

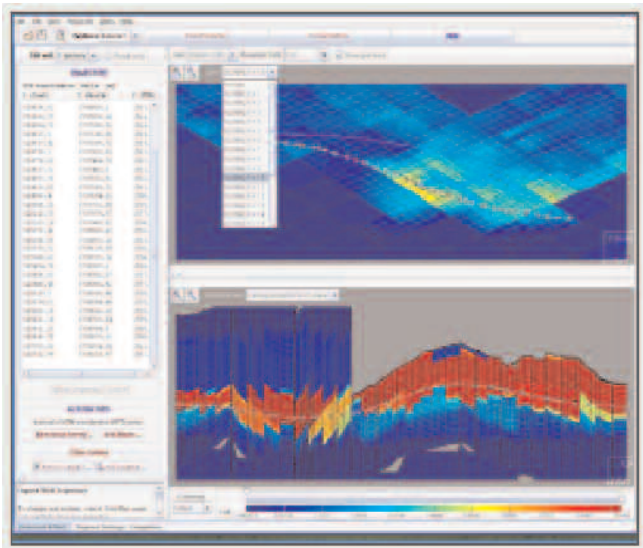
Simulation Software for EquiFlow® ICD Completions

Simulation and modelling is a critical element of an EquiFlow® inflow control device (ICD) or EquiFlow Inject completion. Halliburton has a unique software suite including NETool™ nodal analysis software and QuikLook® service to quantify the benefits and allow near-wellbore and long-term study of an EquiFlow completion.

NETool™ Simulation Software

NETool software is a steady-state, network-based simulator for quick calculation of multiphase fluid flow through a well completion and the near-wellbore region. The well completion and the near-wellbore region are represented by a distribution of nodes that may be interconnected by flow channels. Specification of the completion details leads to an appropriate pressure drop correlation for each flow channel, whether that is the formation, annulus or a range of completion paths.

Through interactive well placement and easy selection of completion components with built-in pressure drop correlations, the effects of well position, length, and completion configuration on production response are easily modelled.



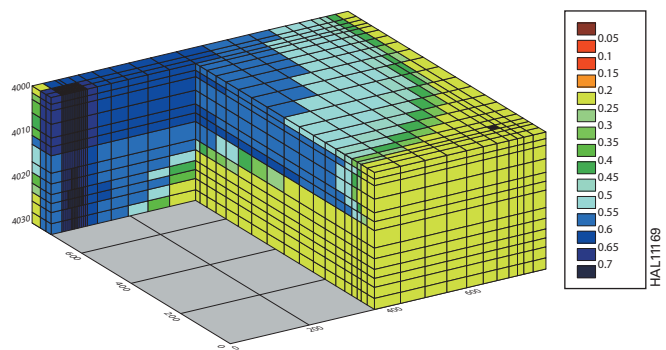
Screen shot from NETool™ simulator

The effects of using an EquiFlow ICD completion can be seen by setting up the basic well parameters in the NETool software and running different completion designs with varying inflow parameters such as water cut, permeability, skin models, etc. NETool software enables the running of numerous scenarios very quickly in order to compare results and optimize the completion.

QuikLook™ Simulation Software

QuikLook™ software is a Halliburton reservoir simulation tool that can be used to study the long-term effects (transient analysis) of an EquiFlow ICD completion on the reservoir. QuikLook simulation software is exceptionally versatile and easy to run, with powerful visualization and output report capabilities, using imported data from other simulators if needed. It is also possible to switch between sanding prediction and geomechanical models.

Designed with the practicing engineer in mind, QuikLook software combines the power of numerical reservoir simulators with a simpler user interface capable of processing a 1,000,000 grid model. Its reservoir fluid management tool has a superior graphic interface to enter complex well data, check data consistency, produce supplemental plots, display interactive graphics, and launch and monitor simulation runs and analyze results.



Time = 200 Days

Screen shot from QuikLook™ simulator

Collaborative Philosophy

Halliburton believes the only means to maximize the benefits of an EquiFlow ICD completion is to model completion and reservoir performance in a collaborative relationship with our clients. In this way we can together not only agree on the expectations about the results of using the technology, but also build a basis for continuous improvement in future completions in the field.

Workflow Overview

Certain well and reservoir parameters are needed to begin the modeling process. The accuracy of the results depends to a large extent on the accuracy of the input data used by the software.

Once the input data is gathered, Halliburton Reservoir Engineers will use NETool software to model the completion and near wellbore as described earlier for up to three basic scenarios in most cases.

1. Barefoot completion – This is typically the standard completion run in the field and is used as a baseline against which all optimized completion scenarios are evaluated.
2. Base case EquiFlow ICD completion – This scenario is run with an optimized EquiFlow ICD design in conjunction with compartmentalization of the pay interval using one or more zonal isolation devices.

3. Optimized EquiFlow ICD completion – In this case the model is adjusted typically by increasing the number of compartments in the completion and employing EquiFlow ICD's with varying pressure drops.

The resulting outputs of the three scenarios clearly illustrate the benefits of leveling the production performance throughout the interval and are frequently sufficient evidence to move the project forward; however, more detailed reservoir response information is available.

Using a proprietary link between the NETool application and Halliburton's QuikLook reservoir simulator, we can together quantify the benefits associated with each successive completion scenario. The result is a clear understanding of wellbore performance over time with regard to cumulative oil production increase, the amount of time water or gas production should be delayed, and the resulting cumulative reduction in water or gas production.

By working in partnership and employing the latest in both simulation and inflow control technology, we together have a means to predict accurately the benefit of placing your trust in Halliburton.

For more information, contact your local Halliburton representative or email us at completions@halliburton.com.