Halliburton helped reduce horizontal drilling days from more than 18 to less than nine, consistently beating targets by 30 percent

**Overview**
This independent energy company has a long history of success in the Denver-Julesburg (DJ) Basin’s Wattenberg Field. One of the United States’ richest fields, this area has already produced more than 4 trillion cubic feet of natural gas.

In 2009, the operator began an ambitious horizontal drilling program to exploit the reservoir more fully and economically. Halliburton provided best-in-class technology and operating practices to help overcome numerous technical and geologic challenges. The operator and Halliburton reduced average drilling days per well from 18-20 to less than nine – beating targets by 30 percent.

Initial horizontal wells showed substantial improvement over vertical development – with average production rates that were seven times higher. The energy company now plans to more than double the number of horizontal wells in 2011.

### Challenges

<table>
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<tr>
<th>Challenge</th>
<th>Solution</th>
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<tr>
<td>Unstable shale near pay zone</td>
<td>Shale stabilizer fluid&lt;br&gt; Halliburton applied a shale stabilizer additive to the drilling system to minimize shale hydration and swelling. Teams also used special muds to ensure sufficient pressure control, circulation, and removal of cuttings.</td>
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<td>10-degree build to horizontal</td>
<td>Modified mud motor&lt;br&gt; Halliburton used a special mud motor that provides greater mobility and rotation than a conventional motor. With the new motor, the operator can drill high-angle curves efficiently and effectively – often in just one run with one PDC bit.</td>
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<td>Continuous improvement</td>
<td>New techniques&lt;br&gt; Staff expansion around a constant core ensured efficient knowledge transfer. Condition-based maintenance improved tool reliability. New fluids and drilling techniques enabled a sub 10-day well within 24-hours of the goal being issued. Halliburton is also evaluating ways to eliminate an intermediate casing string to reduce drilling days further.</td>
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**Solving challenges.™**
Energy company saves approximately $75,000 for each drilling day saved. Average drilling days per well have been cut by more than 50 percent since the start of the program.

Halliburton helped consistently beat targets by up to 30 percent.

Wattenberg horizontal wells have an average of 7x higher production rates than vertical wells.

The operator more than doubled the horizontal program since 2010. It plans to drill 70 wells in 2011, up from 28 in 2010.
Halliburton helped cut horizontal drilling time by more than half

**Reduced drilling days from 20 to less than nine**
The operator began a one-rig, four-well pilot horizontal drilling program in late 2009. Initial horizontal wells took 18-20 days from spud to release. Through lessons learned, the energy company and Halliburton optimized the program and cut drilling time down to less than nine days. Each drilling day saved provides about $75,000 in savings to the operator. Consistent innovation helped beat targets along the way by as much as 30 percent.

**Experienced, consistent personnel on site**
Since the horizontal program began, Halliburton has worked very closely with the operator to provide drilling, fluid, bits, microseismic, wireline, cementing and fracturing services. As the program expanded, Halliburton kept its core team intact to improve knowledge sharing, best practices and collaboration from well to well. This contributed to the reduction in drilling days.

**Reactive shale stabilized**
As drilling progressed, Halliburton used core samples to develop a customized fluid solution that could combat a highly reactive shale layer immediately above the target interval. Halliburton recommended adding CLAYSEAL® PLUS shale stabilizer to the drilling system. It prevented the shale from becoming hydrated and swelling. This decreased the risk of collapse before the wells could be cased and helped reduce NPT.

**Custom drilling tool gets through build in one run with one bit**
To maximize wellbore contact with the reservoir, the operator wanted to turn from vertical to horizontal as quickly as possible – 10 degrees every 100 feet. Halliburton provided a custom, hybrid drilling tool which improved performance, drill pipe rotation, hole smoothness and cleaning efficiency.

“We’re now drilling horizontal wells almost as fast as vertical wells.”
Director of Drilling, Independent Energy Company

Solving challenges.”
Halliburton helped cut horizontal drilling time by more than half

**Condition-based maintenance enhanced productivity, reliability**
To help improve equipment reliability and availability, and to prevent costly, time-consuming breakdowns, Halliburton implemented condition-based maintenance instead of fixed-interval tool maintenance. Using sophisticated tracking technology, Halliburton recorded the vibration, temperature and pressure that each tool was subjected to. Then, based on actual conditions encountered, Halliburton adjusted tool maintenance schedules. This resulted in greater tool availability and contributed to less NPT.

**Expert survey management and wellbore placement**
The density of vertical wells in the area also made collision avoidance a challenge. Because the operator was drilling in a fault-heavy, vertically developed area, survey management was crucial. It used Landmark COMPASS™ directional well planning software and Halliburton survey management software to help ensure safety, efficiency and optimal wellbore positioning. In addition, the operator employed Halliburton StrataSteer® 3D geosteering service to optimize wellbore placement within the reservoir.

**Operator continually sets faster horizontal drilling goals**
In the Wattenberg field, the operator has drilled some of the highest producing wells, some of the longest laterals, and some of the fastest laterals. It has drilled 4,000 foot laterals in just 32 hours and reduced the average time for drilling laterals from five days to just a day and a half. With each new record comes another challenge to beat it.

Now Halliburton is seeking ways to keep the hole open longer so it can eliminate an intermediate casing string. By working with Halliburton to modify formulations and improve well designs, the operator expects to reduce drilling days even more.

“Our expectations are high; we demand the best. Halliburton has stepped up and delivered. We worked as a team to improve our horizontal program.”

*Director of Drilling, Independent Energy Company*