



MATURE FIELDS



UNCONVENTIONALS

Sand Profiling During Well Production Provides Insight and Optimizes Cleaning

INNERVUE™ WELLSUITE DIAGNOSTICS ACCURATELY DETECTS RESTRICTIONS IN HORIZONTAL WELL VIA PRESSURE WAVE ANALYSIS

ARGENTINA

CHALLENGE

- » Gather data regarding location and extent of wellbore blockages restricting production
- » Determine best intervention method to remove debris and increase production
- » Minimize impact on operations

SOLUTION

- » InnerVue™ WellSuite non-intrusive wellbore diagnostics – to locate wellbore blockage using pressure wave technology
- » Halliburton proprietary algorithm and software – to profile sand deposits using advanced analytics
- » Halliburton coiled tubing services – to perform cleanup with pump rates and gel chemicals to lift debris

RESULT

- » Successfully surveyed the restricted well within an hour, minimizing operational interruption
- » Precisely located two obstructions along the wellbore flow path
- » Delivered results quickly to customer, in less than 12 hr
- » Enabled more efficient, cost-effective cleaning based on accurate diagnostic data

OVERVIEW

A multiphase producing well in Vaca Muerta field in the Neuquen province of Argentina was producing sand from a perforated zone in the well’s horizontal section. After about six months of production, the sand was causing a partial blockage in the wellbore and responsible for production inefficiencies. The customer wanted to understand the extent of the sand plugging the wellbore before planning an intervention using coiled tubing.

Halliburton Pipeline & Process Services offered its InnerVue™ WellSuite diagnostics service, which is a safe, non-intrusive solution for locating and profiling restrictions along the wellbore flow path. In close communication with the customer, a survey was planned in the 5-1/2” production casing of about 5,900m MD within a long perforation zone in the horizontal section of the well. This innovative method led to high quality results that ultimately enabled better decision-making and successful intervention.



InnerVue™ WellSuite diagnostics equipment setup at the wellsite.

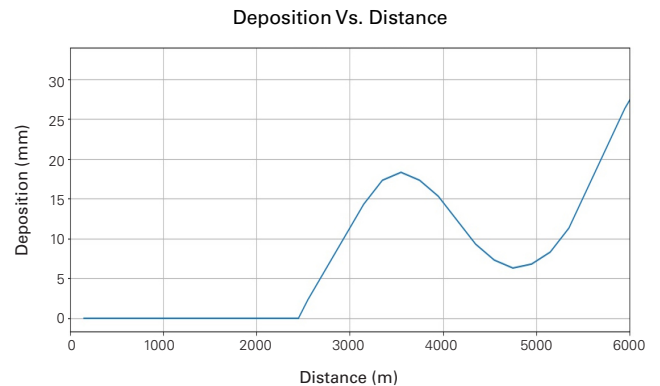
INNERVUE™ DIAGNOSTICS ENHANCED BY ADVANCED ANALYTICS

At the time of the operation, the fluid in the well was a mixture of fresh water and liquid hydrocarbon. An acoustic velocity profile along the well was modeled, based on the fluid composition, and considering the pressure and temperature gradients. At surface, after the well fluid column had stabilized, a bleed valve was quickly opened and closed to create a pressure wave. The pulse traveled through the wellbore and reflected off the restrictions in the flow path, generating a pressure profile, which was recorded using high-fidelity instrumentation. Upon reviewing the data, Halliburton identified that more information than expected was able to be extracted from the data using advanced analytics and a detailed profile of the actual sand restrictions was able to be seen in addition to the location of the blockage.

PRECISE RESULTS LEVERAGED FOR CLEANING CAMPAIGN

In just a few hours, InnerVue WellSuite diagnostics was run and interpreted for the first time in Argentina, clearly and precisely detecting two obstructions—one starting at 2,425m and another at 4,924m—whereas the customer initially thought there was only one obstruction. This detailed information justified

the need to perform a mechanical cleaning in the well to increase its production. During the cleaning campaign using Halliburton coiled tubing services, the knowledge gained from InnerVue diagnostics allowed for an efficient, cost-effective cleaning using pump rates and gel for lifting the debris. In other cases, the requirement and timing for cleaning could be further optimized based on the information, which can offer significant savings.



BENEFITS OF INNERVUE DIAGNOSTICS

The InnerVue diagnostics solution provided the following benefits to the customer:

- » Non-intrusive application
- » Minimal operational impact/rig downtime
- » Quick data collection and analysis turnaround
- » Accurate blockage detection and profile
- » Valuable inputs for coiled tubing cleaning run

This project demonstrated that with detailed pre-engineering, wellbore blockages can be located and profiled to a high degree of accuracy using InnerVue diagnostics—even in complex systems where the fluid composition and properties change.

“Through collaboration with Halliburton, we were able adapt this pipeline technology for use in horizontal wellbores. From a flow assurance perspective, this technology gives us a low cost, low risk method for locating sand/scale bridges in horizontal wellbores without risking mechanical intervention. If an obstruction is found, we then have the necessary information to justify the expenditure for a coil tubing clean out. Additionally, knowing the location of a bridge means that we are not blindly running coil tubing waiting to tag up on something; we can anticipate the plug location and ensure proper run speed and pump rate before we reach the obstruction. The economic and operational benefits of this technology are huge.”

– Operations Engineer

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