Patented Evaporation & Crystallization Process
Timeline

• 2009 – Facility was constructed under previous ownership
  ○ Q4 2009 – Venture Engineering & Construction, Inc. (“Venture”) hired by previous ownership to manage construction and commissioning
  ○ Late 2009 – Operations begin (3,500 bbl/day facility)

• 2010 - Facility encounters increasing and severe metallurgical issues
  ○ Facility shuts down due to improper materials of construction and process issues

• 2012 - Facility is acquired by Fairmont Brine Processing, LLC (“FBP”)
  ○ Venture is hired to redevelop the facility as a 4,000 bbl/day plant

• 2013 - Pretreatment operations commence

• July 1, 2014 - Evaporation & Crystallization process operations commence

• October 1, 2014 – Sold 100% of the plant capacity under two take or pay contracts (4,000 bbls /day) through end of 2016.
Patent & Permits

- **United States Patent**
  - US 8,535,538 B1
  - 20 Years
  - Brine Recycling Process

- **National Pollution Discharge Elimination System (NPDES)**
  - NPDES Permit #01164086554

- **United States Environmental Protection**
  - US EPA ID #WVR00521948

- **West Virginia Department of Environmental Protection**
  - WVDEP Air Permit #R13-2794
Market Needs

• Deep Well Injection ($4.00/bbl plus trucking) Often $15+/bbl all in.
  • Technically Enhanced Seismic Activity
    • Induced earthquakes becoming a more common occurrence
    • Capacity not sufficient to handle future volumes
  
• Sequesters Water Underground
  • Trillions of gallons of recoverable water being injected beneath the earth’s surface

• In The Year 2027
  • 38,041 wells in both Pennsylvania and West Virginia
  • 382,944 bbls of fluid will need to be disposed of on a daily basis (PADEP 2012)

• Fairmont Brine provides a cost comparable, environmentally responsible alternative to deep well injection
  • Contracts range from $6.00 to $7.50/bbl plus trucking
  • Most clients within 60 miles which limits trucking cost
  • Expansion of Plant 1 on-going (10,000 bbls /day)
  • Negotiating 35,000 bbl /day plant with an E&P on a 5 year take or pay commitment
Process Overview

- Nameplate 4,500 bbls /day
- Pre-treatment to remove Barium, O&G, TSS
- Equalization
- Multiple Effect Evaporation (3 Effects)
- Centrifugation and Drying
- Storage of distilled water for cooling and reuse
- Storage of dry sodium chloride rock salt
- Storage of liquid calcium chloride
- Design Feed Total Dissolved Solids (TDS) 17%
  - TDS is a measure of total salt content
Multiple Effect Evaporation

- **Principle of Operation:**
  - Takes advantage of the relationship between boiling point and pressure (boiling point increases with increase in pressure, and decreases with decrease in pressure)
  - Horizontal shell & tube heat exchangers, suppressed boiling type evaporation, feed forward
  - Effect 1 is boiler steam driven (Elevated pressure)
  - Water boiled in Effect 1 used as energy to drive Effect 2 (lower pressure than Effect 1)
  - Water boiled in Effect 2 used as energy to drive Effect 3 (lower pressure than Effect 2)
Multiple Effect Evaporation
BYPRODUCTS

• Distilled Water
  • Reused in the drilling & fracturing process
  • Discharged under NPDES

• Sodium Chloride
  • Dry rock salt for de-icing of roads, as well as the chlorine and caustic soda manufacturing sector within the chemical industry

• Calcium Chloride (“Heavy Brine”)
  • 10.2+ PPG
  • Freeze point -10 to - 25 F
  • Reused in the drilling and hydraulic-fracturing process
  • De-icing of roads and coal piles
  • Dust suppressant
  • Ballast for tractor tires
• Dissolved salts also change the boiling point, as a function of concentration, and composition.
• Mixed salt composition increases the challenge
• As the concentration or composition of salt changes in the feed and throughout the process, operating parameters must be adjusted or boiling will stop
• Careful process control is required
• Byproducts are recycled for reuse

There are no other Evaporation & Crystallization plants operating on flowback and produced water!
As an Alternative To Deep Well Injection, Fairmont Brine Processing Provides Environmentally Responsible Water Treatment Solutions To the Oil & Gas Industry