

ICD Advisor

Software Version: 2.2

APPLICATIONS

- Openhole and cased-hole completions with
 - nozzle ICDs
 - spiral ICDs
 - labyrinth ICDs
 - flow control valves

BENEFITS

- ICD design efficiency is maximized through accurate predictions of reservoir performance.
- Software's workflow targets sweep efficiency and, over the well's life span
 - increases oil production
 - reduces water production and, hence, reduces separation costs.

FEATURES

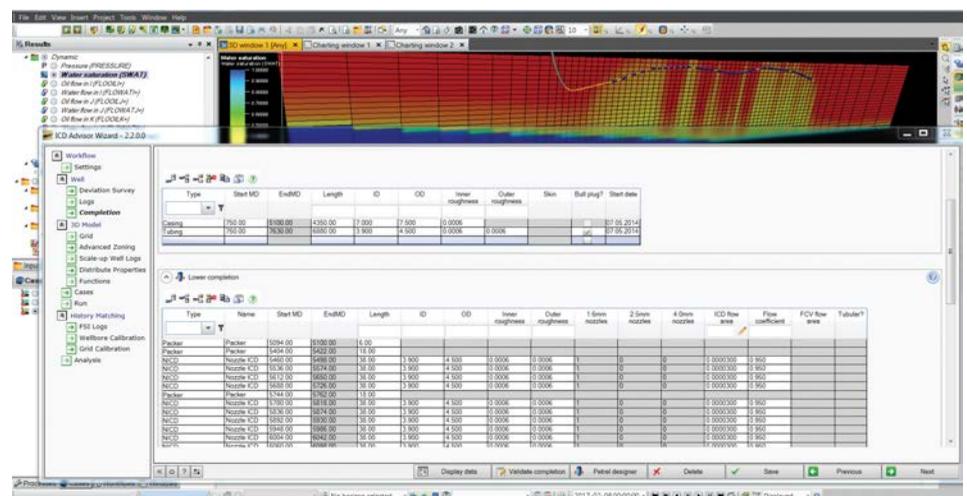
- Uses full 3D, three-phase reservoir flow modeling near the wellbore (flow around packers, fluid contact standoffs, complex flux boundaries)
- Uses existing static and dynamic reservoir models
- Uses ECLIPSE* industry-reference reservoir simulator, the industry standard, for its simulation engine
- Uses LWD logs and deviation surveys as input
- Uses existing Petrel* E&P software platform and (optionally) ELICPSE simulator models to define property distribution in a sector model
- Provides template-based rock and black oil fluid properties definition
- Uses coupled 3D numerical reservoir simulation and multiphase wellbore fluid flow models for ICD performance prediction
- Accounts for packer positioning along the completion and for reservoir fluid flow around the packers
- Accounts for boundary fluxes in the sector model as well as water/oil contact and gas/oil contact positions
- Plots pressure, drawdown, and flux distribution along the completion and in the adjacent reservoir as time functions and production cumulatives

ICD Advisor* software is an internal Schlumberger software package for designing and optimizing inflow control device (ICD) completions through reservoir segmentation, packer positioning, and nozzle sizing.

Shortcoming of conventional design practices

Conventional design practices are based on static modeling. A nodal analysis approach for tubing, annular, and nozzle flow is coupled with analytical, pseudo-steady-state models of radial inflow for cross-sectional areas of the reservoir along the completed section. This approach has several significant shortcomings that are overcome by ICD Advisor software modeling:

- Since inflow models are 1D radial, reservoir flow in the direction of the wellbore is neglected, which effectively introduces multiple no-flow boundaries along the wellbore. These boundaries artificially prevent fluid flow around the packers, the onset of water coning and gas cusping, fracture water overrun, and other similar effects.
- Permeability values derived from relatively "near-sighted" LWD logs are assigned to an entire tortuous path of the fluid flowing into a given completion segment. None of the near-wellbore geologic features, such as faults and stratigraphic layering, are accounted for if the well is placed horizontally.
- Water saturation logs are often extracted from an ECLIPSE simulator forecast at various time steps to validate the ICD completion design against the client's production scenario. Those forecasts, however, are produced for a conventional non-ICD completion case and do not properly represent water breakthrough in an ICD scenario forecast.



ICD Advisor software.

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ICD Advisor software approach

To mitigate those shortcomings, ICD Advisor software, Version 2.2, applies a fully numerical, fully 3D Petrel software platform and ECLIPSE simulator model-based approach to the reservoir fluid flow simulation. This approach is implemented as a Petrel software platform plug-in and provides a quick template-based way to build a typical model geometry around an ICD completion. If further customization is required, the user

has access to a full spectrum of Petrel platform and ECLIPSE simulator functionality. Modeling options include a well-centric approach for short-term forecasting, a reservoir-centric approach for longer-term forecasts, and a full sector model-based approach that uses an existing client model and accommodates well interference as well as a range of boundary conditions.



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