Innovative and Cost-Competitive Hydrogen Storage Systems

by Ingo Stefan and Angelika Frantsits, Magna Steyr Fahrzeugtechnik, Austria

Hydrogen Storage Systems for Automotive Application (StorHy) is an Integrated Project sponsored by the European Union in its sixth Framework Programme. The StorHy consortium includes 34 companies and institutes from 13 European countries and is coordinated by Magna Steyr in Austria.

Alternative fuels and powertrain solutions are among the biggest challenges facing the future automotive industry. Several well-to-wheel studies worldwide have shown that hydrogen has a great potential to become the future fuel for use in automotive applications. Lightweight, easy-to-integrate and safe storage systems are the major technological barriers for an introduction of hydrogen as a widely used vehicle fuel. None of the current storage technologies satisfies the requirements of vehicle manufacturers and end users. However, today’s research and development activities related to hydrogen as an energy carrier indicate that the concept of a hydrogen economy has considerably gained in credibility in recent years. StorHy is an Integrated Project funded by the European Union in its sixth Framework Programme. It is a European initiative to develop automotive hydrogen storage systems by exploring the whole spectrum of present hydrogen storage technologies, namely compressed hydrogen, cryogenic liquefied hydrogen and solid materials. Within StorHy, the leading European automotive industrial companies, hydrogen suppliers, research institutes and universities as well as European standard-certification bodies will develop innovative and cost-competitive storage solutions with the view to mass production. In total, the StorHy consortium includes 34 companies and institutes, Figure 1, from 13 European countries and is coordinated by Magna Steyr Fahrzeugtechnik AG & Co KG.

StorHy Subprojects

StorHy has an overall budget of 18.7 million euro with a requested EU contribution of 10.7 million euro. The project started in March 2004 and will end in August 2008.
The overall project is divided into six different sub-projects, Figure 2. The three vertical subprojects (SP) are SP Pressure Vessel, SP Cryogenic Storage and SP Solid Storage. They focus on in-depth research and development of the three hydrogen storage technologies. The horizontal activities SP Users, SP Safety Aspects & Requirements (SAR) and SP Evaluation will provide requirements and compare and evaluate the vertical sub-projects.

**Objective**

StorHy aims to develop attractive on-board hydrogen storage systems for all three storage technologies suitable for use in hydrogen-powered fuel cell or internal combustion engine vehicles. These storage systems must be appropriate for automotive mass production and meet commercially viable goals for costs, high energy density and durability.

General storage specifications and requirements as well as safety aspects will be elaborated in order to evaluate the different storage technologies in a harmonized way. In order to optimise resources, the activities of StorHy will be coupled to other related projects of the European Union. The final target of StorHy is to identify the most promising hydrogen storage solution for different types of vehicles. Such results should illuminate the future perspectives of hydrogen storage for mobile transport applications and assist stakeholders and decision-makers on the way to the hydrogen economy. Spin-offs for stationary applications will also be considered.

**Subproject Pressure Vessel**

The SP Pressure Vessel investigates the production of lightweight high-pressure hydrogen gas storage vessels at a pressure of 70 MPa, including all the necessary peripheral equipment, Figure 3. Research will focus on the search for liner materials as well as efficient, innovative and highly automated manufacturing processes for composite high-pressure vessels. Additional issues are the high energy density or fractional mass of hydrogen safety, on-board monitoring and recyclability. The pressure vessels have a metal or polymer liner that is used to reduce the leak rate, with appropriate bosses and valve connections in a fibre-reinforced composite structure.