Case Study 1616

Injection Well Cleanout Activities in East Central Alberta Canada

Version 3.0 July 18, 2011
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Case Study for ADL Oilfield Services

Company Profile

Since 2004, ADL has provided expert well stimulation and remediation services, using a precision Stable Foam generating system to successfully complete over 750 vertical and horizontal wells; including injection, disposal and production wells, plus pipeline cleanouts, remediation projects and foam assisted drilling. Major Oil & Gas producers look to ADL as the industry benchmark for generating Stable Foam at surface.

Business Situation

High consumer demand, coupled with a strategic need to sustain long term energy self-reliance, natural gas and tar sands represent the raw fuels of the future. Thousands of new wells are drilled yearly, while thousands more decline in production. Water flood performance is critical to direct the oil to the producing wells.

Clients typically contact ADL Services when conventional methods of injection well cleaning fail, including: chemical flushing or slick water applications.

Technical Situation

The following well case study represents a typical injection well condition assessed and addressed by ADL Services. The injection well is listed by location, characteristics and condition. The UWI number and sensitive owner information are withheld. The subject well includes background, description, solutions and objective well production before and after ADL Services intervention.

Well 1616 - Provost, Alberta Canada
This vertical injection was a combination perforated section and open hole. The injection well perforations were at 895.0 – 897.0 mKb. The open hole was located at 917.0 – 931.0 mKb. The injection well contained no tubing. The water is injected through 4.5 inch casing right to the perforations and open hole. This particular well had 40% porosity and is injecting into the Dina zone formation.

Solution

The ADL Work Design Plan was executed on October 5, 2008 including a structured methodology focused injection well survey and schematic reviews, work layout targeting foam to the point of need, sampling, safety protocol, work execution, monitoring, reporting and cleanup. Particular injection well behaviors or personality was determined, allowing for customized foam design Mutual solvent was recommended for treating oil carry over.

Coil tubing delivered the Stable Foam to the designated target areas. The foam generated at surface, was sampled to assure adequate foam quality and stability. The Stable Foam density was then tested, customized and proven adequate for the well's specific needs.

Initial Stable Foam was applied for first phase well cleanout. As a second phase, mutual solvent was applied and allowed to soak for an adequate contact time. The next phase of application included a second pass of Stable Foam.

Benefits

Injection pressure significantly improved from 3600 kPa before to 170 kPa vacuum after. Injection rates also improved from 850 m^3/day (at 3600 kPa) to 3800m^3. The following Table depicts injection well performance before and after the ADL Stable Foam cleanout:

Well Behavior Before Cleanout		Well Behavior After Cleanout	
Injection Pressure	3600 kPa	Injection Vacuum	170 kPa
Injection Rate	850m^3/day	Injection Rate	3800m^3/day
		Residual Sand Removed	20.5m^3
		Residual Oil Carry Over Removed	13.0m^3

Based on examination of debris contents and the volume of residuals extracted, it was concluded high levels of TDS and oil carry over were the primary causes for injection rate volume decline.

The Stable Foam application process required 18 project hours to assess, stage, execute and complete. The well data shows increased post cleanout injection rates with sustained injection performance spanning 1 year. Post cleanout monitoring by ADL staff encouraged the injection well operator to reduce the well injection rate to maintain a total dissolved solids TDS concentration below 100 ppm.

Post cleanout injection well performance beyond the 1 year of optimized performance was jeopardized by operations increasing water volume in conjunction with increased TDS levels to 350 ppm.

Summary

The subject injection rate was affected by significant amounts of TDS and oil carry over, resulting in residual accumulation and decline.

ADL serviced the well with a nitrogen enriched Stable Foam and a customized design density, coupled with a mutual solvent treatment. Removing 20.5 m^3 of sand and reducing 13.0 m^3 of oil carryover into the well. Post cleanout injection rates were not only restored, but significantly improved and sustained for 1 year.