Submission Summary Slide

- Various objectives of wastewater treatment include satisfying chemical oxygen demand and biochemical oxygen demand levels, removing nutrients (i.e., nitrogen and phosphorus), and reducing sludge.
- In wastewater treatment plants (WWTPs), electric aerators are used to mix the oxygen into the wastewater or sewage. Oxygen, along with microorganisms, are incorporated into the sludge. These microorganisms, through aerobic respiration, will biodegrade the organic material.
- WWTPs use various chemicals, such as ferric chloride and alum, to remove phosphorus and use extended aeration or filters to remove nitrogen.

Our Solution - Nualgi

- Our solution is to promote the growth of diatom algae toward wastewater treatment (i.e., phyco-remediation) using Nualgi - our patented product. Nualgi is a liquid containing 10 micronutrients that are adsorbed on nano silica and was designed to selectively grow only diatoms.
- Unique Biological Features of Diatoms and why Diatoms?
    - Single-celled algae that consume silica and have a surrounding silica-based cell wall (i.e., frustule).
    - Undergo photosynthesis by utilizing carbon dioxide and producing oxygen, a beneficial by-product.
    - Utilize nutrients (i.e., phosphorus and nitrogen) toward promoting their growth.
    - Diatoms require less light and produce more oxygen compared to other algae.
- Phyco-remediation - the use of microalgae and macroalgae in wastewater treatment - using Nualgi will serve as a biological solution to wastewater treatment by:
    - Reducing or eliminating the use of electric aerators, resulting in significant cost savings related to the operations, maintenance, and capital infrastructure costs.
    - Decreasing the cost of recovery or removal of nutrients, which currently involve unit processes in the treatment train, resulting in significant capital, operational and maintenance costs.
    - Decreasing sludge volume and sludge handling costs.

Unique Features of Nualgi for its use in Phyco-remediation of Wastewater:

1) Nualgi is dosed in wastewater to selectively grow only diatoms and no other algae/phytoplankton. Since diatoms have a silica shell and consume silica, they consume Nualgi and other phytoplankton do not. Therefore, we are able to selectively grow only diatoms.
2) Nualgi keeps the trace metals stable in water and do not alter or modify the existing chemistry of the wastewater. Thus, the addition of Nualgi to the wastewater should not result in any impact to existing unit processes in the treatment train of the plant.
3) Nano silica is mobile in water, ensuring that the particles are delivered to all the diatoms in the entire water volume of large tanks and in lakes, rivers, etc.
4) Does not require harvesting the diatoms since they serve as the natural food for zooplankton and fish. This means that treated water with diatoms can be safely released into natural waterways which in turn helps improve the overall health of the receiving body of water and marine life.
5) Our process does not require the construction of any special infrastructure and we can grow diatoms in the open tanks available in all aerobic-based wastewater treatment plants. Therefore, there is no capital expenditure costs or lead time.