What's New in ECLIPSE 2014

Introducing new developments, enhancements, and license simplifications to the ECLIPSE reservoir simulator


BENEFITS AND FEATURES

- Performance improvements through a new solver for the ECLIPSE* industry reference reservoir simulator

- Fully integrated with the Petrel* E&P software platform

- New additions to the extensive chemical EOR modeling capabilities

- Inclusion of a GPU-enabled solver in the ECLIPSE FrontSim simulator

- New ECLIPSE Block Parallel license offers users cost-effective simulation runtime improvements

- More advanced reservoir modeling capabilities now available through the ECLIPSE simulator's base license

ECLIPSE 2014 is a major release of the ECLIPSE simulator, hosting significant new features, performance improvement developments, enhancements to existing capabilities, and simplifications in licensing.

The release includes: additions to the chemical EOR modeling capabilities, performance improvements through a new solver for the ECLIPSE simulator, and the inclusion of a GPU-enabled solver in the ECLIPSE FrontSim simulator.

Licensing has been significantly simplified, translating to more advanced reservoir modeling capabilities being available through the ECLIPSE simulator's base license.

A new parallel license, specifically designed for desktop users, has also been introduced. The new ECLIPSE Block Parallel license is an alternative to the existing fully featured Parallel/MR license. The 2014 release of the ECLIPSE simulator also expands on the integrated workflows offered through the Petrel platform's reservoir engineering facility.
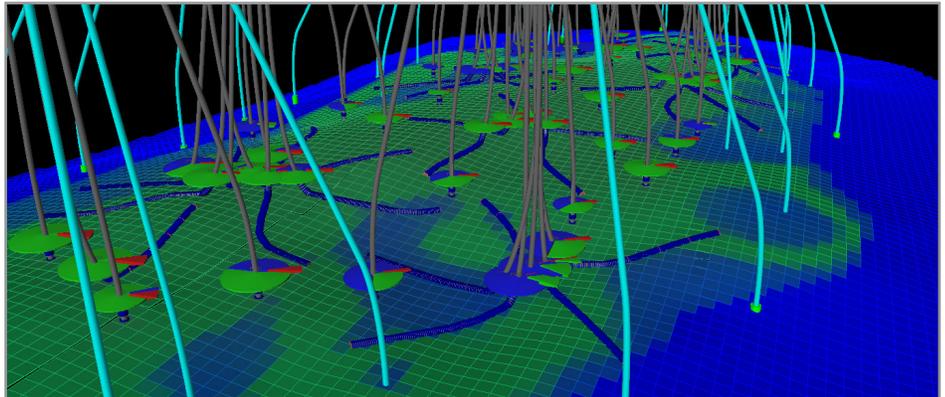
Full-field ECLIPSE simulation visualized with the Petrel E&P software platform.

Enhanced oil recovery

The addition of polymer to injected water reduces mobility and viscous fingering, hence improving sweep efficiency. The 2014 release of the ECLIPSE simulator has been extended to allow the simulation of polymer injection for compositional simulations.

Another application of polymer flooding is the use of temperature-sensitive polymers to block high-permeability channels (thief zones). The polymer adsorbs to the rock surface, expanding as temperature increases, thereby reducing the permeability of the thief zones and allowing increased recovery from surrounding zones.

In 2014, the ECLIPSE simulator capabilities have been extended to include

- temperature-dependent adsorption to improve the control of the polymer behavior through thermo-responsive polymer black-oil simulation

- development of the ECLIPSE Blackoil and Compositional simulators to allow for the effect of salinity on interfacial tension for surfactant injection studies

- end-point scaling of relative permeability and capillary pressure curves, which can now be applied to low salinity saturation functions in the ECLIPSE Blackoil simulator.

What's New in ECLIPSE 2014

Performance

A new linear solver is now available for the 2014 release of the ECLIPSE simulator. The CPR solver utilizes constrained pressure residual (CPR) preconditioning, which leads to significant performance improvements for challenging simulations—in some cases, reducing the run time to a fraction of that previously achieved.

The CPR solver is offered in addition to the nested factorization linear solver, currently available in the ECLIPSE simulator.

The CPR solver has been shown to improve performance significantly for models which exhibit poor convergence due to heterogeneity, injection, dual porosity, miscible gas or chemical agent injection.

A new faster GPU algebraic multigrid solver, utilizing multiple graphic cards, is available for solving the pressure equation in the 2014 release of the ECLIPSE FrontSim streamline-based simulator. The solver utilizes GPUs with high computing capabilities and is specifically recommended for streamline simulation of larger models.

Licensing: Easier access to advanced science

A number of modifications have been made to the licensing structure of ECLIPSE Blackoil, Compositional, and FrontSim streamline-based simulators.

ECLIPSE 2014 has EOR modeling options (such as polymer, surfactant, foam, and solvent) added to the base license that no longer require a specific feature license. The following options have also been added to the base license, allowing for easier access to advanced science: coal and shale gas option, flux boundary, reservoir optimization, environmental tracers, and CO_2 storage.

As an alternative to the existing MR/Parallel licensing scheme, a new single-user, 8-way parallel license has been made available in the 2014 release of the ECLIPSE simulator. The ECLIPSE Block Parallel license offers desktop users cost-effective simulation run-time benefits of running up to 8 way parallel.
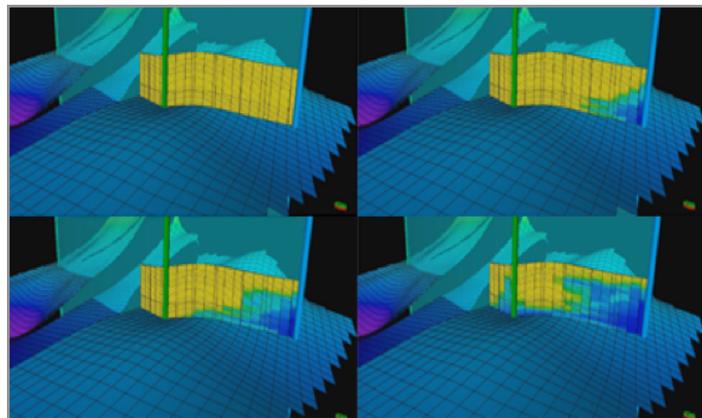
The ECLIPSE simulator supports modeling of numerous EOR options. Above is an example of a full-field polymer flood study.

Additional key developments

- User-defined quantities have been re-engineered to give superior parallel performance over past releases.
- Improved usability of the WAG hysteresis model in the ECLIPSE Compositional simulator.
- A new extension to the Killough hysteresis model has been added.
- The coalbed methane model now includes scaling of reference pressure in the gas adsorption isotherms for each cell.
- The connection skin factor may now be set using user defined quantities.
- Keyword skipping mechanism for FrontSim is now supported in the same way as for ECLIPSE Blackoil and Compositional simulations.

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