

## Bellacide<sup>®</sup> 350

*The Only Fast Acting  
and Long Lasting Biocide*

# Bellacide® 350

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and Long Lasting Biocide*

Biocide for hydraulic fracturing, produced fluids, pipeline,  
downhole and topside applications

- prevents well souring and formation plugging
- controls biofilm and microbially induced corrosion
- compatible with treatment fluids
- improves health and safety



Photo Courtesy of BTS

## Battling bacteria from injection through production

The waters used in the hydraulic fracturing process typically contain a variety of micro-organisms such as sulfate-reducing bacteria (SRB) and acid-producing bacteria (APB). If left untreated, these bacteria can become established in the well, causing severe problems that ultimately reduce production value and increase maintenance costs. In the oil & gas industry, Bellacide® 350 is proven to help operators avoid well souring and formation plugging; control biofilm and microbially induced corrosion; achieve fluid compatibility; and improve health and safety.

### Oil & Gas Industry Challenges

Souring

Formation plugging

Biofilm removal

Microbially induced corrosion

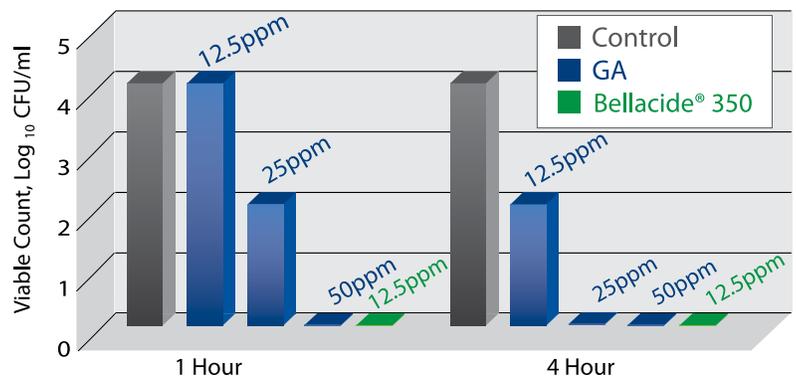
Fluid compatibility

Health & safety

### Preventing souring and formation plugging

If not controlled, SRBs will cause the generation of hydrogen sulfide, which sours the well and leads to iron sulfide, an insoluble scale that plugs pumps, filters, and injection lines. Compared to traditional biocides like glutaraldehyde, Bellacide® 350 exhibits rapid biocidal activity against SRBs under typical hydraulic fracturing conditions.

*Bellacide® 350 achieves complete kill in just one hour  
at dosages 75% less than glutaraldehyde.*





## Controlling biofilm and microbially induced corrosion

The accumulation of bacteria can cause biofilms to form downhole and adhere to the surface casing of the well. Biofilms harbor bacteria, are difficult to remove, and lead to souring and formation plugging, as well as energy losses due to increased frictional resistance.

***Bellacide® 350 is better for biofilm removal than glutaraldehyde.***

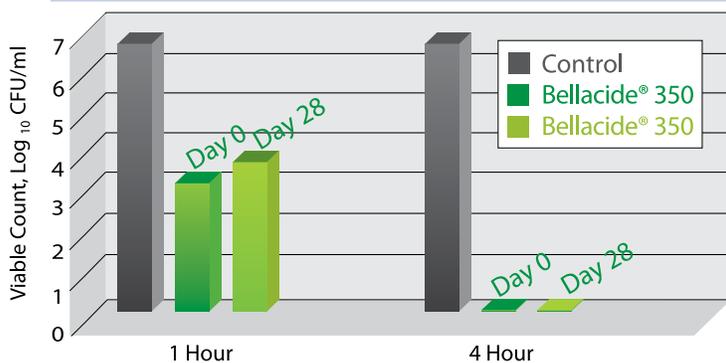


1.3 x 10<sup>7</sup>      <1.6 x 10<sup>1</sup>      <1.6 x 10<sup>1</sup>

\*Based on 50ppm active; fewer spots mean less biofilm

Biofilm can also harbor acid producing bacteria (APB), which secrete organic acids as they metabolize. These acids alter pH thereby inducing premature corrosion. At typical high downhole temperatures, Bellacide® 350 has a long-lasting complete kill impact on APBs, thus controlling microbially induced corrosion.

***Bellacide® 350 achieves complete kill of APBs at high temperature incubation.\****



\* At typical conditions, pH=7, TDS=20,000 at 80°C

Bellacide® 350 has also been proven to exhibit corrosion inhibition properties in standard high temperature oilfield brine corrosion tests.

## Achieving fluid compatibility

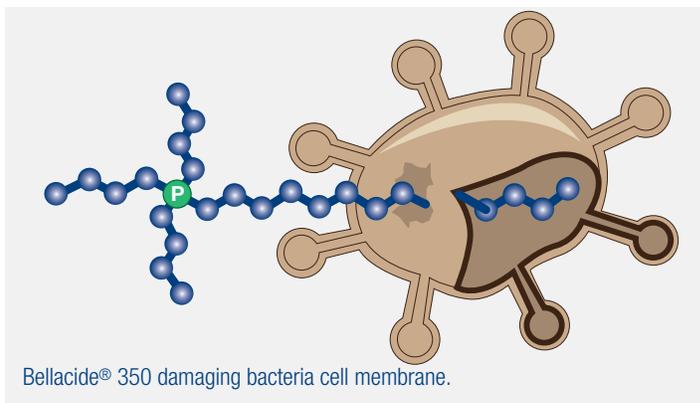
Treatment fluids in oilfield operations can become damaged by biocides that interact negatively with viscosifier or friction reducer fluid components. Compared to traditional biocides, Bellacide® 350 is uniquely more tolerant of anionic polymers and is well-suited for use in combination with cellulosic fracturing fluids.

## Improving health and safety

Bellacide® 350 overcomes the health and safety disadvantages of common biocides such as glutaraldehyde. Bellacide® 350 is not classified as a skin sensitizer, is not subject to exposure limits, and is safer to handle and store than traditional biocides.

## How Bellacide® 350 works

Bellacide® 350 is based on tributyl tetradecyl phosphonium chloride (TTPC) chemistry, an amphipathic molecule, which means it has both hydrophilic and lipophilic functional groups. Bellacide® 350 interacts with and disrupts the structure and function of the bacteria cell membrane. This results in the inhibition of membrane-associated metabolism, loss of intracellular material and osmotic lysis, which ultimately leads to cell death.



Bellacide® 350 damaging bacteria cell membrane.

***Bellacide® 350 acts as a corrosion inhibitor.***

ppm active	Corrosion Inhibition (based on weight loss of mild steel)
25	82%
50	81%

## Typical physical properties

Appearance	Clear, colorless liquid
Odor	Slight
Active ingredient	48-52% (w/w)
Specific gravity at 20°C	0.95-1
pH (undiluted)	6.0-8.0
Viscosity at 25°C (77°F)	55-65 cSt
Boiling point	100°C (212°F)
Freezing point range	-10 to -8°C (14-18°F)
Solubility in:	
water	Miscible with water
ethylene glycol	>50%
methanol	>50%
isopropanol	>50%

### Thermal stability (DSC)

Differential scanning calorimetry has shown that Bellacide® 350 is stable up to a temperature of 300°C (572°F).

### Chemical reactivity/compatibility

The active ingredient of Bellacide® 350 is stable in neutral, alkaline and acidic solution and can be used in cooling water within the pH range 2-12. At normal levels of use, Bellacide® 350 can be used with oxidizing agents such as chlorine.

### Logistics

Transport classification	UN2927, Class 6.1 + 8 Toxic & corrosive for transport Marine pollutant.
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### Packaging

Drums, totes, bulk

### Regulatory approvals

EPA (USA) Reg. No.	83451-15
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### Toxicology data

Acute oral LD50 (rats)	1002 mg/kg
Acute inhalation LC50 (rats)	<0.9 mg/L
Eye irritation (rabbits)	Corrosive
Skin irritation (rabbits)	Corrosive

### Ecological data

96-h LC50 (brown shrimp)	1.6 mg/l
96-h LC50 (rainbow trout)	0.46 mg/l
96-h LC50 (bluegill)	0.06 mg/l

### Biodegradability

Rapidly biodegrades to >50% within 2 hours and ultimately reaches 99% within 96 hours in the presence of activated sludge. Further details on safety and handling are available in the Bellacide® 350 materials safety data sheet.

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*Clear solutions for water treatment*