

Permedia™ Suite Software

Petroleum Systems Software

KEY FEATURES

*Integrate basin-scale and
reservoir-scale processes*

*Extensible; add custom source rock and
fluid reactions via scripts and plugins*

*Reservoir filling; integrate well,
petrophysical and seismic datasets, then
forward model emplaced fluid volumes*

*The best fluid migration
simulator in the industry*

*Co-render and analyze data
from multiple packages and
across all length scales*

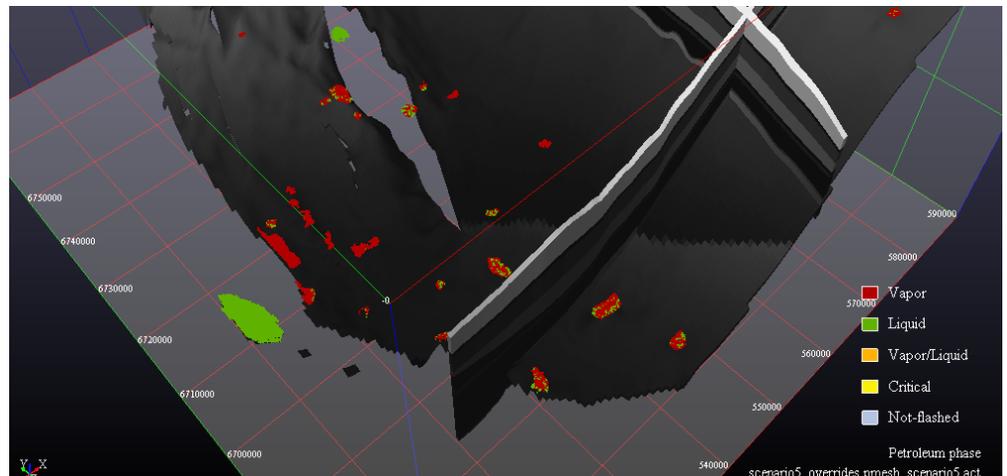
*Works with your existing
data and applications*

OVERVIEW

The industry faces many challenges while exploring and drilling for hydrocarbons in complex geologic environments, including unconventional, deep-water, and sub-salt plays. The rising cost and economic risk of developing these plays is high.

With Permedia™ Suite software, upstream oil companies can quickly and reliably evaluate the viability of their petroleum exploration and production efforts, improve exploration success, and optimize asset development. The software features an unmatched set of simulators and tools designed to provide insight and understanding of complex, fluid-oriented processes operating at basin and reservoir scales.

Permedia Suite software includes a high-resolution petroleum migration simulator that rapidly simulates multi-phase flow behavior in porous, faulted and fractured media to predict petroleum migration trajectories and highly detailed petroleum emplacement patterns. By integrating basin simulation results into exploration workflows, it is possible to highlight optimum sweet spots for both conventional and unconventional resource plays.



Filling a field-scale model using Reservoir Filling

BENEFITS

Basin- to Reservoir-Scale Models

Permedia simulation technology enables integration of regional, basin, and reservoir datasets in a single environment, giving you the big picture and the details on the relationships between exploration and production.

Better Assess Frontier Exploration Risk

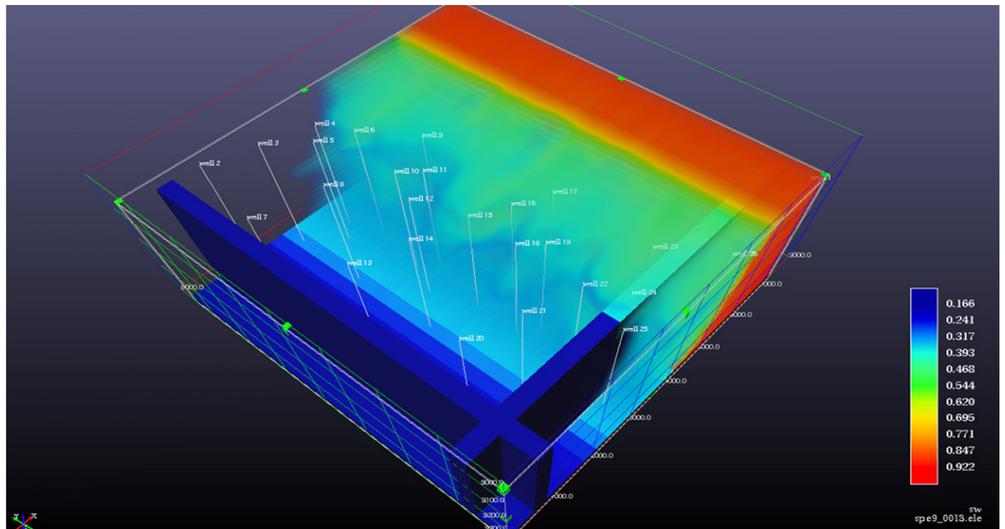
Advanced high-resolution simulation of petroleum fluid flow within basin- and reservoir-scale models enables geoscientists to better assess the elements of frontier exploration risk such as source, migration, reservoir, seal, and trap. It also improves confidence in predicting reservoir potential by reflecting parameter uncertainties and quantifying risk associated with basin and reservoir-scale models.

Optimize Asset Development

Permedia Suite software offers fluid-based workflows such as trap volume analysis (reserve estimation), seal analysis, reservoir compartmentalization analysis, petroleum composition, and quality analysis to ensure high value application in asset development of deepwater, sub-salt, and unconventional scenarios. This includes heavy oil, shale, the complex reservoir geometries of tight gas sands, and CO2 sequestration projects.

FEATURES

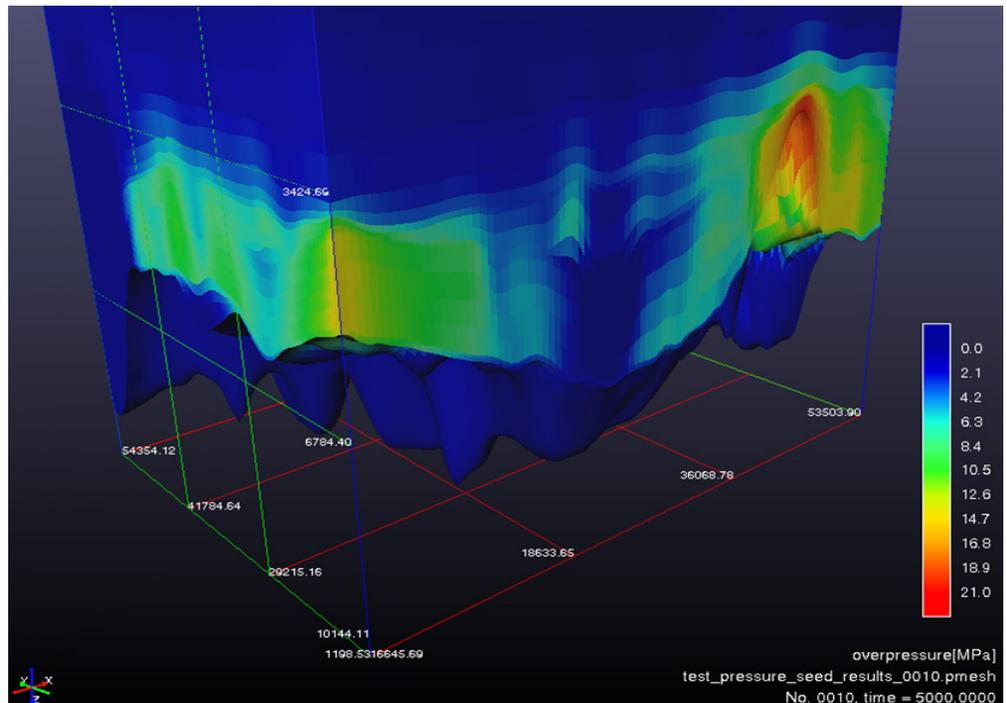
Permedia Suite software delivers petroleum systems technology for basin- and reservoir-scale modeling. The software models basin-scale processes over geological time to help geoscientists evaluate source rock potential, migration, reservoir trap and seal characteristics, reservoir filling, and fluid composition prediction. Permedia Suite software incorporates the basin modeling tools of Permedia Petroleum Systems software, and adds reservoir fluid modeling, including Reservoir Filling, Pressure and Tracers, Fluid Mixing and Black Oil Simulator.



Black oil reservoir simulation

The software's reservoir tools fill the gap between basin and reservoir simulation: while basin models lack the resolution to understand detailed filling processes, and classical reservoir simulators are not designed to handle geological timescales, Permedia Suite software's reservoir tools integrate reservoir and basin workflows. For reservoir engineers, the reservoir tools provide insights into observed composition variations, fluid continuity assessments, and pressure/fluid property compartmentalization. For

basin modelers, the reservoir tools enable the simulation of detailed reservoir charge and filling models that honor the controlling physics and fluid chemistry.



Evaluate high-resolution flow and connectivity with pressure tracers

Reservoir Filling

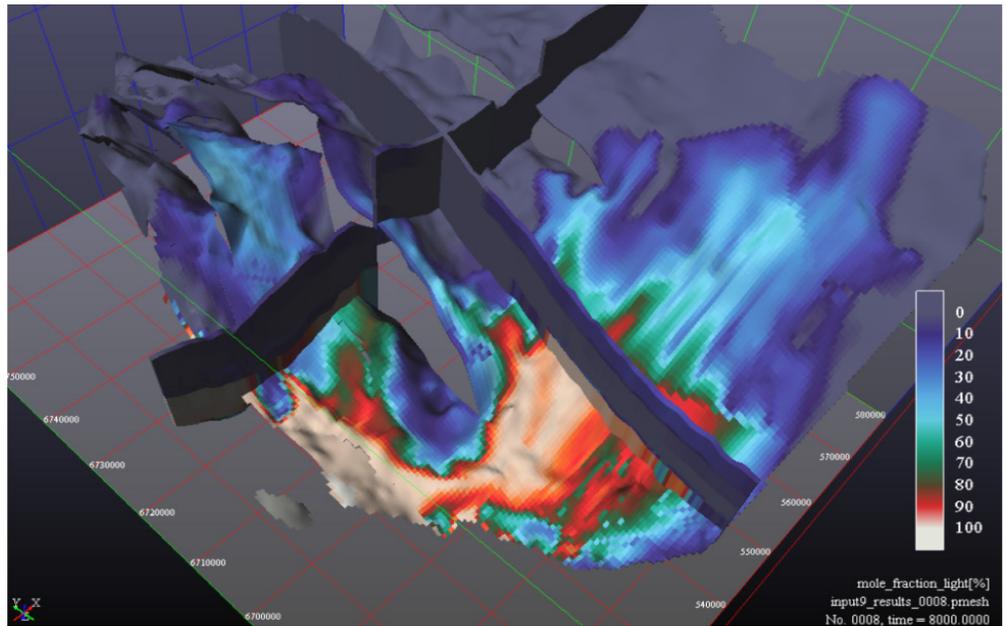
Using Reservoir Filling, you can set various source and sink points and “fill” a high-resolution reservoir or field scale model. The tool is used to evaluate and rank your geological models, quantify containment potential (reserves), and assess connectivity and compartmentalization. Reservoir Filling runs natively on all major mesh formats, including Permedia, Roxar®, GOCAD® and Eclipse™ software. Reservoir Filling uses Permedia software’s advanced Migration simulator, benefiting from its speed and advanced features, including tilted contacts and reactions.

Pressure and Tracers

Pressure and Tracers generates a pressure and velocity field from any volume (structured or unstructured mesh) with sources and sinks (typically injector and production wells). Dope fluids with any number of numerical tracers to track the movement of the fluids. Typical applications include evaluating dynamic connectivity of geostatistically-generated reservoir models, identifying pressure compartmentalization, pre-screening reservoir models prior to full production simulation and for many ground-water flow applications.

Two Component Miscible Mixing

Permedia Fluid Mixing can take any two end-member fluids and mix them according to their responses to convection, diffusion and dispersion. The fluids are assumed to be miscible, but may be compressible. Applications include the mixing of two distinct oils, querying gravity segregation and convection drive during reservoir filling and injecting CO2 into saline aquifers.



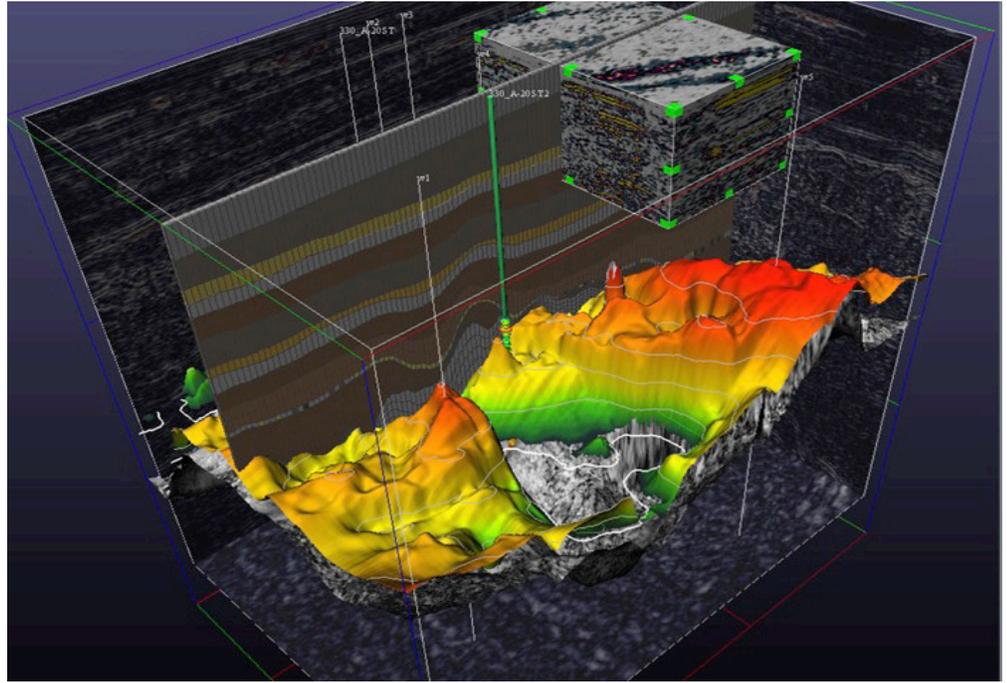
Compositional reservoir filling and mixing

N-Component Mixing

Fluid Mixing includes n-component and multi-phase support. This tool is effectively a compositional reservoir simulator, albeit one that speaks the language of petroleum systems modelers. This full-physics simulator is designed to model reservoir filling and mixing processes that can take place over hundreds of thousands, or millions of years. Processes such as molecular, pressure and thermal diffusion are included. Links with Migration make it the ideal tool for understanding filling and mixing behavior.

SEE YOUR DATA IN CONTEXT

Permedia Suite software includes a complete set of analysis and visualization tools, including a full OpenGL-accelerated 3D visualization environment, a suite of mapping analysis tools, a Well Viewer for analyzing well data, as well as powerful reporting tools for querying and analyzing data. Co-render and analyze data from multiple packages to get a whole new perspective on the complex plumbing of petroleum systems.



Co-render dozens of file types in 3D Viewer

System and Software

OPERATING SYSTEMS

Red Hat® Enterprise Linux® 4/5, 64 bit

Windows® XP/Vista/7, 64 bit

DATA SUPPORT

Use Permedia software seamlessly with your existing tools. Now compatible with Landmark's OpenWorks® database, the software reads files created by virtually every major package, including Temis, PetroMod, Eclipse, Irap™, TrapTester, and GOCAD applications, as well as industry-standard seismic, map, and well files:

- Basin modeling tools support PetroMod and Temis 2D/3D meshes
- Reservoir modeling tools support Eclipse and Irap meshes
- Add faults using data derived from Badley's TrapTester, or GOCAD surfaces
- Geostatistical data - reads GSLib volumes
- Seismic surveys - supports SEGY data from a variety of sources, and reads VoxelGeo volumes
- Cultural data - co-render cultural data from Landmark's Z-Map Plus™, GOCAD, Irap, and Temis applications
- Well data - reads all industry-standard well formats (Irap ASCII well file, GOCAD wells, LAS well file), supports well markers and zones, and writes to GOCAD well format
- Mapping - reads all industry-standard mapping formats (Beicip, Z-MAP 2D Regular Grids, Generic 2D Regular Grid, Irap Grids, Grass 2D Raster Map, CPS-3 2D Regular Grid), and writes to Z-Map Plus, Beicip and Irap formats
- Native GOCAD support - provides native support for most standard GOCAD objects
- Migration simulation results can be output to several volume and map formats, including Z-Map Plus and GOCAD formats

“With Permedia software, we were able to show that what we thought was a reservoir compartmentalization problem was actually a poor understanding of how fluids mix in reservoirs over geological timescales.”

GEOCHEMIST, WOODSIDE ENERGY

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