LOW-DOSAGE HYDRATE INHIBITORS

Minimize cost and optimize performance
HIGHLY EFFICIENT HYDRATE PREVENTION

Hydrate plugs are difficult and costly to remove. They can result in lost production, equipment failure, and safety issues.

Hydrate prevention becomes even more challenging as production increasingly focuses on marginal fields, deeper waters, and more hostile environments where pipelines are routed along the seabed over considerable distances and where pressure gradients and low fluid temperatures promote formation.

Schlumberger has a highly effective and evolving suite of chemicals, equipment, and services that are at the forefront of industry efforts regarding low-dosage hydrate inhibitors (LDHIs).

These inhibitors form part of the PREVENT suite of trusted products and services to preempt and mitigate production issues. The LDHI portfolio is environmentally acceptable and provides capex-efficient alternatives to commonly used thermodynamic inhibitors such as methanol and glycol.

Schlumberger LDHIs maintain flow either by interfering with the mechanism of hydrate formation or by preventing small gas-hydrate particles from agglomerating, thereby helping to ensure that production is maximized and equipment unaffected.
Gas hydrates are ice-like structures comprising water and gas. Hydrate formation is a function of a number of parameters, including temperature, gas composition, and presence of water. Hydrates can easily form under subsea conditions, as has been found in the North Sea and deepwater Gulf of Mexico, offshore Brazil, and West Africa.

Optimal inhibitor choice is determined by fluid and field characteristics. As an industry innovator with proven expertise in hydrate inhibition, Schlumberger provides unrivaled support to customers for LDHI applications to mitigate production threats—studying system conditions using phase-equilibrium modeling and advanced equipment for testing under field conditions. Ensuring selection of the most effective treatment for optimal performance.
CO₂ hydrates formed from dissolved gas (that is, no free-gas phase) under high degree of subcooling.

Hydrates formed from dissolved gas (CICO₂ system).

Methane hydrates formed in the vapor and gas-water interface.

Legend

G = Gas
L = Aqueous phase
H = Hydrate
Gr = Grain

50% REDUCTION in chemical and operational costs as a result of kinetic hydrate inhibitor (KHI) application
Schlumberger provides innovative, highly effective LDHIs with the following modes of action:

- **Kinetic hydrate inhibitors (KHI)**s 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 (AA)**s prevent the agglomeration of hydrate crystals into large masses by dispersing water droplets within the condensate or oil phase.

In comparison to methanol and monoethylene glycol (MEG) based treatments, the reduced treatment application levels of LDHIs—in combination with their low toxicity—renders them attractive for many hydrate inhibition applications. Because no recovery stage is required, leakage risks from storage, treatment, and transportation facilities are significantly reduced.
FEATURES

- Low logistical costs and minimized environmental footprint from reduced storage and injection requirements
- Low toxicity for increased fluid system compatibility and QHSE compliance

BENEFITS

- Effective operation under severe temperature conditions
- Increased stabilization from reduced requirement for pipeline depressurization during cold standby
Case Study

KHI REDUCES OPERATING COSTS BY 50% IN ALBERTA, CANADA

CHALLENGE
A gas pipeline transports around 2,430 m$^3$/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.

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. KHI application saved the operator over 50% in chemical and operational costs.
A full service offering to maintain and restore full production.

Schlumberger production technology specialists deliver targeted, integrated strategies that help to decisively remediate production issues such as deposit formation and naturally occurring gases, 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 unrivaled technical expertise.

Working with the world’s largest oilfield services provider, 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 team’s global footprint and extensive suite of technologies helps customers to reliably and efficiently maximize production—regardless of system complexities or geography.
MAXIMIZE PRODUCTION FROM RESERVOIR TO REFINERY