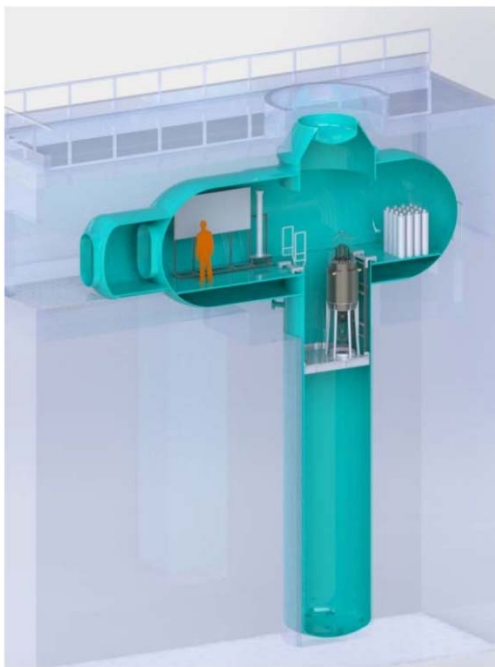


## Full-Scale Corrosion and Hydrogen Testing and Product Qualification System

This project is focused on advancing technologies which can reduce emissions from pipelines by improving corrosion resistance of metallic pipeline materials to reduce the likelihood of leaks to the environment. This project will overcome the shortcomings of small-scale material tests by enabling full-scale pipe testing in corrosive environments. Tests in this new system will improve understanding of corrosion and hydrogen-induced cracking effects on pipeline materials, which will, in the long run, result in materials that are more resistant to corrosion. This in turn will lead to fewer leaks and longer service life in pipelines.



Conceptualized Test System within C-FER's Special Environments Chamber



**RECIPIENT:**  
C-FER Technologies  
(1999) Inc.



**PARTNERS:**  
International  
Partner



**TOTAL BUDGET:**  
\$4,189,630



**AI FUNDING:**  
\$1,375,000  
[TIER]



**PROJECT DATES:**  
JAN 2021 –  
MAY 2023



**PROJECT TRL:**  
Start: 6  
End: 8

## APPLICATION

Pipeline corrosion is a global problem. In Canada, H<sub>2</sub>S-induced corrosion costs Alberta's industry CAD\$40M/year. C-FER has provided engineering support on corrosion-related pipeline challenges all over the world. The consensus established through these activities is that full-scale testing is required to provide new data on the impact of corrosion on materials in service and to benchmark small-scale testing. As a result, it is anticipated that this test system will have both local and global impact.

## PROJECT GOALS

The objectives of this project are to:

- Develop and construct a comprehensive automated test system designed to investigate the impacts of sulfide stress cracking (SSC), stress corrosion cracking (SCC), hydrogen absorption and hydrogen-induced cracking (HIC) on full-scale pipeline and oilfield products
- Successfully demonstrate three main system functions:
  1. Accommodate a representative length of a full-circumference pipe specimen up to 1.2m diameter
  2. Safely accommodate extreme environmental conditions, including very high H<sub>2</sub>S gas concentrations in liquid (H<sub>2</sub>S greater than 50,000 ppm), high pressures (greater than 5,000 psig), and flammable gas mixtures (H<sub>2</sub> and Natural Gas)
  3. Safely contain burst testing of a full-circumference pipe specimen
- Validate the test system design and construction through a comprehensive commissioning and trial test exercise with industry-supplied line pipe material



1 Publication



3-5 HQPs



1 Functional product  
test centre



Indirect project  
GHGs



100-1,000 kT/yr  
Future GHGs

## BENEFITS TO ALBERTA

The successful implementation and use of this novel test system could result in:

- Reductions of up to 360,000 tCO<sub>2</sub>e through mitigation of corrosion in pipelines and production wells in Alberta after 10 years of use
- Improvements in the corrosion and H<sub>2</sub> performance of materials, pipe manufacturing methods, and pipe construction techniques
- Partnerships between C-FER, Alberta- and international-based energy industry operators to access this unique facility, attracting research investment within Alberta and from around the world for years to come
- Establishing secure employment for multiple highly skilled technologists and engineers, as well as the development of new skills for these individuals

## CURRENT STATUS

### MAR 2022

The contract for ownership of the test system by C-FER has been successfully negotiated and executed with our industrial partner. Major hardware procurement is complete. Construction of the entire test system is 90% complete. The automation control software programming is 80% complete. Commissioning of the test system with an industry-sourced test specimen is set to begin upon construction and software completion. The full-scale commissioning specimen is fully prepared and awaiting installation. Small-scale test specimens are 50% prepared.