

Experimental and Numerical Study of Hydrogen-blended Gas Migration

In traditional natural gas pipeline systems, leaks are well understood; however, when multiple gases are involved, the solution becomes far more complex. The blending of hydrogen into existing natural gas distribution systems, or the utilization of pure hydrogen for heating in Alberta introduces additional questions regarding the gas migration behaviour in the event of an unexpected leak.

The purpose of this project is to develop unique modelling capabilities to predict the migration behaviour of hydrogen and hydrogen-blended gas leaks from buried pipelines, assess the differences between leak behaviours in natural gas pipeline systems and those with hydrogen or hydrogen blends, and to inform the processes and technologies needed to effectively detect these leaks. Experimental testing will be conducted by C-FER Technologies in Edmonton, AB, at both small and large scales to validate the numerical models.



RECIPIENT:

ATCO Gas and Pipelines



PARTNERS:

C-FER Technologies



TOTAL BUDGET:

\$1,018,000



AI HCOE FUNDING:

\$509,000



PROJECT DATES:

**APR 2024 –
SEP 2025**



PROJECT TRL:

**Start: 3
End: 6**

APPLICATION

The results of this project will accelerate the viability of broad usage of hydrogen for home and water heating in Alberta and the decarbonization of the existing natural gas system. This project will reduce apprehensions regarding converting existing natural gas home energy systems to a pure hydrogen or hydrogen-blended alternatives and inform risk mitigation procedures to ensure hydrogen and hydrogen blended natural gas systems are just as safe, or safer, than today's natural gas system.



CLEAN RESOURCES

CLEAN TECHNOLOGY

HYDROGEN

PROJECT GOALS

The main goal of this project is to improve the understanding of hydrogen and hydrogen-blended gas migration through porous media, such as soil, and the resulting impacts on risk mitigation processes. These findings will help identify if subsurface leaks from pipelines transporting hydrogen and hydrogen blends pose a similar, lessened, or elevated risk as compared to pure natural gas.

The numerical and experimental modelling carried out as part of this project will provide valuable insight for understanding the differences between vapour migration of pure methane as compared to hydrogen and hydrogen blends. ATCO and C FER Technologies understand that risks can be mitigated with a better understanding of commodity leak behaviour to protect the environment, employees, and members of the community.

BENEFITS TO ALBERTA

Because natural gas is known to move through soil with relative ease, especially with a porous media such as soil – given the buoyant nature of hydrogen relative to methane – further work must be completed to assess how these gases behave in a leak scenario with various conditions. The results from this project will provide invaluable information pertaining to instrument selection for leak detection surveys and risk mitigation programs. In addition, negative public perception or safety concerns surrounding hydrogen pipelines can be minimized with a better understanding of vapour migration principles.



2 Publications



2 Students Trained



3-5 Project Jobs



3-5 Future Jobs



1 New Product/Service



236-339 kt/yr Project GHGs Reduced



236-339 kt/yr Future GHGs Reduced

CURRENT STATUS

APR 2024

C-FER Technologies has begun the literature review stage of this project, which will inform the small-scale test plan design stage expected to commence in May 2024.