason, Hydrogen must first be extracted from other sources to be used as an energy carrier, like electricity.

HYDROGEN PRODUCTION: THERMAL PROCESS

There are many different ways to produce Hydrogen to make into energy. One way is to extract it from

hydrocarbon fuels like diesel, natural gas, and coal through steam reforming. Although this currently accounts for most of the hydrogen that is produced, the process ends up emitting tons of CO_2 into the atmosphere, which can seem counterproductive. Instead, there is a more appealing and exciting type of Hydrogen production know as Green Hydrogen Energy.

GREEN HYDROGEN ENERGY

Another way to make hydrogen is by extracting it from from water through a process known as electrolysis. This process is 100% carbon-free, and only has O_2 gas as a byproduct. The resulting gas can be used in industries that use Oxygen, like the steel and cement industries. In addition, the heat produced by the reaction could be used to heat the homes of the surrounding districts.

In order to perform electrolysis, you need a large input of energy. In steam reforming, this is thermal energy, but the great thing about electrolysis is that its source is renewable energy.

HOW TO USE HYDROGEN ENERGY

In order make use of Hydrogen's energy carrier abilities, you must use a fuel cell. A fuel cell does the opposite reaction of electrolysis: it combines oxygen and hydrogen to create energy and water vapor.

First, H+ that has been extracted from water through electrolysis (usually powered by solar panels or windmills) are loaded into the fuel cells. The electrolysis process is endothermic as it requires a large input of energy; therefore, the reverse of this reaction is required to produce energy.

This is where the magic happens. This reaction is reversed as H_2 separates into H+ ions and electrons with the help of a Palladium catalyst. The ions travel across a Polymer

REFERENCES

1. Hydrogen Explained
2. Making the Move to Green Hydrogen
3. Hydrogen Fuel Basics
4. Hydrogen Production: Electrolysis
5. What Is Green Hydrogen And Will It Power The Future?
6. The Hydrogen fuel cell explained, clean energy

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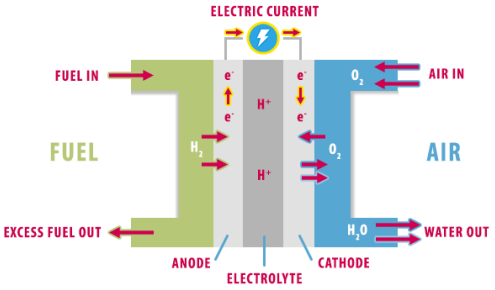
Electrolyte Membrane (PEM), while the electrons flow through the electric current in the fuel cell. Finally, H+ ions combine with the O_2, finishing off the Exothermic reaction with only water as a byproduct. Being an exothermic reaction, this process releases lots of energy used to power whatever machine it's hooked up to (i.e. a car).

HYDROGEN FUEL CELL



Source: KEB America, Auxiliary inverter solutions for fuel cell vehicle turbo compressor applications. Click diagram to open in a new tab.

WHY USE GREEN HYDROGEN ENERGY

Green Hydrogen Energy offers a wonderful solution to the current carbon-emission crisis. With the demand for energy increasing every year, more and more coal, natural gas, and oil needs to be harvested to keep up. The process of turning these ingredients into useful energy leaves our atmosphere chockfull of CO_2 and other green house gases (GHG).This system needs to change in order to provide a better Earth for future generations. Whether you believe in climate change or not, it is clear that clean hydrogen energy is an extremely good option for future clean energy. Once it becomes readily accessible to the masses, Hydrogen

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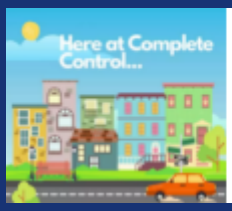

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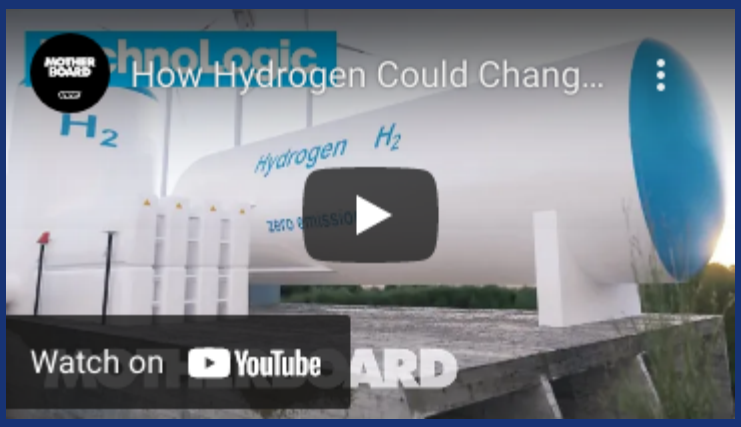
HOW HYDROGEN COULD CHANGE THE ENERGY GAME- MOTHERBOARD



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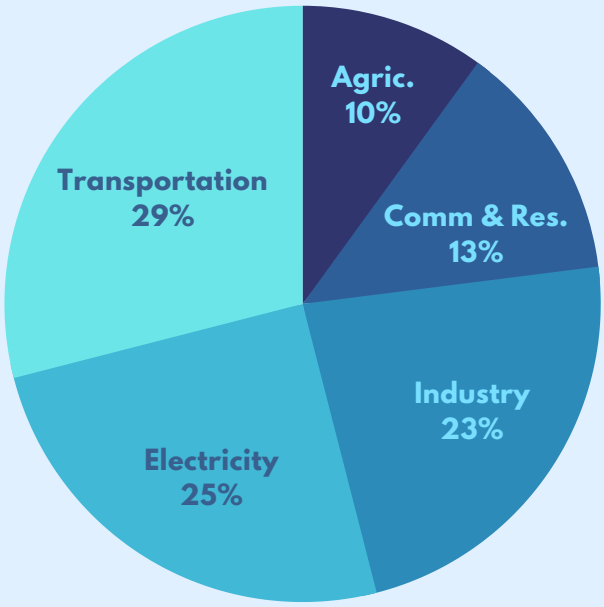
energy will change the world; there's no doubt about it. Motherboard's video, which can be found attached to the left, is a great example of the future of Green Hydrogen, as well as presenting some problems it currently possess in its journey to become a worldwide source of energy.

TOTAL U.S. GHG EMISSIONS BY ECONOMIC SECTOR IN 2019



Source: United States Environmental Protection Agency

Even if Green Hydrogen Energy was only implemented to attack GHG emissions for transportation, it would make an incredible start in creating a net zero world.

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