

A New Formulation for Improving the Cement Sheath Integrity in HPHT Wells



THE INVENTION

This invention introduces a new cement composition and method for cementing oil and gas wells using a unique nano additive. The mechanical, rheological and microstructural properties of the API Type-G cement mixed with nano additive are enhanced under high pressure and high temperature (HPHT) conditions.

MARKET NEED

Oil-well cementing is an important part of the well completion process which protects and seals the wellbore. In deeper wells, HPHT and post cementing operations put extreme stresses on the cement sheath and dramatically affect the cement integrity. As such, the optimal cement slurry should ensure near perfect zonal isolation, shielding of the casing from corrosion and unpredictable shock loads in the deeper zones well cementing service needs to provide proper zonal isolation and act as a support for casing to protect it from corrosive fluids.

The global well cementing services market is expected to reach USD 11.08 billion by 2024, according to a new report by Grand View Research, Inc¹. Primary well cementing dominated the global demand and accounted for 78.6% of the market in 2015 as shown in Fig. 1. Growing exploration for recovering unconventional hydrocarbon sources is anticipated to increase the primary well cementing operations around the globe. Remedial well cementing service segment is anticipated to witness the fastest growth at a CAGR of 6.9% from 2016 to 2024. Other cementing services including advance cementing is anticipated to witness above average growth on account of rising oilfield services requirement, particularly in deep sour gas wells.

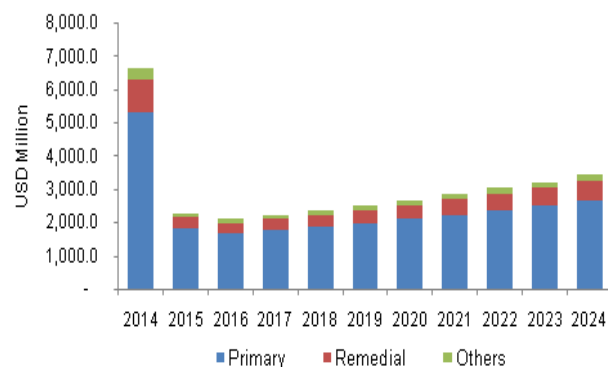


Fig. 1 U.S. Well cementing services market revenue by service, 2014 - 2024

¹ Well Cementing Services Market Analysis By Service, By Application And Segment Forecast To 2024

PATENT PROTECTION

The invention are covered by patents US10150904, US10266747 and US10266746 owned by King Fahd University of Petroleum & Minerals (KFUPM).

COMPETITIVE ADVANTAGE

- Reduces class G cement thickening time by 31%
- Increases the compressive strength of class G cement by as much as 28%.
- Increases in the Young's Modulus of the class G cement by as much as 52%.
- Prevents casing-casing annular flow- due to the reduction of porosity (44%) and the permeability (55%) of the base cement.

MARKET READINESS

Extensive laboratory tests as per API standards were successfully performed to exhibit the performance of the formulated cement slurry. Figure 2 shows cement plug sample utilized for porosity and permeability measurements. The KFUPM invention demonstrated superior attributes useful in HPHT applications over the cement slurry without the nano additive.



Fig. 2 Cement plugs employed for lab testing of strength

NEXT STEPS

KFUPM welcomes an ambitious industry partner to validate this technology at the field scale through licensing/commercialization of this invention.

ABOUT KFUPM

King Fahd University of Petroleum & Minerals is a leading educational organization for science and technology. KFUPM Innovation & Technology Transfer office is tasked with taking innovation from lab to market place.

For further information, please contact:
Email: IP-License@kfupm.edu.sa