



LOWERING BARRIERS TO HYDROGEN FUEL CELL VEHICLE ADOPTION

THE CHALLENGE

Hydrogen fuel cell vehicles offer an alternative to gasoline-powered vehicles, electric vehicles, or hybrids.

Hydrogen fuel cell vehicles have electric motors but are fueled by hydrogen. The hydrogen mixes with oxygen to create electricity inside the fuel cell to power the motor. The only byproduct is water, which is released from the vehicle like emissions from a gasoline car's tailpipe.

Compared with typical plug-in cars that travel about 100 to 370 miles on a single charge, fuel cell vehicles promise 300 to 400 miles per fill-up.

Despite this promise, widespread adoption of this technology has been limited. One of the major hurdles has been the lack of an extensive network of hydrogen fueling stations. At the start of 2020, there were only 61 public and private hydrogen stations in the U.S. This is in large part due to the high cost of deploying and operating a hydrogen refueling station.

THE PIVOTAL DISCOVERY

Any technological advances that make it more economical to operate a hydrogen refueling station make it more attractive to would-be operators, thus contributing to a larger network of fueling stations. Such advances could also lower hydrogen costs paid by fuel cell vehicle customers.

The compressors that supply the hydrogen at refueling stations operate inefficiently — they are oversized to meet demand during peak fueling hours, but during off-peak hours, they remain mostly idle, operating well below full capacity. This fluctuating demand changes the dispensing pressure of hydrogen, eventually leading to lower throughput.

Researchers at the U.S. Department of Energy's Argonne National Laboratory have addressed this issue by targeting the pressure in the compressor. The solution is a "pressure consolidation" technology, which increases the fueling capacity of the compressor by supplying a high stream of hydrogen.

THE IMPACT

- The technology proportionally increases the efficiency of the compressor. With this higher throughput, there is a 20% increase in fuel transfer which, in turn, lowers equipment costs by 30%.
- The technology was licensed to compressor manufacturer PDC Machines (Warminster, Pa.), which has integrated it into PDC's hydrogen fueling systems and is commercializing it in the U.S. and abroad.
- PDC is expanding its manufacturing facilities, adding domestic clean manufacturing jobs, and increasing U.S. exports.

CONTACT

Argonne National Laboratory
9700 South Cass Avenue
Lemont, Illinois 60439
Phone: 630-252-2000
www.anl.gov/partners