

OPHYCS

OPTIC FIBRE-BASED HYDROGEN LEAK CONTROL SYSTEMS



Project ID	101101415
PRR 2024	Pillar 2 – H ₂ storage and distribution
Call topic	HORIZON-JTI-CLEANH2-2022-02-02: Hydrogen and H2NG leak detection for continuous monitoring and safe operation of HRS and future hydrogen/H2NG networks
Project total cost	EUR 2 499 428.75
Clean H ₂ JU max. contribution	EUR 2 499 428.75
Project period	1.1.2023–31.12.2025
Coordinator	Enagás Transporte SA, Spain
Beneficiaries	FEBUS Optics, Fundación para el Desarrollo de las Nuevas Tecnologías del Hidrógeno en Aragón, Fundación Tecnalia Research and Innovation, Groupe Européen de Recherches Gazières, GRTgaz, Lumiker Aplicaciones Tecnológicas SL

<https://ophyics.eu/>

PROJECT AND GENERAL OBJECTIVES

The Ophyics project aims to develop a new system for continuous leak detection based on optic fibre sensor technologies, ensuring the safety and sustainability of a hydrogen-based energy system.

Acknowledging the critical need for effective leak detection methods in light of the environmental impact of hydrogen emissions, Ophyics introduces an innovative approach by developing a solution that includes cutting-edge coating materials for fibre Bragg gratings (FBGs) and the creation of a combined detection system merging FBGs with distributed acoustic and temperature-based detection technologies.

PROGRESS AND MAIN ACHIEVEMENTS

In the first year, the project enabled the determination of the design specifications and requirements of the system from the technical, environmental and economical perspectives.

Progress has also been made in the development of sensor solutions. Coating materials for FBG sensors are developed using advanced plasma techniques, ensuring properties such as coating adhesion and increased hydrogen sensitivity.

The first tests for the development of the combined system (merging three different technologies), and the development of the interrogator and interpretative software have taken place in recent months.

FUTURE STEPS AND PLANS

Coating materials for FBG sensors will continue to be developed using advanced plasma techniques. A test bench will evaluate sensor responses under different environmental conditions during laboratory testing, controlling variables such as temperature, humidity and hydrogen concentration.

The development of FBG interrogators is another critical element of the project, involving advancements such as the integration of optical components for signal amplification and the testing of configurations allowing the measurement of a large number of sensors with a single interrogator. This breakthrough significantly increases the scalability of the system while maintaining accuracy and response time.

The final stage of Ophyics includes validating the combined H₂ detection system in predefined use cases, such as pipelines, hydrogen refuelling stations and gas grid installations.

PROJECT TARGETS

Target source	Parameter	Unit	Target	Target achieved?
Project's own objectives	Minimum leak concentration detected	%	0.4	
	Time of response	seconds	30, with a maximum response time of 1 s at a concentration of 0.4 % volume	
	Detection threshold	l _v /min	0.4 (blending operation); 1.2 (pure H ₂)	
	Time of recovery	seconds	60/20 depending on application	