



IDOS
Scale inhibitors



Additives
for oil production



SCALING IN OIL PRODUCTION

The formation of scaling in the operating lines causes downtime in production resulting in lost productivity and significant cleanup costs. The prevention of these risks remains a major challenge for oil companies.

In this area, REP offers a wide range of inhibitor products of mineral deposits. Our knowledge and expertise are at the service of our customers, and to offer them the best solution available.

Origin and formation of scaling

The main causes of deposits in production oil are:

- incompatibilities between the injection water (seawater, waters of different mineralization...).
- change of thermodynamic conditions between the reservoir and surface facilities (pressure drop and temperature).

The main scaling encountered are:

- calcium carbonate (CaCO_3)
- barium sulfate (BaSO_4)
- strontium sulfate (SrSO_4)
- calcium sulfate (CaSO_4)

Tests in laboratories, on site and at dispatch: at each step, REP checks the validity of its products to ensure the highest quality for its customers.



THE IDOS RANGE

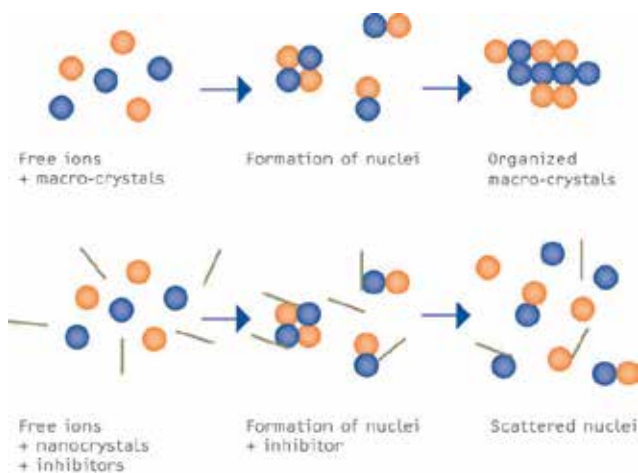
REP offers specific products for the treatment of scaling for oilfield according to the water compositions, the pressures and temperatures encountered.

Through its IDOS range, REP develops compounds of varying chemistry (polymers or phosphonates) to prevent the formation of different types of scaling under severe salinity, temperature and high-pressure conditions.

Inhibitors are known to have two modes of action: some will be at the stage of nucleation, whereas others have an effect on the growth of crystals. The polymers are known to delay or even prevent the first phase of formation of deposits, known as nucleation. In turn, phosphonates preferentially act on the crystal growth phase. Certain inhibitors combine the two effects.

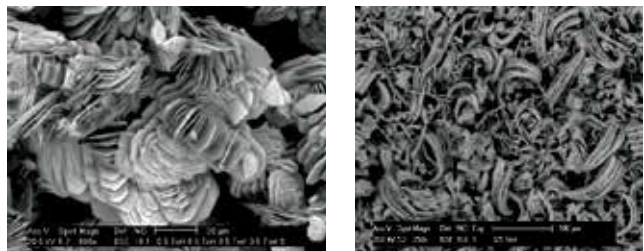
1. Inhibition of nucleation

The inhibitor allows the thermodynamic destabilization of nuclei by absorbing inhibiting molecules on their growth sites.



2. Inhibition of crystal growth

Natural crystals are usually based on a rhombohedral unit cell. The sites with the most rapid growth are the edges and corners. The inhibition or blockade of crystal growth leads to the distortion of the crystal, bringing about the modification of hooked locations, thus stopping the growth.



left: **barite crystals without inhibitor**
right: **barite crystals with inhibitor**
(6 ppm of phosphonate)

source: e.g. from FAST, Heriot-Watt U., 2013

The application of the inhibitor may be performed by:

- Continuous Injection
- Squeeze
- Gas-lift

OUR TAILOR-MADE SOLUTIONS

In order to best meet the expectations of our clients, we tailor our expertise in the field of formulation for each of our clients' requests.

IDOS RANGE

Products	Chemical nature	Active ingredients (%)	Density at 20°C	pH at 25°C	Viscosity at 4/20°C (cPs)	CaCO ₃ Inhibition	BaSO ₄ Inhibition
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POLYMERS

IDOS 130	Polycarboxylic acid	40	1.20 – 1.24	3.5 – 4.5	-	++++	+++
IDOS 150	Copolymer phosphono	50	1.20 – 1.25	2.5 – 4.0	-	++++	++++
IDOS 150ME	Copolymer phosphono	25	1.14 – 1.17	3.0 – 4.5	90 – 100/ 40 – 50	++++	++++
IDOS 150N	Copolymer phosphono	32.5	1.24 – 1.27	6.05 – 7.5	-	++++	++++
IDOS 162	Polyacrylate	50	1.33 – 1.36	6.5 – 8.5	-	++++	+++
IDOS 169	Maleic copolymer	37.5	1.32 – 1.36	6.5 – 8.5	-	++	+++
IDOS 400	Carboxylic derivative	25	1.10 – 1.16	2.0 – 3.0	-	++++	++++
IDOS T100	Polymer tagged	40	1.18 – 1.22	3.0 – 4.0	- / 400 – 600	+++	+++
IDOS T200	Copolymer tagged	40	1.18 – 1.22	3.5 – 5.0	- / 100 – 500	+++	+++
IDOS T300	Copolymer tagged	40	1.18 – 1.22	2.0 – 3.0	- / 100 – 300	++++	+++
IDOS T400	Polymer tagged	40	1.14 – 1.18	1.0 – 2.0	- / 40 – 50	++++	++
CORIDOS 93P10	Polymer phosphono	10	1.13 – 1.17	1% : 5.0 – 7.0	-	++	+++

PHOSPHONATES

IDOS 155	Phosphonate	37	1.21 – 1.24	1% : 4.0 – 5.0	-	++++	++
IDOS 160	Phosphonate	25	1.23 – 1.27	6.0 – 8.0	-	++	+++
IDOS 210	Phosphonate	32.5	1.27 – 1.31	4.5 – 5.5	-	++++	+++
IDOS 210ME	Phosphonate	20 - 25	1.16 – 1.20	4.5 – 5.5	100 / -	++++	+++
IDOS 260	Phosphonate	24	1.16 – 1.20	8.0 – 9.5	90 – 100 / -	++	+++

++++: excellent, +++: very good, ++: good, +: satisfactory, -: not determined

CaSO ₄ Inhibition	Tolerance (Ca)	High stability T°C	Temperatures of max. utilization (°C)	Mode of treatment	Application	Comments
+++	+++	+++	160	Squeeze	Squeeze/Surface	Excellent to squeeze until 160°C against carbonates and on the gas field
++++	++++	++++	180	Squeeze	Squeeze/Surface	Excellent at low and high pH temperatures as well as on high barium content
++++	++++	+++	180	-	Deep offshore	Excellent at low and high pH temperatures as well as on high barium content
++++	++++	+++	180	-	Surface	Excellent at low and high pH temperatures as well as on high barium content
++	+	++	150	-	Surface	Low molecular weight polyacrylate
++	+	++	150	-	Surface	Effective at low pH and high levels of barium
++++	++++	++++	250	Squeeze	Squeeze/Surface	Recommended for extreme temperature conditions (> 160°C) and pressure. Good for squeeze, surface, subsea, high calcium content, barium (600 ppm) and Iron. Runs between pH of 2 and 12. Effective against carbonates
+++	++	+++	> 200	-	Surface	IDOS tagged, simplified dosage
+++	+++	++	> 200	Squeeze	Squeeze/Surface	IDOS tagged, simplified dosage
++++	++++	++	> 200	Squeeze	Squeeze/Surface	IDOS tagged, simplified dosage
++++	++++	+++	-	-	Surface	IDOS tagged, simplified dosage
+++	+++	++++	180	Gas-lift	Gas-lift	Specific formulation developed for gas lift purposes

+++	++	+++	160	Squeeze	Squeeze	In squeeze, replace the IDOS 160 for temperatures between 130 and 160°C
++	++	++	130	Squeeze	Squeeze/Surface	For use in preferred squeeze exceptions: <ul style="list-style-type: none"> • when the temperature is greater than 130°C, use the IDOS 155 instead. • when the calcium content is very high, use the IDOS 150
++	+++	+++	190	Squeeze	Squeeze/Surface	Performing at high temperature and high calcium content. Good absorption in squeeze. Effective against BaSO ₄ at low dose (20 ppm). Operate between pH of 5 and 12
++	+++	+++	190	-	Deep offshore	Base IDOS 210 for deep offshore
++	++	++	130	-	Deep offshore	Base IDOS 160 for deep offshore

TESTS AND PERFORMANCE OF IDOS

In order to assess the effectiveness of an inhibitor according to the specific characteristics of an oil field, we have several tools and methods of selection.

Tendency to formation of scaling:

Multi-scale software

Reference in the simulation of “scales” formation, the Multiscale software calculates the saturation indices of the environment, predicts the type of deposit formed, tendency towards *scaling* and the choice of product to use, according to the conditions provided by the manufacturer.

Compatibility with calcium in a static condition

Performed at atmospheric pressure, these tests verify any potential incompatibility between the inhibitor and water production.

Performance and product selection

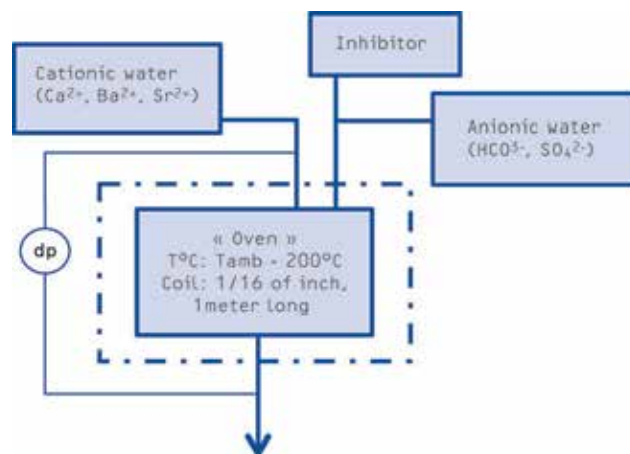
Upon request, we conduct tests under static conditions (*Jar Test*) according to the standards in effect. For a more accurate modeling of formation conditions of scaling, REP has a *Tube Blocking Test (TBT)*, which reproduces an environment up to 200°C and 300 bars.



Tube Blocking Test in REP laboratories

The composition of the waters, in addition to the temperature and pressure conditions, are provided by the client, and are specific to each application.

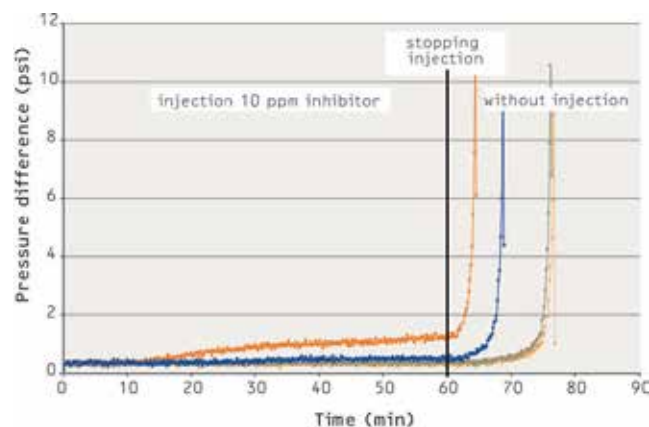
Simplified diagram of the Tube Blocking Test
Threshold of dP 2.5 - 10 psi Pressure from 1 to 300 bars



TBT results

Conditions of test: T = 110°C, P = 150 bar, 100% FW

Legend:
 — Idos 150 ME (orange diamond)
 — Idos 210 ME (grey diamond)
 — Idos 260 (orange diamond)
 — Idos 162 (blue diamond)



For many years REP has controlled compound mixtures of corrosion inhibitors and mineral deposits, called CORIDOS, which can be particularly useful in the context of a deep offshore application.

In order to provide a more efficient solution to its customers, REP has created partnerships with universities and laboratories specialized in the field of scaling, and manufactures products to best respond to the problems encountered.



Environment

In the field of oil production, REP products, developed in strict compliance with European standards, provide maximum safety, hygiene and prevention.

Packaging

REP products intended for use on site are available in a wide range of containers, notably including 215-liter drums and IBC totes of 1000 liters.

For further information about the IDOS Range
or to receive a sample, please contact us on
+33 (0) 1 30 98 80 00 or at info@rep.fr .



REP is available worldwide through its subsidiaries and distributors.
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