TAQA

Case Study:

Major Permian Operator Cures Annular Gas Migration using SwellPlug

Use of SwellPlug swellable particulate as a lead to cement successfully stopped gas migration and eliminated wellhead pressure on previously unsuccessful plug and abandonment.

Well Data

Location: Lea County, New Mexico

Reservoir Type: Legacy P&A

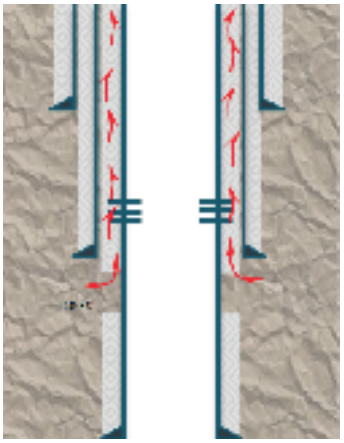
Well History: 1939: well spudded
2017: well temporarily abandoned
2021: well plugged & abandoned

SwellPlug Installation Date: May 2022

Background

At the end of the productive and economic life of a well, it is necessary to plug and abandon them to permanently seal the well with a cement plug to isolate the hydrocarbon-bearing formation from water sources and prevent leakage to the surface.

Traditional methods for both operations can be complex and costly, and gas channeling and inadequate cement jobs are operational challenges. Cement jobs are often impaired by permeable defects, such as fractures within the cement or debonding at the casing/cement interface resulting in micro-annuli. These defects can be caused by various factors, including ineffective cement placement, autogenous shrinkage and debonding upon setting of the cement. The defects offer possible routes for fluid or gas migration, potentially leading to sustained casing pressure (SCP) and other sealing integrity issues.



Gas migration causing Intermediate Casing Pressure

The Challenge

After transfer of assets, the operator assumed responsibility to effectively plug and abandon a legacy vertical well with multiple wellbore integrity issues.

Gamma ray logs showed gas was migrating through the annulus between production casing and intermediate casing, and between the intermediate casing and the surface casing, allowing pressure to build up on the wellhead of this previously abandoned well.

Over the years several attempts to re-plug and abandonment resulting in temporary fixes.

TAQA Solution

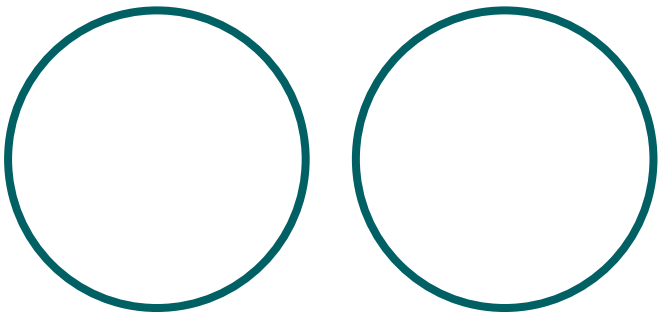
The solution was to pump a SwellPlug slurry ahead of cement to act as a base and keep the cement in the target zone and seal any micro annuli as they form over time.

TAQA's SwellPlug consists of patent protected water swellable particulate material pumped in a slurry that swells through the process of osmosis. Unlike other water swellable elastomers, the TAQA osmotic swellable material remains swollen regardless of the subsequent fluids that it sees making the seal permanent.

A 10ft cement plug was placed on a bridge plug below the target zones in the production casing. The target zones were perforated with charges designed to penetrate through the production and intermediate casing, as well as any associated cement sheath, and into the formation. A squeeze packer run on tubing was run in hole and set above the perforations. Injection could not be established initially, so the perforations were then acidized after which injection rates and pressures were then established. Approx 70lbs of a 50:50 mix of fine and coarse SwellPlug was pumped in approx 70bbls of fresh water gelled with 40ppb at 2bpm which equated to 1150psi surface pressure. Sixty sacks of Class C cement (13.4ppg) was pumped immediately after that at 1bpm at 800-1200psi. The well was shut in for 12 hours holding pressure on the squeeze job. The standard P&A procedure was then followed for subsequent plugs to surface.

Project Results

Well was successfully plugged and regulatory requirements satisfied. No pressure build up on annuli between production casing and intermediate casing annulus or intermediate casing and surface casing has been observed.



Unswollen particulates are pumped from surface into the intended target space or perforation tunnel and generate a differential of around 300psi but with gaps between particles

Particles swell by osmosis and fill the gaps resulting in a seal capable of holding 10,000psi

Principle of Operation

Swellable Particles