ControlSEAL Resin Sealant

Packer Leak Remediation

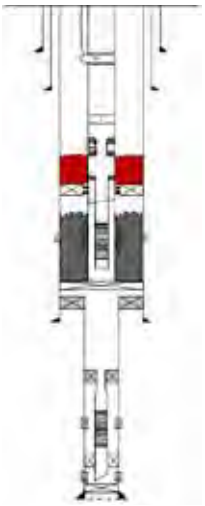
Background

A client was encountering problems with a leaking production packer on their well. They were experiencing communication between the tubing/casing annulus and had made several unsuccessful attempts to resolve this issue. The leaking packer was preventing the well from being put on production. There was a ¼-in. hole in the tubing at 7,506 ft (18 ft above the packer). Although not originally planned for, this hole was being used for gas-lift purposes. The annulus would not hold a full column of seawater, leaving about a 1,000-ft void in the annulus.

ControlSEAL Resin Sealant Job

A total of 20 gal (approximately 15 ft of fill) of 16½-lb/gal ControlSEAL™ was pumped into the annulus and allowed to freefall to the top of the production packer, essentially locking the tubing in place and sealing the annulus so gas-lift production could resume. There were three issues that had to be dealt with on this job. First, there was a freefall from the tie-in point of the annulus to the seawater line in the well at about 1,000 ft. The second was approximately 6,500 ft of water in which the ControlSEAL would have to fall through to land on top of the packer. The third obstacle was the ¼-in. hole 18 ft above the packer in the tubing. It was absolutely critical that the ControlSEAL not cover the ¼-in. hole and fall into the tubing. This is the reason that only 20 gal of resin was used. The job began with the pumping of 3 bbl of seawater into the annulus to wet the outside of the tubing and the inside of the casing over the 1,000 ft of void area. The 20 gal of ControlSEAL was then mixed and pumped into the annulus, immediately followed by 5 bbl of seawater. Five hours were given to allow the ControlSEAL to fall to the top of the packer, followed by 24 hours of waiting to allow the resin sealant to harden.

After 24 hours, a positive pressure test of 500 psi (3,480 psi experienced at the top of the ControlSEAL plug) was performed and passed, revealing that the ControlSEAL had set against the top of the packer and sealed the annulus. Prior to the application, more than 1,100 psi of pressure at the packer seal would create leakoff. The ¼-in. hole was also deemed to be free and clear in this test.



WELL INFORMATION
Production Tubing Size: 2⅞ in., 6½ lb/ft
Production Casing Size: 7⅝ in., 33 lb/ft
Production Packer: 7,524 ft
Well Fluid: Seawater
Well Fluid Weight: 8.45 lb/gal
Estimated Bottomhole Temperature: 165°F
Max Angle: 37° @ 4,924 ft

WILD WELL CONTROL

ControlSEAL Resin Sealant

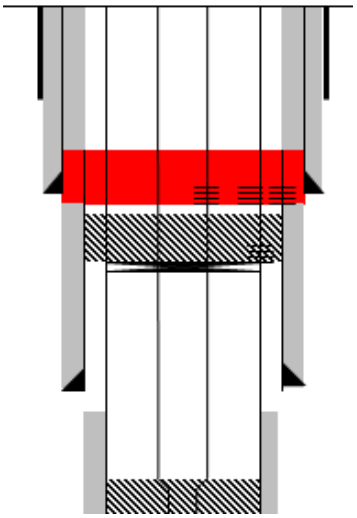
Plug and Squeeze Thru Perforations

Background

During P&A operations of an offshore well, an operator had made repeated attempts to squeeze the 13⅜ x 20-in. casing annulus with cement; however, the cement plug and squeeze operations were not successful at sealing off pressure buildup. The well configuration was challenging due to multiple strings being perforated to reach the 13⅜ x 20-in. casing annulus, which was cemented to surface. The operator selected to squeeze the annulus using ControlSEAL™ resin sealant due to its solids-free formulation that allows deep penetration into the microannulus as well as its ability to create impermeable plugs within casing.

ControlSEAL Resin Sealant Job

Perforations were first shot through the tubing, 9⅝-in. casing, and 13⅜-in. casing, allowing access to the 13⅜ X 20-in. annulus. Circulation was then established in each annulus. Then, 8 bbl of ControlSEAL resin sealant was systematically pumped by opening and closing the respective backside of the annulus in which ControlSEAL was being placed. Ultimately, 6 bbl were placed in the 9⅝ x 13⅜-in. annulus, 1¾ bbl were placed in the 3½ x 9⅝-in. annulus, and ¼ bbl of ControlSEAL was left in the tubing. At that time, 1,000 psi squeeze pressure was applied and monitored for leakoff. After 4 hours, the well was shut in and the ControlSEAL resin sealant was allowed to cure for 44 hours. After a total of 48 hours, the ControlSEAL resin sealant had hardened and effectively sealed the 13⅜ x 20-in. annulus, allowing the operator to continue with P&A operations. No bubbling was observed in the annulus and a positive pressure test was achieved, indicating a successful job.



WELL INFORMATION
Casing: 20 in., 94 lb, K-55
Casing: 13 ⅜ in., 68 lb, N-80
Casing: 9 ⅝ in., 53.5 lb, P-110
Tubing Size: 3 ½ in. OD, 10.2
Top of Cement Plug: 1,850 ft. MD
Perforations: 1,845 ft MD
Max Deviation: 43" @ 13,644 ft MD
Well Fluid: 8.6 ppg Seawater
BHT: 100°F

WILD WELL CONTROL

ControlSEAL Resin Sealant

Resin Annular Plug Placed with Coiled Tubing

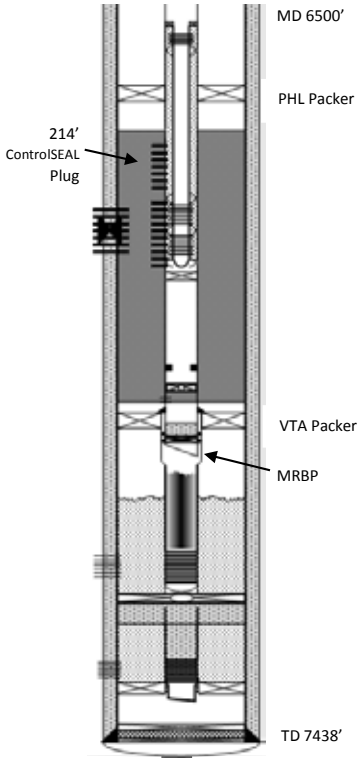
Background

A major operator in the Gulf of Mexico contacted CSI for assistance with a re-complete of one of their wells. The operator needed to create a resin plug for the thru tubing gravel pack operation while simultaneously creating a seal from damaged casing. The location of the PHL and VTA packers limited the plug length to less than 230 ft. ControlSEAL™ Resin Sealant was pumped due to its exceptional mechanical, chemical and rheological properties and its ability to create a good seal in casing with minimal volume.

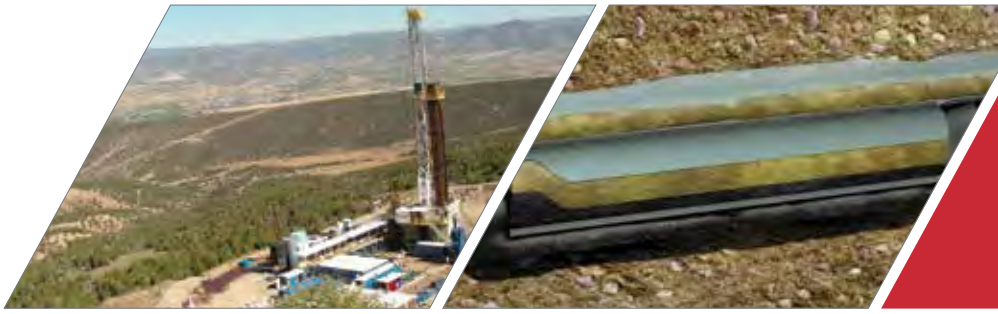
ControlSEAL Resin Sealant Job

The operator temporarily abandoned the bottom production zone by placing a magna range bridge plug in the tubing at 6870 ft MD and dump bailing 8 ft of cement on top. They then punched tubing at 6829 ft & 6615 ft MD and set a retainer at 6824 ft MD. At that point, 1 ¼" coil tubing was run in hole and stung into the retainer. CSI proceeded to pump 7 bbls of ControlSEAL Resin Sealant at a rate of ¼ to ½ bpm thru the coil tubing placing 214 ft of resin in the 7" X 2-7/8" casing annulus. The coiled tubing was then un-stung from the retainer, circulated and pulled out of hole. At that time, the well was locked in with 500 psi of pressure and monitored for leakoff. After 48 hrs of waiting, the ControlSEAL Resin Sealant had hardened and was confirmed to have created an effective seal via a successful pressure test to 3500 psi. The operator proceeded to perforate through the tubing, set resin and 7" casing using a 12 spf perforation gun. The 20 ft perforation interval was located at 6,630 ft – 6,650 ft. Then, a gravel screen and assembly was set between 6655 ft – 6585 ft in preparation for thru tubing gravel packing operations. The well was then released for production.

WELL INFORMATION
Casing Size: 7 in., 29 lb, N-80
Production Tubing: 2 7/8 in., 6.5 lb, N-80
Baker "PHL" Packer: 6,611 ft MD/5,917 ft TVD
Bad Casing: 6,632 – 6,654 ft MD
Circulation Perfs (5 ft): 6,615 ft MD
Proposed Prod Perfs: 6,630 – 6,650 ft MD/5,933 – 5,951 ft TVD
Coiled Tubing: 1 ¼ in. OD
CT Retainer: 6,824 ft MD
"X" Nipple (2.313 in. ID): 6,791 ft MD
Injection Perfs (2 ft): 6,829 ft MD
VTA Packer: 6,842 ft MD/6,117 ft TVD
Well Fluid: 8.6 ppg KCl
BHT: 150°F



WILD WELL CONTROL



ControlSEAL Resin Sealant

Section Mill Plug and Squeeze

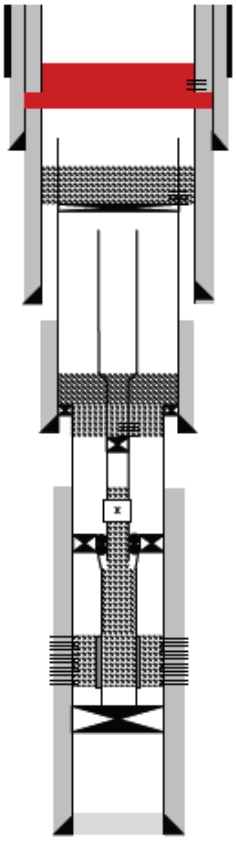
Background

During P&A operations of an offshore well, an operator had made repeated attempts to seal the 10¾ x 16-in. casing annulus; however, the use of conventional cement was not possible due to the inability to establish injection. After multiple attempts, the operator selected to remediate using ControlSEAL™ resin sealant due to its solids-free formulation that allows deep penetration into the microannulus and microfractures.

ControlSEAL Resin Sealant Job

A 5-ft window was milled below the existing perforations through the 10 ¾-in. and out to the 16-in. casing to expose the microannuli and fractures in the cement column. Then, a cast-iron bridge plug was placed 2 ft below the milled window and 5 bbl of 9 ppg unweighted ControlSEAL resin sealant was pumped into place using drillpipe at a rate of 1 bpm. Once the ControlSEAL was placed, the drillpipe was pulled up 4 joints, circulated clean, and pulled out of hole. At that time, 1,000 psi squeeze pressure was applied and monitored for leakoff. After 6 hours, the well was shut in and the ControlSEAL resin sealant was allowed to cure for 42 hours. After a total of 48 hours, the ControlSEAL resin sealant had hardened and effectively sealed the microannuli and microfractures, allowing the operator to continue with P&A operations. No bubbling was observed in the annulus and a positive pressure test was achieved, indicating a successful job.

WELL INFORMATION
Intermediate Casing Size #1: 16 in., 84 lb, K-55
Intermediate Casing Size #2: 10¾ in., 40.5 lb, K-55
Drill Pipe: 3½ in., 13.3 lb
Bridge Plug: 649 ft MD
Section Mill: 647–642 ft MD
Injection Perfs (10 ft): 640–630 ft MD
Max Deviation: 28.23°@ 7,164 ft MD
Well Fluid: 8.6 ppg Seawater
BHT: 70°F



Simplified Schematic Showing a ControlSEAL plug and squeeze