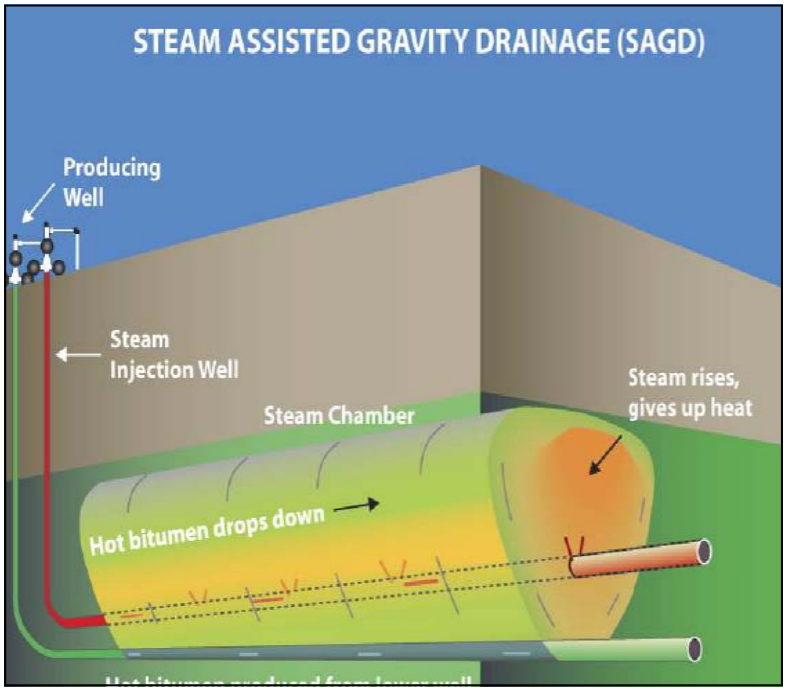
Hayward Gordon Ltd.
Pumps • Mixers • Strainers • Engineered Systems and Controls

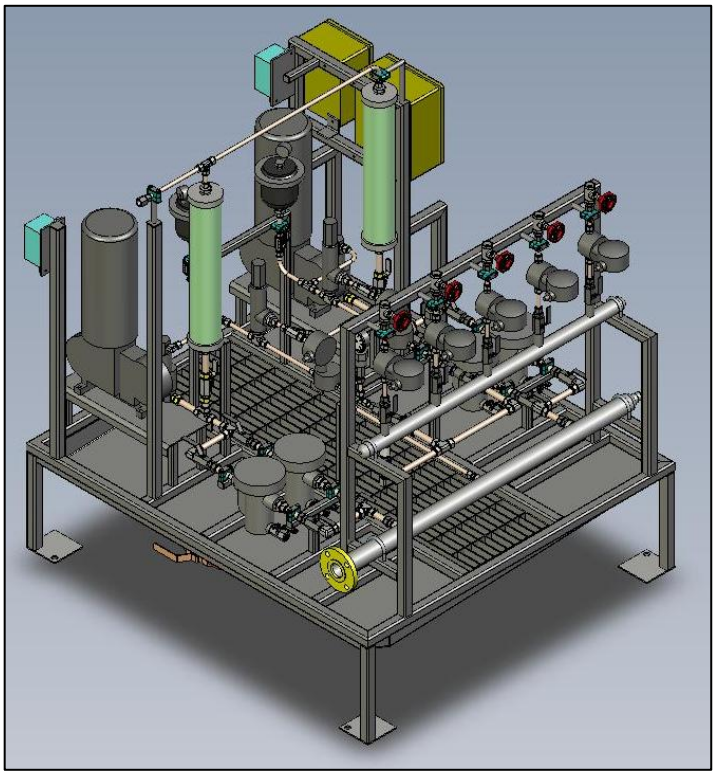
Spotlight on the Canadian Oil Patch – SAGD Production



Steam assisted gravity drainage **(SAGD)** is a method of underground bitumen extraction that is achieved using pairs of horizontal wells for simultaneous heat injection and production. By injecting steam through the upper injection well and into the steam chamber (inset picture), the bitumen along the walls heats up and flows down for collection by the lower well.

This method allows for operations to go after 80% of the bitumen resources that would typically be considered too deep to surface mine and has opened up the oil sands to a number of smaller producers.

The recovered solution in the lower well is a mixture of hot bitumen and condensate which is then pumped back up to the plant for separation. The recovered water is sent back to the boilers to be generated back into steam. The critical components to the SAGD process are the high pressure boilers which generate the steam. The water supply for these boilers is from the subsurface and frequently contains contaminants that can reduce the efficiencies of the high pressure boilers. In order to meet water recycle rates of 98% and minimize water consumption, all water must be purified prior to being used as boiler feed.



Water treatment involves the controlled use of complex chemistries during each stage of the process. ***Hayward Gordon's*** chemical injection skids can be used to accurately meter and inject the required chemicals into each process. These metering skids can be built in Simplex, Duplex and Multiplex designs.

Typical Boiler Chemical Services:

- Polymers (various)
- Caustic Injection
- Chelant Injection
- Reverse Emulsion Breaker
- Regular Emulsion Breaker
- Oxygen Scavenger Injection
- Phosphate Injection
- Filming Amine Injection
- Sulfite Injection

Skid construction can be designed to CSA, ASME B31.1/B31.3, API & ABSA codes and requirements.

Primary Operators in the SAGD Recovery Schemes

ATHABASKA OIL SANDS AREA – In Situ-Enhanced Recovery				
Operator	Field or Area	Geological Formation	Recovery Method	Production (m3/day Bitumen)
Connacher		McMurray	SAGD	(Start Fall 07)
ConocoPhillips	Athabaska	McMurray	SAGD	0
Devon	Jackfish	McMurray	SAGD	0
EnCana	Christina Lake	Wabiska-Athabaska	SAGD	507.1
EnCana	Foster Creek	Wabiska-Athabaska	SAGD	6559.1
Husky		McMurray	SAGD	0
Japan Canada	Hangingstone	Wabiska-Athabaska	SAGD	1198.3
MEG Energy	Christina Lake	McMurray	SAGD	0
Nexen	Athabaska	Wabiska-Athabaska	SAGD	0
Opti-Nexen	Long Lake	McMurray	SAGD	0
Petro-Canada	Athabaska	Wabiska-Athabaska	SAGD	3911.5
Petro-Canada	Meadow Creek	Wabiska-Athabaska	SAGD	0
Suncor	Firebug	Wabiska-Athabaska	SAGD	5604.2
Total E&P Canada	Joslyn Creek	Wabiska-Athabaska	SAGD	149.4

Hayward Gordon Installations

Connacher – Great Divide (BDR) Connacher Oil and Gas Limited is a Calgary-based Canadian oil and natural gas exploration, development and production company. In August 2007, Connacher completed construction at "Pod One", a 10,000 barrel-a-day oil sands processing plant at its Great Divide project, located approximately 80 kilometers south of Fort McMurray on Highway 63. This $200 million project will demonstrate the commercial viability of SAGD projects producing 10,000 barrels per day.

Hayward Gordon has provided a complete boiler chemical package to Pod One including 13 metering pumps skids, 10 storage tanks and spare parts. Total project value was $ 790,000. Pump packages included polymer injection, caustic injection, chelant injection, regular/reverse emulsion breaker, oxygen scavenger injection, phosphate injection, filming amine injection and slop oil treatment.

As of September 2007, the system was in service and working according to design. The Company has already begun the application process for regulatory approval to proceed with its second 10,000 barrel-a-day project, to be located ten kilometers east of Pod One at Algar.

EnCana Foster Creek (Vista Projects) Located in the Cold Lake oil sands deposit, south of Fort McMurray, EnCana's Foster Creek Project started producing in 2002 and currently pumps out about 25,000 barrels of bitumen per day. With and estimated 10 Billion barrels of recoverable bitumen, EnCana plans to take its production which is entirely in-situ to 500,000 barrels per day by 2015.

Hayward Gordon has supplied boiler chemical packages including 5 metering pumps skids, 1 storage tank and spare parts. Total project value (shipped) to date is $ 230,000. Pump packages include chelant injection, demulsifier injection, and amine injection.

EnCana Christina Lake (Vista Projects) Located in northeast Alberta about 120 kilometers south of Fort McMurray, Christina Lake has the potential to be EnCana's largest oil sands project. As a preferred vendor and based on earlier work completed at the Foster Creek site, ***Hayward Gordon*** is actively engaged with Vista Projects to supply various packages on upcoming phases. (Chelant injection, sulfite injection, amine injection and demulsifier injection Phase 1C). – Order value is $ 250,000.

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ENGINEERED SYSTEMS AND CONTROLS

ENGINEERED SYSTEMS		DESCRIPTION	FEATURES
Custom Pump & Process Packages		Your single-source for the design and manufacture of custom engineered pumping systems. Based on process and application specifications, we will produce P&ID's and design the system with necessary pumps, piping, controls and instrumentation. You will receive a skidded, tested and fully functional system complete with documentation that is tailored to your specific requirements.	• Optimal pump type selected for each application • Certified TSSA piping systems welded to ASME B31.1 and B31.3 • CSA approved control panels • Optional PLC's and operator interfaces • Optional CRN registration of components
Tank & Mixer Packages		Hayward Gordon saves you time and money by integrating our in-house mixing expertise into complete turn-key packages that include Hayward Gordon mixers, tanks and various accessories designed to your specifications.	• Range of tank materials includes stainless steel, fiberglass, HDPE, steel, and rubber lined steel • Bridge supports • Level controls
Metering / Chemical Injection Systems		Our custom engineered metering and chemical injection systems include pumps, components, controls, and instrumentation selected to suit the application and customer specifications. Typical applications include Alum, Chlorine, Hydrogen Peroxide, Ferric Chloride, Boiler and Cooling Water Additives, Polymers, Acids, Chelants, Phosphates, Dyes, Pigments, Starches, Coatings, and many other additives.	• Wide range of metering pumps including API 674 and 675 • Piping and frames available in 316SS, steel, or PVC • Certified TSSA piping systems welded to ASME B31.1 and B31.3 • CSA approved control panels • Optional PLC's and operator interfaces
Slurry Makedown & Mineral Dispersion Systems		Complete packaged systems for effective slurry makedown of bulk solids and difficult to wet materials. Typical applications include lime, gypsum, starch, talc, bentonite clay, calcined clay, and soda ash.	• Systems typically include; semi- bulk bag unloading station, overhead hoist, feed hopper with access hatch, dust seal, level monitoring, pneumatic vibrator, volumetric feeder with variable speed control, and mixing tank • Allen Bradley PLC and operator interface for automatic control and monitoring
Dry Polymer Systems		The innovative **ChemVac™** dry polymer makedown system, features a unique "high performance / high pressure" nozzle, providing one of the most efficient wetting systems available. Allen Bradley PLC and operator interface used to provide automatic control and monitoring.	• Feed rates to 1,000 kg/day > 1% concentrations Eliminate "fish-eyes" • Dust-free wetting • Stainless steel construction • CSA control panels
Liquid Polymer Systems		The **Activator™** series of liquid polymer systems provide fast and complete inversion of polymer. Allen Bradley PLC and operator interface used to provide automatic control and monitoring.	• Dilution flows from 5 gpm to over 100 gpm • Unique "Smart-Mixer" and post dilution mixing • Stainless steel construction • CSA control panels

Start-up service available on all systems

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HGCDN01/08rev.2-4M