gastechnology.org

DIRECT CONTACT STEAM GENERATOR

Gas Technology Institute (GTI) is a leading research, development, and training organization addressing global energy and environmental challenges. We're applying energy and aerospace experience to lower energy costs and provide cleaner sources of fuel and power.

DIRECT CONTACT STEAM GENERATOR

For enhanced oil recovery using produced water

GTI's patented direct contact steam generator (DCSG) is a portable, container-based, oxy-fired, direct-combustion steam generator that requires less water and minimal water treatment. It is ideal where water is scarce or expensive to remediate and where greenhouse gas emission reductions are required.

Experimental steam generator test hardware

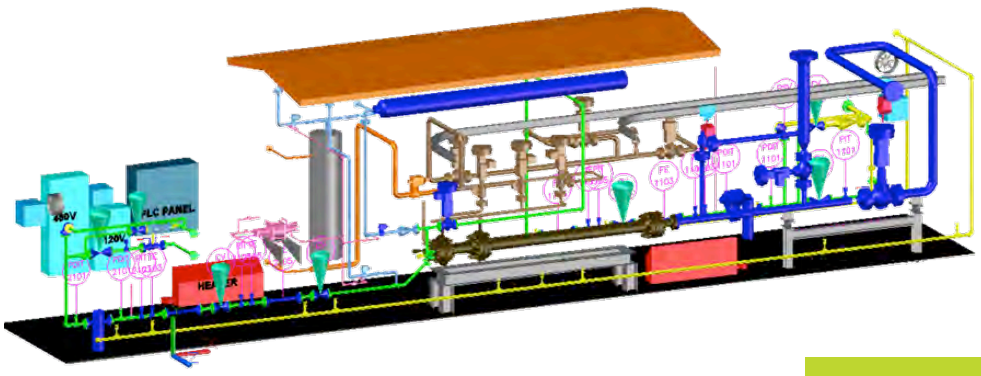
The DCSG has been developed as an alternative to once through steam generators (OTSGs) for steam assisted gravity drainage (SAGD) for heavy oil and bitumen production. It uses produced water as the feed and removes the impurities by filtration from the produced steam. The DCSG has been tested with 13,000ppm total dissolved solids in the feedwater. With a reduction in water treatment required there is a significant savings in capital and operating costs.

The process reduces low-level heat losses associated with cooling the produced water for treatment and minimizes/eliminates blowdown water, further reducing low-level heat losses associated with cooling the blowdown for recycle disposal. There is no flue gas because of the direct combustion and no nitrogen in the steam due to the use of oxy-combustion. Carbon dioxide can be separated from the steam using limestone if desired. The reduction in equipment compared to OTSG substantially reduces the footprint for SAGD operations.

Produced water (left) and condensed outlet stream

Steam generator with lime slurry injection for CO_2 separation. Exhaust stream is steam and reduced CO_2.

STATUS: GTI has performed small-scale $^1/_4MW_{th}$ testing using Alberta SAGD produced water and has a scale-up design for a $12MW_{th}$ system. We are presently seeking to partner with an operator to host a $12MW_{th}$ demonstration.



KEY FEATURES

- Efficient steam generation
- Uses produced water as boiler feedwater
- Designed to meet Canadian regulations and oil sands requirements
- Utilizes steam generated from combustion products (9% additional steam)
- Carbon dioxide capture ready

BENEFITS

- Reduced complexity compared to OTSG
- Nearly eliminates water treatment system
- 50% reduction in water treatment capital cost
- Reduced CAPEX and OPEX
- Zero liquid discharge
- CO_2 reduction of at least 50%
- >10% reduction in NG usage/ BBL steam
- 10% reduction in water usage
- Reduced footprint / modular
- Low NO_x

APPLICATIONS

- Steam assisted gravity drainage
- Heavy oil recovery
- Bitumen production
- Water cleanup with power production

gastechnology.org

Contact: Jim Seaba
james.seaba@gastechnology.org, 847-768-0609

info@gastechnology.org | @gastechnology
1700 S Mount Prospect Rd, Des Plaines, IL 60018 USA