

CASE HISTORY

MPLT-Array (OpenField FAST) deployed for complex three-phase flow environment

CHALLENGE

Region	Asia Pacific
Medium	Oil, Water, Gas

An operator required accurate production logging data to understand complex three-phase flow behavior in a well producing gas, oil, and water. Conventional full-bore production logging tools were unable to resolve the phase segregation and flow dynamics occurring across the wellbore.

A high-resolution, multi-sensor solution was needed, one capable of measuring gas bubbling up through an oil and water column, identifying phase distribution across the wellbore and detecting liquid fall-back, while maintaining a slim profile for access in restricted wellbore geometries.

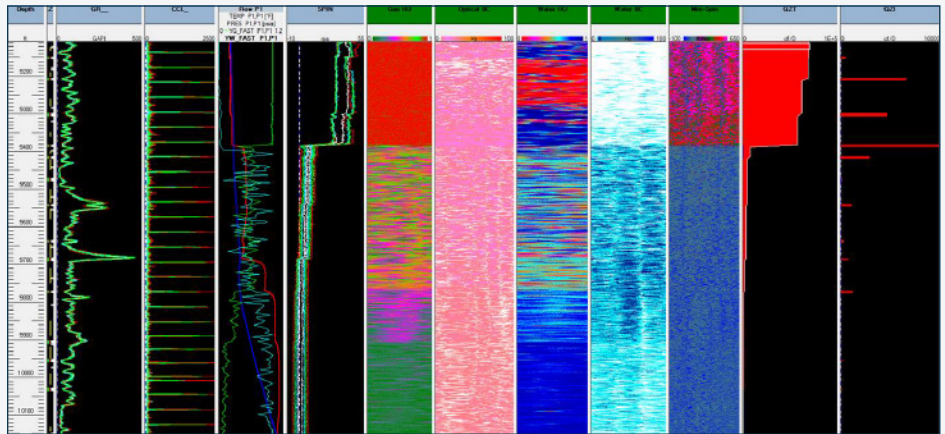
SOLUTION

Scientific Drilling partnered with OpenField to deploy the Flow Array Sensing Tool (FAST) in the 1-11/16" configuration (3 arms, 12 sensors). Each arm carries 4 sensors: 2 optical and 2 mini-spinner (or 2 electrical and 2 mini-spinner), with each sensor recording to memory at 16 samples per second. The tool's optical sensors determine the difference between gas and oil using refractive index properties. These sensors measured gas and oil bubbles within water as they collided with the sensor tips. Each gas/oil-to-water transition was counted as a bubble, with measurements used to calculate gas hold-up and oil hold-up. Electrical sensors determined the difference between water (conductive) and hydrocarbon (non-conductive). A water bubble in a hydrocarbon environment creates an electrical signal; a hydrocarbon bubble in a water environment stops the signal. Each water/hydrocarbon transition was recorded as a bubble, with measurements used to calculate water hold-up.

Mini-spinner sensors measured flow velocity across the wellbore. Higher velocity gas flowed highside, while low-velocity oil and water flowed across the middle and low-side.

Liquid fall-back was also measured (negative velocity lowside, positive velocity high-side), whereas a full-bore spinner would only measure an average flow.

Cumulative and Zonal Flow, Gas bubbling up through Oil & Water column (Right)



RESULTS

OpenField's array sensor solution provided the operator with high-resolution, multi-sensor data that resolved complex three-phase flow behavior that conventional production logging tools could not capture. The 12-sensor array, with optical, electrical, and mini-spinner measurements, delivered a detailed understanding of gas hold-up, oil hold-up, water hold-up, phase segregation, and liquid fall-back. This information enabled the operator to make informed decisions regarding well performance, production optimization, and potential remediation strategies. The 1-11/16" configuration ensured access to restricted wellbore geometries while maintaining the measurement density required for accurate flow characterization.

TECHNOLOGY

Cased Hole Services

OpenField Flow Array Sensing Tool (FAST) MPLT-Array