Replacing Gasoline with Hydrogen Nanobubbles

14-JAN-2010

It is widely recognized that hydrogen provides a completely pollution-free fuel. Until now no practical method has been devised to carry hydrogen aboard an aircraft or in a motorcar. This is so because as a gas it is too bulky under ordinary conditions while confinement under pressure requires containers that are too heavy.

The invention of a new liquid fuel consisting of a dispersion of hydrogen nanobubbles in water solves this problem. The hydrogen nanobubble dispersion (HND) can be carried in a normal fuel tank and can be used as a direct replacement of gasoline in conventional engines. The vehicle range per gallon of HND is the same as that for gasoline. In addition there is a saving in weight by a factor two because of the lower density of HND; this aspect is of particular benefit in the case of aircraft fuel.

The only emission into the environment is water vapor. The need for petroleum is eliminated. The cost of converting hydrogen to HND amounts to 1.2% in terms of the energy content of the hydrogen used.

The device creates nanometer-scale water bubbles filled with hydrogen gas. At this scale, surface tension can maintain the gas within a bubble at very high pressure, about equal to 43,500 pounds per square inch (3,000 atmospheres) inside the bubble. The smallness of such bubbles confers on them stability against gravitational aggregation and merging. The fluid is expected to be stored, distributed and handled like gasoline.

Existing hydrogen storage systems store hydrogen in high-pressure cylinders at about 3,600 pounds per square inch pressure (about 250 atmospheres).

Some research labs are exploring very high-pressure storage at about 12,000 pounds per square inch (about 800 atmospheres).

HCE reports that hydrogen stored in the form created by its proprietary device and process is expected to have a volumetric energy density (higher heating value) from about 24 to 29 megajoules per liter. The stated range is attributable to uncertainties in compressibility and small-scale cohesion factors. This compares favorably with the energy density for gasoline at about 26 to 31 megajoules per liter. The process is expected to have application to other high value gases made more usable in such a storage medium, such as natural gas a.k.a. methane and propane.

More about HCE, LLC at www.hceco.com.
Inquiries should be directed to:

Louis Ventre, Jr.
Executive VP and General Counsel
HCE, LLC
2483 Oakton Hills Dr.
Oakton, VA 22124-1530
Direct Line 703-242-1247
email: ventre@hceco.com