Case study: Slot recovery in the North Sea

Stronghold Barricade reduces time and provides increased efficiency on slot recovery

Challenge

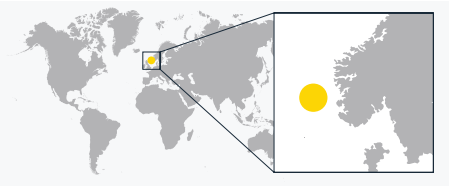
A North Sea customer challenged Archer to plug and abandon a well to legislative requirements while increasing the efficiency of the process. Additionally, the challenge involved recovering the slot back to above the top of the 10" liner hanger to facilitate a new sidetrack.

Traditional plug and abandonment methods are often time consuming and costly. The compound complexity of milling, debris handling, perforating and squeezing cement can, and often do, reduce the chance of success.

Solution

This customer qualified Archer's Barricade as a method to perform the Plug & Abandonment, (P&A). The Barricade is designed to perforate selected casing or liner sections, wash and clean the perforated zone outside of the casing, then enable a permanent rock to rock cement plug—all during a single trip.

The first step of the process was to perforate, and after the guns were fired, to circulate bottoms up to handle any possible influx of gas. Once completed, washing of the annulus behind the casing started, firstly from top to bottom of the perforated interval—and by directing the flow into the annulus using swab cups Archer ensured the annular area was being fully washed and that the perforated interval was being properly cleaned. To verify the washing effectiveness, the perforated area was then washed a second time, now from bottom to top, and at a much lower pressure.



Region: North Sea
Customer: Major Operator
Field: Norwegian Continental Shelf
Well type: Oil and gas

Case benefits

- The Barricade eliminated the need to mill casing
- Provided a clean and open annular space in which to place cement
- The Archer Barricade method ensured that the cement enters the perforations with the dual swab cups that directs the flow of cement
- No need to wait on cement with squeeze pressure
- The Barricade method eliminated the risk of squeezing cement

Key capabilities

- Field proven
- High Circulation rates
- Adjustable distance between swab cups
- Dual swab cup design
- Flow by-pass system
- High performance swivel with 120 rpm rotation

Typical Applications

- Permanent plug and abandon
- Slot recovery
- Formation integrity testing
- Perforate wash, cut and pull
- Seal of annulus pressure

Archer

This time, the observed pressure drop verified the quality of the washing. Bottoms up was circulated again to be certain that the well was free of debris before the cement job. The Barricade method uses the swab cups again to direct the cement flow into the annulus behind the casing. The risk when squeezing cement can always be that there is limited control of where it goes, and that can result in losses when the cement takes the path of least resistance. In this case, by directing the flow of cement through the perforations into the annulus and back again—using the dual swab cups—it is always ensured that the cement enters the annulus as required when the pump and pull cement job is performed.

On this well, three P&A plugs of 50 meters/165 feet each were completed using the Barricade. During the washing sequence a flow rate of 1600 lpm/420 gpm with a circulation pressure of approximately 110 bar/1600 psi was achieved. The perforated annular area was then cemented according to Archer's specifications which resulted in three, load and pressure tested, rock to rock P&A plugs that satisfied legislative and customer requirements.

A new application was added to the Barricade system. A new high performance swivel was used on the last plug while circulating bottoms up after the washing sequence. Rotation at 120 rpm increased the amount of debris coming over the shakers and the swivel also improved on the time needed to circulate the well clean before the cement job.

Result

The customer was impressed by the swivel's performance, agreeing that it further optimized the Barricade system. This system delivered a well free from debris before the cement job; the swivel was considered a great success, and a new milestone was achieved for the Barricade system.

Overall, the objective of plugging and abandoning the mother wellbore was completed in just seven days. One of two barriers across the main reservoir and two barriers across a secondary reservoir were completed at a rapid pace and with positive verifications. The introduction of the new high performance swivel improved and optimized the well cleaning before the cement job and this contributed to a flawless pump and pull cement job.

This Barricade job was a great success for the customer and has provided a robust blueprint for future operations.