Muzic Wireless Telemetry Determines Potential of a Zone, Without Mechanical Intervention—Saving Rig Time

Real-time pressure response enables ending drillstem test early in a nonflowing well with open perforations, Middle East and North Africa

CHALLENGE
Employ downhole test tools to evaluate the middle zone of a reservoir without relying on annulus pressure pulses that could be lost in the overlying interval of open perforations.

SOLUTION
Use Muzic* wireless telemetry to activate downhole tools, including the IRDV* intelligent remote dual valve for independent command of the test and circulating valves, and transmit data in real time.

RESULTS
Determined the well’s potential in only three days of testing by evaluating the reservoir pressure using real-time bottomhole pressure measurements.

Efficiently perform downhole test in challenging well conditions
An operator in the Middle East and North Africa (MENA) was typically completing multiple zones in a sandstone reservoir. In a well completed in three zones, the middle zone was determined to be oil bearing, and a reservoir test was crucial to validate its potential and measure the reservoir pressure.

Testing the target middle zone required isolating it by setting a plug below it and a packer above the top of the perforated interval. However, the open perforations of the uppermost zone would have prevented conventionally operating the downhole tools in a standard drillstem test (DST) string with annulus pressure. The open perforations above the packer posed a high risk for losing the annulus pressure pulses, typically requiring operators to isolate them by squeezing cement or performing other mechanical methods.

An additional complication for conducting the DST was that the well was not expected to flow to surface in consideration of the relatively low reservoir pressure in the zone in a neighboring well. Consequently, knowing when to end the test to prove the reservoir potential was a challenge.

Reservoir Testing

The bottomhole pressure transmitted in real time with the Muzic wireless telemetry system (bottom plot) shows the well potential. This data confirms that the pressure quickly built up when the downhole test valve was closed, but the reservoir pressure was too low to flow to surface naturally. As a result, the test could be concluded once the reservoir pressure was reached. This information would have been difficult or impossible to extrapolate using only wellhead pressure (top plot).
Wirelessly actuate downhole tools and transmit real-time data with Muzic telemetry

Schlumberger recommended using Muzic wireless telemetry to operate the downhole tools with acoustic signals controlled by the test engineer. With this wireless telemetry technology, the operator could conduct the test with open perforations above the packer instead of defaulting to the uncertainty of using annulus pressure pulses for control.

Signature* quartz gauges were included in the test string to acquire high-precision bottomhole pressure and temperature data, which was transmitted by Muzic telemetry to surface for real-time analysis. Additionally, to follow the operator’s test program, Schlumberger incorporated the IRDV intelligent remote dual valve, which provides independent command of a test valve and a circulating valve in the toolstring. Both valves were wirelessly enabled by Muzic telemetry.

Definitely achieved well test objectives in shortened duration

Muzic telemetry enabled the operator to individually test and evaluate the potential of the reservoir’s middle zone. The test and circulating valves of the IRDV dual valve were activated multiple times with the Muzic telemetry commands per the test program. The confirmed operation of the valves avoided any waste of time in checking whether a mechanical problem was preventing the well from flowing during the test.

As expected, the well did not flow to surface. Instead of employing the lengthy traditional procedure of closing the well at surface and monitoring the wellhead pressure to ascertain whether the well is dry or has low reservoir pressure, which would be indicated by pressure buildup at the wellhead, the real-time bottomhole pressure returned by Muzic telemetry made it easy to determine the well’s potential. The operator was able to end the test with certainty after only three days when the reservoir pressure was reached.

The closing of the IRDV dual valve downhole was immediately confirmed via transmission by Muzic telemetry.

To efficiently achieve the operator’s test program, the test string integrated Signature quartz gauges and the IRDV dual valve, both enabled by Muzic telemetry.

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