

Abstracts

Title: Recent platform hydraulic fracturing experience from a low permeability reservoir including views on extension to subsea

Presenters: Jan Håvard Jøranson

Abstract: As part of a strategic initiative to increase production from low-permeability mature assets on the Norwegian Continental Shelf, a single-trip, multistage proppant fracturing system was developed. A frac service tool assembly (STA) is deployed on a dedicated work string, and the fracs are pumped and underflushed before installing the upper completion. With a new frac head concept, the system set a record for stage-to-stage frac time, achieving targets for reduced costs, operational time, and health, safety, and environmental (HSE) exposure.

Following several successful single-stage frac jobs in the field, a horizontal well was planned in the lower part of a low-permeability formation. A higher permeability formation at the top of the reservoir would be drained through multiple transverse fractures. An uncemented liner with frac sleeves and open-hole packers was designed for the completion. Detailed pre-job meetings were held with all involved parties to establish the requirements for the multistage frac system and fracturing program and to build procedures and contingencies for various stages of the operation.

The well was completed and stimulated in autumn 2022, with three proppant fracs placed in a single trip. The three stages were pumped as per the frac program. The underdisplaced slurry volume was reversed out before moving to the next zone. After stimulation, the upper completion was installed, and a wireline tractor was used to shift open the frac sleeves in a single trip. The new frac head stand was rigged-up and down in only 30 minutes, compared to 10 hours with a conventional frac head design. This greatly reduced time between stages and working at height and in the red zone. In addition, there were fewer potential leak paths, reducing the potential for downtime. The well was a successful proof of concept for stage efficiency, exceeding the target of performing two frac stages within a 24-hour period. Further efficiency gains could see stage time reduced to achieve up to four stages within a 24-hour period

The single-trip, multi-stage system can be used in subsea wells also. Equinor (Statoil) has already pumped frac jobs through drill pipe in subsea wells, more than 20 years ago. The only challenge going horizontal and multi-stage, would be the spaceout, Heave is not a concern. Equinor is planning to use the system in subsea wells in the future

Title: Linnorm Gas Field Development – recovery from the tight reservoirs part of the field

Presenters: Knut-Terje Noraberg and Teodor Damian (Shell)

Abstract: Linnorm is an HPHT gas field in the Norwegian Sea, located in the Haltenbanken area. It is the biggest discovered undeveloped resource on NCS, with about 100 bcm in place, relatively equally divided between 3 conventional/primary reservoirs (Lower Ile, Tofte, Lower Tilje) and 3 tight/secondary reservoirs (Upper Ile, Upper Tilje, Middle Tilje). The primary reservoirs are very heterogeneous with interbedded layers of very good properties (500-1500 mD) due to preserved porosities. The tight/secondary reservoirs have very poor reservoir properties (0.0001-1mD). Extensive dynamic simulations and benchmarking studies have been performed to understand the recovery from the tight reservoirs part of the field and potential development concepts like hydraulic fracturing. The conclusion was that it is not economically feasible yet to develop the tight reservoir part of Linnorm field.

Title: SLB Vessels Experience in Hydraulic Fracturing in North Sea

Presenters: Charlotte Giraud, Stimulation Technical Expert for Scandinavia

Abstract: This presentation will detail few examples of propped frac treatment on tight sandstone reservoirs (oil, gas condensate and dry gas wells), executed via stimulation vessels connected to platforms located Southern, Central North Sea, and West of Shetland. It will also discuss why contrary to acid frac no propped frac treatment has been done via pumping the treatment directly to a subsea wet tree?