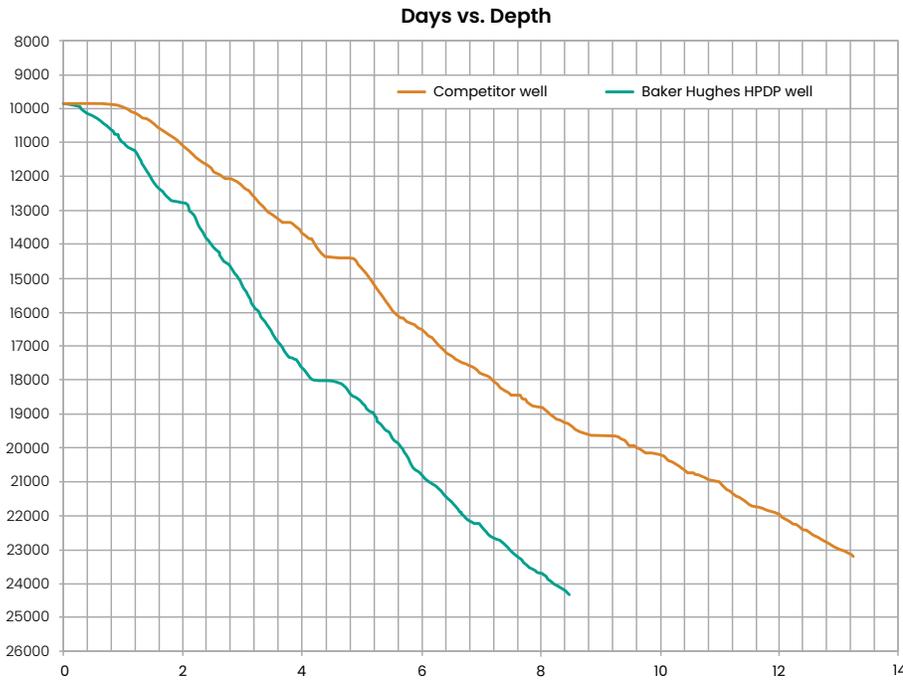


Case study: Monroe County, Ohio

Integrated drilling package improved performance in four wells, saved 50 days rig time, \$4 million USD



An operator in the Utica shale play was experiencing numerous drilling challenges on an extended lateral, including low build rates, low rates of penetration (ROP), and multiple trips to change rotary steerable drilling tools.

At a measured depth (MD) of 21,000 ft (6400 m), the drilling services provider experienced difficulty and was unable to control inclination within 4° of target. The ROP was limited to 45 to 50 ft/hr (14 to 15 m/hr). By total depth, the provider had used six curve-and-lateral bottomhole assemblies. There was also an instance of drillpipe washout and twist-off while drilling the interval. The tools showed extreme premature wear upon post-job disassembly and inspection.

Tool inspections, coupled with drilling fluids analysis, indicated that high solids in the fluid had not only damaged the tools but had also hindered drilling performance with evidence of bit cutter balling. On third-party advice, the operator displaced its existing fluid system with a new invert mud system from the competitor's liquid mud plant.

All of this led the operator to change its approach to managing drilling performance on subsequent wells, choosing a complete Baker Hughes drilling package comprised of Fluids Environmental Services (FES) solids control, drilling fluids, drill bits, and drilling services. The drilling solution

Challenges

- Rapid degradation of previous drilling fluid systems
- Tool failures and lost tools in the hole on the previous pad
- Low ROP/high torque

Results

- Reduced tool failures and directional control
- Improved ROP
- Maintained an average low gravity solids concentration of 5.9% for the 6 1/2-in. holes
- Saved 50 days of rig time over a four-well period compared to past performance for more than \$4 million in savings
- Experienced no health, safety and environmental (HSE) issues or nonproductive time (NPT)

was anchored by the **AutoTrak™ eXact rotary steerable system** which combines the ability to provide advanced logging-while-drilling (LWD) services with the ability to drill high buildup rates (BUR), eliminating the need to compromise between the two. The service helps you drill the most complex 3D profiles with outstanding borehole quality and directional control.

On the next four wells, Baker Hughes provided an efficient dual centrifuge barite recovery system with three drying shakers. This setup, combined with a novel approach that matched the daily losses with the solids removal efficiency, were the keys to delivering a clean and consistent mud system and programming the correct dilution requirements. The plan was followed flawlessly by the dedicated field personnel and the results showed in the improved drilling performance.

Baker Hughes also supplied the **NEXT-DRILL™ eC wellbore strengthening invert emulsion system**, a significantly cleaner and higher performing synthetic drilling fluid that maintained a 5.9% concentration of low-gravity solids in the fluid—far exceeding the competition—while meeting the operator's strict environmental requirements.

This uniquely integrated system to manage drilled solids increased ROP and well-to-well consistency, resulting in 50 days saved over a four-well period compared to past performance, a savings of \$4.03 million USD for the operator.