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imagination at work

# Solutions for Oil Sands Upgrading



Vast deposits of sand containing viscous hydrocarbons are one of the most promising non-conventional sources of oil. GE has the experience and proven technologies necessary for the most effective exploitation of this resource.

### Core Products for the Core of the Process: Upgrading

The bitumen contained in oil sands is characterized by very high viscosity and a high ratio of carbon to hydrogen in

comparison with conventional crude oils. Therefore, the bitumen has to be upgraded before being processed in conventional refineries. This process of upgrading requires huge amounts of hydrogen or the reinjection of carbon and is usually realized

through either:

- Heavy oil upgrading or
- Coking

GE can supply a complete range of products for oil sands processing.



### High Thickness Reactors

Ideal for those applications where high pressure (up to 200 bar) and high temperature (up to 450°C) are crucial.

- Advanced technology for welding reactors up to 400 mm thick
- Full qualification with major Process Licensors (UOP, Chevron, IFP, HRI, Lummus, Shell, Exxon Mobil)
- Outstanding experience in manufacturing 21/4Cr1Mo1/4V reactors
- Proven on site assembly capabilities
- More than 80 units installed recently



### Reciprocating Compressors

Designed in accordance with API618 standards for heavy duty applications, GE's Oil & Gas H series Reciprocating Compressors are the solution of choice for Hydrogen Make-up service in heavy oil processing plants.

- Highest levels of performance, reliability and availability
- More than 1000 units installed in hydro-processing plants, up to 700 bar
- Backed up by GE's Oil & Gas Global Services for installation, start-up and maintenance
- From 100 kW up to the highest power levels found in reciprocating compressors



### Centrifugal Pumps

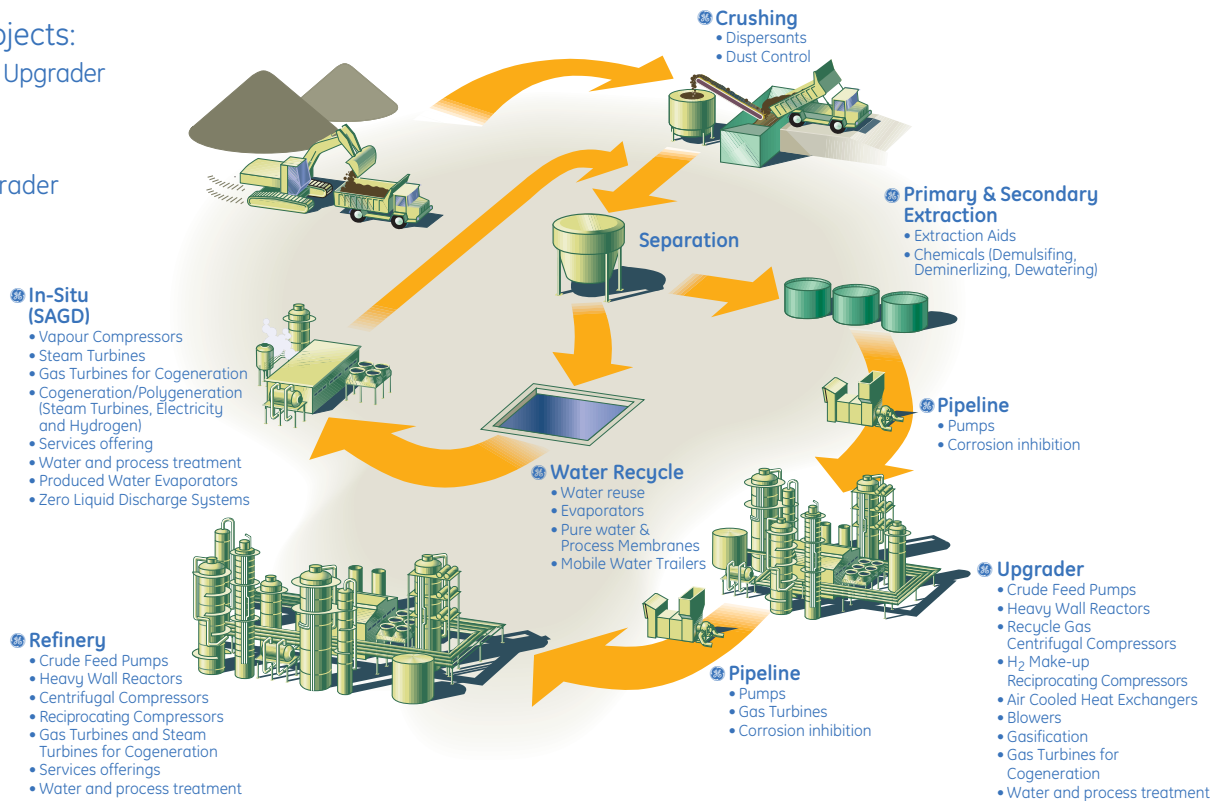
Full range of process pumps for refinery heavy duty processes designed in accordance with API610 (ISO13709) standards for continuous handling of high temperature liquids.

- Highest levels of performance, reliability and availability
- Referenced applications: first & second stage flash pump, reactor charge pump, LCF charge pump, heavy oil charge pump
- Hard facing and meticulous flow path design guarantees long pump life with highly erosive fluids

## Where GE Plays a Role

### Key Oil & Gas Projects:

- Husky Bi-Provincial Upgrader
- Suncor Millenium
- Syncrude UE-1
- Shell Scotford Upgrader
- Nexen Opti
- CNRL Horizon
- Shell Athabasca



### Efficient Platforms for Co-Generation

Maintaining a leadership position in turbine technology, performance and operational flexibility, GE offers both heavy duty and aeroderivative gas turbines with power output from 13 to 520 MWs.

- GE's H System – the world's most advanced combined cycle system and the first capable of 60% efficiency
- The LMS100 aeroderivative gas turbine features an intercooled cycle resulting in the industries highest simple cycle efficiency across the operating envelope
- Full range of service offerings



### Gasification

Gasification is a commercially proven technology that converts asphaltenes & petroleum coke into synthesis gas, which refiners and heavy oil upgraders can use to economically generate hydrogen, power and steam.

- GE offers long-term licensing agreements and customized gasification solutions
- GE has more than 50 years of gasification experience, with more than 60 plants in operation worldwide that use our gasification technology
- Gasification technology improves operating margins by eliminating the need to purchase natural gas to produce hydrogen and steam
- Carbon capture capable



### Water & Process Treatment

GE Water & Process Technologies provides the Oil Sands Industry critical services that maintain optimum operational efficiency. We provide a total solutions approach including treatment equipment, chemicals and tools for monitoring and analysis. The benefits of these offerings include:

- Oil, water and solids separation
- Corrosion inhibition
- Fouling control
- Enhanced product quality
- Asset protection and reliability
- Water Conservation
- Waste Minimization
- Evaporative Produced Water Treatment
- Zero Liquid Discharge Solutions