

Reservoir Evaluation System, Production Logging Recognized Gas Retrograde Condensate for Newly Discovered Low-Resistivity Pay Zone

Objectives

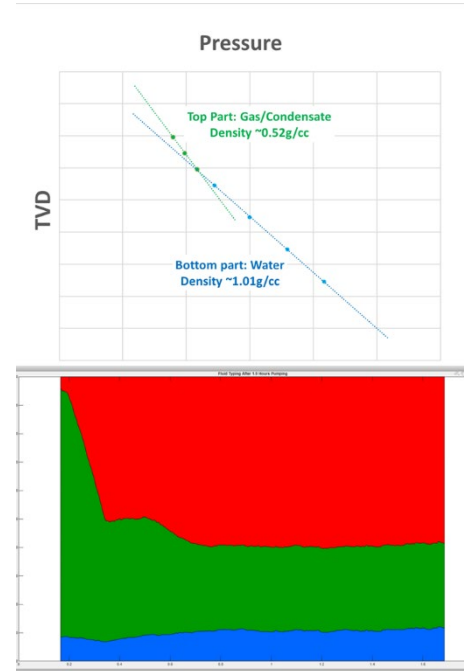
- Determine the most productive zones across multi-layer low-resistivity reservoirs.
- Evaluate the water fraction per zone for future water production shutoff.
- Validate the minimum flowing pressure to avoid condensate banking precipitation.

Our Approach

- Wireline engineers recommended deploying the Reservoir Evaluation System (RES) testing tool to acquire the pressure and fluid sampling.
- The pretest results were used to identify the fluid gradients and to determine the potential oil-water contacts.
- The RES sampling was performed across the defined hydrocarbon zone, enabling the allocation of the three different phases across the condensate region.
- In the second RES sampling station, the absorbance spectrum showed the presence of gas with filtrate for approximately 30 min following the shift to the precipitated condensate and water from the reservoir.
- A total of six samples of gas, condensate, and water mix samples were collected for further lab analysis.
- Upon completion of the well, the production logging tool (PLT) was run to check the results against the RES sampling.
- The PLT was performed with pressure above retrograde the condensate precipitation in one of the zones, confirming the pressure at which only gas was producing.
- The PLT results successfully identified the water production allocation across the drain, confirming the RES sampling findings for each of the tested subzones.

Value to Customer

- The results from the RES sampling and pressure gradients confirmed the exact reservoir net-to-gross ratio, proving the customer was undermined originally.
- The gas-condensate precipitation pressure helped to adjust the completion strategy and production facilities, saving millions.



The pressure gradient shows the transition from gas/condensate to the water phase inside the subzone (top picture). In the lower picture, RES sampling identifies the three phases present across the same sampling point: gas fraction, % (red), condensate oil, % (green), and water, % (blue).

LOCATION

Pakistan

WELL TYPE

Appraisal

HOLE SIZE

8-1/2 in., openhole (RES run)

LINER SIZE

7 in. liner (PLT run)

DEPTH

6,744 ft (2,055 m)

PRODUCTS/SERVICES

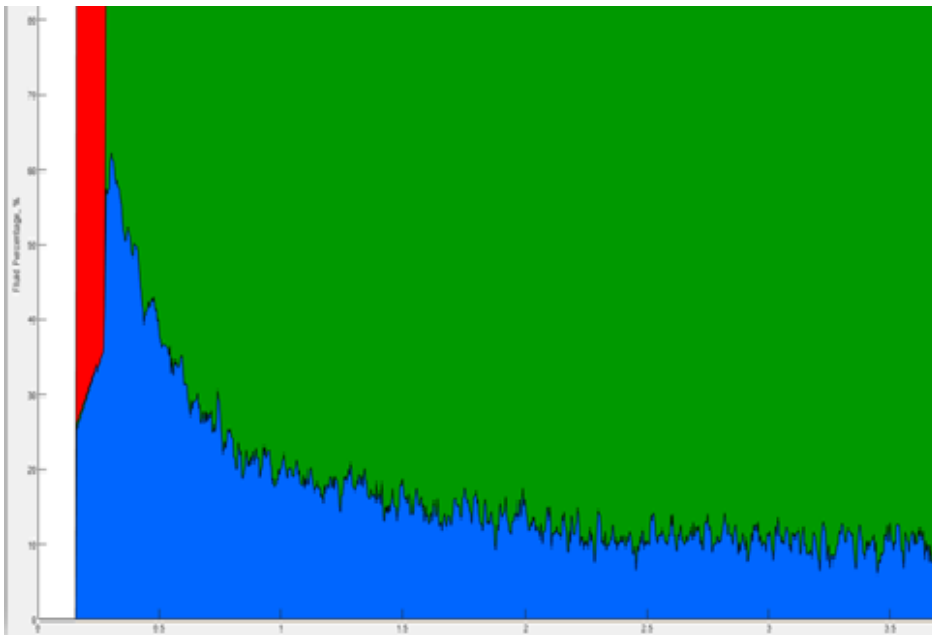
- Reservoir Evaluation System
- Production Logging Tool



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Value to Customer (continued)

- The PLT results helped to maximize the zone for hydrocarbons, increasing the percentage of hydrocarbons recovery, and to aid the customer in planning upcoming reservoir development.
- The RES results helped the customer understand the low-resistivity pay versus openhole logs and optimized the operation and logging expectations from upcoming wells.
- The results from the RES and PLT services allowed the customer to fine tune the simulation modeling and plan future reservoir management.



In the second RES sampling station, the RES sampling of fluid fraction shows the transition from originally flowing gas (red), with subsequent shift to oil/condensate (green) and decreasing trend from filtrate to reservoir water (blue).

