

Alternative Technology Solutions FOR SAGD Produced Water Recycling

Veolia Water Solutions & Technologies can integrate produced water treatment and steam generation to provide the optimal solution for each application.

STEAM ASSIST GRAVITY DRAINAGE (SAGD) IS AN insitu method for recovering oil from tar sands. SAGD projects require large amounts of water for high-pressure steam generation to assist in producing low API crude such as that found in the Oil Sands of Alberta, Canada.

Recycling produced water for steam generation can be an economical and environmental advantage for SAGD projects. Recycling the produced water provides a cost-effective source of water to supply the medium to high pressure steam generators or boilers. Recycling also provides an alternative to expensive surface discharge or deep well injection of the produced water.

Veolia Water Solutions & Technologies (VWS) offers three different technology options for accomplishing highly effective produced water recycling for SAGD projects. Each of these options provide customers with its own set of benefits and advantages, depending upon the specific produced water parameters and generator requirements of the site.

1) Softening IX. Softening IX represents the "conventional" option for treating produced water through a series of chemical treatment steps to bring its quality up to meet the requirements of a once-through steam generator (OTSG). Here, the process train typically consists of induced gas flotation, nutshell filtration and primary and polishing ion exchange.

The Softening IX process was developed for conventional oil recovery, where hardness removal is important. Oil sands typically do not have hardness, however the produced water does contain high concentrations of silica, which is substantially removed by the warm lime process. The Softening IX process, which is currently being used at Suncor's Firebag 1 operation in Alberta and was provided by VWS, offers SAGD projects the most commonly used process design to produce water suitable for OTSGs.

Utilizing Water Tube Boilers. Water tube boilers can provide a number of advantages over once-through steam generators in SAGD projects. Water tube boilers are suitable for alternative fuels, such as the coke remaining after the upgrad-

ing of bitumen. In addition, water tube boilers are available in larger capacities than OTSGs and can be available within significantly shorter delivery times. They can also be suitable for cogeneration projects.

Water tube boilers, however, require a higher quality feed water than can be produced by the conventional Softening IX process. For this reason, VWS offers two alternative process water treatment technologies – Evaporation/ZLD and OPUS™. Each process provides the level of treatment required to serve water tube boilers.

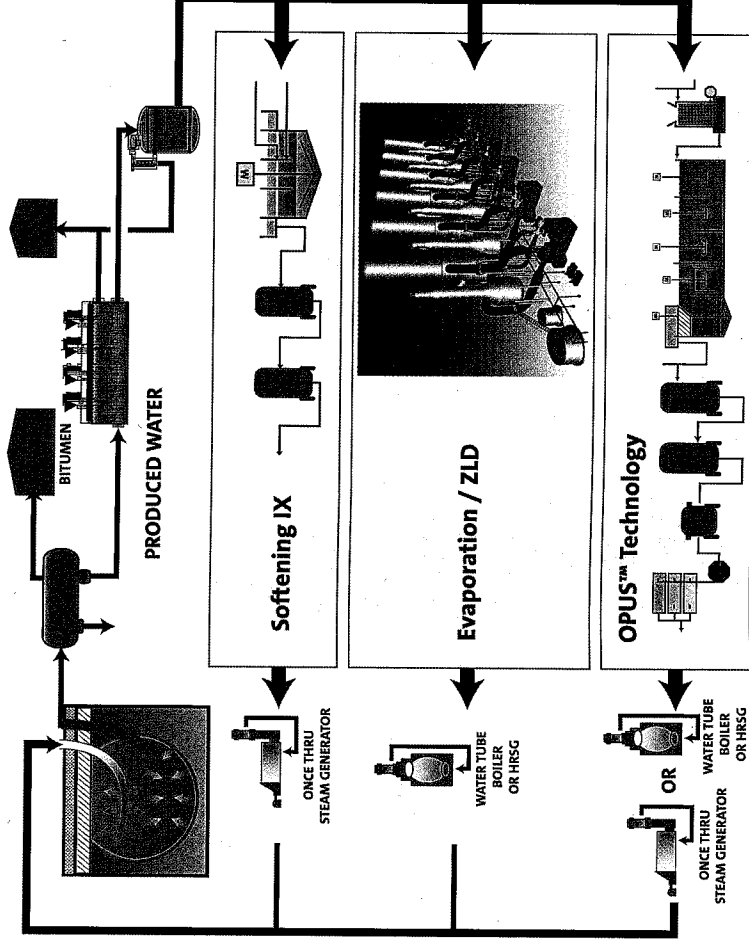
2) Evaporation/ZLD. The Evaporation/ZLD process is a simple, robust and proven technology, well suited to recycle produced water as boiler feed water. The produced water enters the Evaporator/ZLD system where as much as 95 percent of it becomes high quality distillate of less than 5 ppm TDS. Evaporation/ZLD is a more capital intensive process than conventional softening and ion exchange, but allows the use of water tube boilers and minimizes or even eliminates liquid waste. These features can provide

significant strategic advantages for SAGD projects.

3) OPUS™. OPUS technology combines the proprietary high rate chemical softening process, Multiflo™, with filtration, ion exchange and reverse osmosis to generate high quality water and very low waste volume at low power consumption. VWS developed OPUS technology and is currently applying it for produced water in California (see related articles, pages 1 and 2). It can produce the same high quality water as evaporation but has the advantage of less capital. And compared to the conventional softening ion exchange process, OPUS technology provides for a lower operating cost and less waste generation.

Successful Operations. Veolia Water Solutions & Technologies possesses the technological expertise to integrate produced water treatment and steam generation to provide the optimal solution for each application. All three of these effective technology options are designed to provide years of continuous and reliable operations. Advanced technologies, and knowledge of critical produced water treatment parameters are paramount to maximizing re-use and maintaining optimum steam generation. Veolia Water Solutions & Technologies helps ensure our customers successful produced water treatment operations. ■

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