**ThermaLock™ Cement**
*For Corrosive CO₂ Environments*

- Resists corrosion caused by CO₂
- Protects pipe and casing
- Good for all temperatures
- Non-Portland cement formulation
- High strength development and weight retention

**The Challenge: Eliminate Cement Carbonation**
Carbon dioxide (CO₂) is a common element in downhole fluids, whether naturally occurring in ground waters or the result of CO₂ injection processes. When CO₂ comes into contact with the Portland cement that is used to cement well casings, it produces a deterioration phenomenon in the cement called carbonation. Over time, the loss of cement due to carbonation can cause serious damage to downhole tubulars and destroy zonal isolation integrity, resulting in costly remedial services or even abandonment of a well.

**The Solution:**
**Develop A CO₂-Resistant Formulation**
ThermaLock™ cement is a specially formulated calcium phosphate cement that is both CO₂ and acid resistant. The result of a joint development project for high temperature, geothermal wells, ThermaLock cement is now being promoted as an alternative for Portland cement wherever CO₂ may be encountered. It has been laboratory tested and proven at temperatures as low as 140°F (60°C) and as high as 700°F (371°C). Under test conditions that cause Class G, H, and latex-containing Portland cements to lose up to half their weight, the properties of ThermaLock cement are only slightly affected or may actually improve. (See chart on back.)

**Bottom-Line Benefits For Operators**
- Can greatly reduce concerns about the long-term affects of CO₂ and acid in operators’ wells
- Can save high remedial operation costs
- Can save abandonment, redrilling, and recompletion costs
- Doesn’t require special cementing equipment or techniques
- Greatly expands operators’ cementing options and opportunities for new applications

**Proven in Indonesia and Japan**
During the field testing of the new calcium phosphate formulation, a major oil company used ThermaLock cement on several geothermal wells in Indonesia. The largest of eight jobs used about 600 bbl of slurry. The slurry’s density was 14.7 lb/gal with a yield of 2.74 ft³ per sack (73 lb/sk). Bottomhole circulating temperatures ranged from 110°F to 150°F (43°C-66°C). Bottomhole static temperatures ranged from 150°F to 300°F (66°C-149°C). ThermaLock proved 100% successful on this project.

At a site in Japan, the slurry density was lowered to 11.4 lb/gal through the addition of Spherelite additive. Bottomhole circulating temperature was 210°F (99°C). Because of ThermaLock cement’s corrosion resistant properties and successful placement, the operator plans to use ThermaLock cement on its next steam producing well.

A visual comparison of ThermaLock cement (right) and Portland cement (left) shows how CO₂ deteriorates Portland cement over time, while leaving ThermaLock cement virtually unaffected.
This chart shows the results of ThermaLock cement tested against neat Class H cement and Class H cement containing 2 gal of latex additive.

For more information ThemaLock™ Cement, please call your local Halliburton representative or email us at cementing@halliburton.com