

The European Commission's science and knowledge service

Joint Research Centre



EU Overview on Hydrogen Fuelling

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OUTLINE

- 📌 Update European standardization for hydrogen fueling
- 📌 Pre-normative research at JRC on hydrogen fueling
- 📌 Other initiatives:
 - MetroHyVe project
 - Accidents / Incidents database

EU Standards Hydrogen Refueling



Requirement 1: **outdoor hydrogen refuelling points** to comply with **ISO/TS 20100 (withdrawn by ISO)**



Requirement 2: **fuelling algorithms** complying with the **ISO/TS 20100 (withdrawn by ISO)**



Requirement 2: **hydrogen purity** to comply with the **ISO 14687-2**



Requirement 4: Connectors to comply with the **ISO 17268**.

ISO TC197 WG24 - ISO/DIS 19880-1 Gaseous hydrogen -- Fueling stations -- Part 1: General requirements

Challenge: SAE 2601 cannot be referred to on an European legal document

ISO/TC 197 WG27 – ISO/DIS 14687 Hydrogen fuel quality — Product specification

Pre-normative activities:

- FCH JU: HyCora , EMPIR: Hydrogen, MetroHyVE

EN ISO 17268:2016

EU standards under mandate M/533
CEN TC268 WG5Deadline Dec. 2017

FprEN 17127 March 2018
Outdoor hydrogen refuelling points dispensing gaseous hydrogen and incorporating fuelling protocols

Pre-normative Activities.

- FCHJU: HyTransfer, metering protocol for HRS
- EMPIR: MetroHyVe

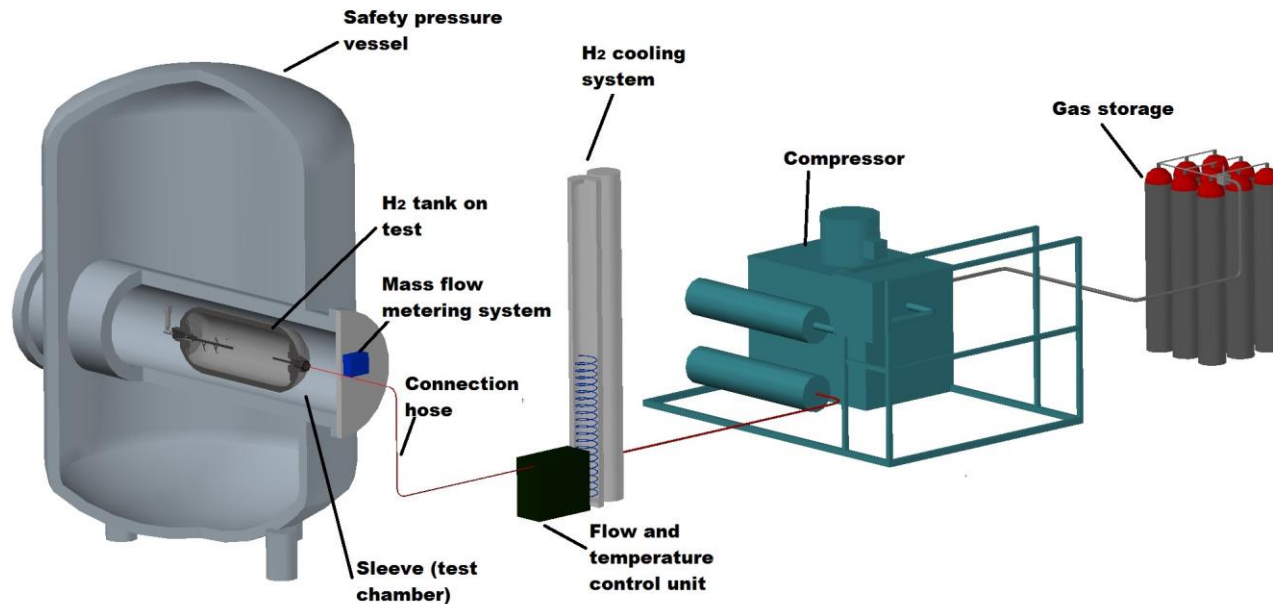
FprEN 17124:2017
Hydrogen Fuel – Product specification and Quality Assurance – PEM fuel cell applications for road vehicles

Rev. for 2019

Research on Hydrogen Refueling at the JRC

GasTeF: High Pressure Gas Testing Facility

EU reference laboratory for safety and performance assessment of high-pressure hydrogen (and natural gas) storage tanks



In 2018:

- 👍 Completed out of specification fillings and consequences to CHSS.
- 👍 Study the effect of tank volume on the refuelling performance.

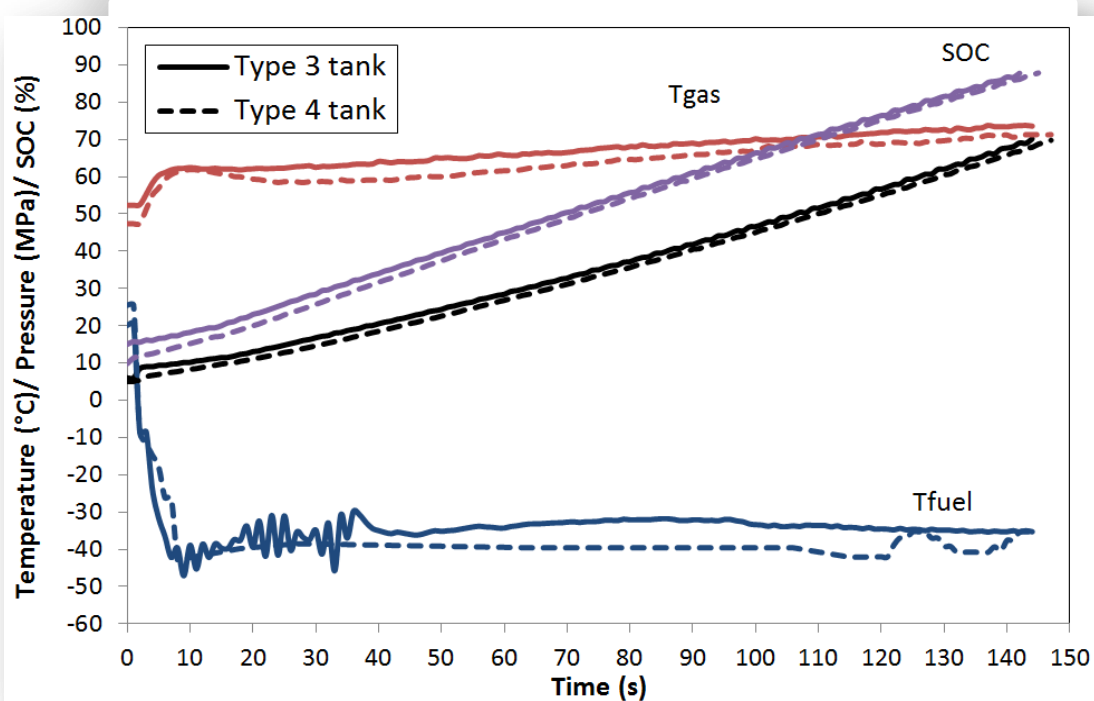
Test under cold $-40\text{ }^{\circ}\text{C}$ and hot $55\text{ }^{\circ}\text{C}$ environmental conditions.

GasTeF only public European facility able to simulate wrong operative conditions at the hydrogen refueling station

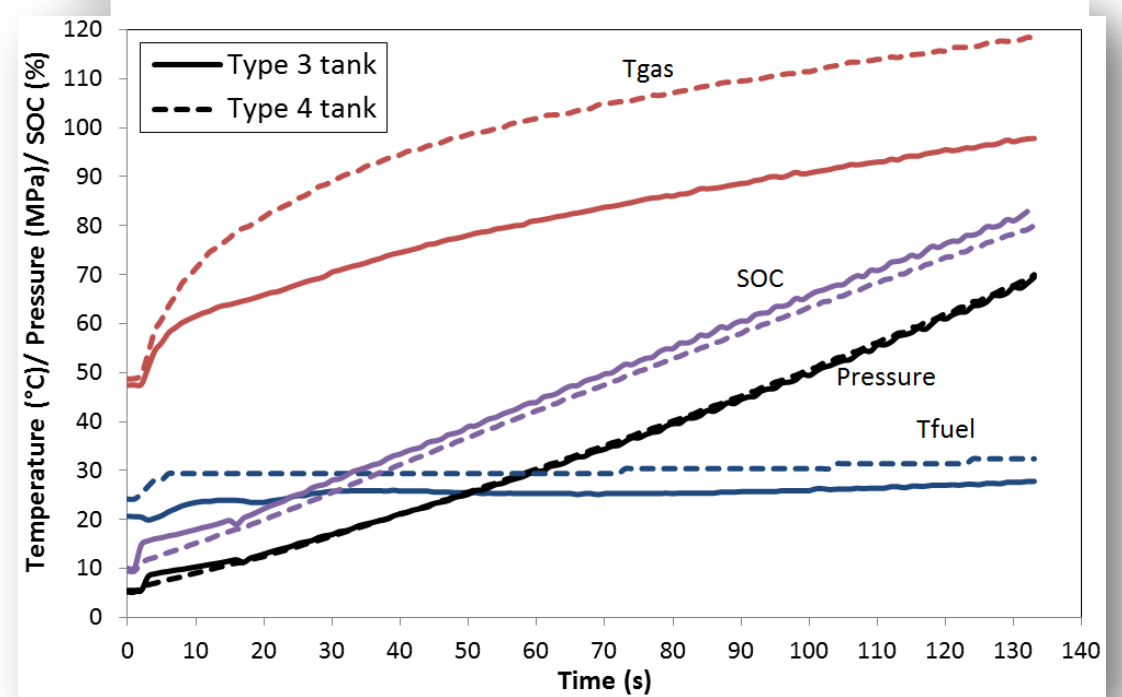
Assessment of out-of-specification during refueling of on-board tanks

Wrong input on the SAE 2601 look up tables: T_{Amb} of 50°C with -40°C input

(a) Single out-of-spec



(b) Combined out-of-spec

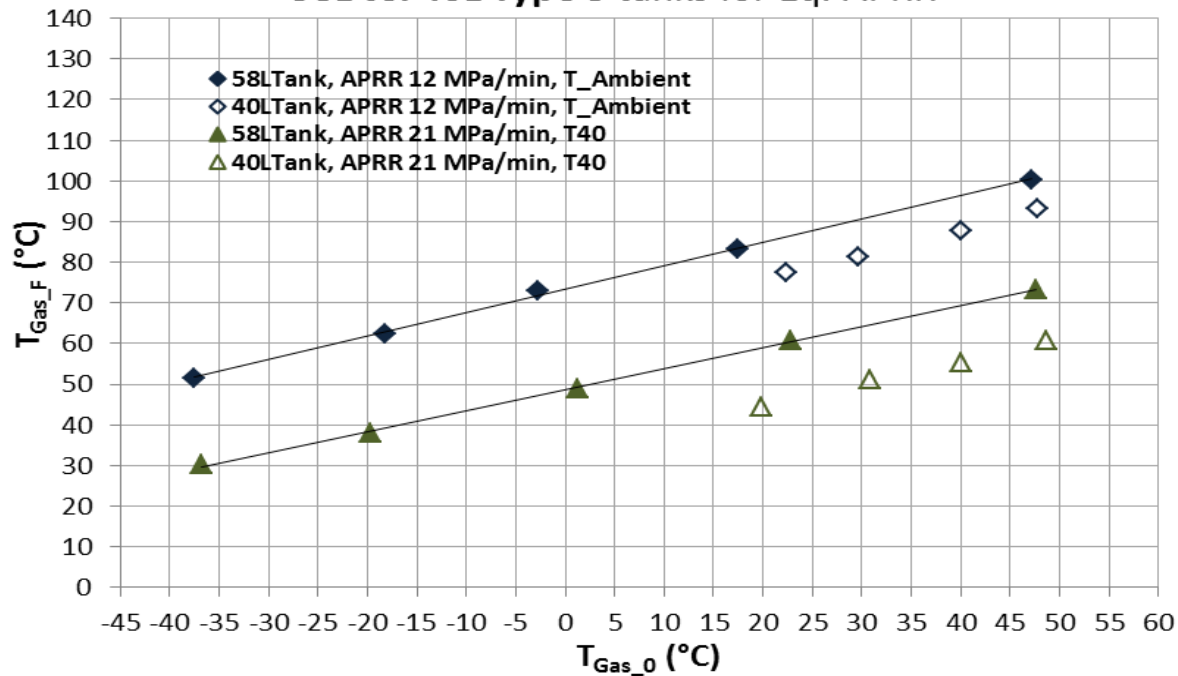


Technical failure: No cooling with a T40 table

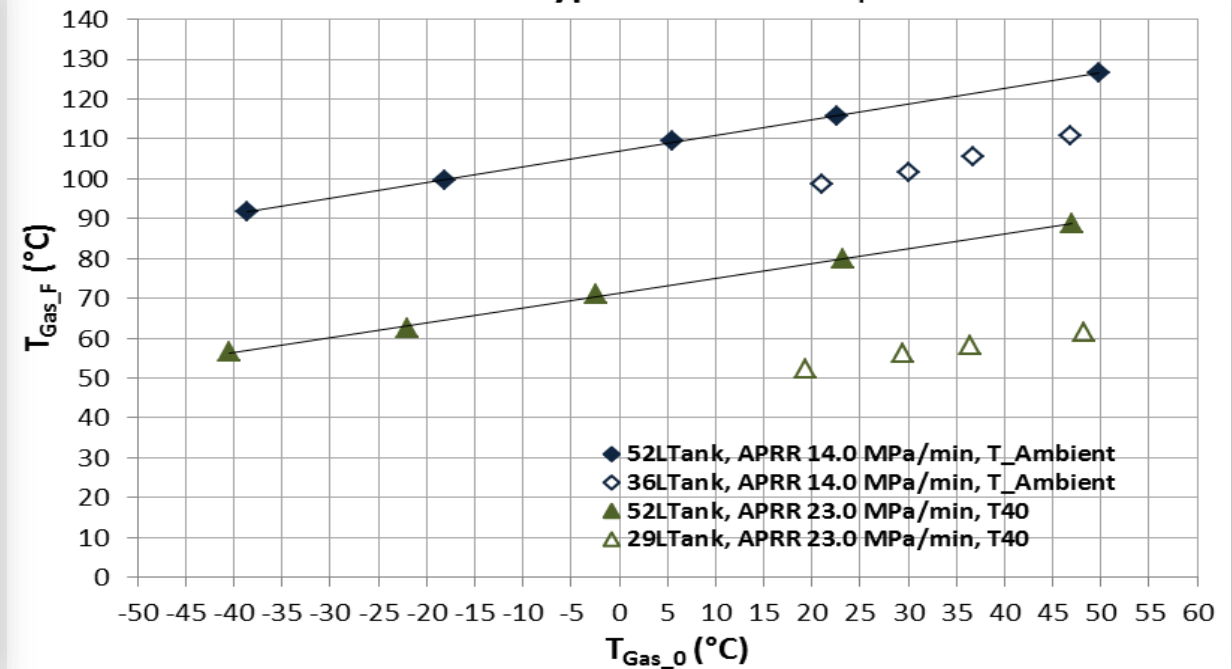
Results of out-of-specification events can be different depending on the tank type

Effect of tank volume on the final refuelling temperature

58L vs. 40L Type 3 tanks for Eq. APRR

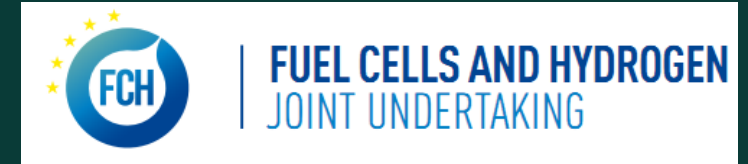


52L vs. 29L Type 4 tanks for Eq. APRR



- 👁 The lower the delivery gas temperature the higher is the effect of the tank volume. This could be explained by the bigger role played by heat transfer in these cases.
- 👁 These results suggest that the refueling protocols should consider not only the capacity of the CHSS but the inlet volume of each of the tank of the system.

Pre-normative Research Hydrogen Metering



Metering Protocol for Hydrogen Refuelling Stations

- ✓ To develop an methodology for the certification and approval of HRS as regards their ability to measure the amount of hydrogen accurately.
- ✓ Certify HRS error rate below 1.5%.
- 👉 Asks for a simplified HRS testing protocol.
- 👉 Validation testing campaign in operating HRS and a buy-in campaign from main certification/approval bodies in EU MS deploying HRS.
- 👉 Duration of ca 1 year.
- 👉 This is intended to bridge the gap between current situation and future development of a proper certification.

See Presentation "Validation of Hydrogen Testing Device in Europe"

Pre-normative Research Hydrogen Metering



EMPIR European Metrology Programme for Innovation and Research:

It is the main programme for European research on metrology. There is a focus on innovation activities to target the needs for industry and accelerate the uptake of research outputs

MetroHyVe: Started in June 2017 till 2019. Funding is 2.3 MEUR

20 partners including European National Metrology Institutes (NMIs) and industrial gas producers

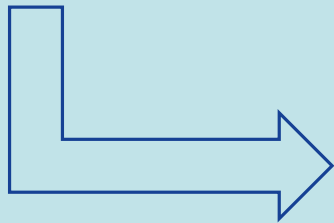


- ✦ **Flow metering** – To develop the necessary methodologies, standards and calibration facilities to allow HRSs to calibrate their hydrogen flow meters to suitable accuracy (1%) under the challenging refueling conditions. Provide recommendations to OIML136 (under revision);
- ✦ **Hydrogen quality assurance** – To develop gas analysis methods to allow measurement of all impurities specified in ISO 14687 and the delivery of primary reference gas mixtures to ensure that all of these measurements are traceable to National Standards;
- ✦ **Hydrogen quality control** – To develop online hydrogen purity analyzers capable of continuously monitoring low level impurities at the refueling station and ensuring suitable performance through robust testing and validation against primary reference gas mixtures;
- ✦ **Sampling** – To develop and disseminate best practice for sampling including suitable approaches for sampling at the station and use of correct gas vessels to ensure a representative sample of hydrogen can be delivered to the laboratory.

Hydrogen Accidents and Incidents database

Collaborative and communicative web-based information platform: repository of data defining events related, directly or indirectly, to hydrogen safety

- ✓ to assist all stakeholders in better understanding hydrogen-related undesired events
- ✓ to keep the industry updated with recent hydrogen events
 - encourage and facilitate industry partners to share experience
- ✓ to serve as an important data source for risk assessment of hydrogen applications
- ✓ to provide **safety lessons learned**





The collection of data is characterized by a significant degree of details and information about recorded events:

- physical consequences
- application chain
- causes
- ...


New HIAD versions

HIAD FP7
2003-2006

H2 events




Registration & log-in




HELLEN
2016


Project events



FUEL CELLS AND HYDROGEN
JOINT UNDERTAKING



Restricted only FCHJU



HIAD 2.0
2017

H2 events +
New H2 public
available events



Free access



<https://odin.jrc.ec.europa.eu/giada/controller?query=Select&action=Refresh>



Thanks

Any questions?

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