SILVER BULLET – Chemical Dispenser

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Patents applied for:
Chemically Treating Plunger Lifted Wells

Important Factors

- Wellbore Configuration
- Rat hole volume
- Casing size
- Water production
- Well accessibility
What is the Silver Bullet

Simple Components

• Plunger Bumper
• Ported extension
• Sand Screen containing chemical
How it works

• Modified bumper spring is used to hold a permeable container (sand screen).

• Sand screen is filled with solid, crystallized, pellets, or encapsulated inhibitors.

• Scale inhibitor is in contact with fluid at active fluid interval and treats water as it enters wellbore. Dissolve rate in most cases is determined by water rate and temperature.

• Wireline installs Silver Bullet in seating nipple at bottom of tubing.
Available Chemicals

When I began this project I only had one slow dissolving solid scale inhibitor to choose from now there are many for scale, corrosion, paraffin, and biocide.
Silver Bullet Objectives

- Improved Chemical Treatment (continuous)
- Reduce Chemical Cost
- Optimized Plunger Lift (reduce stuck plungers)
- Reduced Workover Cost (reduce pulled tubing)
Silver Bullet Phase 1 Pilot Test

- Met with Operations and chemical group and received approval for a small one year pilot test.

- Production operations selected 11 pilot wells, 50% were their worst 50% were normal.

- Install Silver Bullets and catch water samples and analyze chemical residual ppm every two months.

- Randomly pull and inspect for plugging and scale.

- Watch well behavior.
Improved continuous chemical treatment without gaps. Will chemical dissolve fast enough to provide protection?

Monthly well access is not required. Will screens plug off?

Optimize plunger lift by reducing scale. Will scaling be stopped?

Reduced workover maintenance cost. Increased wireline work.
One Year Production Comparison

Silver Bullet Pilot Program
Well Count: 11

Pilot Start: 12/10/2008

GROSS_MCFD VOL_WT_STATIC_PSI

Production Date

Volume Weighted Static PSI
Water Sample Averaging

Well Averages

Sample Averaging

Residual PPM

Scale Sorb PPM

28-6-132p
28-6-132M
28-6-132H
28-6-132N
28-6-132M
28-6-132N
28-6-150p

2/12/09
3/11/09
5/14/09
7/16/09
8/20/09
10/9/09
1/13/10
5/20/10
7/15/10
Average residual for each well
• Total - $1600 - $2200 per well for hardware, chemical, and wireline. Run last from 8 months to 2 years.

• Current cost to monthly batch treat one well is approximately $3600/year.
Lessons Learned

- Water wet chemical before installation to avoid it becoming oil wet and isolated from water contact.
- Iron in production water interferes with scale inhibitors. Treat for corrosion and bacteria before installing.
- Water sampling techniques are important to obtain reliable results.
- Batch treatments can cause short term over treating and lack of treatment.
- Standing valve balls and seats didn’t work.
Best Well Response

This bumper spring was run in November 2008 three weeks prior to installing the Silver Bullet.

Wireline Comment 4/15/09: Plunger clean, pulled Silver Bullet no scale on upper spring, scale beads in bottom slots, no scale on screen, no scale in tubing, operator reports well in best shape and has gone longer than ever before without WL and BS replacement.
Silver Bullet Phase 2

- Increase the number of test wells.
- Test on variety of wells not just worst wells.
- Test Newly Developed Solid Inhibitors.
- Test Combinations of inhibitors.
- Install, monitor residuals, run until failure.
Silver Bullet Chemical Treatments

Where?

- Remote wells.
- Wells not responding to batch or flush treatments.
- Wells with sand bridging problems due to chemical treatments.
- Wells with multiple barriers prohibiting installation of capillary injection strings.
- Reduced cost and exposure.
Questions?
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