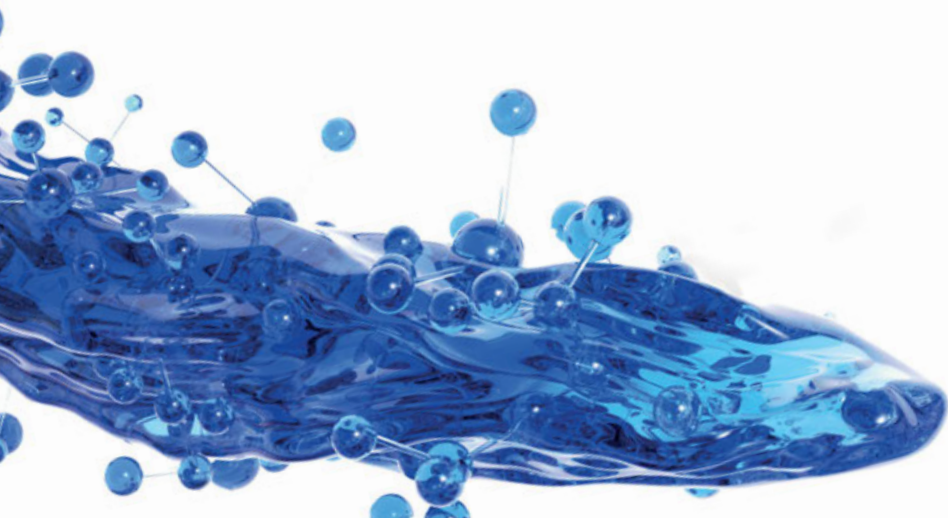


PRODUCTION  
TECHNOLOGIES.  
**FULL SERVICE.**

# PREVENT

CHEMISTRY TO MITIGATE PRODUCTION THREATS



**Schlumberger**

# MAXIMIZE PRODUCTION FROM RESERVOIR TO REFINERY

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# UNLOCK POTENTIAL, **OPTIMIZE PRODUCTION**

Schlumberger provides integrated production technology services that deliver tangible benefits and assurance to customers' worldwide oil and gas operations.

Firmly established at the forefront of technology, Schlumberger integrates pioneering chemical and process solutions, equipment, and software with unrivaled technical expertise.

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

Our global footprint and exceptional service delivery ensures that customers reliably and efficiently maximize production—regardless of system complexities or geography.

Schlumberger uses specialist research laboratories and field support operations to analyze issues across production operations and to engineer integrated solutions that help increase revenue and reduce operational costs through protecting asset integrity, maximizing production, and enhancing product quality.



# PREVENT

## MITIGATE PRODUCTION THREATS, OPTIMIZE PERFORMANCE

No matter how hostile or challenging the environment, the highly effective and evolving portfolio of trusted Schlumberger products and services maintains optimal production, helping to prevent and inhibit issues such as scale, deposit formation, and corrosion.

Schlumberger suite of preventative chemical technologies, chemical data management software, and pioneering SYMETRI\* dendrimer technology provide customers a unique combination of outstanding capabilities and extensive global reach.





# ASPHALTENE INHIBITORS

Schlumberger provides specialist expertise and treatments to minimize flow assurance issues caused by asphaltene precipitation, which helps operators minimize nonproductive time and improve environmental compliance.

Asphaltenes can precipitate out of crude oil because of changes in process conditions. The precipitated asphaltenes can present significant flow assurance challenges such as plugs and deposits in the formation, tubing, separators, and other parts of the system.

The most effective solution is formulated using field and fluid data. A range of laboratory tests is conducted based on this data to simulate field conditions, including the use of Schlumberger RealView\* live-fluid organic solids deposition analysis.

Product performance is modified in the field by measuring changes to process and fluid properties using instrumental and chemical methods.





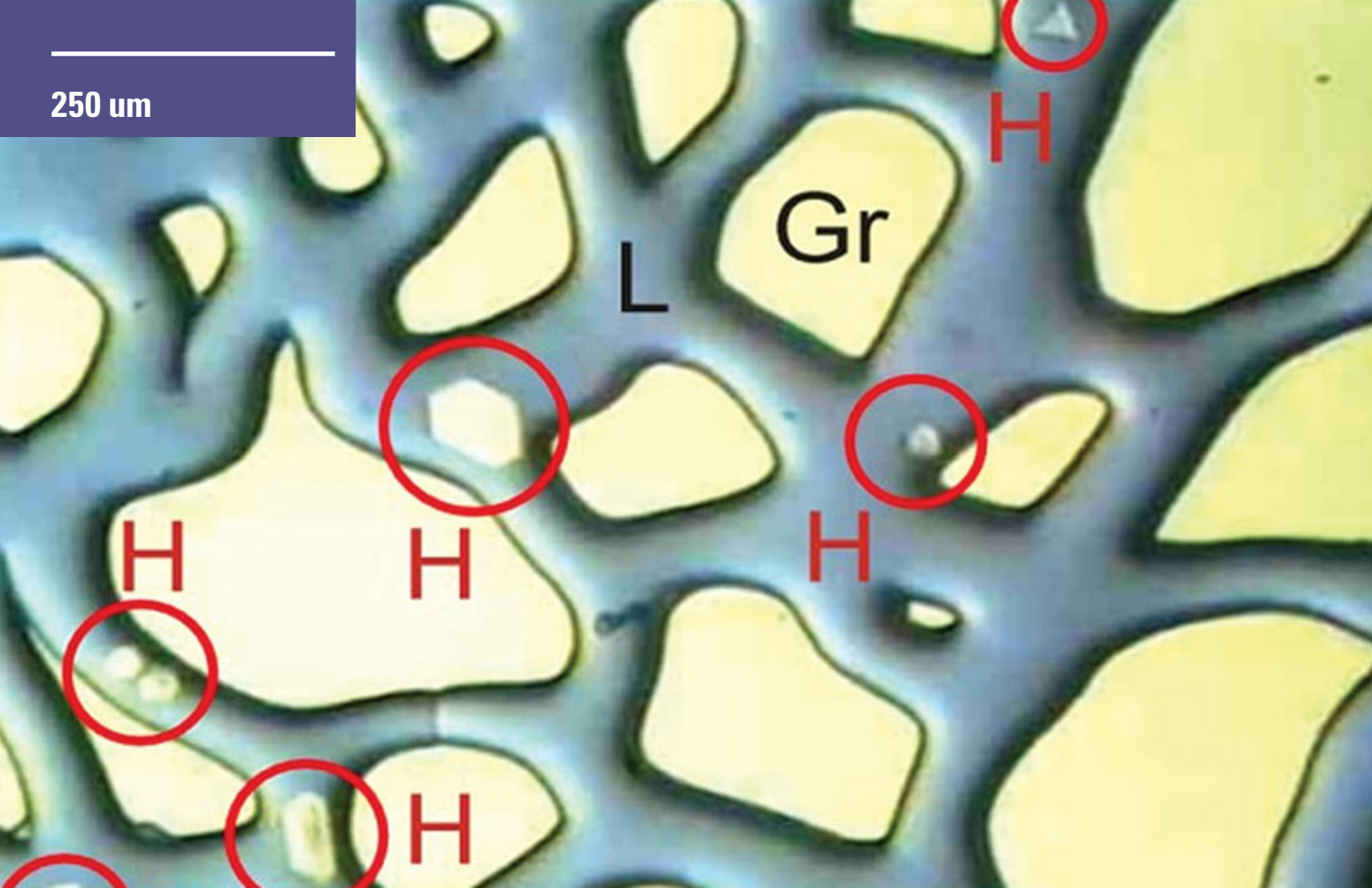
# CORROSION INHIBITORS

Schlumberger delivers a comprehensive portfolio of chemical treatments to preserve asset integrity. The treatments are specifically designed for application in all production conditions to mitigate corrosion regardless of environmental, production, or geographical challenges.

The range includes

- hydrotest products
- cooling water corrosion inhibitors
- environmentally acceptable corrosion inhibitors
- batch corrosion inhibitors
- high-temperature corrosion inhibitors
- gas corrosion inhibitors
- multifunctional products (combined scale and corrosion inhibitors)
- oxygen ( $O_2$ ) scavengers
- hydrogen sulfide ( $H_2S$ ) scavengers
- oil and gas pipeline inhibitors
- subsea and deepwater corrosion inhibitors.

250  $\mu\text{m}$



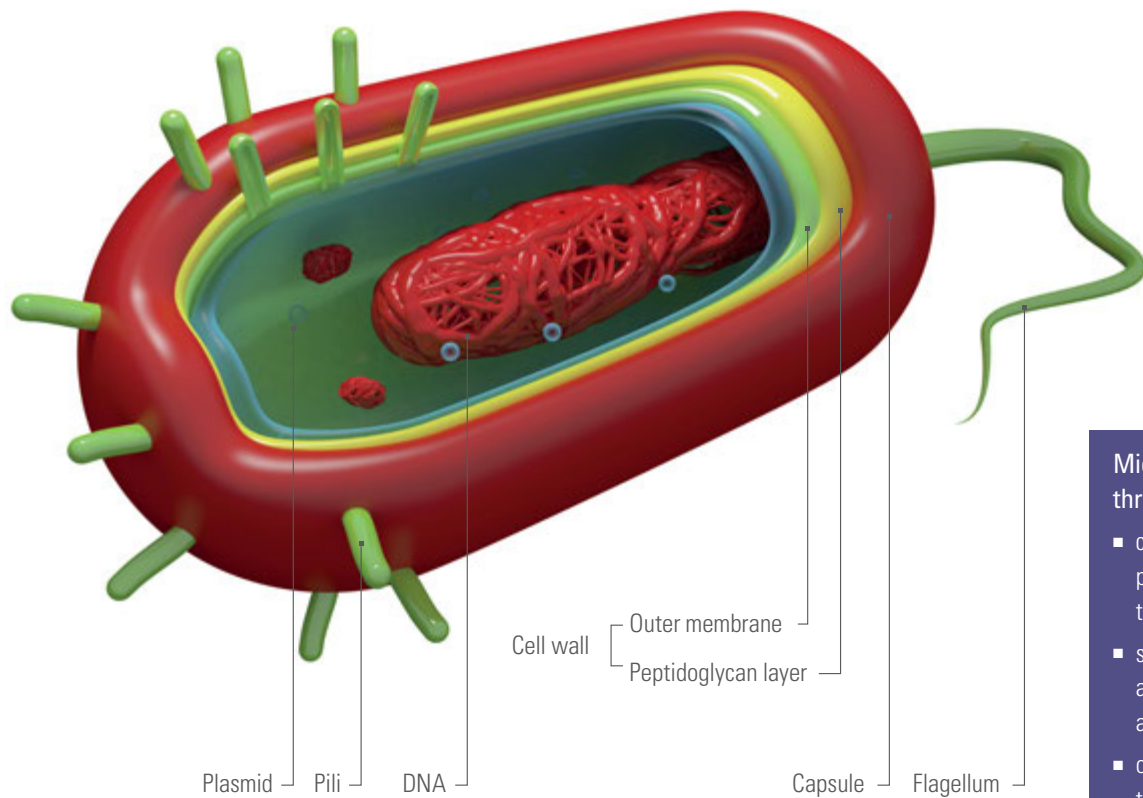
# HYDRATE INHIBITORS

Schlumberger is at the forefront of industry efforts to develop low-dosage hydrate inhibitors (LDHIs) as more environmentally acceptable, capex-efficient alternatives to commonly used thermodynamic inhibitors such as methanol and glycol.

## Modes of action

- Kinetic hydrate inhibitors (KHIs) interfere with hydrate crystal growth or nucleation by embedding themselves into the lattice structure, delaying significant growth for longer than the fluid's residence time.
- Antiagglomerants (AAs) prevent the agglomeration of hydrate crystals into large masses by dispersing water droplets within the condensate or oil phase.

Schlumberger provides detailed support to customers for LDHI applications, studying system conditions using phase-equilibrium modeling and advanced equipment for testing under field conditions to select the most effective treatment. Available technical support includes examination of the product's physical properties and its compatibility with contacted materials.



**Microbiocides fall into three categories:**

- chemistries such as aldehydes that penetrate the cell to denature the protein
- surfactants that coat the membrane and block the passage of nutrients across the cell wall
- oxidizing biocides that destroy the cell wall.



# MICROBIOCIDES

The Schlumberger range of microbiocides is proven to control a broad spectrum of anaerobic and aerobic bacteria, particularly sulfate-reducing bacteria for water-injection and produced-water systems.

These products are effective through direct microbiological activity and by modifying the environment to prevent microbial-induced corrosion.

Schlumberger is at the forefront of pioneering new field-based bacteria detection methods and services, biocide application programs, and nitrate applications to prevent water reservoir souring by shifting the consortia from sulfate-reducing bacteria (SRB) to nitrogen-reducing bacteria (NRB).

Typical oilfield applications include

- water injection systems
- process systems
- fuel systems
- stagnant water masses
- potable water systems.

Product applications are supported through monitoring programs.



# NAPHTHENATE INHIBITORS

Schlumberger has developed patented technology, covering application methodology and high-performance nonacid chemistry, that provides trusted expertise and a highly effective approach, addressing customers' specific needs around the world.

Chemical treatment options include the use of organic acids, acid demulsifiers, and nonacidic naphthenate inhibitors.

Laboratory test methodologies are designed based on the proposed type of naphthenate treatment required to meet the desired results. Schlumberger field monitoring techniques are designed to encompass treatment economics, effectiveness, and environmental and safety issues.





# PARAFFIN INHIBITORS

The Schlumberger paraffin inhibitor range includes crude oil pour point depressants (PPD), known to decrease the rate of wax formation, and paraffin dispersants to prevent deposition in oilfield systems.

Our proven approach starts with the gathering and examination of field information and the subsequent design and implementation of laboratory tests to determine the optimal inhibition treatment.

Treatments include

- paraffin inhibitors and dispersants to inhibit paraffin crystallization and deposition
- PPD to reduce the crude pour point, viscosity profile, and gel characteristics.



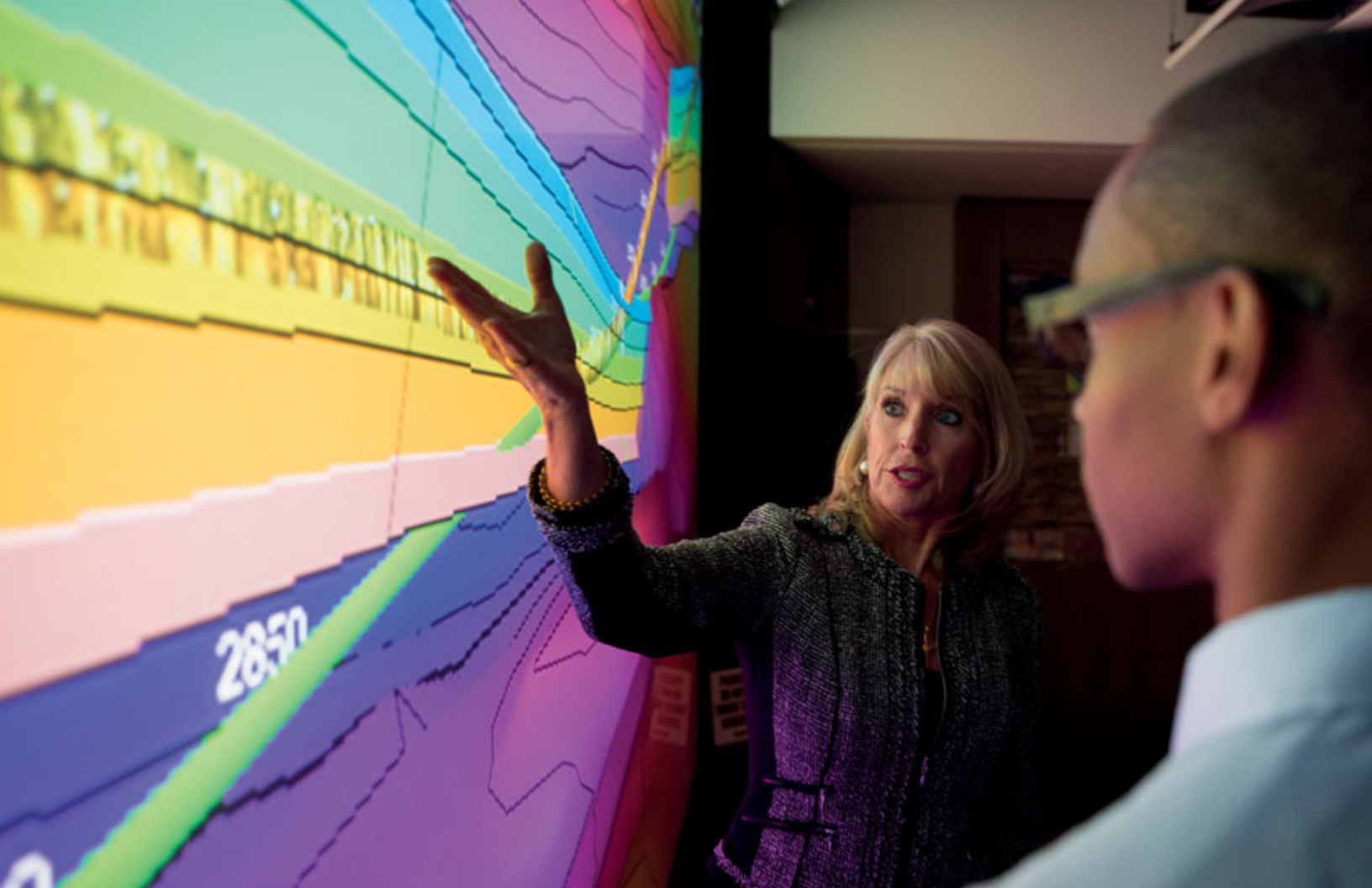
# SCALE INHIBITORS

Schlumberger conducts more scale-squeeze treatments in the North Sea than any other company and has designed an effective scale management strategy to include scale formation and location prediction, evaluation of potential inhibitor chemicals, deployment techniques for long-term effectiveness, and alternative removal options.

The comprehensive suite of inhibitors includes biodegradable, polymeric, and phosphorous-containing scale chemistries, which can all be customized to any scaling regime, are proven in the field, and can stimulate oil production after squeezing.

Deployment techniques focus on three areas:

- continuous injection via gas lift, capillary, and direct surface injection
- preemptive squeezing of reservoirs using nonaqueous base scale inhibitors
- conventional squeeze technologies including tagged and end-capped polymeric inhibitors.





# ChemWatcher SOFTWARE

Schlumberger ChemWatcher\* integrated chemical management software in the Avocet\* production operations software platform 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 operational efficiency, safety, and performance.

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.

## **Case Study**

# KHI REDUCES OPERATING COSTS BY 50% IN ALBERTA, CANADA

## **CHALLENGE**

A gas pipeline transports around 2,430 m<sup>3</sup>/d of gas to a remote amine plant across difficult terrain. Produced water is introduced into the pipeline mainly after a compressor station. To prevent hydrates from forming, the line is treated with 4,000 L of methanol. However, the methanol is carried into the amine plant, contaminating the reflux water and increasing corrosion risks.

## **SOLUTION**

Schlumberger introduced a hydrate inhibitor program using the GT-7569\* kinetic hydrate inhibitor. The KHI was initially applied at 1,500 L/d, approximately 40% of the methanol injection volume. Pig returns and inlet pipeline pressures were then monitored for hydrate formation indicators.

## **RESULTS**

Injection rates were reduced in incremental stages before being optimized at just 700 L/d without hydrate formation. Analysis of reflux water showed no contamination. The application of GT-7569 KHI saved the operator more than 50% in chemical and operational costs.







## **Case Study**

# WAX DEPOSITION PREVENTED FOR MORE THAN 5 YEARS, NORTH SEA

## **CHALLENGE**

The multiphase flowlines of an offshore field were at risk of wax deposition. Because of the area's environmental sensitivity, an inhibitor was needed that combined high performance with low environmental impact, and remained effective within flowlines between 8-in and 12-in diameter and nearly 20 mi [32 km] long.

## **SOLUTION**

Following laboratory testing and field optimization, PI-7258\* paraffin dispersant was applied continuously into the multiphase production lines at dose rates of 50–500 ppm depending on conditions.

## **RESULTS**

PI-7258 dispersant has successfully mitigated wax deposition for more than 5 years. It has also been batch injected on shutdown, startup, and pigging operations. Improved demulsification has also resulted from the effective long-term prevention of wax formation.

# GLOBAL PRESENCE, OUTSTANDING CAPABILITY



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assets and preventing production issues.

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- Scale and footprint
- Mergers and acquisitions track record
- Executorial capability

# UNLOCK POTENTIAL

## OPTIMIZE PRODUCTION

PREVENT

PERFORM

CURE

[slb.com/pt](https://slb.com/pt)

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