

# CLEAN RESOURCES

ENVIRONMENTAL INNOVATION

WATER INNOVATION PROGRAM

## FUNDING DETAILS

### Low Energy Ammonia Reduction from Ammonia-Rich Sludge Thickening Lagoon Supernatant in Canada: Pilot-Scale Demonstration

This project aims to develop operational and control strategies, at pilot-scale, for the treatment of ammonia-rich sludge liquor. The team is focusing on single-reactor nitrification/denitrification and single-reactor nitrification/anammox processes using integrated fixed-film activated sludge reactors. In-line probes/meters are installed for real-time reactor performance monitoring and reactor operation control. This study will evaluate biodegradation mechanisms and provide valuable information that is lacking for full-scale implementation of energy efficient wastewater ammonia reduction technologies, especially under cold Canadian conditions.



**RECIPIENT:**

**EPCOR**



**PARTNERS:**

**NSERC, University of Alberta**



**TOTAL BUDGET:**

**\$410,000**



**AI FUNDING:**

**\$90,000**



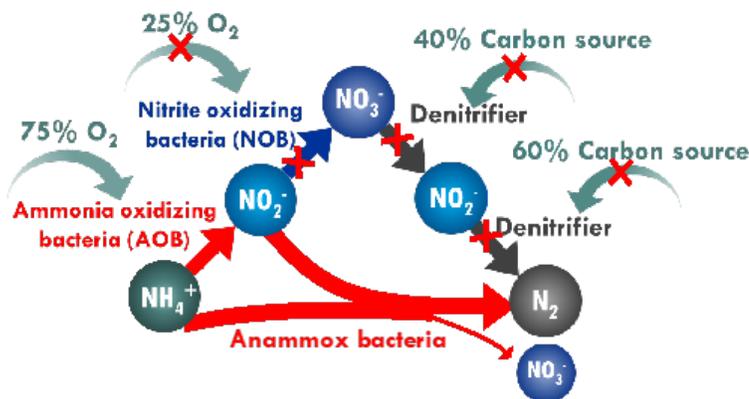
**PROJECT DATES:**

**DECEMBER 2018 – NOVEMBER 2021**



**PROJECT TRL:**

**Start: 5-6  
End: 7-8**



### APPLICATION

The process and control strategies developed in this project can be applied at wastewater treatment plants sharing similar treatment challenges such as those facing high ammonia loading challenges, and/or have a need to transition from energy-intensive treatment conventions to energy-efficient treatment processes.



# ALBERTA INNOVATES CLEAN RESOURCES

## ENVIRONMENTAL INNOVATION

### WATER INNOVATION PROGRAM

### PROJECT GOALS

- Developing energy-efficient reactor operation and control strategies for the treatment of digested sludge thickening lagoon supernatant using single-reactor nitrification/denitrification and single-reactor nitrification/anammox processes that can be adopted at full-scale implementation under cold Canadian conditions
- Optimizing processes using various engineering control options
- Evaluating process performance and ammonia removal kinetics using advanced analytical techniques
- Linking engineering parameters of bioreactor operation and microbiology fundamentals to reveal biodegradation mechanisms
- Improving treatment efficiencies of ammonia-rich sludge liquor with reduced energy consumption and greenhouse gas emission

### BENEFITS TO ALBERTA

- Commercial adoption of processes developed in this project at similar wastewater treatment plants in other major centers in Alberta, and beyond
- Reduction in energy consumption for the treatment of ammonia-rich wastewater/sludge liquor
- Reduction in greenhouse gas emission from wastewater treatment plants
- Offering solutions to high ammonia treatment issues
- Training of highly skilled personnel who are familiar with operating nitrification/denitrification and nitrification/anammox processes, helping wastewater treatment industries transiting to new energy-efficient processes
- Partnership between EPCOR Water Services Inc. and the research group at the University of Alberta will be continued to further develop energy efficient and environmentally sustainable wastewater treatment processes



8 Publications



4 Students  
Trained



2 Future Patents



1 Project Jobs



2 Future Jobs



1.5 kT/yr Project  
GHGs Reduced



4,380 kT/yr Future  
GHGs Reduced

### CURRENT STATUS

#### APRIL 2020

Design, construction and set up of pilot-scale reactors for single-reactor nitrification/denitrification and single-reactor nitrification/anammox processes have been completed. Set up of controlling systems for reactor operation and monitoring has been completed. Two reactors have been successfully tested at EPCOR's Gold Bar Wastewater Treatment Plant and will be relocated to EPCOR's Nutrient Recovery Facility at Clover Bar. Process control strategies are planned to be under continuous optimization in laboratory-scale reactors for more stable operation at pilot-scale.