While stage cementing tools are often deployed in surface or intermediate casing strings, they are increasingly being used as part of the completion string where exposure to hydraulic fracturing operations occurs. Exposure of the stage tool to hydraulic fracturing and the associated high pressure cyclic loads has the potential of affecting the integrity of the seal system of stage cementing tools. Testing was recently performed to qualify the Fidelis™ and FO™ stage cementers for use in these conditions.

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 5½-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.

The radially supported internal sleeve design and redundant fluoroelastomer (FKM) D-seal system allow the Fidelis™ and FO™ stage cementers to withstand these extreme conditions and far exceed the limits of the casing string, even during the most severe hydraulic fracturing operations.

**Control Test**
An untested closing sleeve was soaked at 300°F (149°C) and tested to 20,000 psi 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
- 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

For more information, contact your local Halliburton representative or visit us on the web at www.halliburton.com