



Knowledge transfer to address key challenges in LH2 safety

ELVHYS Dissemination Conference

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Introduction

Effective knowledge transfer is a critical enabler of the ELVHYS project main ambition of increasing the safety of liquid hydrogen (LH₂) transfer technologies and enabling the safe deployment and scale-up of hydrogen as an energy carrier:

- Open exchange of methodologies, best practices, lessons learned, experimental data, and validated models allow stakeholders to build on existing knowledge.
- Bridge the gap between research and industrial deployment translating the project scientific results into practical guidance, engineering solutions, and operational procedures.
- Enable learning across different sectors and applications.
- Accelerate the adoption of best safety practices and support harmonisation of safety approaches.
- Create a lasting project legacy by establishing accessible databases, guidelines, training resources.

ELVHYS Workshops: supporting knowledge transfer



Series of **biannual workshops** with experts on the field of safety of cryogenic hydrogen transfer technologies aiming at the exchange of scientific knowledge and technical experience.

- **Disseminate state-of-the-art safety knowledge** through unique training materials developed and delivered by world-leading experts (<https://elvhys.eu/home>).
- **Facilitate knowledge exchange and collaborative problem-solving** by bringing together researchers, industry representatives and safety experts to share experience, discuss challenges, and identify solutions for inherently safer LH₂ transfer operations.
- **Engage standardisation bodies and industrial stakeholders** by sharing scientific and technical findings with SDOs and industry, supporting harmonised safety approaches and the safe scale-up of hydrogen technologies.
- The series of workshops was shaped to encompass the main safety aspects of cryogenic hydrogen transfer technologies in a systematic order of topics, following the developments of the ELVHYS project.

Cryogenic transfer technologies & safety challenges

WS1 “State-of-the-art of cryogenic transfer technologies and related safety issues”,
hosted by Air Liquide on 21 June 2023.

Industrial practices



ELVHYS D2.1 (2024)

Maritime



HySTRA (2026)

Aviation



Airbus (2020)

Heavy duty applications

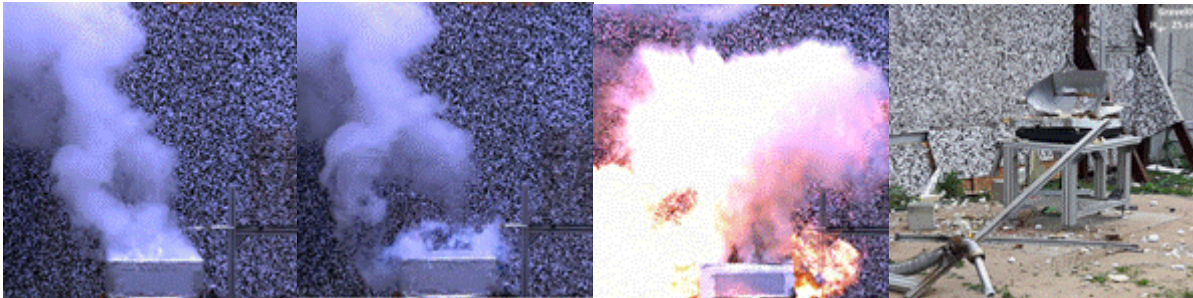


ELVHYS D2.1 (2024)

Experimental research and incident case studies

WS2 “Experimental research and case studies of cryogenic hydrogen incidents”, hosted by the Health and Safety Executive on 29 November 2023.

PRESLHY project



Friedrich (2023)



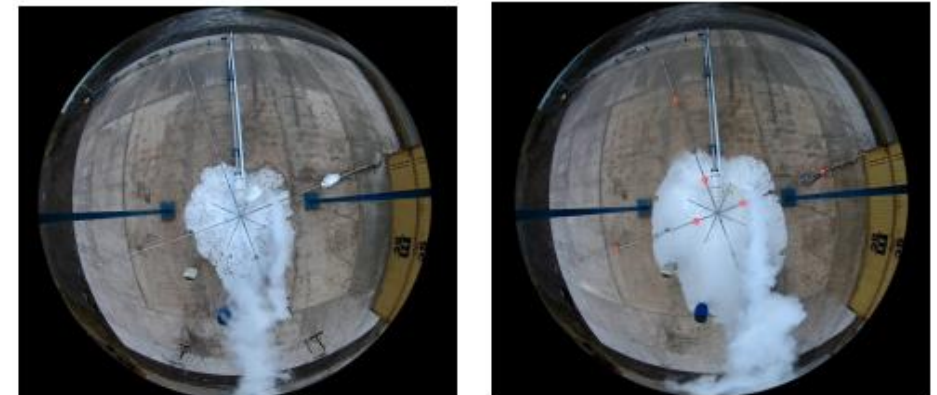
Coldrick (2023)

SH2IFT project



Kluge (2023)

FFI & NPRA project

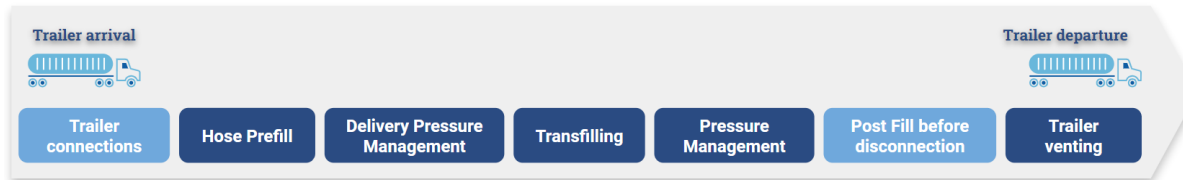


Allason (2023)

Fuelling and bunkering procedures

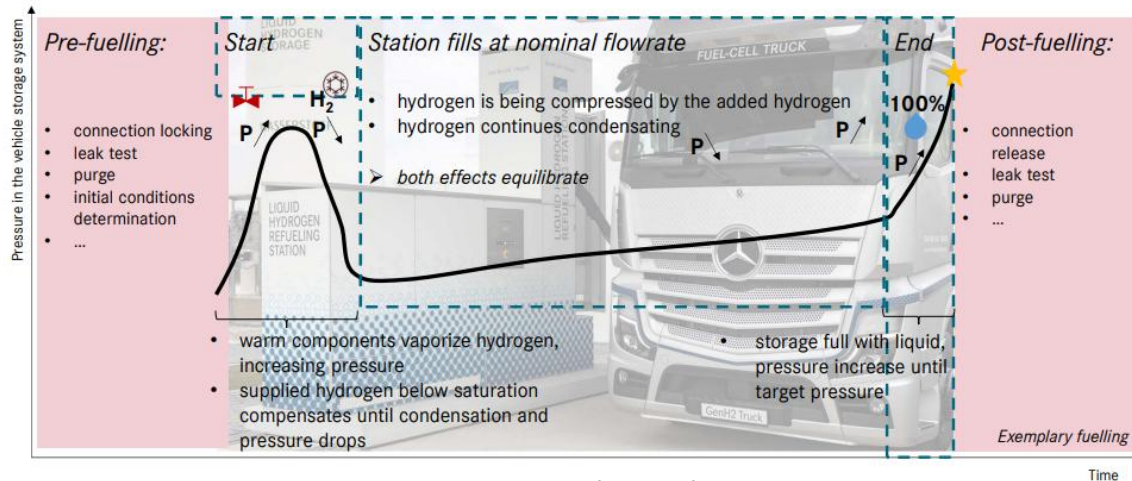
WS3 “Progress in modelling and development of fuelling/bunkering procedures”, hosted by the National Centre for Scientific Research "Demokritos" on 7 June 2024.

Industrial procedures



Houssin (2024)

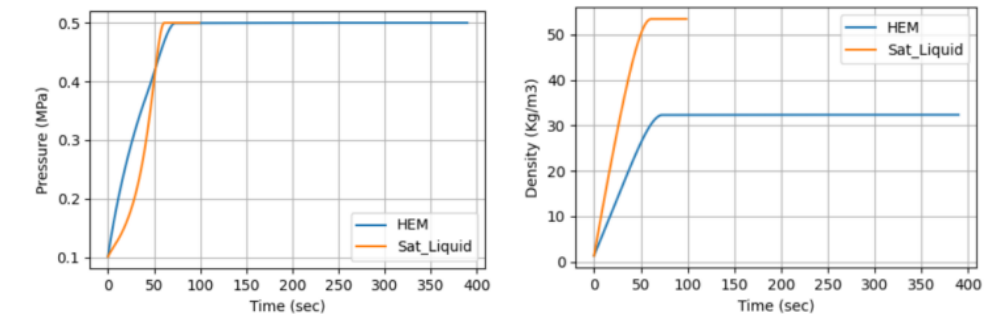
Development of protocols in RCS (ISO/TC197/WG35)



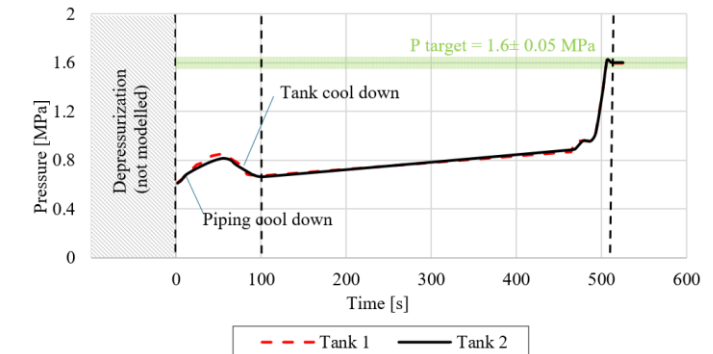
Ravinel (2024)

Modelling

DISCHA Venetsanos (2024)

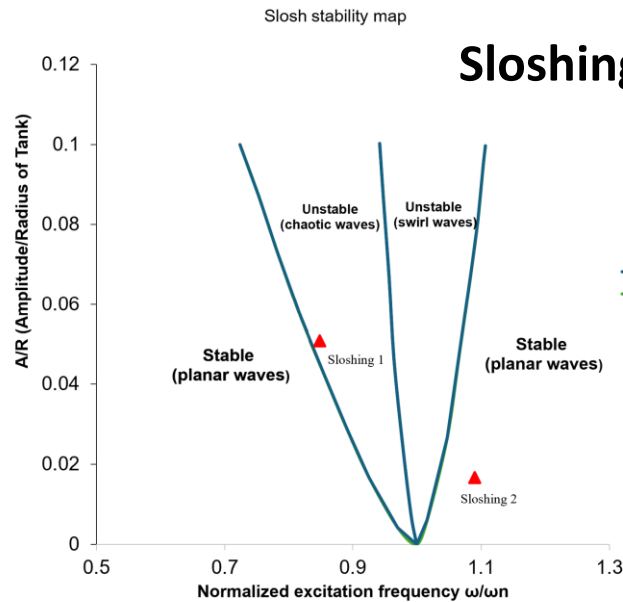


Computational Fluid Dynamics Ebne-Abbasi (2024)



Understanding heat and mass transfer phenomena

WS4 “Understanding of heat and mass transfer for cryogenic and liquid”, hosted by the Norwegian University of Science and Technology on 4 December 2024.

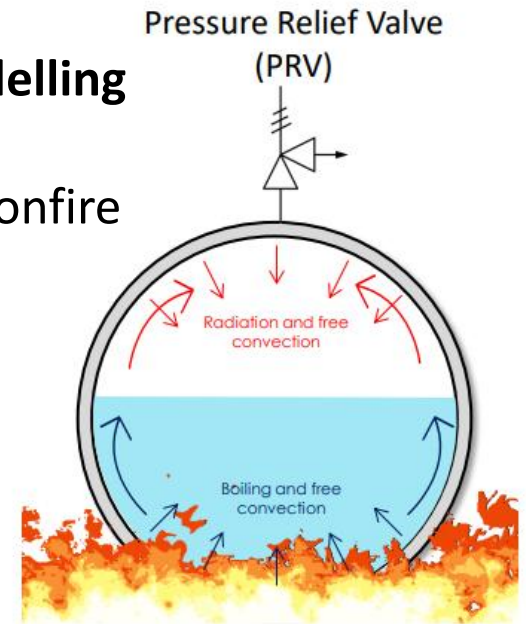


Sloshing and boil-off

Adebayo et al. (2026)

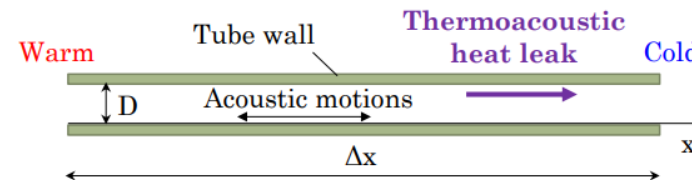
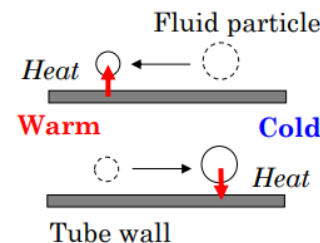
Heat and mass transfer modelling

- LH2 spill and evaporation
- LH2 tanks exposed to a bonfire
- Effect of heat transfer on cryogenic releases
- BLEVE



Schiaroli et al. (2024)

Thermo-acoustic instabilities



Matveev (2024)

Development of regulations, codes and standards

WS5 “Towards RCS for cryogenic and LH2 transferring operations and facilities”, hosted by the Karlsruhe Institute of Technology on 5 June 2025.

- Progress in LH₂ national standardisation roadmaps.
- International perspectives on hydrogen safety standards and ongoing activities within ISO/TC 197 working groups.
- Contribution of pre-normative scientific research to RCS development, including safety data, risk assessment methodologies, and technical justifications for separation distances and safety requirements.
- Identification of remaining knowledge gaps and RCS needs.
- **Key takeaway:** the close interaction between research projects, industry, and standardisation organisations is essential to accelerate the development of robust RCS frameworks for safe LH₂ operations and infrastructure.

ELVHYS outcomes & future challenges

WS6 “Project achievements, remaining knowledge gaps and technological bottlenecks”, hosted by Ulster University on 5 December 2025.

LH2 releases in confined spaces
and occurrence of PPP



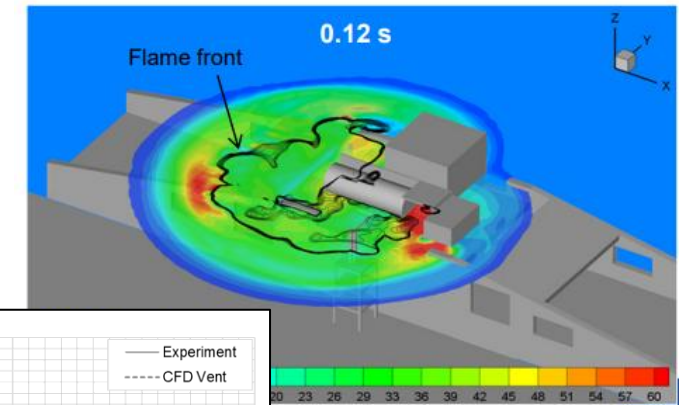
Rattigan (2025)

Oxygen enrichment

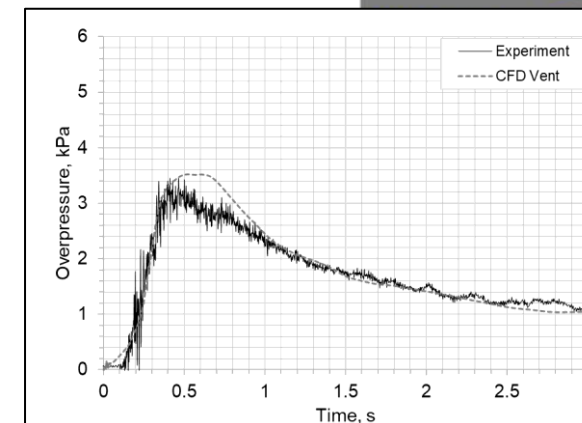


Welch (2025)

Insights from CFD modelling on
consequences analysis



Koutsorakis (2025)



Cirrone (2025)

Bridging research and practice: the ISS

International Stakeholders' Seminar (ISS), hosted by University of Bologna on 30 September - 1 October 2024.

- Bring together international experts, researchers, and industry practitioners to discuss safety challenges for cryogenic hydrogen and LH₂ transfer technologies.
- Facilitate the exchange of experience and best practices on prevention and mitigation strategies, engineering solutions, and risk management approaches for hydrogen applications.
- Enable direct stakeholder feedback on project outcomes, helping align research developments with industry needs and practical implementation requirements.



Welcome to our final event ELVHYS Dissemination Conference!



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Thank you for your attention

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