

NICOLHY

NOVEL INSULATION CONCEPTS FOR LH₂ STORAGE TANKS



Project ID	101137629
PRR 2024	Pillar 2 – H ₂ storage and distribution
Call topic	HORIZON-JTI-CLEANH2-2023-02-03: Novel insulation concepts for LH ₂ storage tanks
Project total cost	EUR 1 999 628.75
Clean H ₂ JU max. contribution	EUR 1 999 585.00
Project period	1.1.2024–31.12.2026
Coordinator	Bundesanstalt für Materialforschung und -prüfung, Germany
Beneficiaries	Alma Mater Studiorum – Università di Bologna, Deutsches Zentrum für Luft- und Raumfahrt EV, Norges teknisk-naturvitenskapelige universitet, Ethnicon Metsovion Polytechnion

<http://nicolhy.eu>

PROJECT AND GENERAL OBJECTIVES

The Nicolhy project aims to develop a novel insulation concept based on vacuum insulation panels that enables the safe and cost- and energy-efficient storage of large quantities of liquid hydrogen (LH₂). Such large-scale LH₂ storage technology is necessary for establishing a hydrogen storage facility with dimensions from 40 000 m³ to more than 200 000 m³ of LH₂. However, new design concepts are needed because the currently available technologies used in small and medium-sized storage facilities today are not suitable for upscaling. The main problems preventing upscaling are the long time required to produce the storage facilities due to the process for their manufacture, their low tolerance for failure and their spherical shape, which reduces the payload in technical applications by up to 50 % compared with other shapes. The novel concept will change these conditions by using a system that is modular, open and time- and cost-efficient while ensuring multifailure-tolerant production, operation and service and has onshore and offshore applications. The Nicolhy consortium is ideally suited to this ambitious project. It brings together experts from the fields of cryothermodynamics, and marine, chemical, process and safety engineering.



The project's technical objectives are to:

- design a tank, along with its thermal insulation and supporting structure, that is suitable for the large-scale storage of LH₂, scalable, energy-efficient and sustainable, with low construction and operation costs, and that ensures improved safety standards;
- define materials and predict overall thermal insulation performance;
- test the novel insulation concept at laboratory scale;
- perform safety and risk analyses during operational and fire scenarios;
- perform circularity, sustainability and scalability assessments of the concept developed.

FUTURE STEPS AND PLANS

- Design and produce a test rig.
- Design and test diverse novel insulation concepts for the storage of LH₂.
- Perform manufacturing, assembly, safety, circularity, sustainability and scalability studies.

PROJECT TARGETS

Target source	Parameter	Unit	Target	Target achieved?	SOA result achieved to date (by others)	Year for reported SOA result
SRIA (2021–2027)	Onshore LH ₂ containment tank CAPEX	€/kg	< 20		100	2020
Project's own objectives	LH ₂ boil-off	mass-%/day	< 0.1		0.3	2020