

PRODUCTION
TECHNOLOGIES.
FULL SERVICE.

HEAVY OIL PRODUCTION ENHANCEMENT

UNCONVENTIONAL HEAVY OIL PRODUCTION OPTIMIZATION



Schlumberger

**MAXIMIZE PRODUCTION
FROM RESERVOIR TO REFINERY**



UNLOCK POTENTIAL. **OPTIMIZE HEAVY OIL PRODUCTION.**

Reduce costs through application of production technologies

Heavy oil provides great economic opportunity. However, when the energy ratio needed to produce and upgrade a barrel of heavy oil can be as high as 40%, balancing economics throughout the project becomes challenging.

Production of medium, heavy, and extraheavy crude oil requires significant investment to lift, process, and transport these highly viscous fluids at ambient temperatures. Heating vessels, heated pipelines, diluents, power lifts, and booster pumps make up just some of the technologies that help meet flow and processing challenges caused by the effects of viscosity.

Schlumberger offers a single-source solution for the enhancement of even the most challenging heavy oil production applications. Our portfolio of chemicals can be used to reduce oil viscosity (for lifting, processing, and transport), maintain system operability and integrity, and improve production performance. And to ensure optimal production conditions, Schlumberger specialists can assess production systems, identify bottlenecks, and develop customized process treatment solutions.

TREATMENT STRATEGY

Schlumberger executes field evaluation total system analysis (TSA) in conjunction with laboratory testing to analyze (and replicate) field conditions to determine the most effective production chemical treatment strategy for optimal process performance.

Schlumberger provides the technology and expertise to ensure quality of oil produced, optimal equipment operability, and recycled water quality, as may be required to meet environmental discharge limits or SAGD steam generation operations.

Our heavy oil production optimization treatment strategies draw from a wide range of production chemical solutions as utilized throughout each stage of production.

These solutions are further enhanced when coupled with our proprietary ChemWatcher* integrated chemical management software in the Avocet* production operations software platform to deliver informed, real-time decisions regarding production chemical applications to drive operational efficiency, safety, and performance.

Process Steps

Drilling

Steam
Production

Injection

Oil/Water
Separation

Water
Treatment

Chemicals Used

Lubricants

Resins

Admixtures

Additives
(fluid loss
mitigation agents,
dispersants,
surfactants, etc.)

Corrosion
inhibitors

Scale
inhibitors

Biocides

Corrosion
inhibitors

Scale
inhibitors

Hydrocarbon
solvents
(vapor extraction)

Asphaltene
precipitation
inhibitors

Emulsion
breakers

Calcium
naphthenate
inhibitors

pH modifiers

Flocculants

Lime and
magnesium
oxide (MgO)

Caustic soda

Oxygen scavenger

Hydrogen sulfide
(H₂S) scavenger

KEY PRODUCTS

Emulsion breakers

Efficient crude oil separation from produced water yields both dry oil for export and clean water for discharge and reuse, thereby maximizing crude oil value and minimizing operating costs.

Reverse emulsion breakers

Where undesired levels of dispersed oil and solids in produced water streams are encountered, reverse emulsion breakers may be deployed to improve efficacy of secondary separation equipment.

Water clarification

Water clarifiers remove remaining fine oil dispersions and other insoluble matter from produced water streams, ensuring that purity specifications are met before water injection, reuse, steam generation, or disposal.

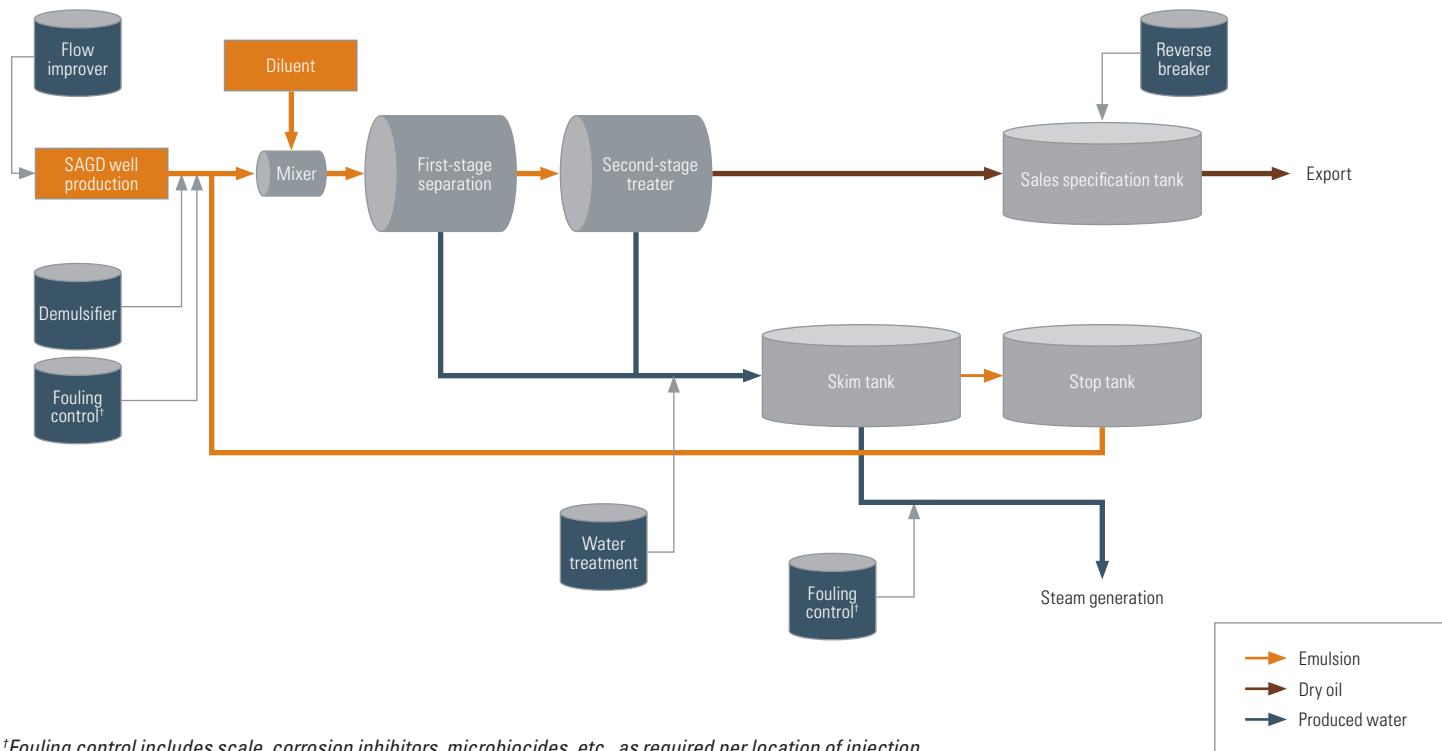
Fouling control

Organic (such as asphaltenes and polymers) and inorganic (such as mineral scale) deposition in production equipment can reduce efficiency of equipment (such as heat exchangers and compressors) and may lead to production flow restrictions. Schlumberger provides specialist expertise and treatments to minimize flow assurance issues caused by fouling, minimizing nonproductive time and ensuring optimal system performance. Our DeScal* descaling, decontamination, and decommissioning service ensures rapid remediation of fouling issues while preventative treatments—including scale, corrosion and asphaltene inhibition management programs—mitigate future fouling potential.

Flow improvers and viscosity reducers

The application of flow improvers and viscosity reducers can help reduce oil viscosity by up to 95% depending on the causes for the increased viscosity. Application of flow improvers consistently results in reduced energy lift needs and therefore reduced operational and capital expenditure, as well as increased oil production and revenue.

TYPICAL SAGD OPERATION SCHEMATIC



¹Fouling control includes scale, corrosion inhibitors, microbiocides, etc., as required per location of injection.



CHEMWATCHER SOFTWARE

Schlumberger ChemWatcher integrated chemical management software enables informed, real-time decisions about operational efficiency, safety, and performance.

ChemWatcher software leverages our global specialist knowledge and technical expertise, continually adding value from field startup through cessation of production. It integrates with market-proven tools such as PIPESIM* steady-state multiphase flow simulator, OLGA* dynamic multiphase flow simulator, and dbrHydrate* fluid analysis software to manage the workflow related to chemical applications, injections, and production processes.

ChemWatcher software depicts asset status and trends using a variety of visualization methods, ranging from simple traffic lights to detailed interactive reports. These facilitate real-time decisions regarding production chemical applications that help drive high-performance, efficient, and safer operations.

In addition to real-time production performance monitoring and analysis, ChemWatcher software is enabled for SCADA and telemetry. It also works as a central repository hub, providing information exchange and analytics for all data relating to

- flow assurance and integrity management
- production and product performance
- inventory management and commercial performance
- laboratory data and trend analysis.

UNLOCK POTENTIAL

OPTIMIZE PRODUCTION

Complete service offering to maintain and restore full production

Schlumberger production technology specialists deliver targeted, integrated strategies that help to decisively remediate production challenges, enabling customers to restore and improve flow performance and revenue while avoiding costly repairs and shutdowns.

Firmly established at the forefront of technology, Schlumberger has a full service offering that integrates pioneering chemical and process solutions, equipment, and software with unrivalled technical expertise.

Working with the world's largest oilfield services provider, our customers benefit from a truly unique combination of outstanding technological capabilities and improve their understanding of how to successfully address production challenges in an increasingly competitive marketplace.

The company's global footprint and extensive suite of technologies helps customers to maximize production more reliably, safely, and efficiently—regardless of system complexities or geography.



GLOBAL PRESENCE. OUTSTANDING CAPABILITY.

With established technology groups led by industry-recognized discipline leaders, Schlumberger ensures correct assessment of applications, selection of effective and fit-for-purpose products, and assured success in individual applications through accurate measurements. Results analysis drives development to ensure continuous improvement.

Our procedures, in combination with ChemWatcher software, form the foundation of this process, ensuring that tailored solutions are managed, accurately monitored, and delivered.

Locations

Technology centers are located in Houston; St. Louis, Missouri, USA; Aberdeen; Stavanger; and Dubai.

Technical service centers are located in Nisku, Alberta, Canada; Broussard, Louisiana, USA; Bogota, Colombia; Rio de Janeiro; Bergen, Norway; Volski, Russia; and Kuala Lumpur. These centers are supplemented by local facilities.





Global workforce

Scale and footprint

Mergers and acquisitions
track record

Executorial capability



Case Study

TOTAL SYSTEMS ANALYSIS ENHANCES HEAVY OIL PRODUCTION OPERATION

Evaluation of production chemistry requirements improves oil quality and process uptime

CHALLENGE

Schlumberger was tasked with conducting a TSA of a production facility in Canada in order to optimize production activity.

- Field consisted of >100 progressive cavity pumped (PCP) wells with sand in flow of API 10–14°
- Large treater units offered high residence time and operated at a high temperature of 130 degC [266 degF].
- Sand removal was affected by hot water jetting twice daily and hydrocarbon soaking of deposited solids to mobilize hydrocarbon deposits.
- Produced water was used to enhance oil recovery.

SOLUTION

Schlumberger undertook a field TSA in combination with laboratory evaluation of selected treatment chemistries prior to field trial deployment and optimization.

RESULTS

Using high temperatures in treater units led to soluble water condensing out of produced oil in the sales tanks as distilled water. This water would tie up throughout the entire system and register in sales oil, preventing offload.

- A resolution was attained by restricting communication between sales tanks (one hot, one cold) while treating with a batch demulsifier (EB-8088).
- A scale inhibitor (SI-4330) was used to mitigate increased scaling potentials in system heaters and vessels as a result of high process temperatures.
- Produced water was treated with a corrosion inhibitor (KI-3482) to minimize process corrosion potential.

UNLOCK POTENTIAL

OPTIMIZE PRODUCTION

PREVENT

PERFORM

CURE

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