

ECLIPSE 2012 Reservoir Simulation Software

Industry-reference simulator

ECLIPSE* reservoir simulation software provides a complete and robust set of numerical solutions for fast and accurate prediction of dynamic behavior—for all types of reservoirs and degrees of complexity, including structure, geology, fluids, and development schemes.

The ECLIPSE industry-reference simulator covers the entire spectrum of reservoir simulation, including black-oil, compositional, and thermal finite-volume reservoir simulation, as well as ECLIPSE FrontSim streamline reservoir simulation capabilities. With a wide range of add-on options—such as coal and shale gas, enhanced oil recovery, advanced wells, and surface networks—you can tailor the simulator capabilities, enhancing the scope of your reservoir simulation studies.

With their depth and breadth of capabilities, innovative technologies, robustness, speed, parallel scalability, and platform coverage, ECLIPSE reservoir simulators have been the benchmark for commercial reservoir simulation for more than 25 years.

Petrel reservoir engineering environment

The Petrel* E&P software platform integrates the multidisciplinary workflows surrounding ECLIPSE simulators, providing transparent data flows and an intuitive graphical user interface for reservoir engineering. It is the ideal environment for simulation pre- and postprocessing, providing key supporting workflows including advanced gridding and

upscaling, history match analysis, uncertainty and sensitivity analysis, well path and completion design, and design optimization of well locations, completions, and reservoir recovery methods.

Blackoil simulation

The ECLIPSE Blackoil simulator supports three-phase, 3D reservoir simulation with extensive well controls, field operations planning, and comprehensive enhanced oil recovery (EOR) schemes.

Compositional simulation

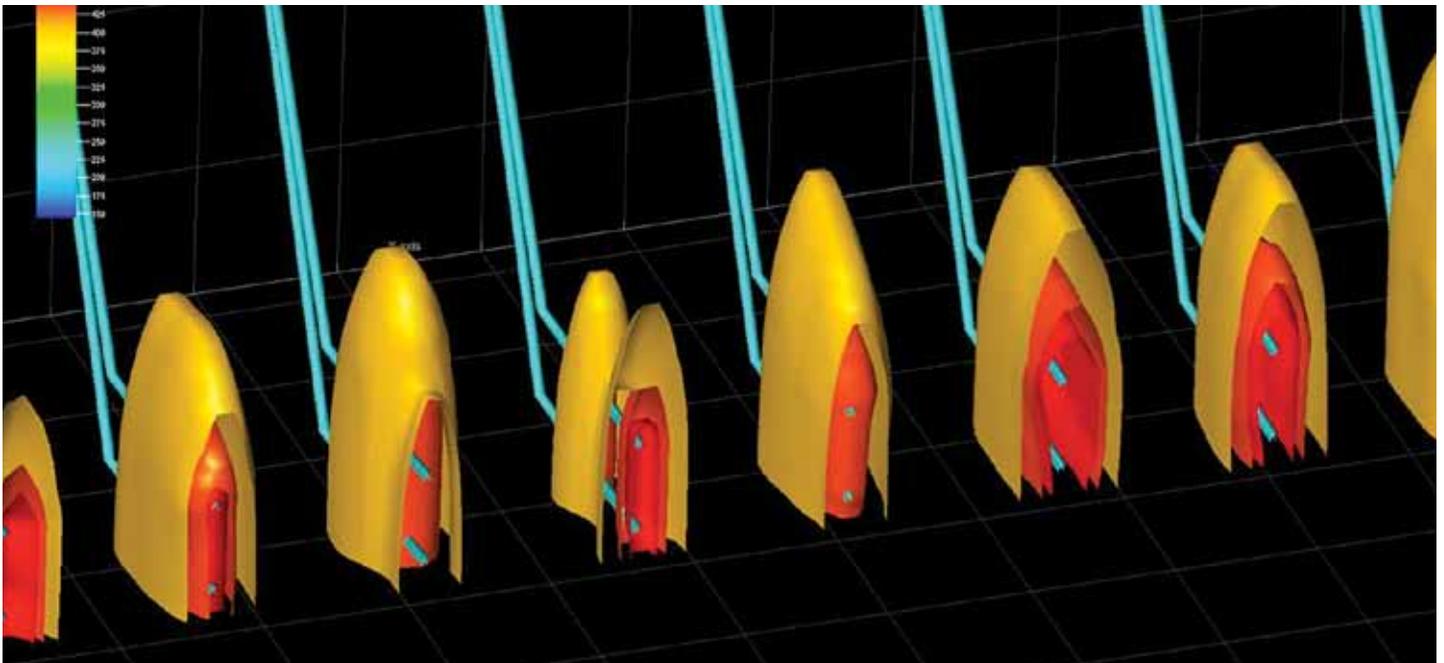
When modeling multicomponent hydrocarbon flow, the ECLIPSE Compositional simulator provides a detailed description of reservoir fluid phase behavior and compositional changes.

Thermal simulation

The ECLIPSE Thermal simulator supports a wide range of thermal recovery processes, including steam-assisted gravity drainage (SAGD), cyclic steam operations, in-situ combustion, heaters, and cold heavy-oil production with sand.

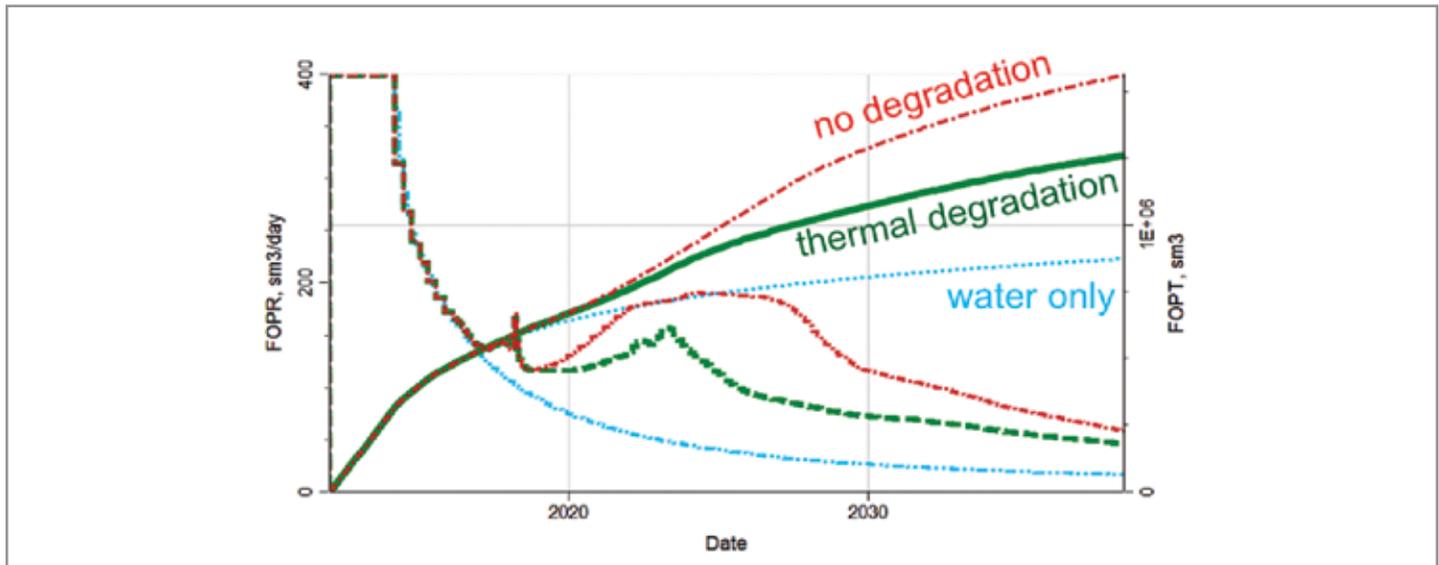
Additional simulation options

The scope of your reservoir simulation studies can be further expanded with a wide range of additional capabilities for ECLIPSE software, such as coal and shale gas, enhanced oil recovery, and advanced wells.



Steam chambers of a multipair SAGD model.

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Effect of polymer thermal degradation on recovery.

ECLIPSE reservoir simulation solutions

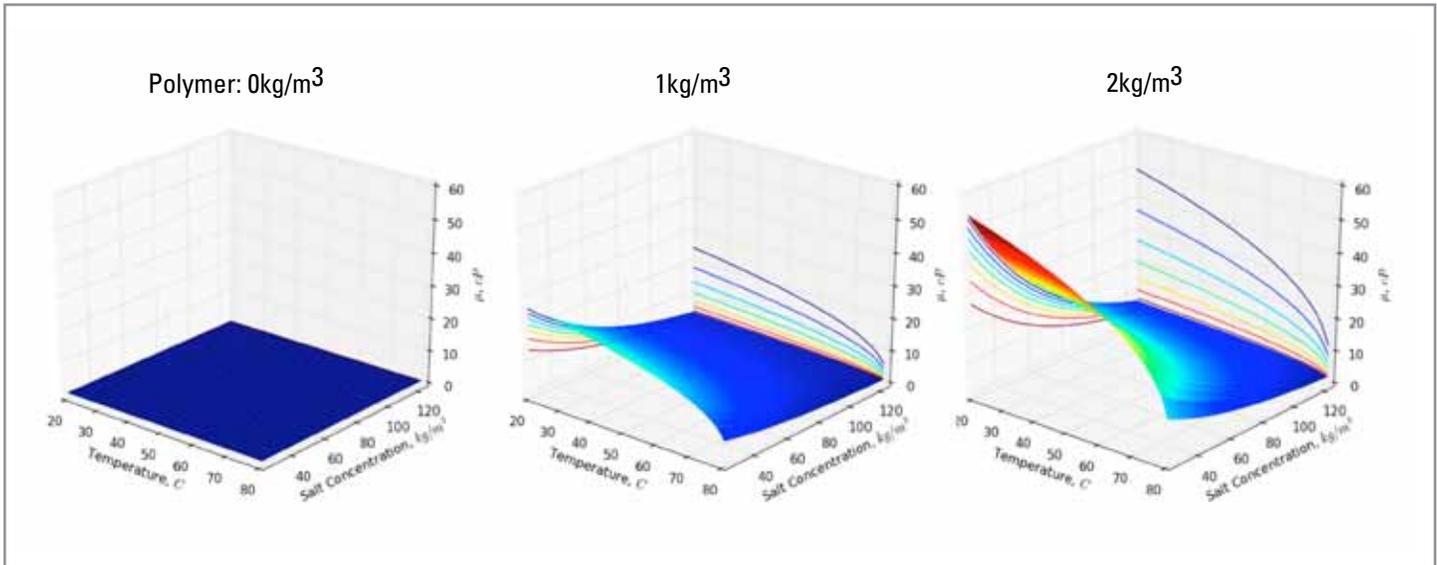
To meet the challenge of producing increasingly complex and remote reservoirs, the 2012 release includes enhancements to ECLIPSE software and the Petrel Reservoir Engineering environment in the following key areas:

- Chemical EOR
- CO₂ storage and EOR
- Coal and shale gas
- Heavy oil recovery
- Complex wells
- Flexible reservoir control
- Streamline-based screening and pattern flood management
- Faster runtimes with parallel processing
- Reservoir geomechanics
- History matching
- Uncertainty and sensitivity analysis
- Design optimization

Chemical-enhanced oil recovery

ECLIPSE software simulates the majority of chemical EOR techniques, including surfactant, polymer, alkaline, low salinity, foam, and solvent. Polymer is added to an injected fluid with the aim of improving mobility ratios to reduce viscous fingering and delay water breakthrough, and to redirect water to the lesser swept regions to increase the macroscopic sweep efficiency.

The 2012 enhancements to the polymer flood model include temperature dependency of the solution viscosity, degradation of the polymer using a temperature-dependent half-life parameter, and shear thinning and thickening of viscosity as a nonmonotonic function of the flow velocity. In addition, polymer and brine can crossflow in the wells. ECLIPSE software is also fully compatible with multisegment and friction wells.



Polymer solution viscosity dependency on temperature and salinity.

Unconventional gas

The development of shale gas and coalbed methane plays worldwide has grown dramatically over the past decade. ECLIPSE 2012 contains several functional enhancements for shale and coal gas simulation; Petrel 2012 provides new user-interface components to support these capabilities.

For easier migration between black oil and compositional modeling of unconventional reservoirs, a selection of keywords for ECLIPSE 100 simulation software are now supported in ECLIPSE 300, such as the input of the Langmuir isotherm tables. The coal region identification number is also now available in ECLIPSE 100—this used to specify the adsorption and diffusion data for regions of the model. Additionally, the Langmuir adsorption isotherms can now be scaled in ECLIPSE 300 simulation software to match specified initial gas concentrations.

Heavy oil recovery

The ECLIPSE Thermal module simulates the majority of heavy oil recovery methods used in the industry, as well as enhancements to the functionality and performance of associated models.

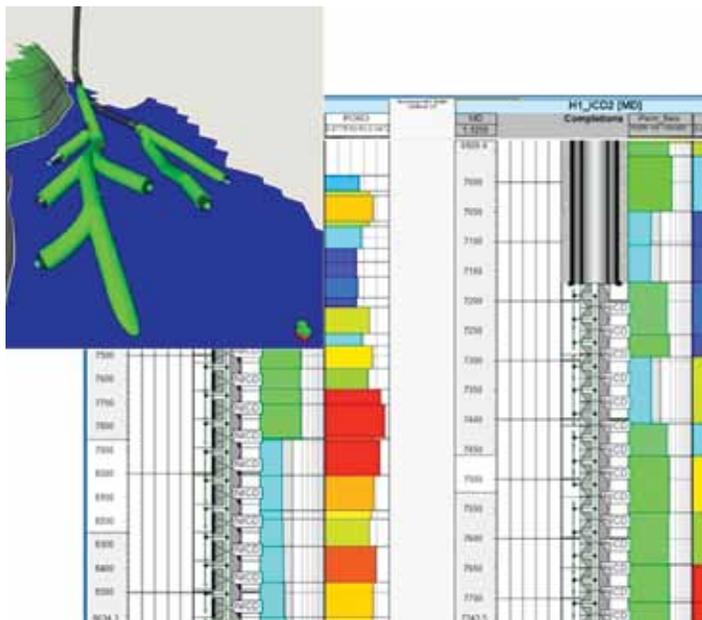
The ECLIPSE Thermal module has been extended to perform a flash calculation for computing the surface volume of injected hydrocarbons for hybrid steam-solvent processes.

Streamline-based screening and pattern flood management

The 2012 version of ECLIPSE FrontSim module includes several key enhancements. In geological screening, you can now control the export of time-of-flight data as well as screening and ranking well points to output files. For waterflood management, the rate can be a target control value—the injection efficiency calculation has been extended to handle gas production.

Performance improvements include a parallel (multithreaded) Algebraic Multigrid Solver to speed up the pressure solve for compressible cases. The three-phase black-oil model has also been extended with solvent and passive tracer models. Further, you can generate streamlines from ECLIPSE results in the Petrel platform using the streamline generation module.

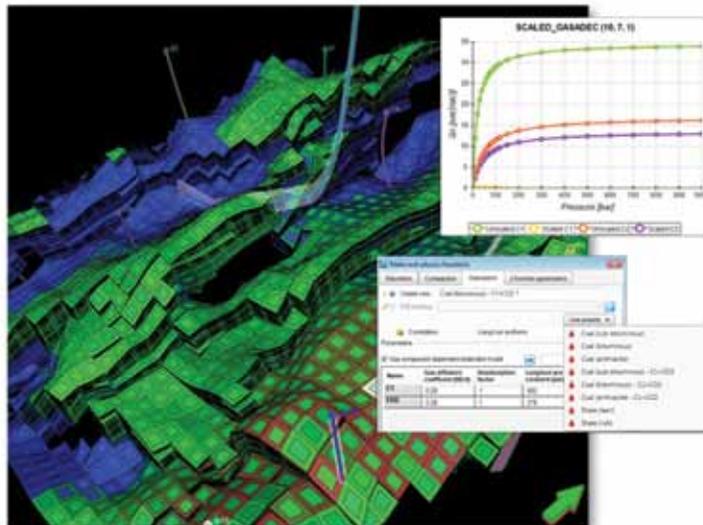
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Multilateral complex well with intelligent completions.

Advanced and complex wells

Long horizontal wells, multilaterals, and wells with intelligent completions are used to increase reservoir contact and to control water and gas breakthrough. These wells—collectively known as advanced or complex wells—require a multisegment well model. The ECLIPSE 100 multisegment well model is now compatible with the polymer option. Polymer flows are reported at the segment level and effectiveness of the polymer in the wellbore can be specified. The ECLIPSE 100 solvent model also now handles well crossflow.



Rock physics modeling and multiporosity displays of coalbed methane and shale gas reservoirs.

Compositional fluid modeling

A compositional foam model has been added to ECLIPSE 300, based on a water-borne surfactant component employing the ECLIPSE 100 functional form for the gas mobility reduction factor. The compositional residual oil model now provides two compressibility models for the residual oil fraction. Additionally, a number of performance improvements have been made to the CO₂ solubility model in ECLIPSE 300.

E-mail sisinfo@slb.com or contact your local Schlumberger representative to learn more.

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