Effective Zonal Isolation for the Life of a UGS Well
Successful cement job saves 3 days of rig time in Berlin, with no surface leaks detected

**Challenge**
Drill and complete a leak-free underground gas storage (UGS) well in Berlin.

**Solution**
Use FUTUR* self-healing cement for long-term protection against loss of well integrity and FlexSTONE* advanced flexible cement technology to provide flexible cement during injection and production phases.

**Results**
Successfully placed cement with no remedial cementing required, saving 3 days of rig time. Detected no surface leaks after completion and achieved an excellent cement bond across the gas injection interval that is expected to last for the life of the well.

**Preventing leaks in Berlin**
Berliner Gaswerke AG (GASAG) is a 160-year-old utility company in Berlin that supplies natural gas to approximately 700,000 customers every year through a pipeline grid, several substations, and a UGS facility. The GASAG UGS facility is located in a highly populated area near the Olympic stadium in Berlin. Zonal isolation is critical to ensure efficiency of the facility and to protect the environment. Effective zonal isolation prevents the injected gas from leaking into nonproductive formations or from migrating to the surface.

**Combining technologies for an effective seal**
To optimally drill and complete a leak-free UGS well, GASAG contacted Schlumberger and selected a combination of FUTUR self-healing cement and FlexSTONE flexible cement to provide two barriers to prevent gas migration to surface.

FlexSTONE cement was designed to withstand pressure and temperature fluctuations during injection and production phases, providing the primary barrier against unwanted gas migration by preventing cracks from forming.

FUTUR self-healing cement provided a secondary barrier against leaks. When hydrocarbons come into contact with the FUTUR sealant, it responds by swelling to close gaps and flow paths. Within hours, the cracks or fissures are healed and the hydraulic seal is reestablished. FUTUR cement can be strategically placed—from surface to reservoir depth, in any string of the well—to distribute an effective long-term seal throughout the well. It continues to reseal whenever annular integrity is compromised.

![Diagram of typical UGS well casing program, showing the production casing and production liner.](image-url)
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**Ensuring well integrity now and in the future**
Once the cement was placed, it was evaluated using a cement bond log ultrasonic imager tool. The logs showed an optimal cement bonding across the treated interval, ensuring that cement placement was successful. Because no remedial cementing job was required, 3 days of rig time were saved. In addition, FUTUR cementing technology will be able to react efficiently and self-repair if the cyclical injection and production stresses cause a loss of isolation.

The excellent results for the well prompted the operator to drill and cement a second well using FUTUR technology.

*Cement bond log–variable density log for a section of the second UGS well, which was also cemented with FUTUR technology.*