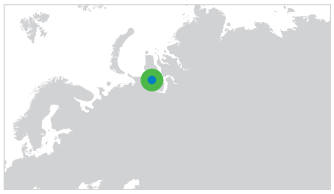
TGT

Case study Horizontal Flow

Accurate flow diagnostics for a horizontal gas well used to optimise development of a low-permeability reservoir



Location: Russia
Customer: Gazpromneft
Field: Novoportovskoe
Well type: Horizontal gas producer
Reference: SPE-207237

Case benefits

- Delivered a detailed reservoir flow profile along a horizontal wellbore, thereby enabling effective field development planning
- Confirmed the efficiency of a horizontal wellbore for producing gas from a low-permeability reservoir
- Provided an accurate flow profile in a situation where conventional production logging tool (PLT) methods could offer only an approximation

Challenge

Producing gas from low-permeability reservoirs is always challenging, and making the correct field development decisions is crucial to success. Operators have to consider issues such as well type and configuration, and wellbore length for each geological or reservoir setting. Accurate gas production profiles from early wells help operators make the right field development choices.

Decisions made in the early stages of field development can have a huge impact on asset economics and longevity. In this case, the operators faced a particular challenge, as obtaining accurate production profiles in horizontal wells with uncemented slotted liners is extremely challenging for conventional PLT spinners. This is because of the complex gas flow regimes in the wellbore and the potential for the reservoir flow to be substantially different from the wellbore flow.

Solution

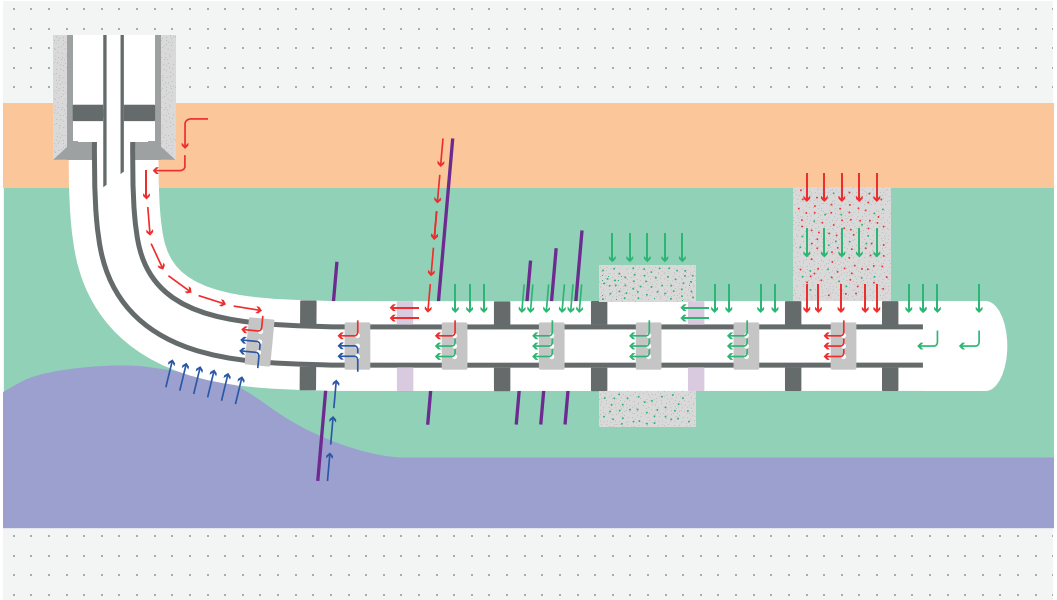
TGT's new Horizontal Flow diagnostics, powered by Cascade3, overcomes many of the challenges that hamper conventional production logs. It delivers a more reliable and complete assessment of flow dynamics in horizontal wells across a wide range of completion scenarios, thereby enabling petroleum engineers and asset managers to keep well and reservoir performance on track.

The Cascade3 flow analysis platform is purpose-built for horizontal wells and incorporates the industry's most advanced thermodynamic and hydrodynamic modelling codes. These enable Horizontal Flow to transform temperature and other well-system data into continuous reservoir flow profiles. These reflect flow activity both into and out of the reservoir, thereby delivering the most accurate picture of reservoir behaviour and downhole inflow and outflow. In this case, Horizontal Flow diagnostics enabled the field operator to

Quantifying flow dynamics in horizontal well systems and accessing accurate reservoir flow profiles is fundamental to managing well and reservoir assets.

Horizontal Flow with Cascade3 is designed to help Production and Reservoir Engineers complete daily tasks with greater certainty and confidence. Whether its locating water/gas breakthrough, understanding the influence of fractures, or maintaining an accurate reservoir model, Horizontal Flow delivers reliable flow profiles in a wide range of completion scenarios.

Equipped with the right information, asset teams can take direct action to keep well and reservoir performance on track.



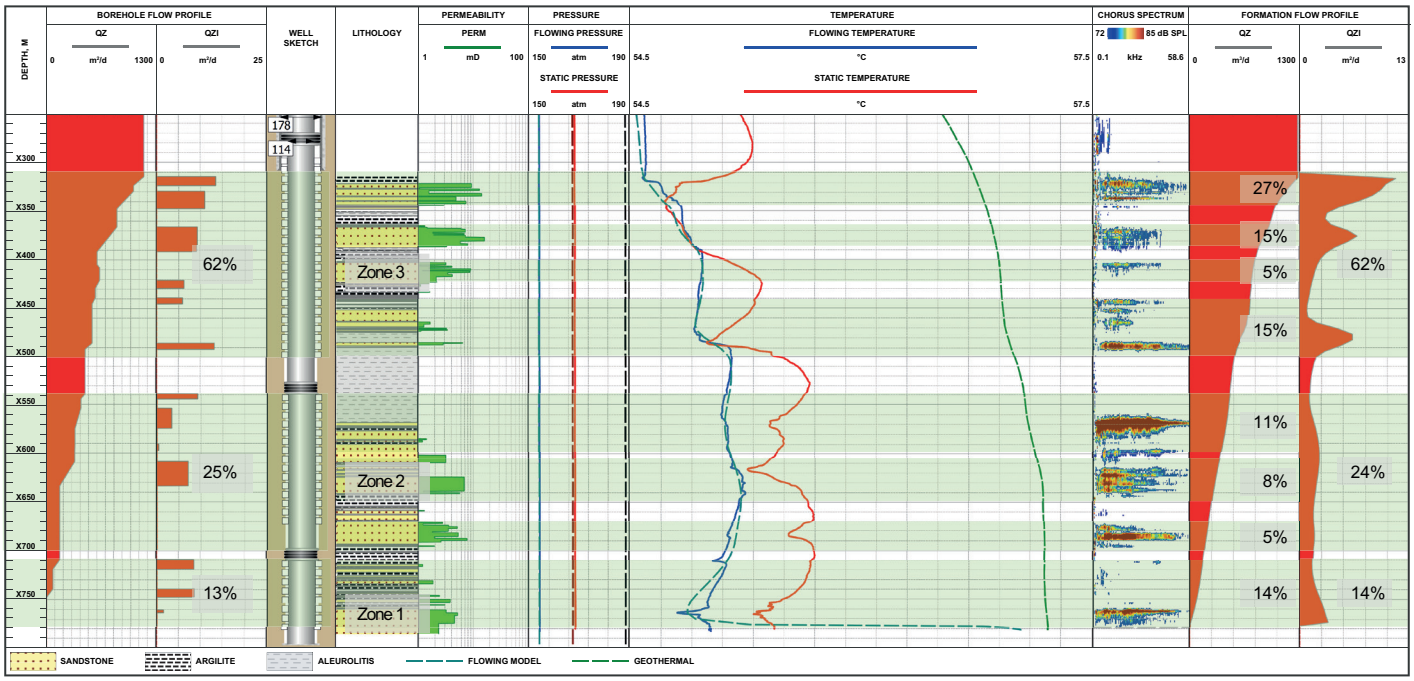
evaluate the production profile and verify that it was consistent with the expected permeability distribution, that is, it matched the known reservoir properties and the current dynamic reservoir model.

Result

Horizontal Flow diagnostics with Cascade3 and Chorus delivered an accurate gas-production profile for a horizontal well that had been drilled in a low-permeability, gas-bearing formation. The subject well was completed using a slotted liner across three zones separated by swellable packers. The contribution of each active permeable unit was accurately quantified with a continuous flow profile. The survey defined production contributions from each of the reservoir subunits, thereby improving the hydrodynamic reservoir model and making it possible to optimise subsequent wells in the ongoing field-development programme.

The Horizontal Flow survey confirmed that the target formations and the toe of the well would make economically viable contributions to production. The toe of the well is the main zone of concern for horizontal gas producers, and operators need to know whether production from that zone will overcome pressure drop and friction to contribute as effectively as the heel part of the well. The results of this survey showed no significant production loss for the well towards the toe. This supported expectations based on reservoir properties and confirmed that horizontal wells are a good option for developing this field.

Horizontal Flow diagnostics with Cascade3 justified the drilling of horizontal wellbores in this low-permeability clastic reservoir and gave the operator confidence to proceed with the existing field development plan. Building on the results of this survey, the operator is planning further horizontal gas producers in this and similar fields.



The Horizontal Flow survey confirmed that the production profile in this gas producer was consistent with the expected permeability distribution. In terms of total flow contribution from each zone, there is good agreement between Horizontal Flow with Cascade3 (14%, 24%, 62%) and standard PLT results (13%, 25%, 62%), but only Horizontal Flow showed the true reservoir flow profile from each layer. Relying on PLT results alone could have led to suboptimal field development decisions.