

Cost-Effective Side-Stream Treatment of High Ammonia Wastewater using Granular Sludge Reactors

The project demonstrates a new granular sludge reactor (GSR) technology for side-stream treatment of ammonia-rich wastewater generated from digested sludge dewatering processes at municipal wastewater treatment plants (WWTPs). Based on energy-efficient nitrogen reduction mechanisms and advanced design, GSR is a simple modular and scalable single-reactor process, that is ~10 times more efficient than comparable wastewater treatment technologies on the market today. GSR will be a cost effective, innovative solution to effectively remove ammonia from side-stream wastewater, and will help minimize treatment footprint, greenhouse gas (GHG) emission, and energy consumption while delivering reliable treatment with low maintenance and operation requirements.



RECIPIENT:

**Water3 Innovation
Inc.**



PARTNERS:

**City of Calgary,
University of
Alberta**



TOTAL BUDGET:

\$850,000



AI FUNDING:

\$350,000



PROJECT DATES:

**MAR 2023 –
MAY 2025**



PROJECT TRL:

**Start: 6
End: 8**

APPLICATION

The project will generate specific design information for the full-scale implementation of side-stream treatment at the Bonnybrook WWTP. Project data generated will be applicable and helpful in designing the side-stream treatment for other WWTPs, including small and remote communities.

ALBERTA INNOVATES CLEAN RESOURCES

ENVIRONMENTAL INNOVATION

WATER INNOVATION

PROJECT GOALS

The main objective of this study is to demonstrate the technical feasibility and economic viability of the innovative granular sludge reactor (GSR) processes for cost-effective side-stream treatment of high ammonia centrate at the demonstration-scale. The project will generate design information for the full-scale implementation of side-stream treatment at the Bonnybrook Wastewater Treatment Plant (WWTP).

Quantifiable outcomes for the two-year project are:

- (i) Fabrication, construction and commissioning of a GSR system;
- (ii) Optimized treatment process; and
- (iii) Development of a comprehensive techno-economic assessment for application of the GSR technology in WWTPs.

BENEFITS TO ALBERTA

This study is critical for the City of Calgary to implement novel technologies for cost-effective alternative treatment of high-strength wastewater. A stand-alone side-stream treatment for high-strength ammonia stream reduces the ammonia load in the plant influent and increases the plant's secondary-treatment capacity. GSR offers stable and easy operation under ambient temperature conditions with small reactor footprint and outstanding treatment performance. The GSR technology approach enables WWTP operations to go above and beyond minimum regulatory requirements to protect the environment, enhance operational performance, and to provide a better water service to users. Project results will also be applicable and helpful in designing the side-stream treatment for other WWTPs, including small and remote communities.



**2 Students
Trained**



1 Patent



1 Project Job



**1 New
Product/Service**



**15% Future GHGs
Reduced**

CURRENT STATUS

MAR 2023

The GSR technology has been successfully demonstrated at the pilot-scale for high ammonia centrate treatment and showed stable operation for an extended period of time. Based on a dynamic control logic for intermittent aeration, feeding and settling, the GSR reactor can achieve consistent high ammonia removal efficiency under high volumetric loading rates and short hydraulic retention times.