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FUTUR

Active set-cement technology for long-term zonal isolation

ADVANTAGES

- Repairs microannuli, internal cement cracks, and other hydrocarbon leak paths
- Extends production life of the well
- Self-repairs to protect against loss of annular hydraulic seal
- Eliminates costs related to remedial cementing operations and lost production
- Reduces well-monitoring costs

APPLICATIONS

- As a lead or tail system during any primary cement job
- In wells producing oil, condensate, gas, or a mixture of hydrocarbon fluid
- For plugging and abandoning wells
- In areas requiring enhanced protection against sustained casing pressure (SCP) throughout the life of the well

FEATURES

- Mixes and pumps using conventional cementing equipment
- Self-repairs cement sheaths without intervention
- Prevents annular migration of unwanted hydrocarbons to the wellhead or to surface
- Reacts only upon hydrocarbon exposure and otherwise remains dormant within the cement matrix
- Addresses possible future environmental regulations

INNOVATION IN WELL CEMENTING

FUTUR* active set-cement technology is a new and unique sealant that improves long-term zonal isolation and protects against hydrocarbon leaks and SCP at the wellhead. Pumped and placed as part of any primary cementing operation, the FUTUR cement forms an added isolation barrier above the reservoir, reacting whenever the cement sheath is damaged during the long-term productive life of the well. In the event the cement is damaged and hydrocarbons start to flow through either a crack or microannulus, this set cement responds within hours to seal the pathways, effectively healing the cement sheath. Once these flow paths are healed, the hydraulic integrity of the well is fully restored. This self-healing action is repeatable if annular integrity is further compromised during the life of the well.

UNIQUE SEALANT PERFORMANCE

In laboratory and field tests, FUTUR active set-cement technology outperforms any conventional cement system in preventing hydrocarbon migration and the potential for SCP. Long-term durable zonal isolation can be reestablished and maintained to extend the productive life of the well.

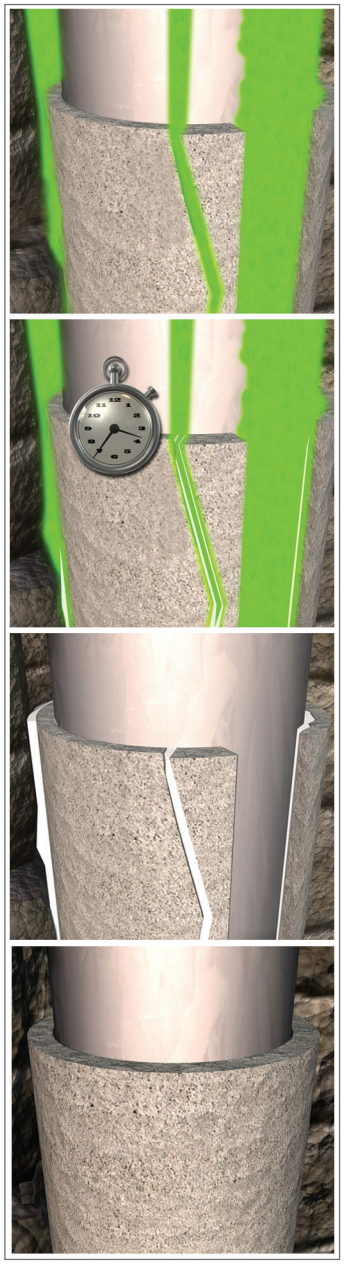
The responsive sealant can be strategically placed as part of the casing or liner cementing operation in any section of the well to form an effective long-term seal above the reservoir.

To provide an extra level of security against hydrocarbon leaks and SCP, FUTUR technology incorporates safety factors into the well cementing design to enhance well integrity and zonal isolation during completion, production, future remedial work, and abandonment.

LONG-TERM ISOLATION SOLUTION

The targeted placement of FUTUR active set cement reduces the risk of possible future degradation of the cement sheath through unplanned well events. The system has properties comparable to conventional cement systems and can be pumped with standard cementing equipment. No additional equipment or personnel are required.

To maximize well integrity, cement slurry should be used in at least 2 barriers above the reservoir, and each barrier should be at least 500 ft.



Hydrocarbon flow (shown in green) activates FUTUR active set cement whenever the integrity of the cement sheath is compromised, efficiently sealing the leak path and reestablishing well integrity.

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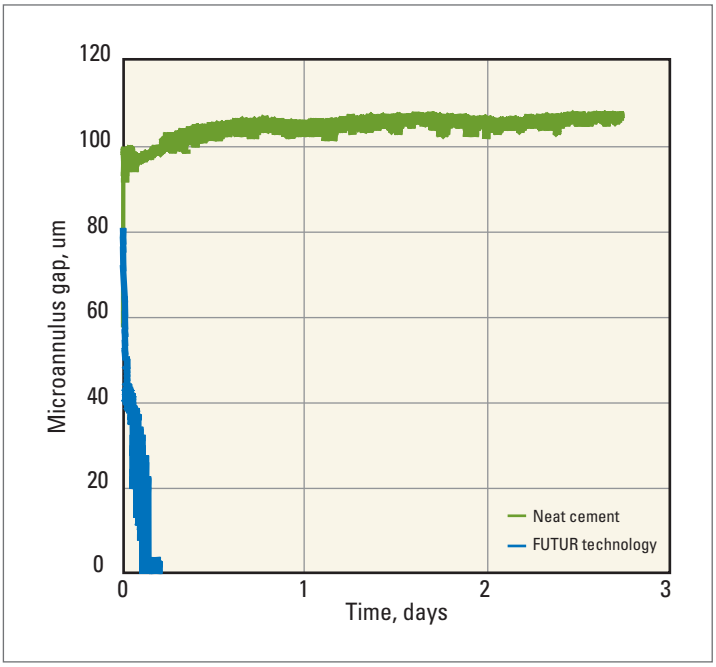
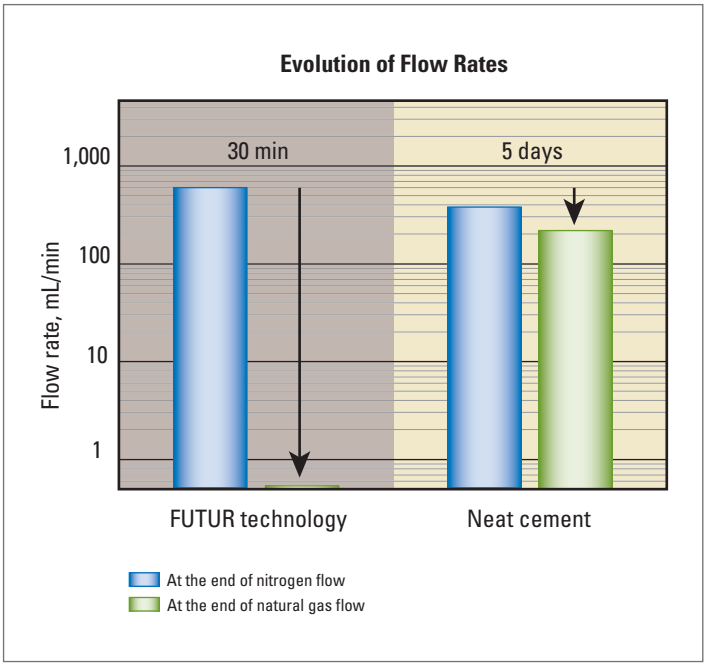


Oil flow shutoff in a 100 um microannulus. Using FUTUR technology, the oil flow has dropped after a few hours, the cement matrix has self-repaired, and annular integrity is restored. A conventional system under the same conditions shows no improvement.



Gas shut-off test conducted at ambient temperatures and 21 MPa (3,000 psi). Initial flow rate is established using nitrogen gas (shown in blue), after which the system switched to natural gas. After 30 min, FUTUR active set cement reduced the flow to negligible quantities.

FUTUR active set cement acts as a shield, reacting automatically upon contact with hydrocarbons migrating to the surface when stresses applied to the well break the initial annular integrity. When placed above the reservoir, this innovative technology

- efficiently prevents oil or gas from traveling through a damaged cement column
- continues to work for the life of the well and beyond, activating when leaks in casing occur during production or after abandonment
- eliminates the need for well intervention by ensuring long-term protection and preventing costly repairs and production downtime.

CASE HISTORIES

The FUTUR technology was used in two wells in the Stolberg field in the Central Alberta foothills region to address SCP, surface casing vent flows, and gas migration issues that conventional systems could not adequately mitigate. Current cementing practices in this area include the use of gas-tight slurries. The slurry incorporating the self-healing sealant was mixed using standard cementing equipment and procedures, and the unique sealant design was adjusted for the anticipated well and drilling fluid conditions. More than 1 year after implementation, the wells show no signs of pressure buildup in the annulus or at surface.

In Germany and Italy, FUTUR technology has been used to enhance zonal isolation in underground gas storage (UGS) wells. UGS wells often cross multiple depleted hydrocarbon zones that can still produce gas. The challenge is to avoid gas loss to these zones and prevent dangerous surface leaks that damage the environment and reduce the well's storage capacity. In the areas where gas leaks are common immediately after completion, the FUTUR active set cement contained the leaks to protect the environment and the investment made in gas storage.

Specifications

Density Range	1.4 kg/L [11.7 lbm/galUS] to 1.92 kg/L [16 lbm/galUS]
Exposure Temperature Limits	20 degC [68 degF] to 138 degC [280 degF]
Hydrocarbon Activation	Oil Gas condensates Gas

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