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Did You Know ?

The First Hydrogen Fuel Cell Vehicle was Created in 1966

Clean energy technology has evolved by leaps and bounds since General Motors first introduced their Hydrogen Fuel Cell Electrovan

Electrification of Transportation

The Electrovan from General Motors is generally considered to be the first use of a hydrogen fuel cell to power a vehicle. The ground-breaking design used a fuel cell that combined super-cooled liquid hydrogen and liquid oxygen. This early prototype began the technology evolution leading to today's new generation of hydrogen-powered vehicles, powered by fuel cells using pressurized hydrogen combined with native oxygen from ambient air sources.

These new-generation hydrogen fuel cells are accelerating the use of clean energy in transportation. To protect the environment, the world is converging around the same conclusion: Transportation in the long run should be electric. Electric vehicles can be powered by batteries, fuel cells or a combination of both. Batteries today are mature technology and are expanding in their reach. However, if and when all vehicles go electric, today's batteries will run into natural resource limitations in terms of materials such as Cobalt. Relying on battery power alone also has range limitations, as batteries require periodic recharging at stationary charging locations.

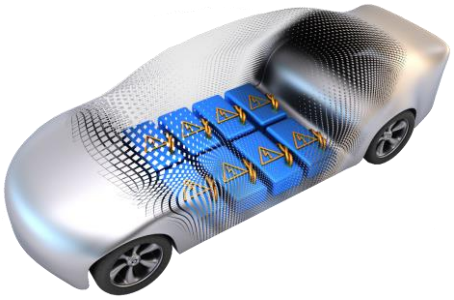

Figure 1 - Electric Vehicles are Growing in Popularity

Fuel cells essentially convert the potential energy of a fuel into electricity by means of an electrochemical reaction of hydrogen fuel with an oxidizing agent. It is very similar to a battery, wherein an electrochemical reaction arises as long as fuel is available. Pressurized hydrogen is combined with oxygen from the air, with no harmful emissions like sulfur, nitrogen oxides, and ozone, and with only water as a by-product.

Hydrogen fuel cell technology may turn out to be one of the most significant fast-growing areas for zero-emission energy systems. With the acceleration of technological innovation, fuel cells are well-poised to be the most efficient and environmentally-friendly form of alternative energy generation, not only for vehicles but also for industry and households.

Evolution of the Fuel Cell Market

According to Grand View Research, the global fuel cell market is projected to grow at 20.9% CAGR to reach $24.81 billion USD by 2025. The combination of international pressures pushing for the adoption of alternative energy and the projected operating cost improvements in hydrogen fuel cells is expected to further tip the balance away from traditional fossil fuels. The availability of hydrogen fueling infrastructure also will be key to influencing widespread consumer adoption.

Fuel cell market evolution is expected to leverage high-payback applications first, such as heavy cars like today's hybrid cars and Sport Utility Vehicles, public transportation applications (trains, buses, etc.) and stationary fuel generation (power plants), with the technology migrating into smaller private vehicle applications as the costs come down. Especially for heavier vehicles, the power source should be compact and lightweight— for these applications, fuel cells have a large advantage. In addition, the combination of fuel cells and batteries holds promise for significantly extending the driving range of vehicles, as the fuel cells can recharge batteries while on the move.

Fuel Cell Architectures

Fuel cell architectures span a range of designs that use various fuel sources, the most common ones being Solid Oxide Fuel Cells (SOFCs) and Proton Exchange Membrane Fuel Cells (PEMFCs). Per Grand View Research, PEMFCs, which use hydrogen fuel, accounted for over 76% of the units shipped in the United States in 2016. PEMFCs are versatile, being suitable for portable, stationary as well as transportation end applications. Being compact, they are considered the prime candidate for vehicle and portable applications.

Bipolar Plates – At the Heart of the Energy Generation Process

One of the most critical elements in PEMFCs are the Fuel Cell Bipolar Plates which distribute hydrogen and air, conduct electrical current from cell to cell, and remove heat from the active area, while avoiding leakage of gases or coolant. Multiple bipolar plates are combined within the PEMFC to provide the required level of electrical energy production, in much the same way that the cells in a battery collectively combine to deliver specified output levels.

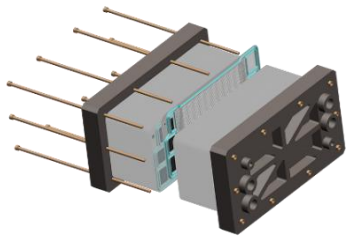

Figure 2 - Multiple Bipolar Plates Combined within the PEMFC

PEMFCs are projected to be an important factor in the conversion of fossil fuel transportation to greener and more sustainable energy sources. Fuel cell manufacturers will need to partner with reliable specialists that can deliver high-quality bipolar plates within tight specifications, in the large quantities required. A vertically integrated solutions provider is key to achieving this cost effectively; one that can assure tight control over the entire production process, from initial design through metal stamping, welding and overmolding of gaskets, to final testing and Quality Assurance sampling.

For more information, download our Fuel Cell Bipolar Plates brochure or email us at communications@interplex.com.