

Case study: United Kingdom, North Sea

MICRO-WASH increased production capacity in U.K. North Sea well

For a complicated offshore well design, a major European operator selected Baker Hughes to deploy the **MICRO-WASH™ high-definition remediation system** on a multilateral well in the U.K. sector of the North Sea.

The dual-lateral well was designed to produce natural gas from two separate reservoirs. With a 10.2 lb/gal **OMNIFLOW™ DIF invert emulsion drill-in fluid system** designed to minimize formation damage, it was drilled to 17,426 ft MD (5311 m), with a 6-in., 2,790 ft (850 m) horizontal section to the west and a 2,078 ft (633 m) section to the east.

The first leg was drilled and the whipstock was set to enable drilling the second leg. This raised the question about what type of fluid to leave below the whipstock, since re-entry to the first leg for cleanup or remediation was not possible. Since the wait between suspending the well and bringing it online might have taken several months—which it ultimately did—it was decided that leaving an oil-based mud (OBM) in the hole would pose too much risk for wellbore damage and screen blockage by the OBM filter cake.

After extensive lab testing through Baker Hughes, it was determined that applying MICRO-WASH in a NaBr brine was appropriate for this application.

After the lower completion was run in the west leg, the well was displaced to MICRO-WASH. As the wash pipe was pulled to above the flapper valve, to isolate the reservoir, the well began to lose fluid, indicating the application had successfully begun to remove the filter cake on the wellbore. The flapper valve shut and the lower completion was left suspended in the MICRO-WASH, which slowly dissolved the filter cake and water-wet the wellbore.

After running the whipstock for the east leg, it was also drilled with OMNIFLOW DIF, and its lower completion was also run with the open hole displaced to MICRO-WASH. As was the case with the west leg, losses occurred upon pulling the wash pipe, thus indicating successful filter cake disruption.

The well production had been calculated at about 50,000 mscfd of gas. The first leg produced 60,000 mscfd and the second leg raised the production flow to 80,000 mscfd. This was the maximum rate and the limit of the production equipment. All these results are indications of an excellent and efficient reservoir clean up by the MICRO-WASH, with the production rate far exceeding the predicted maximum from an undamaged reservoir.

Challenges

- North Sea, U.K. sector
- Complicated, multilateral well
- Reduce risk for wellbore damage and screen blockage
- Disrupt and eliminate filtercake

Results

- MICRO-WASH high-definition remediation system
- OMNIFLOW DIF invert emulsion drill-in fluid system
- Successfully disrupted filtercake
- Protected reservoir
- Exceeded predicted maximum production rate



Oil-based mud filter cake before treatment with MICRO-WASH™ treatment.



Water-wet mud filter cake after with MICRO-WASH™ treatment.

OMNIFLOW™ DIF Formulation

Constituent	Make-up	
Base Oil	0.51 m ³	0.51 bbl
OMNI-MUL	23 kg/m ³	8 lb/bbl
RHEO-CLAY™	10 kg/m ³	4 lb/bbl
CaCl ₂	180 kg/m ³	63 lb/bbl
Water	0.285 m ³	0.285 bbl
FLOW-CARB™	286 kg/m ³	100 lb/bbl
OWR	65/35	65/35

