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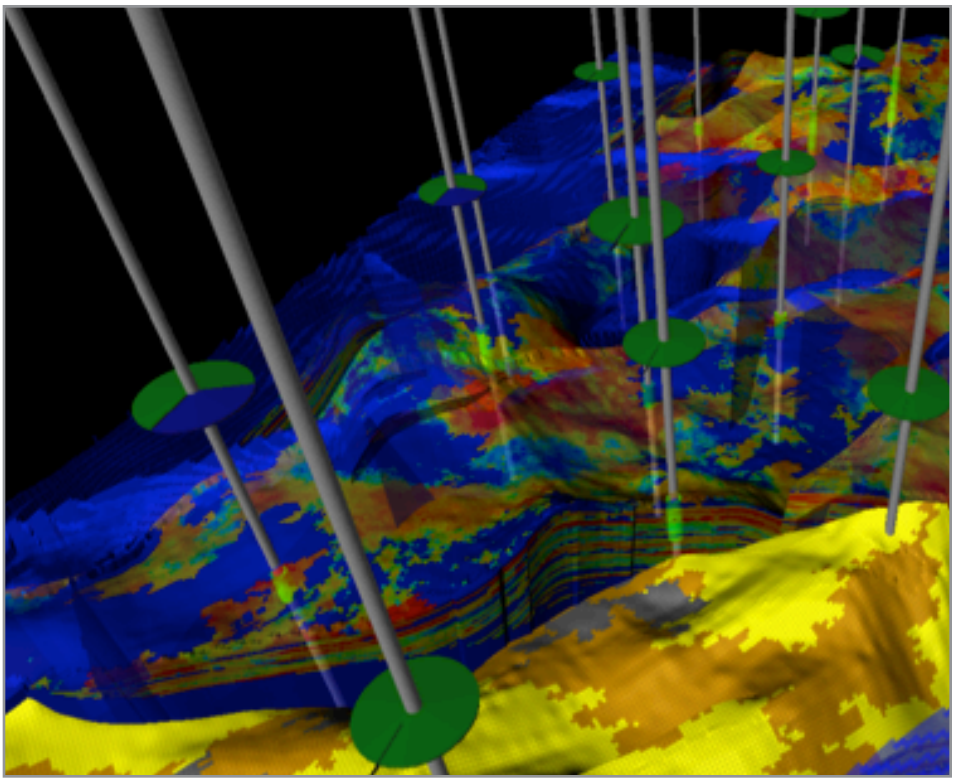
ECLIPSE 2014

Robust, reliable reference simulator

BENEFITS AND FEATURES

- Industry's most complete set of numerical solutions for fast, robust and reliable prediction of dynamic reservoir behavior
- Covers entire spectrum of reservoir simulation, including black-oil, compositional, thermal and streamline simulation
- Fully integrated with the Petrel* E&P software platform to simulate any field development strategy with ease
- Confidently model enhanced oil recovery schemes, such as chemical EOR, thermal recovery, and miscible and immiscible gas flooding
- Examine and understand the full range of uncertainties in reservoir behavior for robust reserves estimation, design optimization, and production forecasting
- Streamline-based screening and pattern flood management
- Simulate unconventional reservoirs including coalbed methane, shale gas, shale oil, and naturally fractured reservoirs
- Accurately model highly deviated, horizontal, and multilateral wells with advanced completions and inflow control devices.
- Benefit from extensive capabilities, computational robustness, speed, and unmatched physics



Full field ECLIPSE simulation visualized with the Petrel platform.

The ECLIPSE* industry-reference reservoir simulator offers the industry's most complete set of numerical solutions for fast and accurate prediction of dynamic behavior for all types of reservoir, development planning, and operations. With more than 30 years of continuous software development and innovation, the ECLIPSE simulator combines extensive capabilities, computational robustness, speed, and unmatched platform coverage.

Suitable for a wide range of simulation problems

The ECLIPSE simulator covers the entire spectrum of reservoir simulation, including black-oil, compositional, thermal and streamline simulation.

The ECLIPSE Blackoil simulator is the industry standard for reservoir modeling. It supports three-phase, 3D reservoir simulation with a huge range of capabilities, including advanced well modeling, tracer tracking, enhanced oil recovery schemes, fault and fracture networks and aquifer identification.

The ECLIPSE Compositional simulator provides full equation of state modeling for multicomponent hydrocarbon flow. It enables modeling of reservoirs where there are compositional changes with depth, condensates, or volatile crude oils and gas injection programs. In addition to supporting the same unrivalled range of capabilities as the Blackoil simulator, the ECLIPSE Compositional simulator allows you to model chemical reactions and CO_2 flooding and storage.

The ECLIPSE FrontSim streamline simulator is a three-phase, 3D black-oil and compositional simulator. It supports a wide range of features, including dual porosity and permeability, compressible and incompressible fluids, and advanced field management controls.

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Enhanced oil recovery (EOR)

The ECLIPSE simulator supports a wide range of EOR options, including thermal recovery, chemical EOR, and miscible and immiscible gas flooding.

Thermal recovery methods are typically required for heavy oil, extra heavy oil, and bitumen reservoirs, in which the oil viscosity is high but reduces with temperature. The ECLIPSE Thermal simulator supports a wide range of thermal recovery processes, including steam flooding, steam-assisted gravity drainage (SAGD), wellbore heaters, in situ combustion, and cold heavy oil production with sand (CHOPS).

Polymer added to injected water decreases its mobility and helps reduce viscous fingering to improve sweep efficiency. The ECLIPSE polymer model takes into account both increased viscosity of the polymer solution and reduction in reservoir permeability that results from polymer adsorption onto the rock.

Surfactant supports residual oil recovery by reducing surface tension between the oil and water phases. The ECLIPSE surfactant model handles all important features of a surfactant flood on a full-field basis, including surfactant effects on miscibility and wettability.

Foam reduces gas mobility and slows down breakthrough of injected gas. The ECLIPSE simulator expresses gas mobility reduction as a function of foam concentration and other relevant parameters. The progress of foam can be tracked as a tracer or as a water component.

Solvent modeling in the ECLIPSE simulator is handled by a four-component extension to the black-oil model that simulates recovery mechanisms in which injected fluids are miscible with hydrocarbons in the reservoir.

Alkaline injection decreases the rate of adsorption of surfactants and polymers. The ECLIPSE simulator models alkaline as a tracer; the concentration of this is used to determine oil/water surface tension and adsorption of polymer and surfactant. Combined chemical floods can easily be simulated in the ECLIPSE simulator using chemical EOR models and sophisticated field management logic.

Uncertainty and optimization

The uncertainty and optimization capabilities of the Petrel platform in combination with the MEPO* multiple realization optimizer enables advanced simulation-intensive workflows to be run in the ECLIPSE simulator. This enables reservoir engineers to examine and understand the full range of uncertainties in reservoir behavior as well as parameter dependencies and probabilities associated with delivering both greenfield and brownfield projects.

Assess and mitigate geomechanical risks

Two-way coupling between the VISAGE* geomechanics simulator and ECLIPSE reservoir simulations provides property updates in the geomechanics model as reservoir pressures, temperatures, and saturations change through time and through permeability and porosity updates of reservoir models at any selected time step. These simulations can be used to evaluate changes to reservoir performance caused by geomechanical effects, and assess how the stress fields in both the reservoir and the overburden are influenced by different production schedules, well configurations, and injection programs.

Model unconventional reservoirs

The ECLIPSE simulator facilitates simulation of different types of unconventional reservoirs including coalbed methane, shale gas, shale oil, and naturally fractured reservoirs. Unconventional reservoirs typically have nano-darcy permeability, complex fracture networks from natural and induced fractures, and adsorbed gas in organic materials in the rock matrix. Capabilities include dual porosity, dual permeability modeling as well as multiporosity modeling supporting detailed study of transient behavior in the matrix, including rock compaction effects.

Advanced wells and field management

The ECLIPSE advanced well model enables realistic modeling of highly deviated, horizontal, and multilateral wells with advanced completions and inflow control devices. The key advantages are the ability to accurately represent the well configuration, wellbore fluid dynamics, and flow control devices.

The ECLIPSE simulator enables users to easily simulate any field development strategy and can allow extensibility for coupling to external simulators. Every well (or group of wells) in the simulation can have production/injection rates and pressure targets. In addition, dedicated models support gas field operations, gas lift optimization, surface networks, and reservoir coupling.

Petrel reservoir engineering environment

The Petrel software platform integrates the multidisciplinary workflows of the ECLIPSE simulator, providing transparent data flows and an intuitive graphical user interface for reservoir engineering. The Petrel platform is the ideal environment for simulation pre- and post-processing, with key supporting workflows including advanced gridding and upscaling, assisted history matching, uncertainty and sensitivity analysis, and well path and completion design.

software.slb.com/eclipse

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