Contract No. G-045-085

"Conceptual Design for Chlor-Alkali and Valuable Materials Production from Oilfield Brine"

Submitted by: Barr Engineering Co.

Principal Investigator: Richard Hardegger

PARTICIPANTS

Sponsor	**Cost Share**
Triple 8 (cash)	$75,000
Triple 8 (in-kind)	$35,000
	$110,000
North Dakota Industrial Commission/OGRC Funding	$110,000
Total Project Cost	$220,000

Project Schedule – 14 months
Contract Date – July 23, 2018
Start Date – May 2, 2018
Final Report: July 1, 2019

Project Deliverables:
Status Report: October 1, 2018 ✓
Status Report: February 1, 2019
Status Report: May 1, 2019
Final Report: July 1, 2019

OBJECTIVE/STATEMENT OF WORK:

This project will develop a preliminary base plant design, products list, and economic assessment for a near-term commercial facility that produces at least 1 million gallons per week of 35% hydrochloric acid (HCl) solution along with a corresponding amount of caustic soda. The process will be designed in a modular way such that its capacity can be scaled up later to produce additional materials from oilfield brine. Module additions would be a future retrofit, if deemed economically beneficial. The project will also evaluate the feasibility of recovering other high-value materials, such as lithium, magnesium, rare earth elements, iodine, potassium and bromine from the oilfield brines. The outcome will propose a vetted technology such that investment marketing and establishment of a commercial facility can commence relatively quickly.

Barr Engineering Co will be the lead organization for this project. The University of North Dakota Institute for Energy Studies (UND IES) and Triple 8 LLC will partner with Barr Engineering Co. UND EIS will provide process modeling and laboratory analysis to support the process design. Triple 8 LLC is the private business interested in commercializing the proposed technology and will provide matching funds and in-kind support. OneCor Services LLC supports this initiative and would utilize the local supply of HCl.

STATUS

The Contract has been executed.

October 2018 Status Report received - It states in part: We completed the following activities during our first reporting period:

- Sample of produced water collected from Brunelle SWD
  - Sample was analyzed for major chemical constituents
- Market analysis for a facility processing 25,000 barrels of brine per day for the following products:
  - Hydrochloric acid
  - Caustic soda

    - Chlorine gas
    - Sodium hypochlorite
    - Magnesium metal
    - Bromine
    - Potash
    - Calcium chloride
    - Lithium hydroxide and lithium stearate
- Basis of Design
    - Codes and standards applicable to design and construction
    - Mechanical
    - Electrical/controls
    - System control & monitoring
    - Instrumentation (in progress)
    - Structural Design (in progress)
    - Civil/geotechnical
- Conceptual design
    - Process design (in progress)
- Process modeling and selective precipitation
    - Sampling and testing (in progress)
- Consideration of environmental requirements
    - Air permits (in progress)
    - Liquid waste discharge (in progress)
    - Solid waste disposal (in progress)
    - TENORM (in progress)
    - Construction permits (in progress)
- Capital cost expectation (in progress)

(A copy of the complete status report is available on the website.)

Updated 11/29/2018