

# Predictive Modelling of Hydrogen Releases from Nuclear Waste Pipelines: A Collaborative Study with Sellafield Ltd

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## I. Introduction

The goal of this work is to improve the understanding of gas build-up mechanisms and support the design of safer containment and transport systems in nuclear environments. In particular, the focus is on hydrogen accumulation, which poses a significant risk due to its flammability and potential for explosion. Developing and validating accurate predictive models is essential for ensuring safety in such scenarios.

## II. Experimental Approach

To support the development and validation of these models, a series of small-scale explosion experiments will be conducted using the MK-II test rig. This experimental setup features a high-pressure spherical chamber equipped with four impellers, which enables control over both laminar and turbulent flow conditions. Hydrogen will be introduced into the chamber through a controlled source and ignited using an integrated ignition system. The vessel is designed to withstand internal pressures of up to 40 bar. High-speed cameras will be used to visually capture the ignition and flame propagation processes. At the same time, pressure sensors located at various positions inside the chamber will record the pressure dynamics throughout each test. These measurements will provide detailed insight into the behaviour of hydrogen under different flow and ignition conditions.

## Technical Track

Fuel Cycle and Waste Management

**Primary author:** HUSSIEN, Mohammed (University of Leeds)

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