Treating Produced Water to Zero Liquid Discharge in a Combined Heat and Power Application

An integrated Concentrator from Heartland Water Technology, Inc. captured waste heat from six compressors to treat 30,000 GPD Marcellus shale produced water to zero liquid discharge.

Key Takeaways

- Successful cogeneration solution
- Minimize environmental footprint
- Flexible, safe and cost-effective treatment of produced water waste stream

Overview

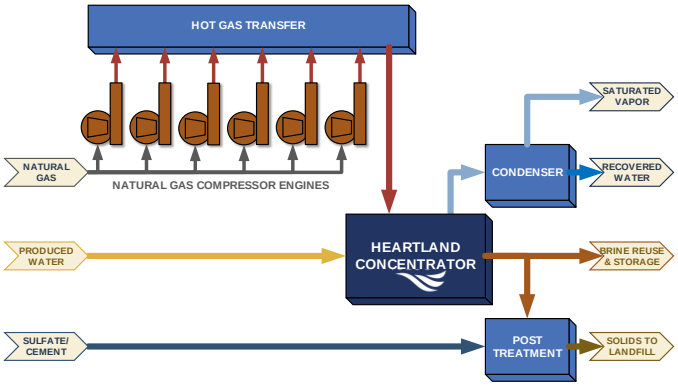
The customer was seeking a cost-effective treatment solution for the water produced from their natural gas drilling operations in the Marcellus Shale. Because its solution can be configured to run on waste heat generated from natural gas compressors, Heartland Water Technology, Inc. was able to capture sufficient thermal energy from the six compressors on the customer's site to treat the entire produced water stream, eliminating the need for additional energy.

In fact, Heartland was able to affordably and efficiently treat up to 750 bbl/d (31,500 GPD) of processed water all the way to zero liquid discharge.

Background

Due to the geology of the region, local deep-well disposal of produced waters was not an option for the customer. As a result, disposal often required transport via tanker truck to a remote deep-well location in Ohio at a significantly elevated cost. The customer turned to the expertise of Heartland to provide an economically viable wastewater treatment solution.

Heartland Solution



The customer selected Heartland to install and operate a LM-HT® Concentrator capable of processing up to 750 bbl/d of produced water to a broad range of final concentrations up to zero liquid discharge (ZLD).

Heartland's unique evaporative process provides a simple, robust treatment solution for challenging wastewaters. An innovative process design provides maximum flexibility in thermal energy sourcing, including the use of waste heat from various combustion exhaust gases. In addition, Heartland's unmatched processing flexibility allows for a broad range of wastewater treatment specifications to be met using a single unit operation. As a result, The Heartland Concentrator™ featuring its proprietary

LM-HT® system, provides a variety of opportunities for integration with industrial processes to optimize economics through energy efficiency and highly customizable processing capability.

Waste Heat Integration

The Heartland Concentrator™ was integrated into the compressor station to use waste heat from the 6 compressor engine exhausts and a 300 KW generator for evaporation. Each connection included automated safety isolation valves, and supply header pressure was continuously monitored to optimize operating conditions and ensure no backpressure was placed on the engines driving the compressors.

Not only was this a robust mechanical design, but the waste heat provided enough thermal energy to treat the entire produced water stream.

ZLD Treatment Mode

Initial operations at the site involved treatment of produced water to ZLD. Heartland's process concentrated produced water, reducing the total wastewater volume by almost 80%.

From ZLD to Brine Treatment Mode

While Heartland's technology successfully operated continually in ZLD treatment mode, the hydraulic fracturing process evolved to allow use of higher TDS water making it less critical to treat to ZLD levels of concentration.

In response, Heartland adjusted operations with a simple set-point change, processing produced water to a concentrated brine with very high TDS but containing minimal precipitated solids. Operating in this manner minimized the volume of deep-well disposal while simultaneously providing an opportunity to recycle a portion of the water for drilling operations.

Conclusion

The operation of its Concentrator at the customer's Compressor Station is a prime example of the versatility and capability of Heartland's solution. With successful operations both in ZLD mode for solid waste disposal and in brine mode for a combination of beneficial reuse and deep-well liquid disposal, the Heartland Concentrator™ successfully demonstrated its operational flexibility and effectiveness across a wide range of treatment specifications.

Additionally, the Heartland Concentrator™ operated efficiently at remote oil and gas well sites and pipeline locations with little or no access to electricity or service water. It is this level of synergy with oil and gas operations that positions Heartland Water Technology well ahead of the competition as a cost-effective and consistent wastewater treatment solution for the Oil & Gas industry.

HEARTLAND
WATER TECHNOLOGY