# Loss Prevention and Maintenance Modelling for Hydrogen-based Industry

#### **Description**

This Ph.D. is part of the H2GLASS project (<a href="https://h2-glass.eu/">https://h2-glass.eu/</a>).

To achieve net-zero emissions by 2050, the glass industry must undergo complete decarbonization. The H2GLASS project aims to develop the necessary technology stack to enable 100% hydrogen combustion in glass manufacturing, ensuring the required product quality, and manage this safely.

#### **Primary objective**

Guarantee safe design and operability of emerging hydrogen-based industry

#### **Secondary objectives**

- Loss of integrity analysis: models and <u>sensors</u> for H2 applications
- Safe design for emerging H2 industry
- Risk-based inspection and <u>maintenance</u> model development

#### Hydrogen monitoring framework Material degradation Flame monitoring and Leak monitoring and detection monitoring and detection detection - Catalytic - Ultrasonic techniques Thermal heat detector Optical fibre detector - Acoustic emission techniques - Resistance based - Electromagnetism testing - Work function based - UV detector - Optical - UVIR detector Visual testing - Acoustic - MIR detector Pd Nanoparticles-based Data collection to improve maintenance planning Inherent Safety Assessment of H2-fueled Glass Manufacturing Integrating 1 Risk assessment Maintenance the RBM approach: planning

Risk acceptability

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H2GLASS - advancing Hydrogen (H2) technologies and smart production systems TO decarbonise the GLass and Aluminium SectorS

- Master's degree in Chemical and Process Engineering – University of Bologna (2020-2023)
- Bachelor's degree in Chemical and Biochemical Engineering – University of Bologna (2017-2020)

### Estimated progress of the PhD project:

Just started ... < 50 % > 50 % Almost done ☺

#### **Publications**

- Collina G., et al., (2025). Multi-stage monitoring of hydrogen systems for improved maintenance approaches: an extensive review, International Journal of Hydrogen Energy, 105, 458-480.
- Collina G., et al., (2024). Hydrogen in Glass Sector: A Comparison between Risk-Based Maintenance and Time-Based Maintenance Approaches, *IFAC-PapersOnLine*, *58*(8), 109-114.



TA4 – Applications TA5 – Safety

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