Optimizing Plug Drillout Operations with Real-Time Flowmeter and CT Data, Eagle Ford Shale

Integrating surface multiphase flowmeter, coiled tubing, and flowback data enables detailed characterization of well behavior for efficient plug drillout operations.

CHALLENGE
Optimize equipment layout for postfracturing drillout operations and define empirical methodology for evaluating well behavior during plug drillout operations.

SOLUTION
Obtain differential pressure measurements from across the plug debris catcher in combination with high-resolution Vx Spectra* surface multiphase flowmeter data to characterize well behavior during plug drillout and guide operations.

RESULTS
Achieved detailed analysis of well behavior during plug drillout yielding optimization of plug drillout operation.

Optimize completion operations during drillout campaign
To increase efficiency and optimize postfracturing plug drillout operations in the Eagle Ford Shale of South Texas, an operator collaborated with Schlumberger on a solution that would improve meeting its completion objectives.

Introduce Vx Spectra flowmeter to completions operation
The operator requested that the Vx Spectra surface multiphase flowmeter be integrated into its drillout operation along with standard drillout equipment. The Vx Spectra flowmeter gives an output of three-phase flow rates in standard conditions through low-energy gamma radiation measurements with fluid dynamic models. By measuring from a single point in the venturi throat, the flowmeter is able to constantly determine the precise phase fractions of water, oil, gas, and solids during the job.

To determine the differential pressures during the job, Schlumberger set up two pressure sensors on the inlet and outlet of the plug catcher, both connected to the Vx Spectra flowmeter. Differential pressure acquired by the Vx Spectra flowmeter was integrated with measured proppant flowback data to identify when the solids would return to surface. Additionally, coiled tubing data was used to identify the return time for plug debris and for pumped gel sweeps. With these advanced data acquisition and evaluation processes, the well operator was able to obtain better control of the plug drillout process.
Integrate datasets to improve rig-up efficiency and downhole certainty

The time of delivery of plug debris to surface was computed from the time when the plug was tagged and milled and the history of the return rate, which was measured with the Vx Spectra flowmeter. The Vx Spectra flowmeter is an ideal tool for diagnosing well behavior during plug drillout operations. An additional level of control is provided by differential pressure measurements across the plug catcher. As a result of the implemented procedure, the operator precisely knew when plug parts would return to surface. Combination with data from coiled tubing and information on the depth of each plug gave the operator a high-resolution view of downhole activities.

Schlumberger provided full operational support to the field operations, working together to process and combine the Vx Spectra flowmeter data with the coiled tubing and flowback data. The operator used the results from the Vx Spectra flowmeter to identify and optimize the surface equipment layout and procedure for well control.

CASE STUDY: Detailed flowback data using Vx Spectra flowmeter guides drillout operations, South Texas

Plug catcher differential pressure and sand concentration trends for two wells of the three-well pad.

<table>
<thead>
<tr>
<th>CT pump rate</th>
<th>Return rate</th>
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<tr>
<td>Formation injection rate</td>
<td>Formation rate out of soil organic carbon</td>
</tr>
<tr>
<td>Sand concentration</td>
<td>Corresponding CT depth for returns</td>
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<tr>
<td>CT depth</td>
<td>Downhole gel pill identifier</td>
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<tr>
<td>Gas</td>
<td>Frac plug identifier</td>
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Sand peaks identified with events that occurred during the job.

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