Fuel-Cell Vehicles
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Photo: Bruce Whitaker
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Smaller fuel cells and high-pressure fuel tanks move fuel-cell vehicles closer to reality.

Nissan, DaimlerChrysler, General Motors and Ford had their latest fuel-cell vehicles at Challenge Bibendum to demonstrate the progress being made in the hydrogen-powered segment of the future of sustained mobility, including smaller fuel cells, more compact lithium-ion batteries and high-pressure hydrogen storage to improve driving range.

An environmentally friendly alternative power source for vehicles, fuel cells use hydrogen to efficiently produce electricity without producing any harmful emissions—the only by-product of the process is water. Hydrogen is a renewable resource that can be obtained from many sources and can be produced by many methods.

The 2005 Nissan X-Trail FCV features a new Nissan-developed fuel cell that is almost 60 percent smaller than the one in the previous 2003 X-Trail FCV, but with the capacity to generate 90 kW of power—which is a 40 percent increase over the previous fuel cell.


Nissan had two X-Trail FCVs at Bibendum, including one with expanded storage volume for hydrogen in the same amount of space, with a high-pressure tank that stores hydrogen at 700 bar (10,000 psi). The expanded fuel storage increases the Trail FCV's range to 500 kilometers (310 miles).

DaimlerChrysler brought four fuel-cell vehicles to Bibendum: two A-Class "F-Cell" vehicles, a B-Class "F-Cell" cutaway, and a Mercedes-Benz Citaro bus with a fuel-cell drive system. More than 100 Mercedes-Benz cars, buses and vans with fuel-cell technology are being tested around the world, including 30 fuel-cell buses in the public transportation systems of ten European cities, as well as Perth, Australia, and Beijing, China.

One of the A-Class "F-Cell" vehicles is equipped with a 700 bar (10,000 psi) hydrogen storage tank to increase the driving

range to about 400 km (248 miles). The B-Class "F-Cell" cutaway shows the development of next-step technology for the fuel cell in conjunction with Ballard Power Systems, a leader in the development of proton exchange membrane fuel cells, and includes a hydrogen recirculation system for the next series of fuel-cell vehicles that may be on the road in the next 2-3 years for testing.

Other fuel-cell vehicles at this year's event included General Motors' latest Opel Zafira HydroGen3 with a 60 kW/82 horsepower electric motor that has set a number of endurance records for fuel-cell vehicles. Ford entered the Focus FCV and Tongi University from China had two Santana 3000 fuel-cell vehicles at the event.

Driving a Fuel-Cell Vehicle

MSN Autos had the opportunity to drive the 2005 Nissan X-Trail FCV at Challenge Bibendum, which demonstrated how far fuel-cell vehicles have progressed since the first time we drove one about five years ago. The experience was very similar to driving any other vehicle except that it was very quiet—because of the electric motor—and it was right-hand drive.

We sat in the driver's seat expecting specific, special instructions needed to drive such a high-tech one-of-a-kind vehicle. Since it was already running, the only instructions given were to move the transmission selector to Drive and release the brake. Go figure.

The biggest adjustment while driving the X-Trail FCV was being aware that pedestrians may not hear the vehicle coming due to its quiet operation. The electric motor provides quick response with a lot of torque on tap, so the driving experience is much like many current production cars. The use of thin, laminated cell lithium-ion batteries reduces the system's intrusion into the vehicle's interior.

In contrast, when we drove a fuel-cell vehicle just five years ago, much of the rear cargo area was taken up with system and monitoring equipment, while our co-driver was busy in the passenger seat monitoring instruments and computers. That vehicle also made a number of strange sounds unlike, the smooth, silent current X-Trail FCV.

Developing a Fueling Infrastructure

One of the big challenges facing hydrogen fuel-cell vehicles as a viable alternative mode of transportation is the development of an infrastructure for safe, convenient refueling.

The California Fuel Cell Partnership (CaFCP) is a collaboration of more than 30 member companies who are working together to promote the commercialization of hydrogen fuel-cell vehicles.

Through the CaFCP, auto manufacturers, energy suppliers, technology companies and government agencies are all working together to thoroughly investigate all possible fueling options, and to test them in real-world conditions.

For fuel-cell vehicles to be successful, they will also need a convenient, safe fueling system. More than 20 hydrogen fueling stations are in currently in operation in California, and CaFCP members continue to plan and build more fueling stations for fuel-cell vehicles.

"[The fuel-cell market] is tremendously competitive and the automakers are all working very hard to beat each other and to have the best fuel-cell vehicle and that is very important," said Catherine Dunwoody, executive director of CaFCP. "But there are a number of areas where they do need to cooperate. No one company can do this on their own, so the fueling infrastructure, working with the energy industry to be sure the fuel is available, and educating customers and the public about the technology [are also important]."