

CLEAN RESOURCES

CLEAN TECHNOLOGY

HYDROGEN

FUNDING DETAILS

Monitoring of Blended Hydrogen Behaviour in Pipe Systems

Hydrogen is key to achieving the nation’s 2050 net-zero emissions goal and calls for research to enable safe transportation. Compared to trucks and rails, long-distance transportation and distribution of hydrogen through pipelines are safe and economical. Pipelines already exist, including long-distance and distribution networks of natural gas pipelines in which hydrogen can be transported efficiently by blending with natural gas. However, hydrogen is a very light and highly combustible substance, creating transportation safety challenges. This project investigates the flow behaviour of blended hydrogen for safe transportation through pipelines through judicious combinations of experimental and modeling investigations.



RECIPIENT:
University of
Calgary



PARTNERS:
ATCO, NSERC, MKS



TOTAL BUDGET:
\$1,151,480



AI HCOE FUNDING:
\$500,000



PROJECT DATES:
FEB 2023 –
MAR 2025



PROJECT TRL:
Start: 3
End: 6



APPLICATION

Hydrogen can be integrated into Alberta’s existing and extensive natural gas pipeline network, creating instantaneous large-scale market demand to advance the sector. Hydrogen distributed by pipeline offers the most economic means for large-scale and long-distance hydrogen export. Therefore, no additional pipelines are necessary to be built as integrating hydrogen into existing pipelines is more feasible. The safe transported hydrogen can be used in fuel cells, consumer appliances, power generations, and industrial chemical processes.



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PROJECT GOALS

Developing new leak detection strategies of blended hydrogen and monitoring of hydrogen behaviour in pipelines will realize a significant improvement in hydrogen safety. Continuous monitoring will replace pipeline inspection’s current reactive behaviour. The project will investigate how blended hydrogen with natural gas and odorant behave within the pipelines including stratification, odorants proliferations; in flow measurements of blended hydrogen; and the development of hydrogen leak detection sensors. In Canada’s cold environment, traditional sensing methods may not be sufficient for hydrogen transportation through pipelines. The newly developed leak detection sensors can be integrated with existing and new pipelines. The project is timely and critically important for reaching the hydrogen economy that would benefit Albertans while ensuring the net zero energy transition.

BENEFITS TO ALBERTA

There are strong motivations for moving towards adopting a hydrogen economy. Utilizing hydrogen would reduce greenhouse gas emissions in an array of applications. Globally, 78% of emissions come from the production and consumption of energy, thus there is potential to reduce the total carbon footprint through a hydrogen economy. Hydrogen is a versatile energy source and a zero-emission fuel that supports the transition to a sustainable future alongside electricity. The production, transportation, storage, and utilization of energy in the form of hydrogen presents efficiency advantages over electricity. The development of the hydrogen-based technology includes the creation of large-scale jobs through infrastructure research and expansion. The proposed hydrogen technology will enhance national security, competitiveness by preventing accidents, contributing to social stability and public welfare.



5 Publications



6 Students Trained



2 Patents



1 Project Job



10 Future Jobs



2 New Products/Services



1 Spinoff Company



10 kt/yr Project GHGs Reduced



100 kt/yr Future GHGs Reduced

CURRENT STATUS

FEB 2023

The University of Calgary team has been investigating the stratification behaviour of blended gases with the partner organization and developed a preliminary experimental stratification setup.