

Fidelis™ Stage Cementer

MULTIPLE-STAGE CEMENTING CAPABILITY WITH HYDRAULIC FRACTURING DURABILITY

OVERVIEW

Multiple stage cementing is used to place cement slurries in two or more stages at predetermined points. Staging the cement placement allows the use of a variety of cementing blends at different well levels and/or avoids the hydrostatic and pumping pressures required when cementing deep holes to full depth. Because the functional purpose of stage cementers is to lift cement to surface in stages, these tools are typically unable to withstand the cumulative stresses encountered throughout the life of the well. For stage cementing applications in the production casing string, operations require a more robust tool.

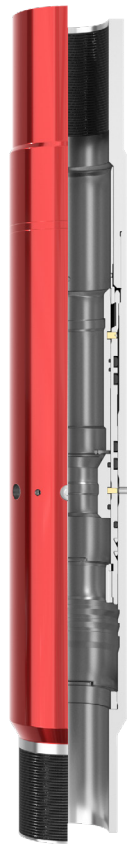
The Fidelis™ Stage Cementer is an internal sleeve, multiple-stage cementing tool designed to support the placement of cement in stages with the resiliency to withstand higher pressure stimulation treatments during well completions.

Internal sleeves and premium seals help maintain wellbore integrity for the life of the well

After the Fidelis stage cementer closes, casing integrity is restored by means of an internal closing sleeve and two sets of CO₂ resistant, high-pressure seals on either side of the flow ports. The internal sleeve design provides increased stability over external sleeve options during well completions and will not interfere with fiber or monitoring cable. Double lock rings on the closing sleeve latch into the outer case and lock the tool closed after completion of the second cementing stage. These features result in a seal that retains structural

» Hydraulic fracturing durability

The Fidelis™ stage cementer has double lock rings on the closing sleeve that latch into the outer case to lock the tool closed after completion of the second cementing stage. This feature helps maintain a seal that can withstand cumulative stresses and later well events.



FEATURES

- Double lock rings on the closing sleeve latch
- Internal pressure containment sleeves
- CO₂ resistant seals
- Six dedicated cementing ports, which can be tailored to accommodate fiber monitoring
- Suitable for up to 350°F (149°C)
- Displacement type plug sets are available for wells over 30° deviation

BENEFITS

- Designed to withstand cumulative stresses from later well events
- Reliable stage cementing for production casing strings
- PDC drillable

integrity after cementing operations are complete and can withstand cumulative stresses and later well events such as: well testing, injection and simulation treatments, and production cycling throughout the life of the well.

Displacement or free fall plug operated

The Fidelis stage cementer is plug operated and allows multiple-stage cementing jobs to be performed in either two or three stages. This tool is operated with the use of a composite free-fall plug for wells up to 30° deviation and a displacement type plug set for wells over 30° deviation, regardless of depth, pressure, or temperature.

Zero bubble gas test proves tight sealing capability

The Fidelis stage cementer has been tested to the V0 rating per industry specification API 19AC. This rigorous test exposed the seals of the closed cementer sleeve to a combination of pressure reversals and temperature swings ranging from 350°F to 150°F. During this gas test, the seals on the closing sleeve were monitored for any signs of leaks, and the result was a passing zero bubble acceptance criteria during each hold point in the test envelope.

Hydraulic fracturing durability

Three tests were successfully performed: a control test, a simulated 30-stage hydraulic fracturing job, and a severe 5,000 cycle fatigue test at 80-percent of the calculated burst pressure. All tests were performed with a 5 1/2-in. 17-23 lbs/ft P-110 closing sleeve. In each test, the tools survived the cyclic pressure loads and passed a 20,000-psi final pressure test.

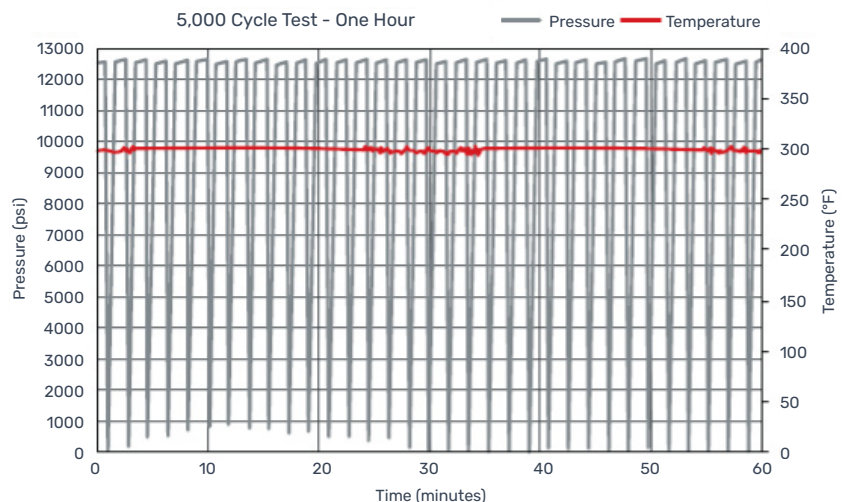
Cycle Fatigue Test

Control Test

An untested closing sleeve was soaked at 300°F (149°C) and tested to 20,000 psi internal pressure without failure. No damage to the closing sleeve or seal system was observed.

Simulated 30-stage frac job

- » 30 pressure cycles
 - 10,500 psi for 3 hours
 - 4,000 psi for 1 hour
- » 300°F (149°C) for duration of test
- » After pressure cycles, tested to 20,000 psi without failure
- » No damage to closing sleeve or seal system



5,000 cycle fatigue test

- » 5,000 pressure cycles (over 83 total hours at peak pressure)
 - 12,500 psi for 1 minute
 - Bleed to 0 psi and repeat
- » 8 thermal cycles from 150°F to 300°F (67°C - 149°C)
- » After pressure cycles, tested to 20,000 psi without failure
- » No damage to closing sleeve and only minor wear to outside seals - redundant seals undisturbed

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