ACTive Isolation Service Reduces Water Production by 4,000 bbl/d in an Openhole Horizontal Well

Live CT zonal isolation service enables successful water shutoff

**CHALLENGE**
Shut off water from lower horizontal openhole section in a producing well in a naturally fractured depleted carbonate reservoir.

**SOLUTION**
Deploy ACTive Isolation* live CT zonal isolation service and CoilFLATE* coiled tubing through-tubing inflatable packer to shut off water in an openhole horizontal well using a combination of mechanical and chemical isolation techniques.

**RESULTS**
Eliminated water production by 4,000 bbl/d and increased oil production by 30% without any subsequent acidizing.

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High water cut in a depleted openhole horizontal well
Increasing water production in mature fields has a significant impact on production economics. This was the case for the Ratawi oolitic limestone reservoir in Wafra oil field, which is partition-zoned between Kuwait and Saudi Arabia. A majority of the wells are completed as horizontal open hole, artificially lifted using ESPs, with a few wells showing localized fractures in some areas. The candidate well was producing 6,157 bbl/d with 94% water cut. An FMI* fullbore formation microimager log showed a high fracture density in the toe section and water coning was suspected from the lower section.

Given the operational limitations and constraints, a well-rounded approach for candidate selection and subsequent treatment needed to address the following challenges:
- openhole horizontal well with natural fractures needs water shutoff
- combinations of mechanical and chemical isolation techniques are required
- depleted well does not indicate a pressure response on the surface.

**Real-time evaluation and decision making**
The operator chose to deploy the ACTive Isolation service using real-time downhole data to interpret and optimize treatments. A chemical water shutoff was proposed comprising a flowing gel (MARCITSM) to plug off conductive fractures and a rigid gel (MARA-SEALSM) to seal off the near-wellbore region. A 3-in openhole CoilFLATE packer was also proposed to achieve zonal isolation in conjunction with cement slurry as a capping fluid.

**Single-run operation enabled by zonal isolation service**
Real-time measurements from the ACTive Isolation service enabled a successful single-run operation and improved operational reliability while reducing the risk of failure. A casing collar locator ensured maximum depth accuracy while setting the CoilFLATE packer under subhydrostatic conditions. The packer sealing condition was monitored during treatment to interpret internal and external downhole pressures. The squeezed pressure can be fully controlled below fracture pressure. The downhole pressure response was used to fine-tune gel concentration based on real-time formation response.

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**CASE STUDY**

Coiled Tubing

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ACTive Isolation service was used to perform a water shutoff intervention (shown above in red oval), significantly decreasing water production by 4,000 bbl/d.

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