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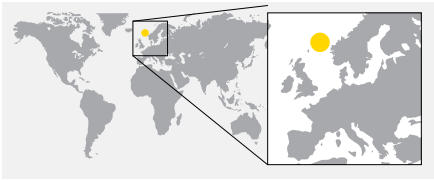
**Case study:** Stronghold Barricade

# Reducing cost and improving effectiveness of P&A on Statfjord.



**Region:** North Sea
**Customer:** Statoil
**Field:** Statfjord
**Well type:** Oil and gas

## Challenge

Statoil was seeking an efficient and reliable method to plug and abandon its well (P&A), whilst minimizing the use of rig time, and ensuring and effective, long-lasting seal.

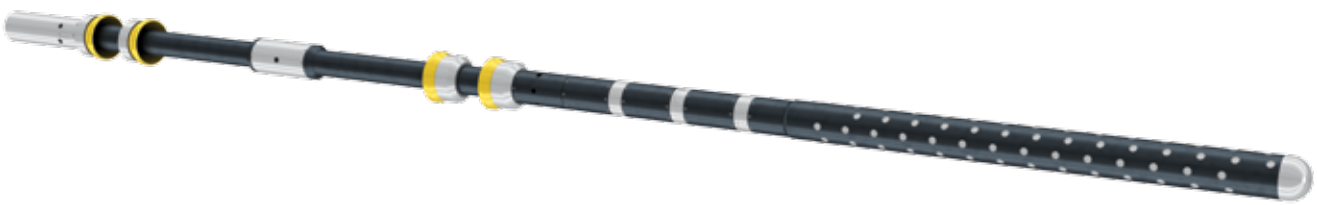
Traditional P&A methods are often time consuming and costly—the need for milling and debris handling; perforating, and then preparation of the seal zone to receive cement; the deployment of a rock-to-rock cement seal; and the subsequent verification of the seal using logging techniques, can all add complexity and risk. Also, squeezing cement into perforations without washing and purging the perforated zone can reduce the chance of success.

## Case benefits

- The Barricade eliminated the need to mill casing and provide more security when drilling out cement.
- Provided a clean and open annular space in which to place cement.
- Customer was able to set a balanced cement plug and squeezed cement into washed perforations.

## Key capabilities

- Field proven
- High circulation rates
- Adjustable distance between swab cups
- Dual swab cup design
- Flow by-pass system



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## Solution

Archer's Barricade system is designed to perforate selected casing or liner sections; wash and clean the perforated zone completely; then enable permanent rock-to rock cement plugging—all during a single trip.

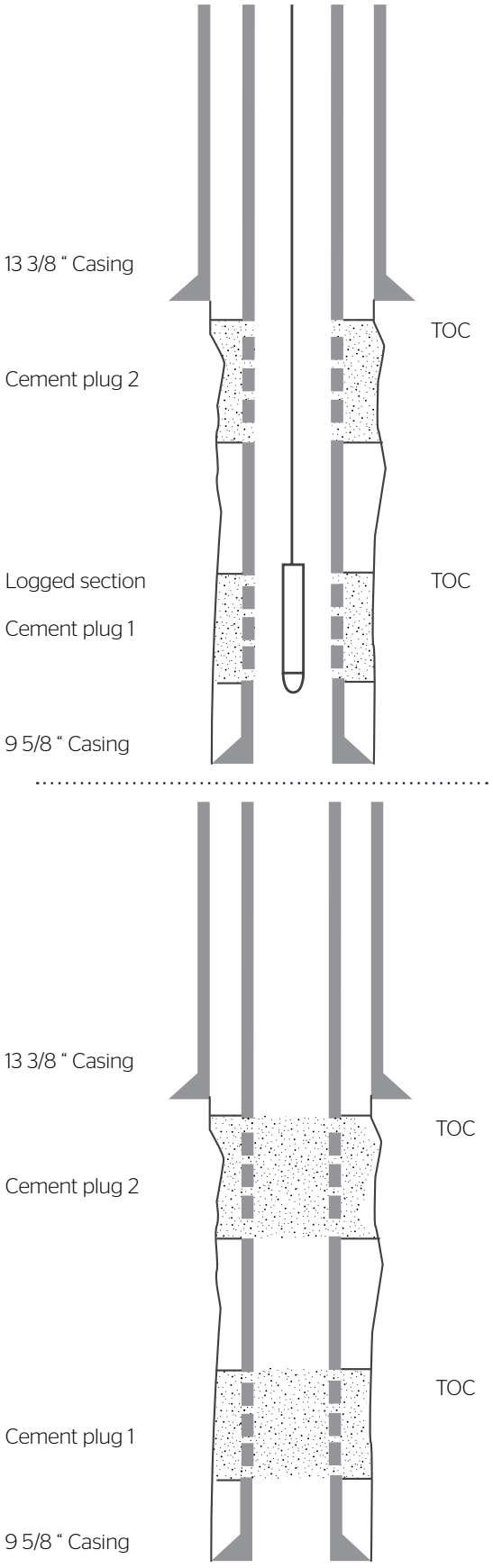
By eliminating the need for milling and debris handling, and preparing the seal zone to receive cement, the Barricade delivers a step change in P&A efficiency and effectiveness.

In this case, the Barricade was deployed after the initial perforations had been performed. The perforating program targeted two intervals at 2240–2303 m and 2108–2170 m respectively, and was configured to deliver 12 shots per foot with a hole size of 0.48 inches. After perforation, the Barricade was deployed to the top of the shallowest perforation interval and the washing sequence commenced as the Barricade was deployed further into the well. During washing, a flow rate of up to 2200 liters per minute with 40–45 bar circulation pressure was achieved. By visually examining the fluid returns over the shakers and monitoring the pressure points throughout the perforated intervals, it was possible to observe that debris was being successfully removed from the perforated zones. A spacer was pumped into the perforated zone before pulling out of hole. Then, after blowing out the solid ball seat, an open ended stinger was deployed, enabling a balanced cement plug to be set and cement to be squeezed into the pre-washed perforations. A cement evaluation log was deployed following the Barricade operation, in order to verify the quality of the cement seal.

## Results

The Barricade eliminated the need to mill casing, and has provided a clean and open annular space in which to place cement, creating a secure and permanent seal of the well. High-circulation rates enabled improved efficiency and more effective removal of debris from the perforated zone. Eliminating the need for milling and debris handling, and preparing the seal zone to receive cement, has reduced overall complexity, risk and cost, whilst at the same time improving the integrity of the end result, as validated by a subsequent cement evaluation log.

This Barricade job has been a great success for Statoil and has provided a robust blueprint for future operations.

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