

FACTS

Cooperative Research Program

Project Summary

Evaluation of Design Qualification Testing Method for Compressed Hydrogen Containment Systems

Purpose

Hydrogen fuel cell vehicles have the potential to significantly reduce energy use, harmful emissions, and world dependence on fossil fuels. Because fuel cell vehicles will be fueled with compressed hydrogen, the Safety Working Group of the SAE Technical Standards Program is defining systems-level, performance-based tests to ensure that a compressed hydrogen containment system is capable of containment throughout the service life of the vehicle and does not burst when exposed to service-terminating events such as penetration or fire.

Project Scope

This cooperative research effort studies the effects of time, temperature, humidity, tank material, liner material, and cycle number hydrogen containment vessels designed for 70 MPa (megapascal) service in order to validate proposed methods and investigate key alternatives for inclusion in SAE J2579, *Technical Information Report for Fuel Systems in Fuel Cell and Other Hydrogen Vehicles*.

Performance verification (design qualification) requires demonstration of full performance after potential cumulative exposure over a service life to anticipated roadway exposures and extremes of potential stressful service conditions. Containment without rupture or unintended discharge is expected. Testing and issues addressed include:

- The time required to conduct the gas pressure cycles in Expected Service-Life Performance Test
- The Expected Service-life Performance Test for typical Compressed Hydrogen Containment Systems

- Confirmation that container types which have experienced on-road problems in the past are detected (and rejected) by the proposed tests
- Demonstration of the Durability under Extreme Conditions and Extended Usage Test for typical Compressed Hydrogen Containment Systems

Role of SAE*Project management*

- Provide a legal framework for industry discussion, meeting space and meeting facilitation
- Develop statement of work, project milestones and schedules

Subcontract administration

- Identify key testing organizations
- Acquire proposals and bids from subcontractors
- Develop and administer contracts with all testing subcontractors; monitor deliverables and schedules

Organization of funding and fiscal management

- Budget development
- Prepare required agreements to obtain funding
- Solicit funding
- Develop proposals for and acquire government funding
- Establish escrow accounts, account for all funding, and disburse project funds as required

Evaluation of Design Qualification Testing Method for Compressed Hydrogen Containment Systems (cont'd.)

Subcontractor/Partner/Affiliate

Organizations

Project fully funded by the US Department of Energy

Powertech Labs, INC provided

- Consulting
- Lab Usage
- Procurement of components and assemblies
- Field tests
- Reporting

Final Deliverables

A presentation detailing project findings will be delivered to the SAE Fuel Cell Standards committee. A final report will include all data, test results, analysis of all test results, and conclusions will be made available to committee members including representatives from the International Organization for Standardization (ISO), American Society for Testing and Materials (ASTM), American Society of Mechanical Engineers (ASME), and the Environmental Protection Agency (EPA). Results of this work will be shared with a broader industry audience via conferences and other venues. SAE maintains a direct interface with the National Highway Traffic Safety Administration (NHTSA) ensuring results are considered for incorporation in future rule making.

Project Budget: Approximately \$ 414,000.00

Project Timeline: October 2007 – November 2008

Project Participants

Industry

Adam Opel AG
Air Liquide
Air Products & Chemicals Inc
Alion Science & Technology
American Honda Motor Co Inc
Alion Science & Technology
Battelle Memorial Institute
BMW AG
BMW of North America LLC
California Air Resources Board
CATARC
Chart Inc
Chevron Learning & Resrch Center
Chrysler LLC
Coupled Products
CSA America
CSA International
Daimler AG
Diversified Computer Engrg & Devel
Energy Conversion Devices Inc
FAB Industries
Ford Motor Co
General Hydrogen Canada Inc
General Motors Corp
GWS Solutions of Tolland LLC
Honda R&D Americas Inc
Honda R&D Co Ltd
Inergy Automotive Systems LLC
Intertek Automotive Research
Japan Automobile Research Institute
Mercedes-Benz Technology
Motor Vehicle Fire Research Institute
Millennium Cell Inc
MLH Consulting
Motor Vehicle Fire Research Institute
National Hydrogen Association
National Renewable Energy Laboratory
Next Energy Center
Nissan Motor Co Ltd
Nissan Technical Center NA Inc
Nitto Kohki Co Ltd
Ovonix Hydrogen Systems LLC
Pacific Gas & Electric Co
Parker
Powertech Labs Inc
Proteus Services Group LLC
Quantum Technologies Inc
Siemens VDO
Sion Power Corporation
Sofco-Efs Holdings LLC
Staubli
Swagelok Co
Synaptics Inc
Technology Transition Corp Ltd
Toyota Motor Co Ltd
Toyota Motor Engineering & Manufacturing
Toyota Technical Center USA Inc
US Dept of Transportation
US Fuel Cell Council
UTC Fuel Cells
Versa Power Systems
W L Gore & Associates Inc
WEH GmbH

US Government

US Department of Energy (DOE)
National Renewable Energy Laboratory Division (NREL), a facility of the US Department of Energy for renewable energy and energy efficiency research, development and deployment