

Case study: North Sea, Norway

# Multiple product lines, disciplines mobilized to deliver perfect gravel pack ahead of schedule

Over the past several decades, well completions have become more and more complex. Wells are being drilled deeper, further, and into harsher environments than ever before. Sand control and well stability in extended-reach wells is especially critical for producers. In November 2018, an operator in the North Sea awarded Baker Hughes a challenging opportunity: manufacture, deliver, and install both the lower and upper completion in less than nine months.

With the collaboration of multiple product lines, Baker Hughes provided the optimal solution: a single-trip gravel pack completion using the **SC-XP™ Prime System, ExcellPak™ 2X2 XTreme Alternate Path® screens**, and **Terra Pack III™ Xanvis-based gravel pack fluid**.

The SC-XP Prime System is V0 qualified and excels in deepwater sand control applications. The single-treatment position reduces complexity, provides positive indication during operations, and allows sufficient weight down during gravel packing, keeping the tool in the proper position. The SC-XP crossover tool also provided the customer with a solution to an unforeseen event. Upon pulling out the hole, a third-party's shifting tool became stuck on the isolation valve. Baker Hughes experts suggested using the acid placement feature in our tool that diverts the flow path out the end of the string. As soon as circulation around the shifting tool was achieved, the string became unstuck, saving the customer significant downtime and/or a fish in the well.

The customer specifically requested the ExcellPak 2X2 screens for this project because of the long openhole interval and well stability issues. In the case of a hole collapse during the gravel pack job, this technology enables the gravel being pumped to bypass any obstruction and complete the pack without voids. Per the models and pumping data, the shunt tubes were indeed activated near the end of the job indicating an obstruction was present. Nevertheless, over 100% of the calculated sand volume was successfully placed across the formation without issue.

Proper well control requires the use of >1.5 specific gravity (SG) brine. A competitor wanted to use cesium formate for the gravel pack carrier fluid, a more expensive (10x) option. Baker Hughes offered a more cost-effective solution: the Terra Pack III gravel pack fluid. Extensive laboratory testing proved that excellent rheology, proppant transport, and suspension could be achieved at the challenging bottomhole temperature of 249°F (120°C) with a specialized brine consisting of 1.55 SG calcium bromide (CaBr<sub>2</sub>). Baker Hughes deployed a skid fleet of pumping equipment to prepare and pump from smaller footprints where rig space is a premium.

For this project, Baker Hughes personnel completed approximately 3,000 hours on the rig. During this flawless execution, no health, safety and environmental (HSE) incidents and no nonproductive time (NPT) were recorded.

## Challenges

- Deepwater 1,315 ft (400 m)
- Bottomhole pressure 7,512 psi (51.7 MPa)
- Reactive shales present in reservoir (well stability)
- Time constraints
- Sand production
- Gravel pack fluid performance
- Requirement for bubble tight lower completion

## Results

- Spearheaded comprehensive solution a month ahead of customer estimate
- Calculated 103% gravel pack
- Saved an estimated \$1,700,000 USD in gravel pack fluid costs
- Experienced no HSE issues
- Incurred zero NPT hours out of 2,748 operational hours

Baker Hughes displaced a competitor by being able to manufacture, deliver, and execute this entire completion in less than eight months lead-time.

While the customer saved an estimated \$1,700,000 USD by eliminating the more expensive cesium formate, by coordinating the comprehensive lower and upper completion, Baker Hughes provided the customer with a viable long-term deepwater solution for decades.

