

DosTreat™

# Scale Inhibitor Solutions

Take control of continually  
changing process conditions

# Constant Assurance with DosTreat™ Scale Inhibitor

We help you to improve your production and equipment life

The formation of scales can have an extremely detrimental effect on hydrocarbon production. Scale precipitates are caused by a change of conditions in a production system containing the mixing of incompatible waters, a disturbance of formation water equilibriums, and/or a change in pressure and temperature. Any or a combination of these effects cause ordinarily soluble compounds, to precipitate as depositions in the production system, with devastating consequences and sometimes leading to restrict flow-through injection, production, and tubing strings.

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## Delay Deposit Formation and Expedite Production

DOSAS offers a broad range of antiscalants including phosphonates and polymers for the different deployment techniques used to treat oilfield scale, including squeeze, topside, and continuous injection. Our antiscalant technology is designed to prevent the formation of these scales to improve production and extend equipment life.

### **DosTreat™ Scale Inhibitor**

DosTreat™ Antiscalant Solutions are designed to treat a variety of scales encountered in the oilfield production operations from land to offshore. In addition, they prevent mineral scale formation from entering into precipitation reactions, adhering to the surface of scale crystals, modifying nuclei, or altering active growth sites properties and blocking them to delaying further expansion of crystal in a controlled way. Our solutions also ensure optimized production by removing flow restrictions caused by scale deposition.

# Phosphonate Scale Inhibitor

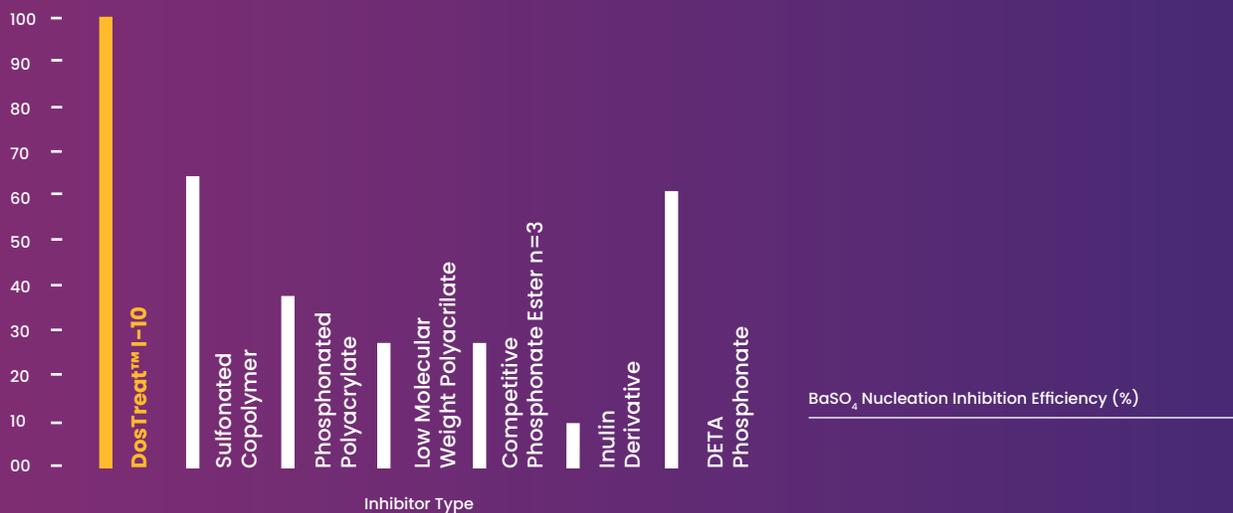
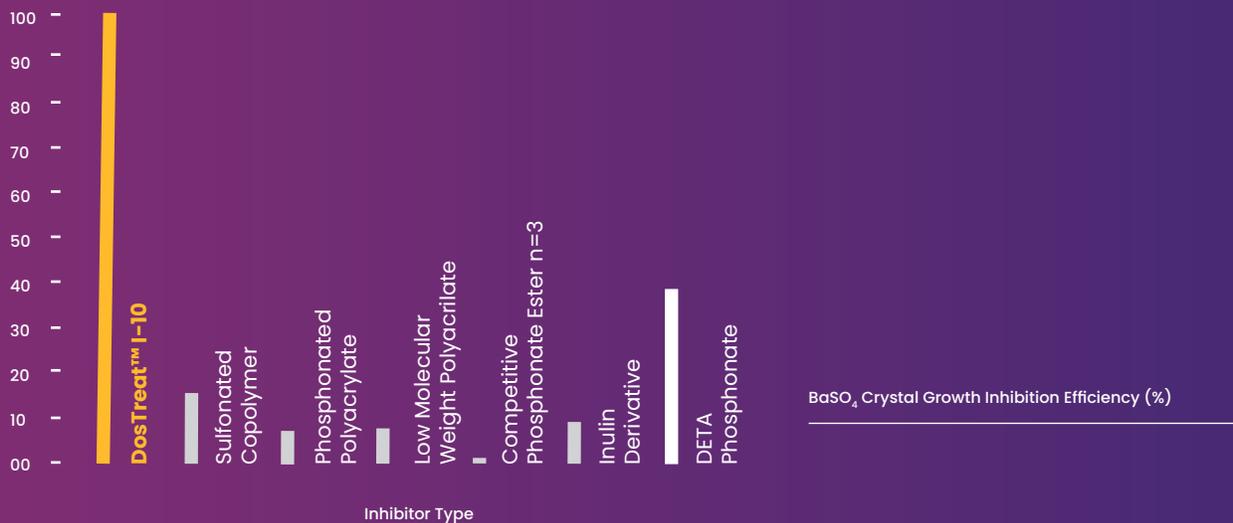
Organophosphonates are multifunctional metal ion control agents. By definition, they contain at least one functional group,  $-PO_3H_2$ , attached to a carbon atom. The carbon to phosphorous bond is one of the phosphonate's desirable attributes:

- A strong anionic (negative) charge & multiple bonding sites within their complex structures
- Excellent tolerance to dissolved iron
- Environmentally acceptable inhibitor

## Amino Phosphonates Unique Blend for Optimum Performance

DOSAS offers DosTreat™ I-10 an amino phosphonate where the carbon holding the  $-PO_3H_2$  functional group is bonded to a nitrogen atom in the molecule.

The static inhibition efficiency shows how effective DosTreat™ I-10 is in preventing scale formation under a specific set of test conditions. Laboratory experiments represent superior common carbonate and sulfate inhibition ability with low MIC compared to competitive products and industry-standard during nucleation and even more pronounced during crystal growth stages.

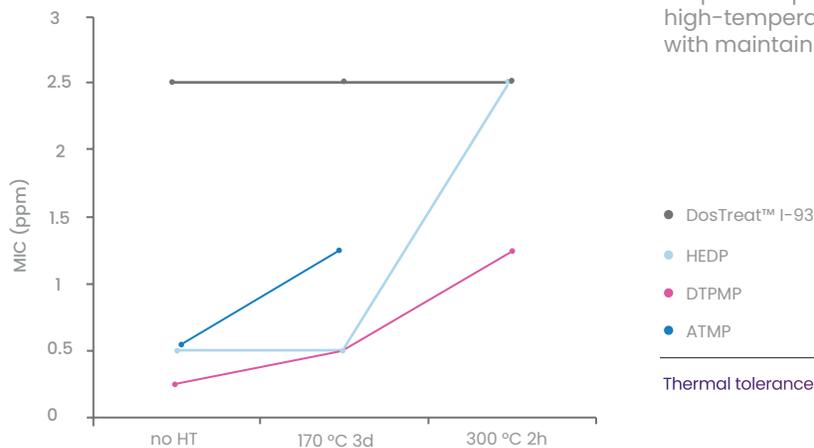


# Polymeric Scale Inhibitor

Polysulfonates have been used particularly for high-temperature squeeze applications, however, several classes of scale inhibitors once thought to be unstable at high temperature in solution may be applicable for squeeze applications because their stability is increased once they are adsorbed to the formation rock.

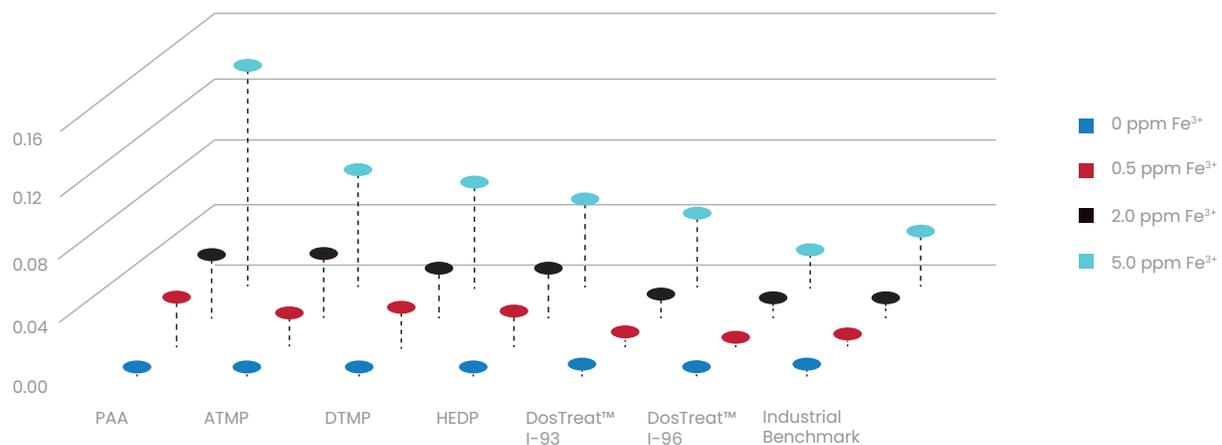
The sulfonated polymers features:

- Extensive range of brine and thermal tolerance
- Enhanced inhibition due to dispersion mechanism



## Performance and Tolerance of DosTreat™ I-93 and DosTreat™ I-96

One of the qualities of a good antiscalant solution is its tolerance and performance in stressed conditions. Process Measurement and Control Group (PMAC) study confirmed that DosTreat™ I-93 (Sulfonated Copolymer) and its formulation DosTreat™ I-96 outperform the industrial benchmark in iron tolerance under oxic as well as anoxic conditions. In addition to proven inhibition in presence of iron, DosTreat™ I-93 can be effectively used to control scale formation/disperse suspended particles in high acidic, high calcium, and high-temperature environment, i.e. geothermal wells with maintaining performance.



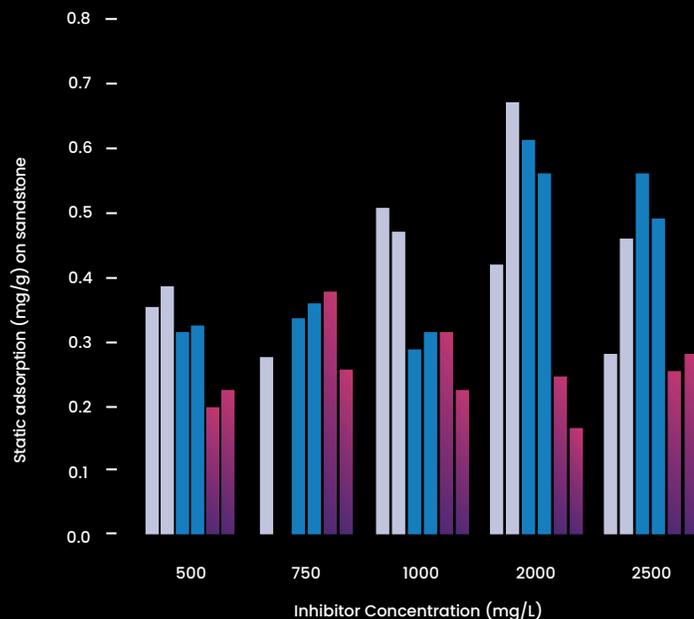
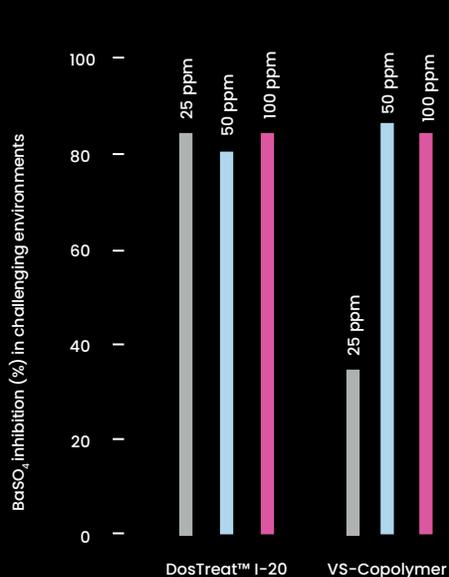
# Phosphonated Polymer Scale Inhibitor

Phosphonates end-capped environmentally acceptable polymers have unique technology placement of phosphonate groups on the end of the polymer chain providing maximum adsorption efficiency on surfaces (including crystal surfaces) to control of carbonate, sulfate, and exotic scale.

- Best-in-class environmental performance (high biodegradability, low bioaccumulation & aquatic toxicity)
- Effective broad spectrum scale control in high temperature and high pressure conditions
- Extended squeeze lifetimes

## End-Capped Phosphonated Polymer with Maximum Adsorption Efficiency on Crystal Surface

DOSAS offers an end-capped phosphonated polymer with accepted performance in the North Sea that outperformed many competitors' products in preventing common scale formation at low MIC. Laboratory experiments using the DosTreat™ I-20 give a comprehensive understanding of this unique technology.



Product	DosTreat™ I-10	DosTreat™ I-20	DosTreat™ I-30	DosTreat™ I-40	DosTreat™ I-50	DosTreat™ I-60
Chemical Name	Phosphate ester	Sulfonated acrylate copolymer	Sulfonated carboxylate copolymer	Sulfonated styrene copolymer	Polycarboxylic	Acrylic copolymer
Product Form	Liquid	Liquid	Liquid	Dry	Liquid	Liquid
Appearance	Colorless to pale yellow	Slightly yellow	Off-white to yellow solution with slight haze	Tan solid	Clear	Clear to slightly hazy

### Physical and Chemical Properties

pH	2.5 - 4.0	2-6	8	5-9	2-4	4.0
Stability	Low temperature	High temperature	Mid temperature	Mid temperature	High temperature	High temperature
Specific Gravity	1.4-1.55	-	-	-	1.23	-

### Functional Properties

CaSO <sub>4</sub> Inhibition	○	○			○	○
CaCO <sub>3</sub> Inhibition	○	○	○	○	○	○
BaSO <sub>4</sub> Inhibition	○	○	○	○	○	○
SrSO <sub>4</sub> Inhibition	○	○			○	○
Silica Inhibition						○
NaCl Inhibition			○			
FeS Inhibition				○		
PbS, ZnS Inhibition		○				

### Application Notes

	Topside, pipeline, downhole	Topside and squeeze treatment	Topside injection or downhole treatment	Boilers and cooling towers	Cooling, boiler, and water injection	Topside and downhole production equipment
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### From Proactive Applications to Successful Operations

DOSAS wants to be a total solution provider for your flow assurance needs. We cooperate with you to understand the problem and offer a solution that works for you and your customers. Our extensive antiscalant portfolio includes homopolymers, copolymers, terpolymers, and unique phosphonate-based products.



# TESTING FOR PERFORMANCE OF ANTISCALANTS?

DOSAS' extensive antiscalant product line includes homopolymers, copolymers, terpolymers, and unique phosphonate-based products. Our laboratory technicians are experienced in all methods of testing related to oilfield scaling issues, from the analysis of scale itself to various techniques for testing the efficiency of our products, to developing customized blends for more challenging production environments. We utilize our static and dynamic testing capability along with scale formation modeling in specific oilfield conditions to recommend the best program to prevent scaling and optimize your operation.



## Efficiency Tests

### Dynamic tube blocking test

Dynamic "tube blocking" performance test (TBR), commonly used for scale solution selection in oilfield environments, partly examines the ability of Antiscalants to prevent adherence and growth within micro-bore coils and determine the minimum necessary solution concentration.

### Static bottle tests

The static inhibition efficiency (IE) (%) is a measure of the effectiveness of an inhibition solution in preventing scale formation under a specific set of experimental test conditions, i.e. temperature, pH, etc., at a particular time after mixing the two incompatible brines.

### QCM technique

Quartz crystal microbalance (QCM) is a very sensitive mass deposition sensor based on the piezoelectric properties of the quartz crystal. It is used for monitoring the scaling process from nucleation to the growth phase. It provides an understanding of scaling potential and inhibitor efficiency.



## Characterization Tests

### Thermal stability test

For high-temperature reservoir applications, thermal aging tests need to be carried out to ensure that the SIs are stable at the respective temperatures for the expected squeeze lifetime.

### Compatibility tests

Mixing antiscalants and brine results in a problematic reaction. The reaction can cause a change in the physical and chemical structure of the scale solution. Compatibility tests are necessary to reassure that the solution does not precipitate when mixed with formation brines to cause formation damage.

### X-Ray diffraction test

X-ray diffraction (XRD) is a technique used in materials science for determining the atomic and molecular structure of a material. This is commonly used for characterizing scales as well as other oilfield samples.



MAXIMIZE PRODUCTION WITH

# DOSTREAT™ SOLUTIONS



ROBUST FEATURES FOR  
**ROBUST PERFORMANCE**

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