

Case study: Offshore, Norway

Post-erosion, gas-tight-qualified gravel pack system eliminates intermediate completion in big-bore gas wells

A major operator in the Norwegian North Sea planned for eight big-bore gas wells as part of its third-phase development. The field has significant production history of the thin oil layer. A 656-ft (200-m) gas cap rests above the thin oil layer, and the operator has used it to provide pressure support to the oil zone as well as serve as a natural gas lift in the oil wells. The third phase targeted production of this vast gas reserve.

The completion design used 9 5/8-in. “big-bore” production tubing to enable the operator to reduce the number of wells in the field from fourteen to eight, a substantial cost savings. Additionally, the operator sought to reduce the pressure drop from the reservoir by increasing the minimum inside diameter (ID) at the lower completion. The operator proposed eliminating the intermediate completion, or gravel pack sleeve straddle. Eliminating the intermediate completion in these big-bore gas wells requires a gravel pack system capable of acting as a gas-tight barrier immediately after completing gravel pack operations and while running the upper completion.

Baker Hughes recommended the **SC-XP™ Prime gravel- and frac-packing system**. The SC-XP gravel pack system provides a versatile, cost-effective, and efficient sand control solution for multiple applications using a common tool platform. Another key benefit is the SC-XP Prime system’s crossover tool port and gravel pack sleeve port provide excellent erosion resistance for added reliability.

To meet the customer’s specific requirements, an extensive qualification program was completed to qualify the gravel pack system for use as a gas-tight barrier post-erosion. The gravel pack packer was qualified to API IID1 validation V0 in as-rolled casing. The gravel pack sleeve provided the most technically challenging requirements: a full-scale erosion test, immediate closure of the sleeve after pumping, followed by an API 19AC Annex A V0 validation.

Following the successful qualification program, Baker Hughes retrofitted its existing inventory with the gravel pack sleeve design changes. This included detailed instruction provided to the region personnel, enabling them to successfully configure and pressure test the gravel pack sleeves prior to shipping the equipment offshore.

Baker Hughes field personnel deployed the completion equipment successfully without any health, safety and environmental (HSE) issues or nonproductive time (NPT). The SC-XP Prime gravel pack design reduced the completion hardware needed for an intermediate completion and saved up to 15 hours of rig time.

Another key benefit of the Baker Hughes solution is the reduced risks in safety and well integrity. With a V0-qualified gravel packing system that isolates the reservoir immediately after gravel packing is complete, the operator establishes the deep barrier earlier in the well operation. This eliminates risks that would be present if running in intermediate completion,

Challenges

- For gas producer wells, a gas-tight qualified barrier is necessary for running upper completion
- Traditionally, the gravel pack sleeve has not been qualified as gas-tight after pumping a gravel pack job (“post-erosion”) so a straddle or intermediate completion is required
- To increase the project value of the well’s life, the intermediate completion needs to be eliminated

Results

- Eliminated intermediate completions with post-erosion, gas-tight barrier-qualified gravel pack system
- Reduced rig time and cost associated with the installation of intermediate completion
- Improved safety and reduced multiple operational risks
- Executed flawlessly with zero NPT or HSE incidents
- Reduced the pressure drop from the reservoir and added significant value to the project over the well life

especially in scenarios where the lower completion installation had issues, such as excessive losses or accidentally fracturing the formation.

Contingency operations to remedy those situations often require pumping lost-circulation material (LCM) that can have disastrous effects on the productivity of a well due to increased skin at the lower completion. It also eliminates the risk scenarios where the only option is to run the intermediate completion on losses, an undesirable option that carries the risk of a well control scenario.

The Baker Hughes solution delivered a post-erosion, barrier-qualified gravel pack system that enabled a simplified, truly big-bore completion for high-rate gas wells. The SC-XP gravel pack system reduced risk, saved completion costs and rig time, and will provide the operator significant value over the well lifetime by increasing the overall recoverability.