ALBERTA INNOVATES

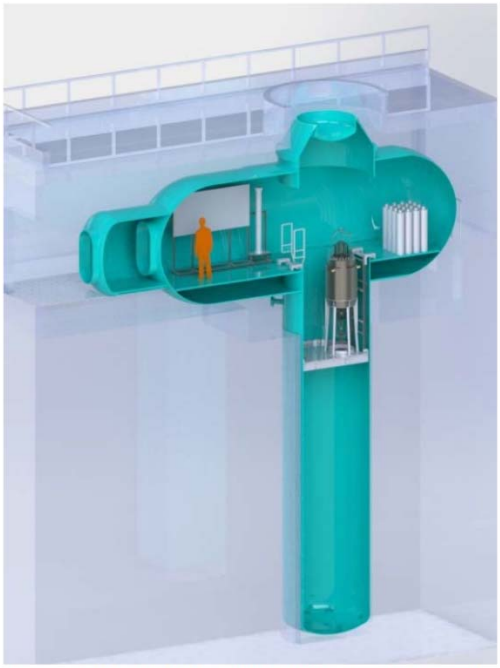
CLEAN RESOURCES

ENVIRONMENTAL INNOVATION

LAND & BIODIVERSITY

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

FUNDING DETAILS

RECIPIENT:
C-FER Technologies (1999) Inc.

PARTNERS:
International Partner

TOTAL BUDGET:
$3,401,660

AI FUNDING:
$1,375,000 [TIER ER]

PROJECT DATES:
Jan 2021 – Mar 2022

PROJECT TRL:
Start: 6
End: 8

APPLICATION

Pipeline corrosion is a global problem. In Canada, H_2S-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.

ALBERTA INNOVATES

CLEAN RESOURCES

ENVIRONMENTAL INNOVATION

LAND & BIODIVERSITY

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_2S gas concentrations in liquid (H_2S greater than 50,000 ppm), high pressures (greater than 5,000 psig), and flammable gas mixtures (H_2 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

BENEFITS TO ALBERTA

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

- Reductions of up to 360,000 tCO_2e through mitigation of corrosion in pipelines and production wells in Alberta after 10 years of use
- Improvements in the corrosion and H_2 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

1 Publications

3-5 HQPs

1 Functional product test centre

Indirect project GHGs

100-1,000 kT/yr Future GHGs

CURRENT STATUS

MAR 2021

Design of the automated test system is complete. Procurement of hardware for the system is 85% complete. External fluid supply, sampling and measurement infrastructure is 90% complete. Automation control software programming has begun. Industry-supplied line pipe material has been received and pre-cut in preparation for machining. Facility construction and commissioning will be completed by December 2021. A trial testing program will be completed by Spring 2022 with further testing anticipated.