

Middle East

ProMILL Duo™ Dual Casing Isolation Solution for a Complex Two Cap Rock Project

Ensured rock-to-rock barrier restoration for fluid pressure isolation in the annulus between dual casing strings

Complex Remediation for Dual-Casing Isolation

A customer in the Middle East engaged Wellbore Integrity Solutions to restore cap rock integrity in a complex deep land well. The objective was to isolate two cap rock formations located at depths of 8,240 ft and 5,500 ft.

The well experienced sustained annular pressure and hydrocarbon migration to the surface due to microchanneling caused by poor cement integrity between the 7 in, 29 ppf C-75 casing and the 9 $\frac{5}{8}$ in, 47 ppf C-75 casing.

To mitigate these issues, Wellbore Integrity Solutions collaborated with the customer to develop a targeted remediation strategy involving dual-casing section milling across both cap rock intervals. Extensive pre-job planning was conducted to optimize milling depths, ensure effective swarf recovery, and maintain proper hole cleaning. Wellbore mud properties were adjusted to enhance debris removal while keeping standpipe pressure within operational limits.

For each dual-casing window, the milling sequence was executed as follows:

- **Inner Casing Milling** – The operation commenced with the 5500 K-Mill cutting and milling the 7 in casing.
- **Cement Removal and Casing Cleaning** – The 5500 ProMILL® underreamer was deployed to remove residual cement and clean the 9 $\frac{5}{8}$ in casing ID.
- **Outer Casing Milling** – The 9 $\frac{5}{8}$ in casing was then section milled as required.
- **Rock-to-Rock Barrier Restoration** – The 5500 ProMILL underreamer enlarged the cementation zone to 13.5 in in the open hole, exposing fresh formation to facilitate effective rock-to-rock bonding across both cap rocks.



Both dual-casing milling operations were successfully executed, restoring cap rock integrity and achieving the customer's permanent barrier isolation requirements at these critical geological depths.

CHALLENGE

Two rock-to-rock barrier restorations were required in the same well to prevent hydrocarbon migration. Cap rock isolation was needed at depths of 8,200 ft and 5,400 ft due to microchanneling caused by poor cement integrity across the casing annuli.

SOLUTION

- Deploy the 5500 K-Mill milling tool to initiate the cap rock restoration process
- Utilize the 5500 ProMILL® underreamer for precise underreaming and enhanced borehole conditioning
- Implement the 6000 ProMILL Duo™ to achieve rock-to-rock isolation of both cap rocks, ensuring a fully restored cap rock barrier

RESULT

- A dual-casing section milling operation was safely executed using a Kelly Rig.
- As a critical part of the well plug and abandonment plan, rock-to-rock barriers were effectively placed across both casing strings
- Successfully prevented hydrocarbon migration to the surface
- Ensured protection of the freshwater reservoir from contamination
- Eliminated the need for 112 days of conventional pilot milling from the surface