Open Hole Sidetracking Technology

January 20, 2010
U.S. Shale Plays
Introduction

- Conventional Cement Plugs
- Sidetracking/Open Hole WhipStock
- Expandable Anchor Technology
- Time Comparisons
- Options
- Case History
- Conclusions
Conventional Sidetracking
Open Hole Sidetrack with Cement Plug

- FISH
- Drill pilot hole TD.
- Run logs (caliper)
- Pump Balanced Kick-off plug
- Wait on Cement
- Time Drill to Sidetrack the well
Open Hole Sidetrack with Whipstock & Packer

- Drill pilot hole to TD
- Run logs (caliper)
- Run whipstock with Inflatable Packer
- Orient whip
- Hydraulic Actuation
- Sidetrack the well with minimal rat-hole
Open Hole Sidetrack with Expandable Anchor

- Drill pilot hole to TD
- Run logs (caliper)
- Run whipstock with Expandable Anchor
- Orientation
- Hydraulic Activation
- Sidetrack the well with minimal rat - hole
Expandable Anchor

**Features & Benefits**

1. Hydraulically actuated/mechanically locked blocks, designed to engage open hole formations, with no string manipulation required
2. Ideal for medium to hard formations
3. Variable expansion capability allows anchor to span multiple hole sizes
4. Axial and torsional load capacities greater than typical hydraulic or mechanical anchors
5. Retrievable

### Expandable Anchor Specifications

<table>
<thead>
<tr>
<th>Size (in.)</th>
<th>OD (in.)</th>
<th>Torque (lb-ft)</th>
<th>Push/Pull Capacities (lbf)</th>
</tr>
</thead>
<tbody>
<tr>
<td>4 ½ x 7</td>
<td>3.69</td>
<td>6,000</td>
<td>50,000</td>
</tr>
<tr>
<td>7 x 9 ¾</td>
<td>5.62</td>
<td>30,000</td>
<td>100,000</td>
</tr>
<tr>
<td>9 ½ x 13 ¾</td>
<td>8.00</td>
<td>50,000</td>
<td>150,000</td>
</tr>
<tr>
<td>13 ¼ x 20</td>
<td>11.75</td>
<td>80,000</td>
<td>150,000</td>
</tr>
<tr>
<td>Tool Body Diameter (in.)</td>
<td>Max. Expanded Diameter (in.)</td>
<td>Typical Open Hole Size (in.)</td>
<td></td>
</tr>
<tr>
<td>--------------------------</td>
<td>-----------------------------</td>
<td>-----------------------------</td>
<td></td>
</tr>
<tr>
<td>3.69</td>
<td>6.061</td>
<td>4-3/4</td>
<td></td>
</tr>
<tr>
<td>5.62</td>
<td>9.217</td>
<td>6-1/8 &amp; 7-7/8</td>
<td></td>
</tr>
<tr>
<td>8.00</td>
<td>13.165</td>
<td>8-1/2 &amp; 8-3/4</td>
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</tr>
<tr>
<td>11.75</td>
<td>19.085</td>
<td>12-1/4</td>
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</table>
Time Comparison Cement Plugs vs. Whipstock & Expandable Anchors
Open Hole Whipstock System Deployment Options

- SHEAR SUB – No rat hole
- CEMENTING MANDRELS
- VARIOUS MILL – 3’-15’ rat hole
- PDC BIT SYSTEM – PDM Directional BHA Drill ahead
Shear Sub

Shear Sub Pushes Whip Top Not Shear Bolt

Torque Transmitted Through Whip Top Not Shear Bolt
Drill Ahead System

- PDC Drill Ahead Mill Run on Directional Drilling Assembly
- Whip stock System Hanging below
- RIH, Orient, Set, Sidetrack, Drill Extended Rathole
- Proven System
### Open Hole Job Summary

<table>
<thead>
<tr>
<th>Hole Size</th>
<th>Mill to Whip</th>
<th>Shear Off Sub</th>
</tr>
</thead>
<tbody>
<tr>
<td>6.000&quot;</td>
<td>1</td>
<td>0</td>
</tr>
<tr>
<td>6.125&quot;</td>
<td>61</td>
<td>0</td>
</tr>
<tr>
<td>6.500&quot;</td>
<td>4</td>
<td>0</td>
</tr>
<tr>
<td>6.750&quot;</td>
<td>10</td>
<td>0</td>
</tr>
<tr>
<td>7.875&quot;</td>
<td>4</td>
<td>0</td>
</tr>
<tr>
<td>8.500&quot;</td>
<td>5</td>
<td>0</td>
</tr>
<tr>
<td>8.750&quot;</td>
<td>300</td>
<td>46</td>
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</table>
On average, Open Hole Whipstock Technology saved companies 2 ½ days and approximately $86,250/well in the Shale Plays compared to traditional cement plugs.
Shallot Focal assembly was run 6/10/19 in T15-12T, and the step was then tripped in 10’ intervals, by 3’/step, active and passive weight. The shallot was run in 90’ intervals and tripped out when necessary. The shallot was run in the shallot’matrix to allow for tripping out of the target. Shallot was then tripped in 10’, certified, and locked off the side with no issues. All shallots completed on 6/12/19.

Total Time to Complete: 11.9 Hours
SMITH DELIVERS A SUPERIOR SOLUTION FOR PETRONAVK IN THE HAYNESVILLE BOSSIER SHALE

Trackmaster® Plus Open Hole Whipstock System Saves Big Time While Improving Well Geometry

Petronawk Energy Corporation faced a major challenge in setting off a cement plug in the Haynesville Shale. After struggling for days with a dedicated, dedicated open hole whipstock system, the decision was made to turn to the Trackmaster® Plus. The solution was a Trackmaster® Plus with an inserted whipstock system, allowing the operator to set the plug in a fraction of the time. The system reduced the time to set the plug by more than 80%, allowing the operator to complete two additional wells in less than 50% of the time.

Objectives:
- A more efficient and cost-effective system for setting off cement plugs in open hole sections.
- Enhanced operational efficiency and reduced non-productive time.

Customer:
- Petronawk Energy
- Well Location: Sabine Parish, LA
- Completion: 1,900 ft.
- Drilling Engineer: Ondro Montgomery
- Completion Engineer: Sherry Annette

Perforations:
- Bossier Shale
- Depth: 11,717 ft.

Results:
- Fieldhouse work was made in 3 months.
- Fieldhouse pipe was completed in 1 day.
- Initial OGL was limited to 20%.
- Initial OGL was limited to 40%.
- Initial OGL was limited to 60%.
- Additional OGL was made in less than 50% of the time.
- More than 10 comparable jobs successfully deployed to date.
SMITH DELIVERS A SUPERIOR SOLUTION FOR MARSHALL & WINSTON, INC. IN LEA COUNTY, NEW MEXICO

Trackmaster™ Plus Open Hole Whipstock System Saves Rig Time

Marshall & Winston, Inc. needed a reliable solution for a planned open hole sidetrack after drilling an 8 ½” vertical pilot hole. An 8 ¼” Smith Trackmaster™ Plus Open Hole Whipstock System was selected. The sidetrack was started at a depth of 8,377 ft. The Smith Trackmaster™ Plus Open Hole Whipstock was run in hole at 8,377 ft and sidetracked the hole through the sandstone. The sidetrack was accomplished in one trip and the string was pulled in 22 minutes. The Smith Trackmaster™ Plus Open Hole Whipstock System saved the operator valuable rig time and helped get the project back on schedule.

Well Name: Pilot and Sidetrack Wells
Section: West Texas and New Mexico
Date: November 2022
Operations: Open hole sidetrack

Key Points:
- No cement needed for the sidetrack
- No need for reaming
- No casing required
- String was pulled in 22 minutes without problems
Conclusion

• Open Hole Sidetracks with Expandable Anchor Technology is a cost effective alternative to setting a cement plug.

• Using Expandable Anchor Technology has proven to be reliable for Sidetracking Operations.
Thank you.