Stepan
OILFIELD SOLUTIONS

PETROSTEP® SI-1

Inorganic Scale Inhibitor

Scale can deposit on almost any surface. Once formed, it will continue to build unless it is treated. Stepan Oilfield Solutions' PETROSTEP SI-1 is a proven inorganic scale inhibitor. In Dynamic Scale Loop Tests (DSLT), the new PETROSTEP SI-1 outperforms other commercially available products in preventing scale build-up.

Using a 30% dilution of PETROSTEP SI-1, neutralized with sodium hydroxide, at 25 ppm for a calcite brine and at 50 ppm for a gypsum brine, we compared how well it prevented crystal formation versus two competitors' scale inhibitors at the same dilution and treating rate. Scale build-up was measured by an increase in differential pressure inside the test section. Figures 1 and 2 below show lower differential pressure when the brine is treated with PETROSTEP SI-1 (grey lines) compared to the brine left untreated (red lines) and the brines treated with competitive products (light blue and dark blue lines). The difference in efficacy is especially apparent in the rapid pressure rise of gypsum brine treated with competitor 1, as shown in Figure 2.

FIGURE 1

Calcite Brine Treated with 25 ppm of PETROSTEP SI-1 at 70°C and 500 psi

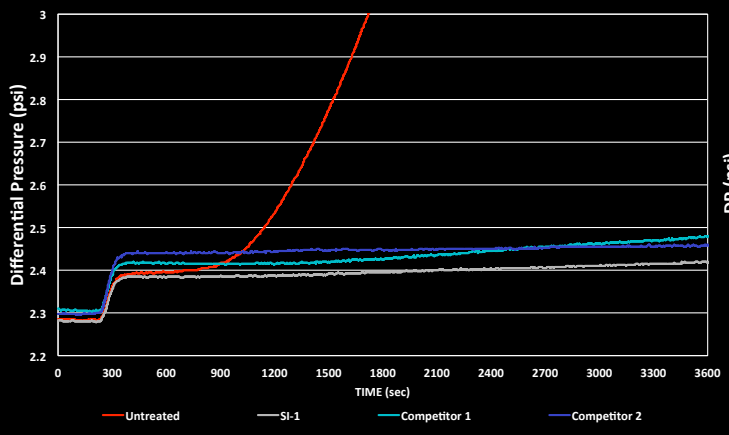
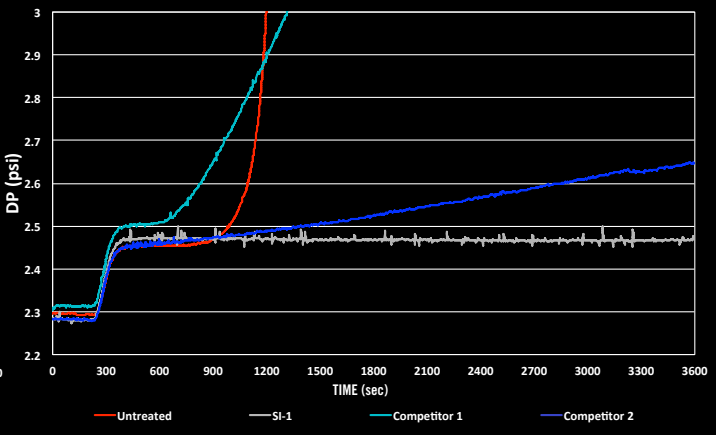


FIGURE 2

Gypsum Brine Treated with 25 ppm of PETROSTEP SI-1 at 70°C and 500 psi



DSLT SUMMARY

- Treating rate: 30% dilution of PETROSTEP SI-1 neutralized with sodium hydroxide
- Test temperature: 70°C
- Test duration: 1 hour
- Instrument: Ametek Chandler Dynamic Scale Formation System

Taking these conditions from the tests to the field, scale build-up takes on a more serious implication in the pipeline as it can block the flow of production fluids, as well as potentially create a site for under-deposit corrosion. If scale is allowed to build up in treating tanks and on equipment, extensive time and effort may be required to remove it. PETROSTEP SI-1 can mitigate these issues by binding with the scale particles and preventing them from agglomerating.

In the photos below, you can see scale precipitating at the bottom of untreated brines. Brines treated with PETROSTEP SI-1 remain clear, without any scale precipitation.

CALCITE

GYPSUM

BARITE

BOTTLE TEST METHOD

Brine composition: NACE[1] Laboratory Screening Test - TM0374-2007

Treating rate: 100 ppm (30% dilution of neutralized PETROSTEP SI-1)

Test temperature: 70°C

Test duration: 24 hours

PRODUCT PROPERTIES AND APPLICATION RECOMMENDATIONS:

PHYSICAL PROPERTIES

- Solids: 68 – 72%
- Appearance at 25°C: clear liquid
- Color Gardner: 6 maximum
- pH (5% in water): 1.5 – 2.5
- Specific gravity: 1.2 – 1.5

FORMULATION RECOMMENDATIONS (W.W%)

- 30% PETROSTEP SI-1
- 10 – 15% base to neutralize to pH 6 – 7.5
  - Base options for optimum results: sodium hydroxide, potassium hydroxide, monoethanolamine
- 55 – 65% deionized water

APPLICATIONS

- Scale inhibition (calcite, gypsum and barite)
- Working temperature: up to 70°C
- Working pH: 5 – 8

TREATING RATE

- 50 – 200 ppm with above formulation, or
- 2 – 50 ppm based on active concentration

[1] *National Association of Corrosion Engineers*