UNC CHARLOTTE
The WILLIAM STATES LEE COLLEGE *of* ENGINEERING

Senior Design Project Description

Company Name	Genesis Water Technologies, Inc	**Date Submitted**	**06/22/17**
Project Title	Isolating Lithium From Brine Water Solution to create High Purity Lithium Carbonate (GNYS_ION/GNYS_ELECT)	**Planned Semester**	**Fall/Spring 2017-2018**

Personnel

Typical teams will have 4-6 students, with engineering disciplines assigned based on the anticipated Scope of the Project. 250 hours are expected per person.
Complete the following table if this information is known, otherwise the Senior Design Committee will develop based on the project scope:

Discipline	Number	Discipline	Number
Mechanical	2	Electrical	2
Computer	1	Systems	
Other (Civil/Env Engineer)	1		

Note: The numbers above are for each team. So one team will be 6 and a total of 12 for the two teams.

Project Overview:

Lithium is an increasingly valuable element with the explosion of usage in battery storage applications. With the demand increasing, it is becoming interesting to investigate waste water streams to determine if economic Lithium recovery is possible.

The proposed project seeks to build a proof-of-concept device to implement the Supporter's technology and measure the effectiveness of the process for the recovery of lithium and possibly other rare metals from samples of liquid surface or deep well sources. The purpose and specific goals of the project are to increase the recovery of lithium from the deep well liquid samples to 85%+ with purity of greater than 99.5% at a lower cost per ton than conventional lithium extraction methods currently available.

The project seeks to achieve these goals through the use of specialized treatment technology and recently developed and commercially available porous (lithium ion sieve/LISs) to extract valuable metals in the brine solution and through the use of an alternative resin based media as one of the process steps for isolation. All of the process technology will be supplied by the Industry Supporter. The task of the team is to develop a mechanical/electrical implementation that can process samples and determine what the result is.

This project will be to develop a proof of concept model to process brine waste water and recover Lithium and potentially other rare earth elements.

Initial Project Requirements:

Baseline Samples

Actual brine water samples and soil samples will be provided and shipped to University of North Carolina – Charlotte. The brine water samples will be analyzed for water quality parameters using ICP-MS for metals. This analysis will confirm the independent lab testing performed on the samples brine water and soil samples for verification purposes of the lithium content in the samples.

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System design and testing

In this task, the goal is to configure each of the process components in the isolation process required to achieve a recovery of >65-70% of Li with final product of Lithium carbonate with purity of >99.5%. It is important to note that while the process being implemented is a chemical process, the students will not have to develop the chemistry of the process. The Chemistry of the process will be provided to the team by the supporter, so the project work is not chemistry development, but just the design and build of the mechanical and electrical apparatus to process samples based on the process parameters provided. In other words, the Industry Supporter will act as the Process Engineer and the student team the mechanical and electrical engineers. Industry supporter has committed to attend the weekly team meetings to provide the chemical process input.

There will be 6 process component steps: Clarification/Filtration, Electrocoagulation, Ion Exchange, Evaporation, Rehydration/Precipitation and Drying. At each step, ICP analysis will be done (off line, not integrated) to confirm outputs of the stage and inputs to the next process step.

Dual Project: The second Project Team will do exactly the same, except they will replace the Ion Exchange step with Electrolysis.

Technical Supporter will provide Mechanical and Electrical performance requirements for each step in this process, so students can design and build a proof of concept model to process actual samples to determine if the design achieves the desired recover and purity rates.

Expected Deliverables/Results:

A proof of concept, small scale unit that can process a brine sample through 6 process steps. The size is envisioned to be about the size of a desktop.

Disposition of Deliverables at the End of the Project:

GWT will take possession of the proof of concept model after the Expo is complete.

List here any specific skills, requirements, knowledge needed or suggested (If none please state none):

Specific skills required:

- After each process step, an ICP analysis will have to be run to determine element composition. Civil/Environmental Engineering Student will be required to do this analysis. Dave Naylor has confirmed that he can provide a student to the team each semester to support the project and perform this testing. Student should have an interest in Environmental Engineering and Water treatment.
- Technical Supporter will provide team guidance on the Chemical processes required. Technical Supporter will translate the process requirements to mechanical and electrical requirements that the student design team can design and build to.