

# Bellacide<sup>®</sup> 355

high performance, multifunctional in fracturing applications compared to DBNPA

## Challenge

While DBNPA is fast acting, it disappears quickly and, as a liquid, contains glycol, which acts as a food source for APB's and SRB's. Therefore, bacteria remaining can quickly lead to problems in the well's production. It is also ineffective at elevated temperatures or in the presence of reducing agents (H<sub>2</sub>S).

## Solution

Using Bellacide 355 delivers fast kill, while providing stable, long lasting control against APBs. Regrowth of bacteria does not occur with Bellacide 355, as seen in Graph 1. Bellacide 355 works when reducing agents are present and at elevated temperatures (Table 2).

## Conclusion

At an effective dose of 250 ppm, Bellacide 355 is fast acting, long lasting and outperforms DBNPA.

**Bellacide 355** is a fast acting, broad spectrum biocide with superior activity compared to other non-oxidizing biocides. Highly effective against problematic organisms, Bellacide 355 MMC (minimum microbicidal concentration) against sulfate reducing bacteria (SRB) is 100 ppm in 1 hour.

Benefits of Bellacide 355 (TTPC)

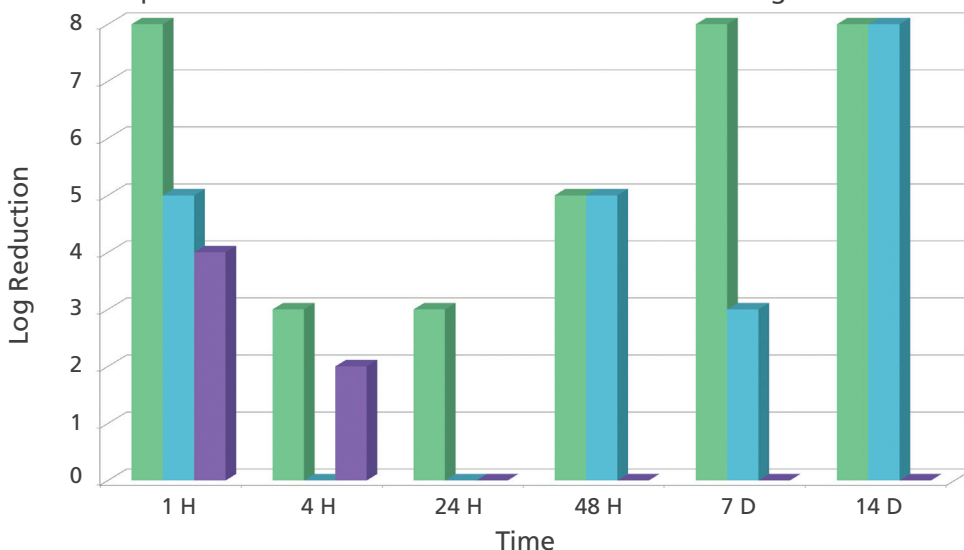
- Procedure - Cell disruption through membrane wall
- Operational – No persistent foaming
- Operational – Provides >80% corrosion inhibition

Bellacide 355 is a 5% aqueous solution of tributyl tetradecyl phosphonium chloride (TTPC).

### Bellacide 355 - Fast acting, long lasting

Appearance	Clear, colorless liquid
Specific gravity at 20° C	0.98
pH	6.0 – 8.0
Odor	Slight to none
Boiling Point	100° C (212° F)
Solubility	
- Water	Completely miscible
- Methanol	>50%
- Isopropanol	>50%
- Ethylene glycol	>50%

Graph 1 - Bellacide 355 versus DBNPA in Acid Producing Bacteria Test



The long lasting effect of Bellacide 355 outperforms DBNPA

- DBNPA 5% at 250 ppm
- DBNPA 20% at 250 ppm
- Bellacide 355 at 250 ppm

\*Conditions, 30K TDS, pH 8 re-inoculated vile at 24, 48 hours, 7 days

Our wide selection of biocide chemistry can be tailored for any treatment scenario.

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Table 2 - Biocide Comparison

	Bellacide 355	20% DBNPA
Dosage	250 ppm	200 ppm
Use Cost	1X	1.1X
Kill Speed	Fast	Fast
SRB Performance	Excellent	Good
Biofilm Removal	Excellent	Poor
Thermal Stability	Very Stable	Poor
Persistency	>28 days	<7 days
Safe Handling	Excellent	Extremely Poor
Gel Breaker Compatibility	Excellent	Poor
Reducing Agent Compatibility	Excellent	Deactivates

## Bellacide 355: The Only Fast Acting, Long Lasting Biocide for Oil & Gas

Features	Benefits
<ul style="list-style-type: none"> <li>Compatible with gel breakers</li> <li>Provides additional corrosion inhibition</li> <li>Removes biofilm</li> <li>Synergistic with halogens</li> <li>Kills algae even at low dosages</li> <li>Stable at high temperatures</li> <li>Compatible with reducing agents</li> <li>Not a skin sensitizer</li> </ul>	<ul style="list-style-type: none"> <li>Does not interfere with gelling operations</li> <li>Prevents souring during fracking</li> <li>Continues to provide protection against souring even post-frac, during production</li> <li>Prevents Microbiologically Induced Corrosion (MIC)</li> <li>Protects pipelines, pumps, valves, safety equipment</li> <li>Not affected by H<sub>2</sub>S*</li> <li>Compatible with chlorine and oxygen scavengers</li> <li>Safer to handle than traditional O&amp;G biocides</li> </ul>

\*DBNPA is deactivated by H<sub>2</sub>S and any other reducing agent.



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