Regional San—SASD Graduate Fellowship 2018 Problem Statements

Fellowship Project Scope Criteria

- Fellowship projects can be either feasibility studies, lab work, or literature reviews.
- Research study and related work associated with fellowship project will be technically guided by CSUS Faculty.
- Research work will not be conducted within the Sacramento Regional Wastewater Treatment Plant process area as a full pilot study given the limited time (150 hrs) to complete the fellow ship project. Independent laboratory work and/or study is preferred.
- Data and results from research will not be used for planning or design projects but can be used to justify follow up work for Regional San that will be exclusively coordinated by Regional San staff. For example, fellowship study will be viewed as preliminary work that can help justify a potential full pilot study to be run by SRWTP staff at a later date.

Proposed Projects/Studies

Calcium Nitrate Reaction Rate Study

- Calcium nitrate is a widely accepted odor control chemical that is used for biochemically oxidizing dissolved hydrogen sulfide and preventing the generation hydrogen sulfide in wastewater conveyance systems.
- Evaluate the removal and/or prevention of hydrogen sulfide at varying calcium nitrate dose rates.
- Investigate the reaction rate of oxidizing hydrogen sulfide at varying calcium nitrate doses and wastewater conditions such as: temperature, pH, alkalinity, etc.
- Investigate and evaluate potential catalysts to accelerate the biochemical oxidation reaction rate (pH, alkalinity, etc.) to optimize use at full scale.

Potential advisor(s): Amir Motlagh

Evaluate Energy Dissipation Baffles for Secondary Clarification

- Evaluate the potential benefit of theoretically retrofitting an existing SRWTP secondary sedimentation tank (SST) with energy dissipation baffles for the purpose of increasing flow capacity at peak conditions.
- Computational Fluid Dynamics (CFD) simulation to evaluate the theoretical performance of the SSTs with and without proposed baffle(s) retrofit both under normal and peak design load conditions.
- Recommend modification or changes to enhance flow capacity and treatment performance of the existing SSTs.

Potential advisor(s): Amir Motlagh

Facultative Bacteria Jar Study

- A growing number of proprietary facultative bacteria cultures are being used within collection systems, pumps stations, and wastewater processes to reduce fats, oils and greases (FOG), and oxidize sulfide compounds that contribute to foul odors.
- Evaluate the efficacy of wastewater treatment through bio-augmentation using facultative bacteria cultures.
- Determine the viability of hydrogen sulfide removal/prevention, FOG destruction, and water quality improvement at different bacteria concentrations or dose rates.

Potential advisor(s): Amir Motlagh

Identification of Nitrifiers under Various Operational Conditions

- Nitrification is one of the major processes in nitrogen removal in wastewater treatment plants.
- Using molecular tools, this project will focus on better understanding the bacterial communities in nitrification processes.
- The microbial communities involved in ammonia removal process will be studied in different operational conditions in nitrifying sidestream treatment (NST) to identify them in molecular scale beyond "black box" approaches and relate their abundance to performance efficiency of NST.

Potential advisor(s): Amir Motlagh

Odor Media Evaluation

- Evaluate the potential adsorption capacity of alternative "green" or nonhazardous media for the purpose of hydrogen sulfide and volatile organic compounds (VOCs) removal from foul air.
- Investigate the impact of environmental conditions (temperature, humidity, etc.) on media adsorption capacity and removal efficiency of odor compounds.
- Evaluate the costs/benefits, O&M costs and related considerations of using recommended alternative media to retrofit a current SRWTP fixed carbon filter.

Potential advisor(s): Amir Motlagh

Feasibility Study of Nitrogen Removal Using Anaerobic Ammonia Oxidation (anammox) Process

- Providing an efficient treatment process, the partial nitritation/anammox (PN/A) process is capable of removing high concentrations of ammonia from industrial and municipal wastewater.
- This project will study the autotrophic nitrogen removal process in a lab-scale anammox system and evaluate the treatment feasibility for various operational conditions such as low temperature operation and high organic matter loads.
- The project will be initiated with a lab-scale anammox reactor to evaluate the treatment process. Further study will be performed to determine the feasibility of converting the nitrifying sidestream treatment (NST) to full-scale anammox process.

Potential advisor(s): Amir Motlagh

Evaluating Environmentally Sustainable Bioscrubbers for Efficient Odor Control

- Bioscrubbers as an effective and economic solution for odor control are extensively used in wastewater treatment plants.
- This project will focus on evaluating different scrubber media for their ability to provide efficient odor reduction and simultaneously create less residual hazardous waste.
- Various media will be assessed with variable loading rates in different operational conditions and their performance and residual waste will be monitored.

Potential advisor(s): Amir Motlagh