Petrel Advanced Completion Optimization

Using INTERSECT high-resolution reservoir simulator

Workflow for reservoir-centric lower completion design and interval control valve optimization across well life

Applications

- Evaluation of various lower completion designs in the well completion planning stage
- Lower completion design optimization postdrilling
- Optimized interval control valve (ICV) adjustment across the life of the well

Features

- Included in the Petrel™ E&P software platform with the core Petrel reservoir engineering license
- Powered by INTERSECT™ high-resolution reservoir simulator

How it improves performance

Available as a module for the Petrel E&P software platform, Petrel advanced completion optimization (ACO) incorporates a workflow that uses the INTERSECT high-resolution reservoir simulator for detailed model-based comparative analysis of multiple lower completion options. It enables optimizing hydrocarbon recovery with respect to various factors, including project economics, constraints, and environmental footprint.

At the completion concept selection stage, Petrel ACO and the rich functionality of the Petrel platform enable identifying the well design—single-bore or multilateral well, number of laterals, conventional, inflow control device (ICD), or intelligent completion—that will maximize results. If an intelligent completion is a concept under study, the workflow enables reservoir and completion engineers to optimize ICV selection and packer placement to maximize oil recovery and delay the breakthrough of unwanted fluids, such as water and gas. It supports ICVs with on-off, multiposition, or continuously variable chokes.

In conjunction with the INTERSECT reservoir simulator, the workflow evaluates multiple ICV configurations to identify the best solution—based on user constraints such as cost and produced water treatment capacity—while reducing simulation time and computational resource requirements by a factor of >100. The outputs are flow rates, volumes, and pressures, which can be used to compare recovery, production, flowing bottomhole pressures, drawdown, and fluid movements across the reservoir. Subsequently, simulation results can be used to adjust valve settings over the life of the well as part of an active production optimization routine.

How it works

In the case of intelligent completions, the workflow simulates and compares fluid movements across the reservoir section over the life of the well for a range of ICV completions. Powered by streamlines, it uses the concept of time of flight—the time it takes unwanted fluids (such as water and gas) to reach the wellbore—to recommend proactive adjustments to ICV positions; alternatively, a constraint-based reactive approach is used to suggest valve choke settings. In either case, the goal is to optimize production and recovery.

What it replaces

Conventional methodologies for ICV completion optimization, which are time and computational resource intensive and lack the ability to help optimize valve settings **after ICV installation in the well**.

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