**CASE STUDY**

**Geomechanics and Drilling Optimization Workflows Improve Horizontal Well Campaigns in Peru**

Multidiscipline consulting team helps Pluspetrol overcome drilling risks, saving approximately USD 2.78 million per well

**CHALLENGE**

Determine how to minimize geomechanics-related drilling events and low rates of penetration (ROP) that led to an average loss of 2.2 days per well and costly sidetracks.

**SOLUTION**

Implement an integrated geomechanics and drilling optimization process. Deploy rotary steering systems for the first time.

**RESULTS**

Dramatically reduced lost time due to geomechanics-related drilling events; hit drilling targets 5 to 9 days faster at increased ROP; saved USD 2.78 million per well.

“Results achieved were the sum of multiple aspects of the project—including multidisciplinary planning, technical support in geomechanics and drilling engineering, rotary steerable systems, drilling fluids, well placement, and other technologies.”

Jaime Tapia
Drilling superintendent
Pluspetrol Norte S.A.

---

**Mitigating geomechanical and drilling issues**

Pluspetrol Norte S.A. initiated a series of horizontal drilling campaigns in the Yanayacu, Corrientes, Jibarito, and Capahuari fields of the Marañon basin in the northern Peruvian rainforest.

Previously drilled wells encountered considerable geomechanical and drilling problems. Costly sidetracks were common. The average historical NPT per well was 2.2 days. Geomechanical incidents, including stuck pipe, wellbore instability, and tight holes, accounted for a full 97% of NPT in deviated and vertical wells and 69% of NPT in previous horizontal wells. Only five horizontals wells had been drilled before—all with aggressive dogleg severities—using conventional downhole motors that required sliding nearly 100% of the time. Cuttings removal had been inefficient, lowering ROPs. Stationary components had created friction, further reducing ROPs and causing mechanical and differential sticking of the drillstring and packoffs.

Due to changes in reservoir conditions, advances in technology, and new environmental constraints, Pluspetrol decided to implement a fresh approach.

**Multidisciplinary evaluation, forecasting, and support**

To mitigate drilling risks, minimize NPT, and reduce costs, Pluspetrol joined forces with the Schlumberger petrotechnical services for geomechanics team. Working closely with the customer, consultants delivered a comprehensive multidisciplinary evaluation. This unique geomechanics and drilling optimization workflow had four main phases: data audit, predrill mechanical earth modeling, modeling while drilling, and end-of-well review.

For the data audit, the team compiled, integrated, and analyzed all available data in geology, geophysics, geomechanics, reservoir engineering, and drilling engineering. As part of predrill planning, they performed a geomechanics study, building a 1D mechanical earth model (MEM), which provided a reliable wellbore stability forecast. They analyzed horizontal stress magnitude and orientation, performed trajectory sensitivity analysis, and evaluated potential drilling hazards. Finally, they created a plot from data measured from the DrillMAP* drilling planning and management tool to summarize risks and guide preventive measures while drilling. During drilling, a Schlumberger geomechanics specialist compared data from the rig with the predrill forecast to detect deviations and unexpected borehole conditions. After drilling, consultants met with Pluspetrol to document key performance indicators, identify lessons learned, and optimize plans for subsequent wells.

---

*Planned time versus depth (former technical limit)*

*Actual drilling performance*

Integrated multidisciplinary approach. This approach enabled the operator to hit targets in 9 fewer days than anticipated.
In addition to the multidisciplinary evaluation and support, Schlumberger also recommended replacing traditional downhole motors with a modern rotary steerable system (RSS). Over a 3-year period, Pluspetrol drilled seven successful horizontal wells in the Marañon basin.

**Saving time, accelerating ROI, dramatically lowering costs**

By establishing best practices in geomechanics and drilling optimization, the company significantly reduced geomechanics-related NPT. The first two wells, for example, had no wellbore instability issues, no stuck pipe, and only moderate tight hole events, which were easily managed at the rig site. In another field, historical NPT that resulted from geomechanics-related drilling events dropped from approximately 70% to 15%, or from an average of more than 2 days to less than a day.

Use of the RSS improved drilling performance, required fewer BHAs per well, increased total well length 200–300 meters per well, and increased ROP despite the longer wellbores. Ultimately, Pluspetrol hit its drilling targets 5 to 9 days ahead of schedule, saving rig time, bringing production online sooner, and accelerating return on investment.

As a result, costs were dramatically reduced. Previously, drilling events, fishing, lost in hole events, and sidetracking had cost an estimated USD 2.38 million (sidetracking alone cost USD 2.2 million) per well. With the new approach, Pluspetrol not only eliminated about USD 2.36 million of those costs, but saved an additional USD 420,000 per well by hitting targets ahead of schedule. Net savings: approximately USD 2.78 million per well.