

# Operator Drills 4,245 Feet in Shoe-to-Shoe Run, Hitting Sweet Spot a Week Ahead of Plan

## UNIQUE ENGINEERED DRILLING SOLUTION INVOLVING 4¾-INCH EARTHSTAR® SERVICE AND iCRUISE® SYSTEM MAXIMIZES ASSET VALUE

EAST GULF REGION, OMAN

### CHALLENGES

- » Accurately place well in the sweet spot
- » Avoid unwanted reservoir exits in non-productive zones
- » Navigate thin reservoir in new area with limited control points
- » Mitigate very low resistivity contrast between target zone and boundaries
- » Drill economically within plan

### SOLUTIONS

- » Collaboration with Halliburton multi-discipline teams and operator's subsurface team
- » Integration between rigsite personnel and our Halliburton remote drilling center in Muscat.
- » Unique engineered solution, including the following technology:
  - 4¾-inch EarthStar® ultra-deep resistivity service
  - iCruise® intelligent RSS
  - ALD™ azimuthal lithodensity LWD service

### RESULTS

- » Increased reservoir understanding
- » Successfully drilled 4,245 feet (1294 meters) in shoe-to-shoe run
- » Reduced well time, finishing seven days ahead of plan
- » Managed costs by eliminating need for sidetracks
- » Reported zero NPT

### OVERVIEW

An operator was drilling a horizontal well in a new area of Oman's Eastern Gulf region, with limited control points and very low resistivity contrast between the target zone and wellbore boundaries. The operator also faced uncertainty regarding the geological model, lateral changes, and petrophysical attributes in this very thin reservoir. Precise geosteering tools were needed to maintain proximity to the reservoir roof and to drill shoe to shoe in a sweet porous zone in order to avoid costly and time-consuming sidetracks in non-productive zones.

### ENGINEERED DRILLING SOLUTION ENHANCES RESERVOIR UNDERSTANDING AND REDUCES WELL TIME

The Halliburton Sperry Drilling team was brought in to increase reservoir understanding, maximize reservoir exposure, and reduce well time. Close collaboration with the client's subsurface team, along with knowledge sharing among various Halliburton disciplines, enabled effective and timely communication – a key to the project's overall success.

An engineered drilling solution resulted from extensive modeling, pre-job meetings, and feasibility analysis. With buy-in from all stakeholders, a clear geosteering strategy/workflow was implemented, consisting of the following combination of tools:

- » Thin 4¾-inch EarthStar® ultra-deep resistivity service, with logging-while-drilling (LWD) technology to map reservoir and fluid boundaries
- » iCruise® intelligent rotary steerable system (RSS), with at-bit gamma sensors and triple-combo LWD to optimize bit placement
- » ALD™ azimuthal lithodensity LWD service, which is placed below the EarthStar service to reduce uncertainty of well position stratigraphically within the target zone

An integrated approach included the Halliburton Well Services group, along with our onsite geosteering team, directional drillers, and surface data logging services – all working in conjunction with the geosteering operations setup in our Halliburton remote drilling center located in Muscat, Oman.

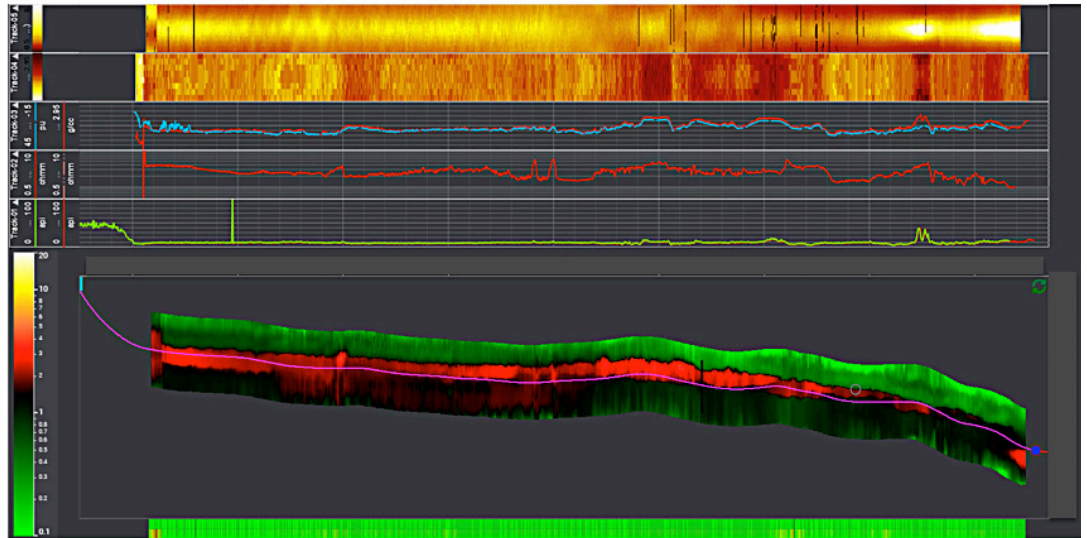


**OPERATOR DRILLS SHOE TO SHOE A WEEK AHEAD OF PLAN, MAXIMIZING ASSET VALUE**

The drilling campaign successfully mapped the reservoir’s top and bottom throughout the lateral section. The right combination of tools allowed the directional drillers to steer in exceptionally low resistivity contrast between the target zone and boundaries. They were also able to maximize reservoir exposure, covering the required percentage of the reservoir contact. Furthermore, all the drilled sections were successfully drilled shoe to shoe, in a run covering 4,245 feet (1294 meters).

The EarthStar service forward modeling data confirmed that the reservoir was thinning, thanks to its ability to detect the upper boundary approximately 20 feet (6.1 meters) true vertical depth (TVD) away, while the trajectory/EarthStar service was in a formation of 1.5-ohmm resistivity. This was accomplished using a single receiver at 24 feet (7.3 meters) spacing.

The first-time use of this uniquely engineered solution helped maximize asset value through accurate drilling that enabled the operator to finish the well a week ahead of plan, with zero non-productive time (NPT).



	Depth In, ft	Depth Out, ft	Footage Drilled	Operating Hours	Drilling Hours	Avg. ROP, fph	Net Reservoir
<b>EarthStar® + iCruise Services</b>	6,055	10,300	4,245	95.0	45.8	92.7	88.7%

Data logged from the EarthStar® service and iCruise® intelligent RSS while drilling 4,245 feet (1294 meters) in this successful shoe-to-shoe run.

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