FlexSTONE Isolation Suite

Complementary services for optimized zonal isolation
Concrete solutions for zonal isolation

Modern developments in cementing technology have resulted in unprecedented control over cement-slurry and set-cement properties. CemCRETE® concrete-based oilwell cementing technology from Schlumberger enables cement systems to be customized for the specific conditions in a well. The engineered-particle size technology used is field proven worldwide; since its introduction in 1996, more than 3,500 CemCRETE® jobs have been pumped.

CemCRETE cement systems can be engineered specifically with high flexibility. The result is FlexSTONE® advanced flexible cement technology. By combining flexibility with a linear expansion of up to four times that of conventional cements, FlexSTONE technology offers improved resistance to cement sheath cracking and microannulus development. FlexSTONE HT® high-temperature advanced flexible cement technology offers the same properties at temperatures up to 250 degC.

FlexSTONE cement systems offer reliable long-term zonal isolation under changing downhole conditions. They help to reduce or eliminate well maintenance and remediation costs, preserve isolation during stimulation treatments, and reduce the risk of annular pressure buildup during a well’s producing life. They address cementing challenges in high-pressure, high-temperature wells and have the potential to extend the productive life of wells in tectonically charged areas. FlexSTONE cement plugs also offer security in mature fields that require uneconomic wells to be permanently abandoned.

Performance by design

The properties of FlexSTONE cements are much more predictable than those of, for example, foam cements that have been designed for flexibility. Engineered-particle technology enables various properties to be optimized for each particular well. But a sound understanding of how the cement will behave under the anticipated stress conditions is essential when designing any flexible cement system.

CemSTRESS® cement sheath stress analysis software is used to model the mechanical performance of conventional and CemCRETE cement systems, including FlexSTONE systems, under changing well conditions. Complementing this software is the SlurtyDesigner® proprietary application, which contains design rules, advice, and warnings about the cement system and also predicts set-cement properties, including flexibility. SlurtyDesigner software can yield a Young’s modulus value that can be used as input to CemSTRESS software to further optimize the robustness of a particular cement system.

Schlumberger routinely uses the CemSTRESS and SlurtyDesigner applications to optimize all FlexSTONE cementing system designs. The FlexSTONE and FlexSTONE HT cement technologies in combination with these two applications for optimizing cement design constitute the FlexSTONE Isolation Suite of services for optimized zonal isolation.
Zonal isolation under stress

The FlexSTONE Isolation Suite for optimized zonal isolation brings together the Schlumberger tools and products needed to achieve cement sheath integrity throughout a well’s productive life. This comprehensive package for customizing and engineering cement systems for each candidate well ensures that the right system is used in every application. A three-stage approach is used for optimizing long-term zonal isolation.

1. Select the candidate wells that will benefit from the FlexSTONE Isolation Suite by using CemSTRESS software to predict cement sheath behavior.
2. Identify the FlexSTONE or conventional cement systems that are robust under the given well conditions.
3. Optimize the cement system design using SlurryDesigner and CemSTRESS software.

Applications for cement optimization

CemSTRESS software is a new Schlumberger 2D mathematical modeling application that simulates cement sheath behavior during downhole pressure and temperature variations. The application includes sensitivity and robustness analysis features that quantify the ranges of values that individual parameters can have without cement sheath failure occurring. It can also be used as an adviser when selecting cements. The underlying model for the CemSTRESS application is discussed in an academic paper (Baumgarte, Thiercelin, and Klaus, 1999) and has been independently verified by third parties.

When used in cement engineering studies, CemSTRESS software can predict the condition of existing cement sheaths in old wells and their tolerance to future stresses. When planning cement jobs, the application analyzes the suitability of each proposed cement system for withstanding the anticipated well events. Analysis can be based on laboratory tests of existing cements, the performance of predefined FlexSTONE and conventional blends in the application database, or the anticipated properties of newly designed blends.

The application identifies robust cements: those that do not develop an inner or outer microannulus and that do not suffer compression or tension failure. It also identifies any cement systems that fail in one of these three modes. If any of the cement systems analyzed falls short of the expectations, CemSTRESS software can predict the robustness of alternative blends that have been optimized for the specific well conditions using SlurryDesigner software.

Robust solutions

Advanced cementing technology that eliminates the need for remedial intervention has the potential to pay for itself many times over. Under challenging conditions, the FlexSTONE Isolation Suite of services can reduce the risk that zonal isolation will be compromised by creating a robust cement sheath matched to the specific stress environment. The result is improved zonal isolation for your well’s productive life.

Reference