HyInHeat project

Hydrogen technologies for decarbonization of industrial heating processes

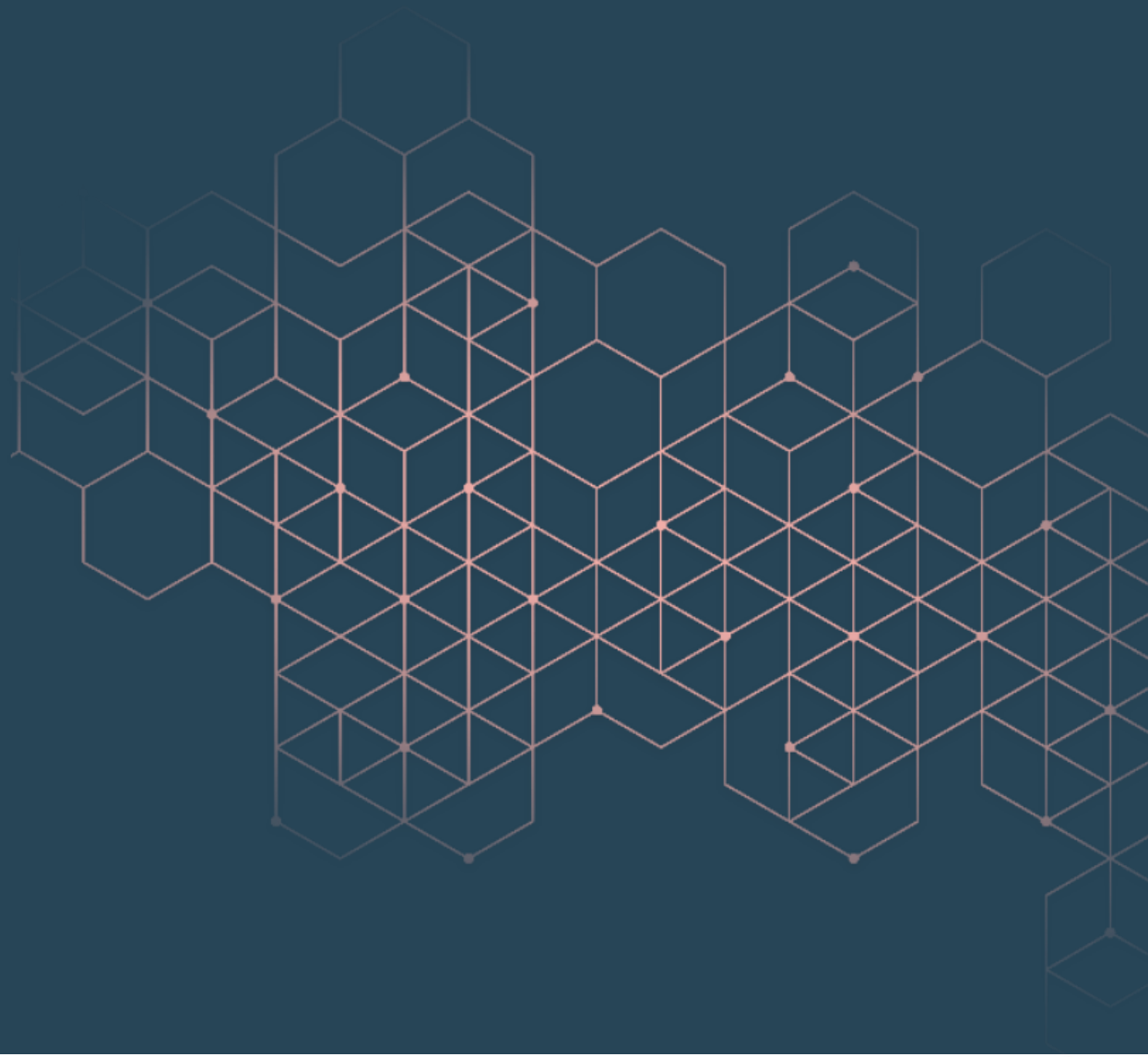
28/10/2026, Brussels

This project has received funding from the European Union's Horizon Europe research and innovation program under grant agreement No 101091456

HYINHEAT

Table of content

1. General introduction of HyInHeat
2. KER 1: Hydrogen Combustion Burner Technology for Walking Beam Furnaces - **Sarralle**
3. KER 3: Flow meter and quality analyzer - **Endress+Hauser SICK**
4. KER 4: Calorimeter by spectroscopy - **Endress+Hauser SICK**
5. KER 5: Devices for CEMS measurement for NOx in H_2 combustions - **Endress+Hauser SICK**
6. KER 7: Ultrasonic flow measurement equipment of the offgas for higher temperatures - **Endress+Hauser SICK**
7. KER 10: Safety training material - **Norwegian University of Science and Technology**

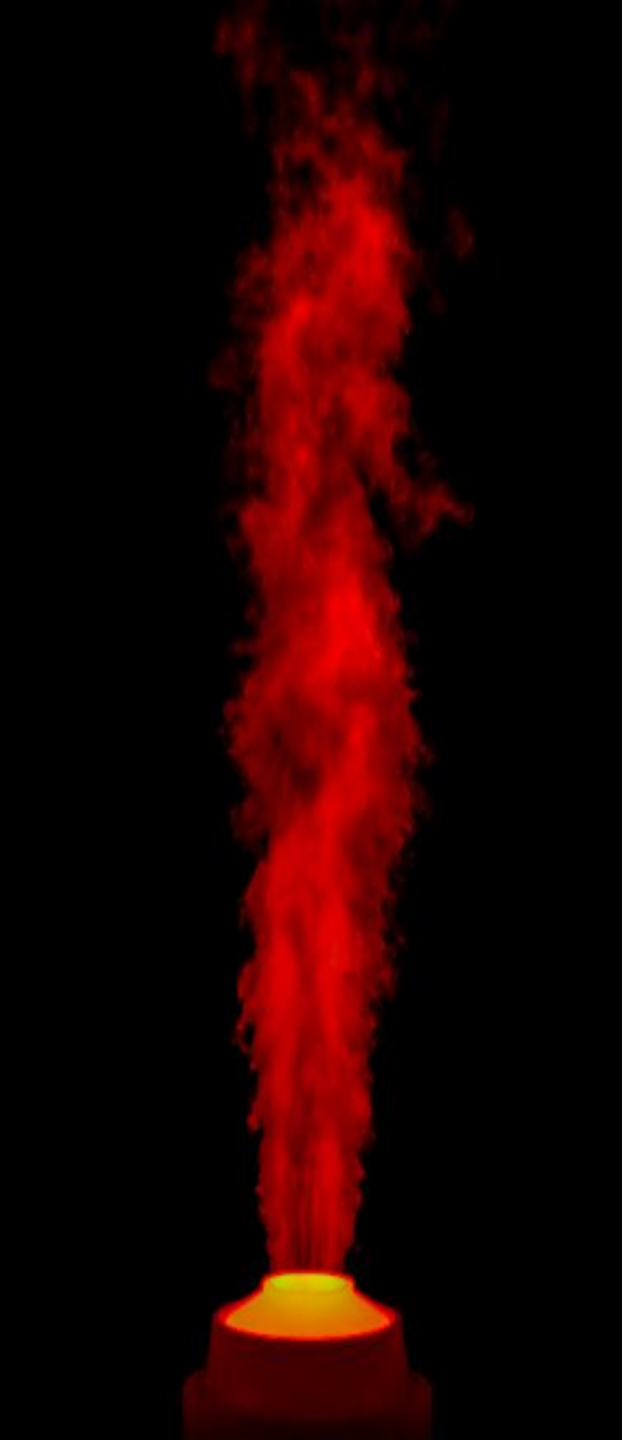


The project in brief

Title:	Hydrogen technologies for decarbonization of industrial heating processes
Acronym:	HyInHeat
GAP No.:	101091456
Call:	HORIZON-CL4-2022-TWIN-TRANSITION-01-17
Start/End:	01/01/2023 to 31/12/2026 (48 months)
Total budget:	23.96 Mio. €
EU contribution:	17,71 Mio. €
Coordinator:	RWTH Aachen University

The partners





The objectives

Redesign heating processes for H_2 as fuel

8 demonstrators for H_2 heating | 1 full off-gas system redesign | 1 greenfield reheating furnace design study | 2 retrofit design studies

Modify heating equipment and infrastructure for use of H_2

4 burner modifications and optimizations | measurement instrumentation development for fuel supply and combustion control | H_2 compatible fuel supply implementation | refractory investigation and optimization

Develop O_2 combustion processes to improve efficiency

6 demonstrators with pure O_2 as oxidizer | 1 demonstrator with oxygen-enhanced combustion

Integrate instrumentation to characterize fuel composition & flow

2 measurement technologies for fuel quality | combustion control instrumentation development | NOx emission measurement technology development

Prove economic viability compared to heating alternatives

Demonstrators as baseline | comparison on basis of KPIs | individual business case evaluation

Key Exploitable Results



KER 1: Hydrogen Combustion Burner Technology for Walking Beam Furnaces - **Sarralle**

What is the innovation?

A fuel-flexible burner enabling H_2 integration into reheating furnaces operating seamlessly on any H_2/natural gas blend, with either air or O_2 as oxidizer.

What problem does it solve and for whom?

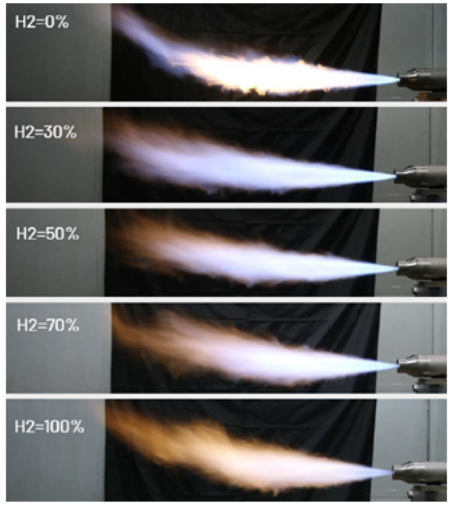
It enables steelmakers to decarbonize their primary gas-consuming furnaces, despite the uncertain H_2 supply and costs.

What is the current status?

Industrial-scale validation in a walking beam furnace across a wide range of H_2/natural gas blends, in both air- and oxy-combustion modes (up to 100% H_2-O_2).

What is needed next?

- Industrial early adopters & replication sites.
- Funding for full-scale commercial deployment.
- Large-scale green H_2 supply and dedicated distribution infrastructure.



Sarralle prototype trials, H_2 share 0 → 100%

Developed with
Nippon Sanso

Demonstrated at
ArcelorMittal Olaberria-Bergara

Primary market
Steel reheating furnaces

TRL 6→8
reached in HyInHeat

6 MW
2 burners in zones 7 and 8

0–100%
H_2 in natural gas blends, 21–100% O_2

HYINHEAT

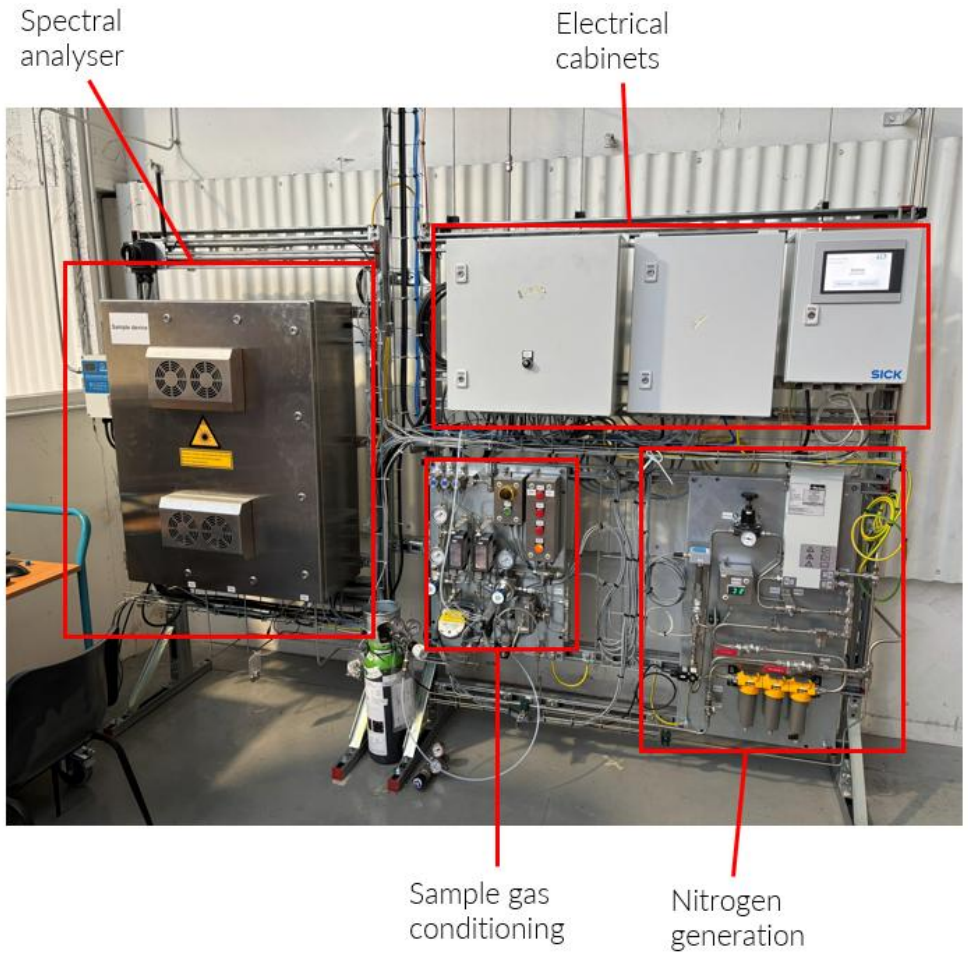
KER 3: Flow meter and quality analyzer - **Endress+Hauser SICK**

- New developed ultrasonic flow meter for 100 vol% hydrogen → FLOWSIC610
  - First certified flow meter for custody transfer of hydrogen (accuracy class 1) globally.
  - Introduced to the market in April 2026.
- Usable along the hydrogen value chain.
  - Export pipeline, electrolyzers and steam methane reforming.
  - Transport and storage.
  - Compressor stations.
- Possibility to determine both, flow and hydrogen purity.
  - Algorithm developed for hydrogen purity during HyInHeat project.
  - Very low uncertainties, especially for high H_2 concentrations.
    - Standard deviation < 0.05 mol% for > 90 vol% H_2.
  - Hydrogen purity indication can be integrated into the device as option.



KER 4: Calorimeter by spectroscopy - **Endress+Hauser SICK**

- The analyser measures the full spectrum of the sample gas and determines the concentration of all gas components.
- In the HyInHeat project, a prototype was build-up and adapted to the local installation conditions.
- With the determined concentrations, the calculation of the Wobbe index, respectively the calorific value was realized.
- The measurement technology is further investigated for different applications.
- With the in-house expertise of Endress+Hauser SICK, it is possible to integrate sample conditioning systems according to the customer needs.



KER 5: Devices for CEMS measurement for NOx in H_2 combustions - **Endress+Hauser SICK**

- Currently used analysers and systems for emission monitoring are certified up to max. 40 vol% water vapor in the exhaust gas.
- Further, NOx emissions are normalized to a dry basis according to current regulations.
- In hydrogen combustion, the water vapor content is higher, especially if oxyfuel combustion is used.
- EHS investigated different analysers, which were tested to measure NOx in the wet exhaust gas containing up to 100 vol% water vapor, at two demonstrator plants.
- Conclusion: There are already analysers available, which are suitable for this measurement task.
- But: CEMS regulations need to be rethought. With such a high water content in the exhaust gas, NOx emissions cannot be calculated to a dry basis. This would distort the result.
    - As example: 100 ppm NOx in the wet exhaust gas calculated to a dry basis:
      At 20 vol% H2O (NG+air): 125 ppm
      At 35 vol% H2O (H_2+air): 154 ppm
      At 67 vol% H2O (NG+O_2): 303 ppm
      At 98 vol% H2O (H_2+O_2): 5,000 ppm

KER 7: Ultrasonic flow measurement equipment for offgas for higher temperatures - **Endress+Hauser SICK**

- Ultrasonic measurement for gas velocity is limited to temperatures up to 200 °C.
- Exhaust gases, especially with hydrogen as fuel, are assumed to have higher temperatures.
- Flow measurement is relevant for precise monitoring of emissions. Therefore, a flow measurement for gas temperatures up to 350 °C was developed and tested at a demonstrator.
    - Direct flow measurement of hot gases with no active cooling of measurement device, no moving parts, no pressure loss, very low maintenance requirements.
- Technology is further investigated and in the phase of prototyping.



KER 10

H_2 Safety Training- Modular Materials

Preparing Operators for Safe Hydrogen Heating



- Modular learning materials
- Interactive contents
- Industrial relevance
- Adaptable format & language

KEY OUTCOMES

- Improved safety
- Trained and competent workforce
- Safer technology deployment
- Confident industry transition

ADDRESSING KEY CHALLENGES:

- Knowledge and skill gaps for safe H_2 heating
- Uncertainty in handling & emerging risks

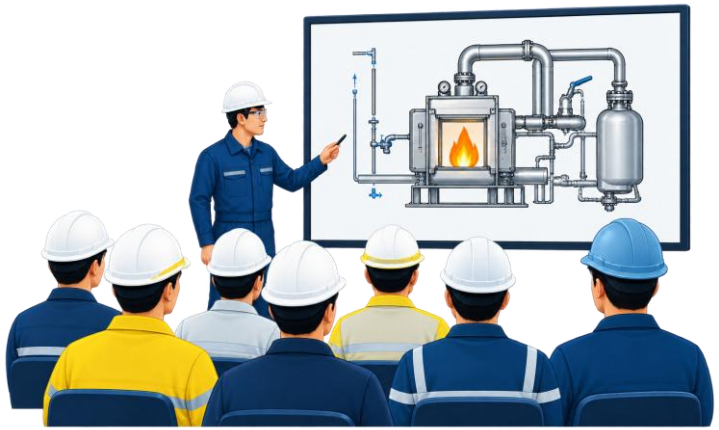
INTENDED USERS

- Operators
- Engineers
- Regulators
- Maintenance teams
- Managers

KER 10

H_2 Safety Training- Modular Materials

Ready to deploy, looking for pilot project partners & support to scale



STATUS:

Training material ready for deployment

- Modular courses developed
- Flexible and adaptable for different industries
- Available in English (adaptable)

LOOKING FOR:

- Pilot project partner
- Strategic partnerships
- Funding opportunities
- Collaborations

Contacts

abhishek.subedi@ntnu.no

nicola.paltrinieri@ntnu.no

NTNU HYINHEAT

The partners

























































Find out more information about the project!

