

CLIMATE CHANGE INNOVATION AND TECHNOLOGY FRAMEWORK

Awardee Summary

CCITF PROGRAM	Clean Technology Development
PROJECT TITLE	Field validation of a low-carbon technology for the remediation of hydrocarbon contaminated sites
SECTOR	Energy Efficiency
ORGANIZATION	Northern Alberta Institute of Technology
PROJECT LEAD	Paolo Mussone
AI PROJECT ADVISOR	Dallas Johnson
GRANT AMOUNT	\$383,000
START DATE	11/1/2018
END DATE	4/30/2020

PROJECT OBJECTIVE: Refine and validate an integrated geophysical device fitted with customized sensors able to provide quantitative data related to soil and ground water characteristics to provide time-dependent information of the bioremediation process and enable the development of site treatment optimization and control strategies.

PROJECT PROFILE:

Background

There are an estimated 30,000 former fuel storage and retail sites across Canada contaminated by hydrocarbons. These sites cost companies, private site owners and municipalities hundreds of millions of dollars in asset retirement obligations. FCL in partnership with other cooperatives across Western Canada including UFA and Arctic Co-op have developed a novel in situ microbial remediation approaches for the decontamination of downstream fuel storage and retail sites impacted by petroleum hydrocarbons. This technology relies on the injection of aqueous formulations to stimulate the growth of naturally occurring bacteria capable of degrading hydrocarbons, reducing site remediation costs by over 50%. While this approach has proven scalable in several sites across the Prairie, many site owners still avoid this option because results can be inconsistent primarily as the result of inadequate equipment capable of providing robust, continuous, real-time monitoring data and only partial understanding of the microbial communities, and their dynamics, present in these soils.

Project objectives

The main objective of this project is to address these challenges by refining and validating an integrated geophysical device fitted with customized sensors able to provide quantitative data related to soil and ground water temperature, redox potential, pH, free and residual hydrocarbon phase, and volatile organic hydrocarbons. These sensors will be integrated with an electronic system for data storage, management and transmission and fitted with with customized solid-phase samplers used to extract and identify

microorganisms as well as detect biomarkers representative of the metabolically active microbial community. This set of information will provide time-dependent information of the bioremediation process and enable the development of site treatment optimization and control strategies in a feedback loop, reducing remediation timelines and costs.

Project budget and timeline

This project is anticipated to start on November 1 2018 and end on April 30 2020. The work planned is aligned with ongoing remediation activities that FCL, UFA, Stantec and Nichols Environmental have started carrying out on two sites in Stony Plain, Alberta in the summer of 2018. These activities are going to be completed by March 31 2020. The project budget is approximately \$780,000, of which approximately \$383,000 requested from the CCITF CTD program.

GHG emission reductions

The deployment of this bioremediation technology on a large scale will result in considerable GHG emission reductions compared to excavation and disposal methods that are still prevalent in Alberta. The average emissions associated with the latter methods is typically estimated at 8.2 ton CO₂ equivalent / m³ of soil treated, while in situ techniques only account for less than 0.0003 ton CO₂ equivalent / m³ of soil treated (Amposah et al. 2018, J. Cleaner Prod.). The knowledge gained from this project will also contribute toward reducing the liability costs which Canadian companies and municipalities are currently facing related to site retirement obligations.

GHG EMISSION REDUCTION SUMMARY: