Are Advancements Robust Enough to Deliver on Hydrogen's Immense Potential?

The need for 'green' power and fuel efficiency is motivating the energy community to investigate hydrogen as a compelling alternative fuel. While hydrogen continues to pose significant challenges in terms of commercial production, storage and transportation, the market is rapidly evolving with diverse production and storage technologies, which are at different stages of commercial development.

Hydrogen is being regarded as a promising candidate to replace conventional hydrocarbon fuels in the long run. As researchers strive to solve inherent problems of hydrogen production and storage, the energy community is eagerly awaiting the commercialisation of this novel energy carrier.

Currently, hydrogen could be produced by three methods – thermo-chemical, electrolysis and photochemical reactions, depending on the sources used for generation of hydrogen. Among various hydrogen storage methods presently in use are compressed and gaseous hydrogen storage, metal hydride hydrogen storage, slurry based chemical hydride storage and sodium borohydride hydrogen storage.

"Every hydrogen production and storage technology has a role to play in helping the energy community to inch towards this commercial production of green power," notes Frost & Sullivan Technical Insights Analyst Viswanathan Krishnan. "The market is big enough to accommodate many players in this segment."

Positive signs abound with methanol or steam reforming and electrolysis technologies having developed complete commercial systems for hydrogen production for industrial uses. Reinforcing this trend has been the emergence of compressed or gaseous hydrogen storage and metal hydride hydrogen storage as some of the commercialised technologies in hydrogen storage.

Hectic activity is ongoing as hydrogen production using solar power, biomass, oxidative reforming of ethanol over platinum catalysts, solid state reactions, bacterial hydrogen production, PEM electrolysis for back-up power and other applications are being considered for their commercial potential. At the same time, chemical hydride based hydrogen storage, carbon nanotube hydrogen storage, boron nitride hydrogen storage and nanoporous materials storage exhibit prospects for commercialisation.

A key challenge for the future centres on achieving cost competitiveness in relation to conventional fuels. "The anticipated cost reduction in the hydrogen technologies coupled with the developments in the fuel cells would decide the pace of commercialisation of hydrogen technologies," says Mr. Krishnan. " Research activities would add a new dimension towards the commercialisation of these technologies"

The potential application base of hydrogen is projected to be wide and varied. From powering homes, industries, laptops, cell phones and back power applications to personal transport and mass transportation, hydrogen has immense potential. When deployed in conjunction with a fuel cell, hydrogen could provide unlimited power, making it much sought after fuel for military applications. Prospective uses in a military setting include flight line tow tractors, mobile command centres, tactical wheeled vehicles and personal transportation at base operations.

Apart from numerous high-end military applications, hydrogen could be generated on board in a vehicle and supplied along with the conventional fuel to the combustion engine. This is expected to effect substantial fuel savings and efficiency. With the development of hydrogen infrastructure, it is set to find widespread use in fuelling stations for powering vehicles.

"The day is not too far for a green fuel like hydrogen to conquer the conventional hydrocarbon fuel, as we are forced to find an alternative and a long lasting fuel in terms of efficiency and low emissions", concludes Mr.Krishnan.

Source: Technical Insights