Join us!

The Expert Networking Group (ENG) will gather the European automotive OEM's, HRS operators, gas companies, connector manufacturers and other related experts.

The ENG will hold several meetings during the project to discuss the activities and progress of HyTransfer and seek the input of the experts to adjust the research program and the formulation of the final recommendations.

Contact us to participate: Coordinator@HyTransfer.eu

Project Data

Duration: 06/2013-11/2015

Budget: 3.1 M€

Funding: 1.6 M€

Contract n°: FCH JU 2012-1-325277

Project Coordinator

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Figure 1 from title page: Graphical example of the validation work that was performed in preparation of HyTransfer and an example of the simulations that are going to be performed in the project. Source: JRC

This project is co-financed by the Fuel Cells and Hydrogen Joint Undertaking.

www.HyTransfer.eu

HyTransfer

Pre-Normative Research on Gaseous Hydrogen Transfer

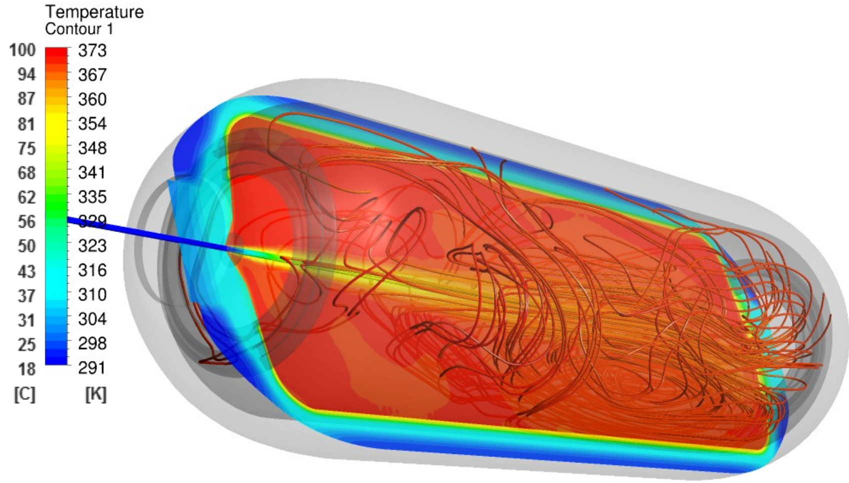

Figure 1 (explanation on last page)

What really matters: Maximum Gas Temperature or Maximum Tank Wall Temperature?

Coordination | Industry | Research & Testing | Regulations, Codes & Standards | Funding

Challenge

Hydrogen gas transfer generates heating and cooling

Transferring compressed hydrogen from an arbitrary tank A into tank B consists of emptying tank A and filling tank B. Emptying tank A cools down tank A, even excessive cooling may occur when emptying a large tank such as used for hydrogen trailers. The filling process on the other hand creates heat which can lead to overheating of tanks made of composite material. Overheating is critical for both small and large tanks in various applications such as filling transportable containers, onsite storage tanks or when refuelling vehicles.

Figure 2: Hydrogen tank, type 4 (plastic liner and composite wrapping). Source: Hexagon

Objective

Improved filling approach to be recommended to International Regulation, Codes and Standards (RCS) Bodies

The objective of the EU funded project HyTransfer is to develop and experimentally validate a refuelling approach with optimized temperature control during fast transfers of compressed hydrogen. This refuelling approach will meet the required temperature limits of the materials and takes into account both the container's and the system's thermal behaviour.

A thermodynamic model will be developed (Figure 1 on the title page shows a pre-study) and its results experimentally validated. The resulting new refuelling approach will be evaluated in the field and its benefits quantified with regard to performance, costs, and safety.

Finally, recommendations for implementation into international standards will be proposed for wide scale implementation into refuelling protocols.

Figure 3: Honda FCX Clarity refuels hydrogen, State-of-the-Art in 2007. Source: Honda

Scientific Approach

What really matters: Tank Wall Temperature

As hydrogen vehicle refuelling is the leading application, the project HyTransfer will focus on fast filling of composite tanks, as the one shown in Figure 2. There are two main parameters that can be altered to avoid overheating: the speed of transfer has to be limited or the gas has to be cooled prior to introduction. Both parameters strongly impact performance and costs.

The usual temperature limits of composite pressure tanks are -40°C to +85°C. Current regulations focus on the hydrogen itself not exceeding these temperature limits. Heat exchange between gas and plastic liner (type 4 tanks) is rather slow so HyTransfer aims to accurately predict the actual temperature of the material.

To better understand the thermal behaviour of the tanks, a thermodynamic model based on the MC Method will be developed. The results obtained with this model will then be compared to those obtained from experiments to validate its accuracy.

Figure 4: Hydrogen trailer with large storage tanks. Source: Hexagon