

Case study Reservoir Flow

Detailed characterisation of injection profiles enables operator to optimise waterflood performance



Location: Thailand
Well type: Water injector
Reference: SPE-191011

Case benefits

- Identified active layers using the Chorus acoustic platform
- Provided information for potential zonal isolation or recompletion programs to enable the operator to optimise waterflood performance
- Calculated injection profiles with the aid of thermal simulations

Challenge

Waterflooding contributes approx. 45% of the total production in the Sirikit field and will continue to play a key role in the future. Improvements in waterflood performance would have a positive impact on financial performance, but waterflood optimisation requires a clear understanding of the injection profile with the water distribution in the reservoir.

Solution

The operator selected TGT’s Reservoir Flow product to evaluate injection profiles and identify active layers. Delivered by the True Flow diagnostic system, using the Chorus acoustic platform and the Cascade thermal platform; Reservoir Flow product provides the information operators require to make informed decisions to enhance waterflood

performance—that may involve zonal isolation or recompletion. Reservoir Flow complements conventional production logging diagnostics by evaluating flow profiles behind casing at the well-to-reservoir interface.

The Chorus diagnostic programme involved acquiring data during injection and shut-in conditions. The data was used to reveal active layers, and temperature simulations were used to calculate the injection profiles.

Result

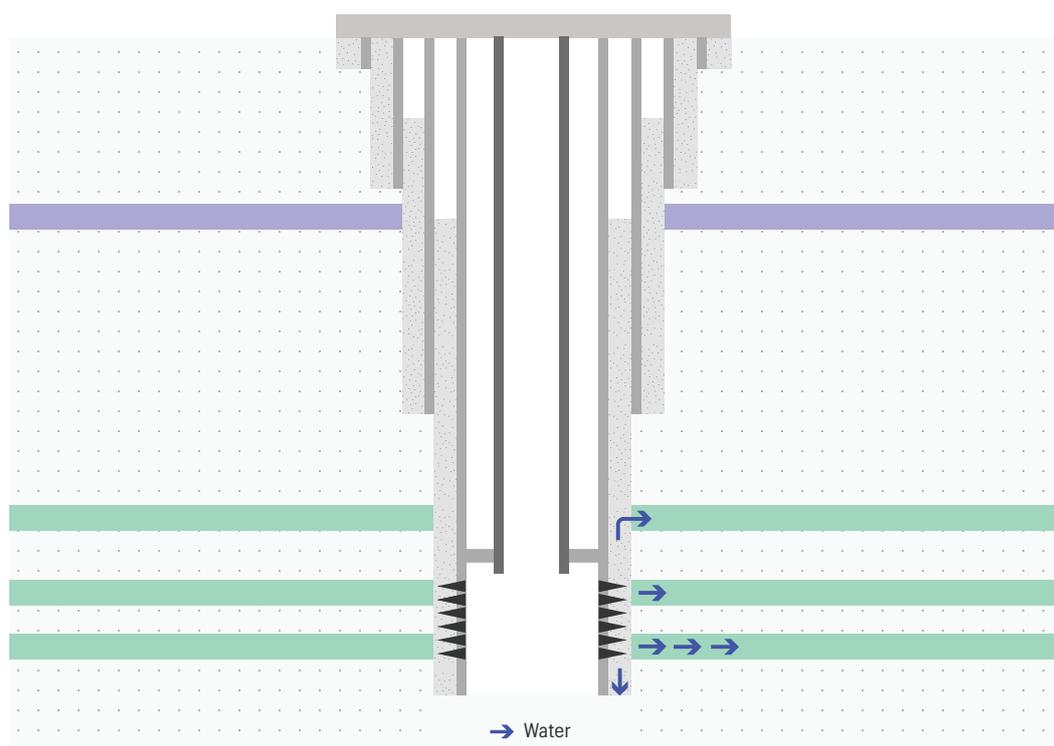
The injector under investigation was designed to inject into two sections of a multi-layer reservoir, that were separated by a packer. The lower injected zone was below the tubing shoe, whereas the upper injected

 Reservoir Flow example well sketch.

Reservoir Flow locates flow profiles behind casing at the well-to-reservoir interface.

Delivered by our True Flow system with Chorus and Cascade technology, Reservoir Flow provides the clarity and insight needed to manage well system performance more effectively.

Reservoir Flow is commonly used to diagnose unexpected or undesirable well system behavior, but it can also be used proactively to ensure the well system is working properly.



zone was controlled via a Sliding Sleeve Door (SSD) (Figure 1).

The distribution of water behind casing in the reservoir was substantially different to the data obtained by conventional production logging techniques.

In the upper section, conventional techniques only showed the injected water exiting from the wellbore through the SSD. However, Chorus acoustic data and temperature simulation was able to additionally define the distribution of the injected water in the reservoir.

In the lower reservoir section, the injected water was meant to advance laterally from the well to the reservoir through perforations. However, the Chorus acoustic data and temperature simulations, together with conventional production logging data, showed that the injected water flowed through the perforation across the L1.1 reservoir, passing through a cement channel and moving into the more permeable L2.1 and L3 reservoirs.

The diagnostic results made it possible for the operator to plan a more suitable workover to improve waterflooding performance and increase recovery.

Chorus data indicated the presence of high-amplitude acoustic signals that correlate with the permeability profile. These acoustic signals are generated by injection water being absorbed in the reservoirs. The Cascade platform's advanced thermal simulation enabled quantitative interpretation of logging data. The simulation-based profile is shown in the Reservoir Injection Profile column.

