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StethoScope Service Delivers Precise Pressure Profile, Mitigates Sticking Risks in High-Uncertainty ERD Well

In first run in continental Russia, formation pressure-while-drilling service enhances drilling and field development decisions, Siberia

CHALLENGE

Acquire pressure profile in highly depleted layer with high risk of differential sticking.

SOLUTION

Run the StethoScope* formation pressure-while-drilling service as it can sustain large static and dynamic stresses while providing highly accurate measurements.

RESULTS

- Obtained pressure profile and mobility measurements in the target sandstone gas and water-bearing layer.
- Constructed formation fluid gradient based on pressure measurements.
- Mitigated stuck pipe risks.

Increase formation pressure understanding in Arctic environment

An operator was developing the central and eastern parts of a field located offshore the Kara Sea in the Yamal-Nenets district of northwest Siberia, Russia, and decided to drill extended-reach wells from land. Often, produced layers are penetrated in the buildup section of the wells. In this well, however, the layer in the buildup section had an unknown level of depletion, introducing risk to the operation.

The drilling environment included several potential challenges, such as wellbore instability, mud losses, packoff, and differential sticking. The main risk in obtaining stationary pressure measurements was the possibility of differential sticking in the target layer, which could have had very low formation pressure caused by dramatic depletion.

Acquire and analyze formation pressure while drilling

After considering the challenging environment and narrow mud-weight window determined by pore pressure and fracture gradient studies, Schlumberger recommended running the StethoScope formation pressure-while-drilling service. Because this was the first time that this service was used in continental Russia, expert collaboration and extensive preparation were required to secure the success of the operation.

The StethoScope service enables acquiring accurate, real-time pressure and mobility measurements while drilling the well. In addition to classic pressure data applications like determining reservoir potential and hydrodynamic connectivity, the real-time StethoScope service allows calibrating the wellbore stability model, optimizing drilling fluid weight and casing depth, and enhancing well placement based on pressure and mobility values.

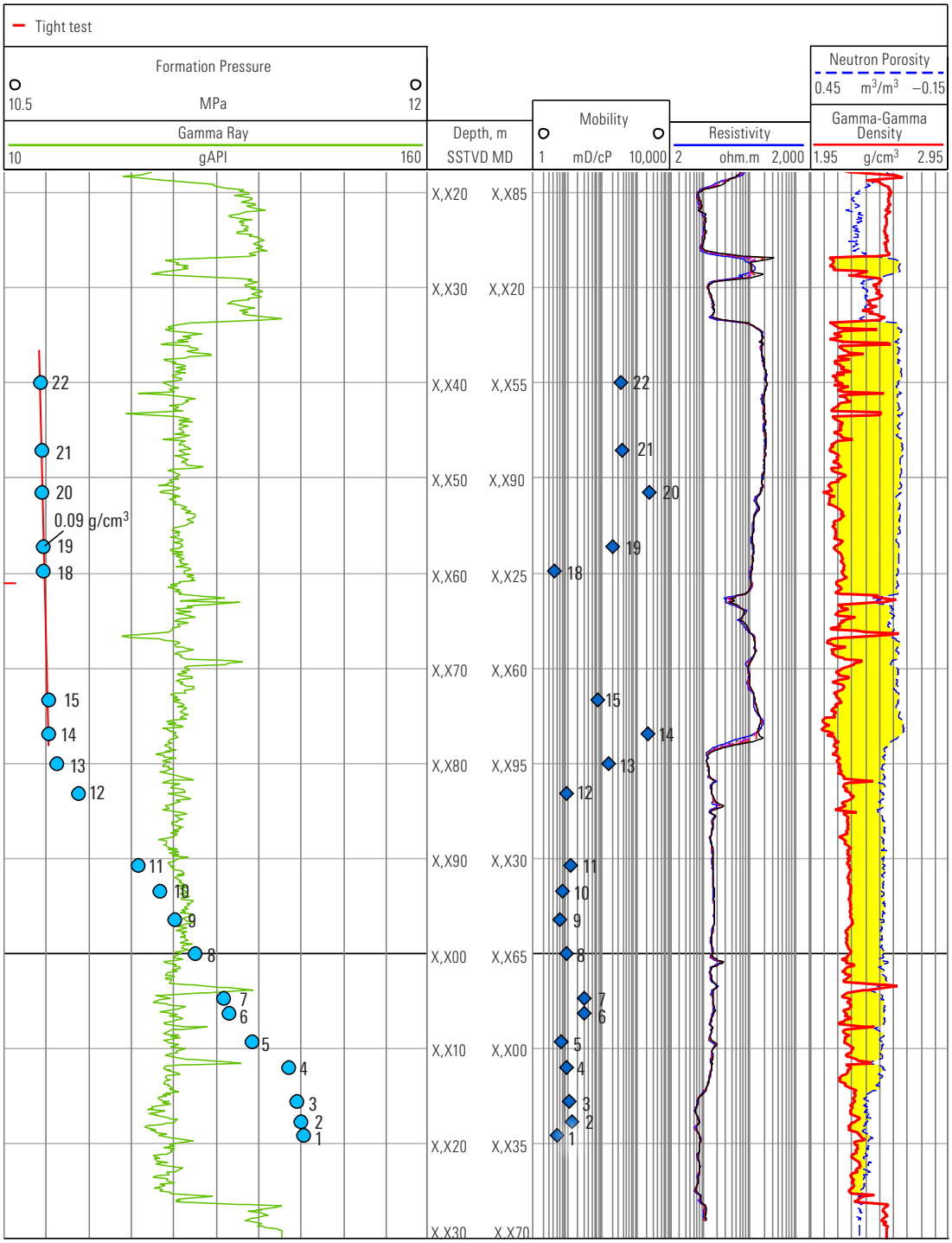
Optimized decisions with real-time pressure and mobility data

The Schlumberger team performed 21 pretests and used the results to calibrate the existing geomechanical model that influenced the operational recommendations for subsequent drilling programs.

Using the StethoScope service, the operator successfully acquired pressure and mobility profiles across the target layer. The acquired data was transmitted to and interpreted in a processing center that allowed controlling test quality and adjusting the program in real time.

Actual formation pressure numbers confirmed that the layer's depletion was 70 psi higher than expected. The team also used the pressure measurements to construct the formation fluid gradient, which suggested high connectivity inside the layer. Because of good planning and flawless execution, Schlumberger delivered high-quality data that enabled the operator to optimize its field development plan.

The pressure profile of the target formation confirms that its upper region is the most depleted. This zone is gas bearing, confirmed by LWD logs and the zone's pore pressure gradient, which corresponds to gas density (0.09 g/cm³). The formation is proved to have good hydrodynamic connectivity, but depletion is 70 psi higher than was initially anticipated.



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