xOptimPVT™

Next-Generation PVT Fluid Modeling and Analysis:
Automated. Accurate. Efficient.

Technical Catalogue

SEDA GROUP
SMART ENERGY DATA ANALYTICS

Table of Contents

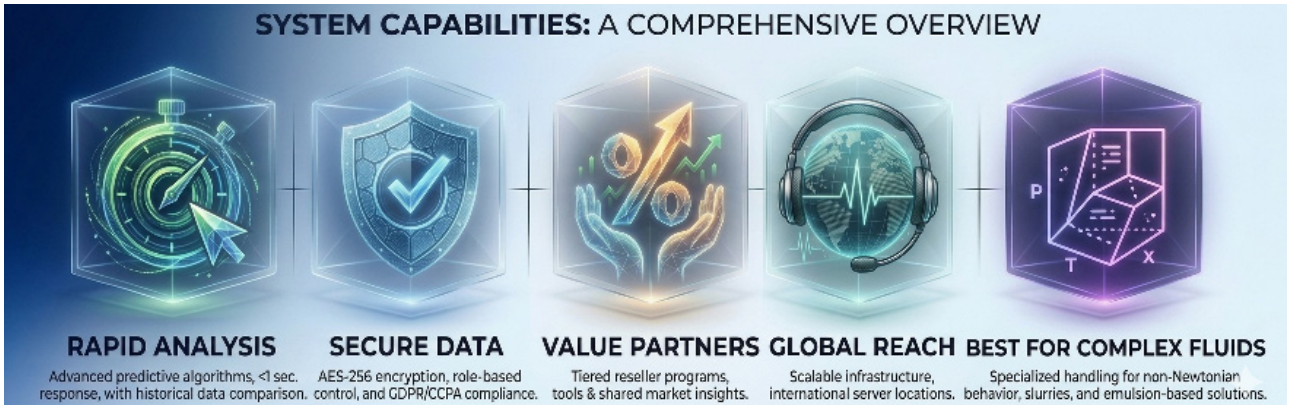
About PVT

PVT (Pressure-Volume-Temperature) software is one of the most important engineering tools used in the petroleum and energy industry for understanding the physical and thermodynamic behavior of reservoir fluids. Reservoir fluids are highly complex mixtures of hydrocarbons, water, gases, and other components whose properties continuously change as pressure and temperature vary during drilling, production, transportation, and processing operations. Accurate prediction of these changes is essential for reservoir management, production optimization, facility design, flow assurance, and economic evaluation.

xOptim™PVT is a comprehensive thermodynamic and fluid characterization software platform developed to accurately model and predict fluid behavior under reservoir and surface operating conditions. The software performs rigorous phase equilibrium and thermodynamic calculations to simulate fluid behavior from the reservoir pore space through the wellbore, pipelines, separators, and processing facilities. It supports both black-oil and compositional fluid modeling approaches and can represent single-phase and multiphase systems across a wide range of pressure and temperature conditions. A key strength of **xOptim™PVT** is its ability to model the complete spectrum of petroleum and geothermal fluids encountered in the energy industry, ranging from dry gases and wet gases to gas-condensates, volatile oils, black oils, heavy oils, extra-heavy oils, geothermal brines, and complex reservoir fluid systems. The software is designed to provide reliable and consistent predictions for both conventional and unconventional reservoirs, ensuring accurate fluid characterization regardless of fluid type or reservoir complexity.

The software provides advanced Equation of State (EOS) modeling capabilities for fluid characterization, laboratory data regression, fluid property prediction, separator optimization, gas injection studies, depletion analysis, production forecasting, and compositional simulation support. **xOptim™PVT** enables engineers to match laboratory PVT measurements, construct representative reservoir fluid models, and evaluate fluid performance throughout the life cycle of an oil and gas asset. One of the distinguishing features of **xOptim™PVT**is its comprehensive quality-control (QC) framework. The software incorporates advanced thermodynamic consistency checks, laboratory-data validation procedures, automated error detection algorithms, and diagnostic tools that allow engineers to identify measurement inconsistencies and ensure the highest possible confidence in experimental data and fluid models. The platform has been designed to provide one of the industry's most complete environments for PVT data quality assurance, helping minimize uncertainty and significantly improving the reliability of engineering studies and development decisions.

About PVT



xOptim™PVT supports the full range of standard and advanced PVT laboratory experiments used throughout the petroleum industry, including Constant Composition Expansion (CCE), Constant Volume Depletion (CVD), Differential Liberation (DL), separator testing, swelling studies, gas injection evaluations, slim-tube experiments, viscosity measurements, density measurements, saturation pressure determination, compositional analysis, fluid characterization, interfacial tension measurements, and EOS regression and tuning studies.

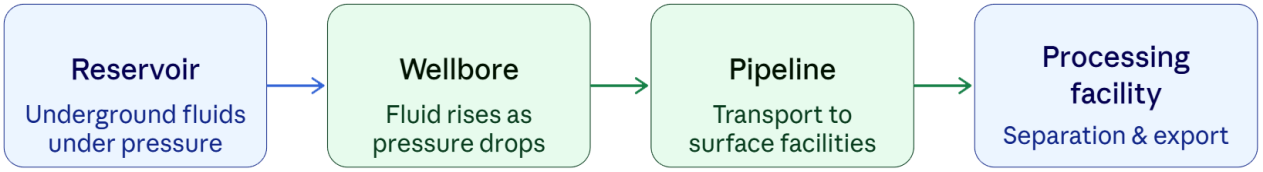
The software provides an integrated workflow for managing, analyzing, validating, and interpreting laboratory data from all major PVT test types. The software calculates and predicts a wide range of critical engineering and thermodynamic properties, including density, specific gravity, viscosity, gas-oil ratio, formation volume factor, compressibility, thermal expansion coefficients, bubble-point pressure, dew-point pressure, phase envelopes, critical properties, surface and interfacial tensions, enthalpy, entropy, fluid compositions, phase distributions, relative phase volumes, saturations, and gas and liquid compressibility factors. In addition to conventional PVT analysis, **xOptim™PVT** incorporates advanced flow-assurance capabilities. The software can evaluate and predict production challenges such as asphaltene precipitation, wax precipitation, and hydrate formation under varying pressure and temperature conditions. Integrated sensitivity-analysis and uncertainty-evaluation tools allow engineers to assess operational risks and optimize production strategies before costly field problems occur.

The software includes powerful visualization and reporting tools that allow users to generate phase diagrams, pressure-temperature plots, fluid property trends, compositional analyses, EOS tuning diagnostics, laboratory-data QC reports, uncertainty evaluations, and sensitivity studies. Its computational efficiency enables rapid analysis of large fluid datasets while maintaining the thermodynamic rigor required for demanding engineering applications. Furthermore, **xOptim™PVT** has been designed as a unified platform that bridges laboratory measurements, thermodynamic modeling, flow-assurance studies, reservoir engineering workflows, production-system analysis, and facility-design applications. The software provides a streamlined environment for data management, model development, validation, forecasting, and reporting, enabling engineers to move efficiently from raw laboratory measurements to field-scale engineering decisions.

By combining advanced thermodynamic models, robust numerical methods, industry-leading quality-control procedures, comprehensive experimental coverage, and broad fluid applicability from light gases to extra-heavy oils, **xOptim™PVT** provides a complete next-generation platform for fluid characterization and PVT analysis. The software supports reservoir engineers, production engineers, flow-assurance specialists, and facility designers in improving decision-making, reducing operational risks, optimizing production systems, maximizing hydrocarbon recovery, and enhancing overall asset value.

Who Uses It

PVT software is used by:
Reservoir engineers; to build accurate fluid models for simulation
Production engineers; to optimize well and separator performance
Drilling fluid specialists; to optimize drilling fluids and well hydraulics.
Flow assurance teams; to predict and prevent blockage in near-wellbore, wellbore, pipeline and equipment
Process Engineers, to evaluate fluid properties for process design



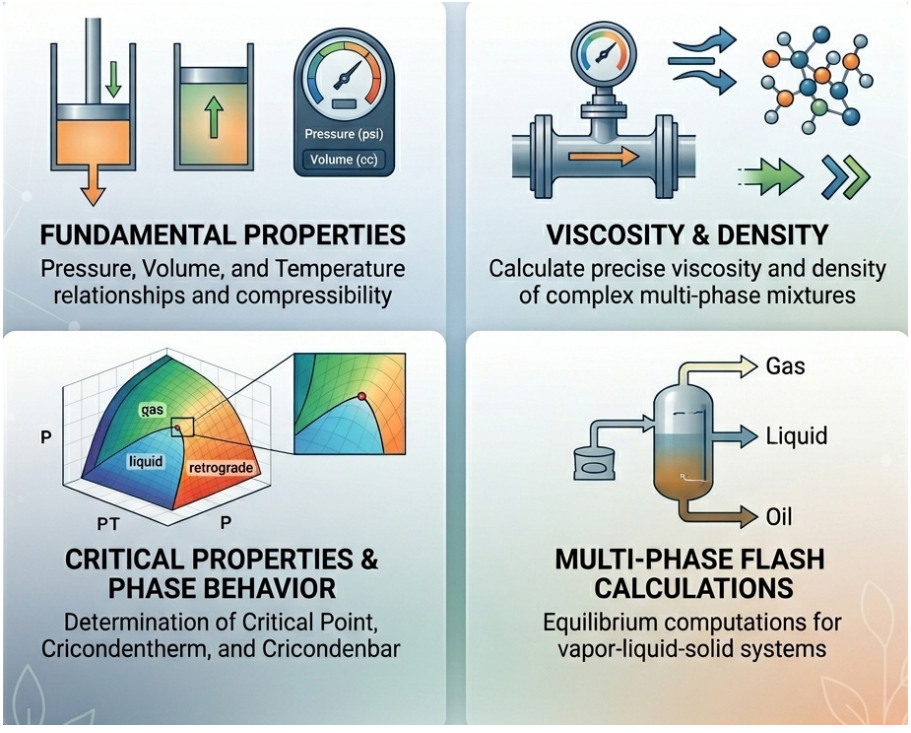
Why It Matters

Without accurate PVT characterization, reservoir performance predictions become unreliable — leading to inefficient field development and increased operational costs.

What PVT Software Calculates

Key fluid properties modeled include:

- Density, viscosity, and compressibility
- Gas-oil ratio (GOR) and formation volume factor (FVF)
- Bubble point and dew point pressure
- Phase envelopes and critical properties
- Enthalpy, thermal properties, and interfacial tension and Miscibility



Advantages

xOptimPVT™

Our PVT analysis delivers more accurate, stable, and representative reservoir evaluation.

ACCURATE PHASE BEHAVIOR FOR COMPLEX FLUIDS

Reliable phase prediction for volatile oils, some black oils, heavy oils, and gas condensates across a wide range of conditions.

RELIABLE NEAR-CRITICAL REGION MODELING

Robust performance and stable predictions in near-critical regions where conventional methods often struggle.

HIGH-QUALITY QUALITY LINES

Accurate generation of quality lines for precise saturation pressure (Psat) calculation and consistent phase behavior tracking.

IMPROVED FLASH CALCULATION ACCURACY

Higher convergence reliability and accuracy in multi-phase flash calculations across different fluid types and conditions.

SMART SPLITTING & LUMPING

Advanced splitting and lumping strategies preserve critical behavior and composition integrity with higher accuracy.

BINARY COEFFICIENTS SUPPORTED

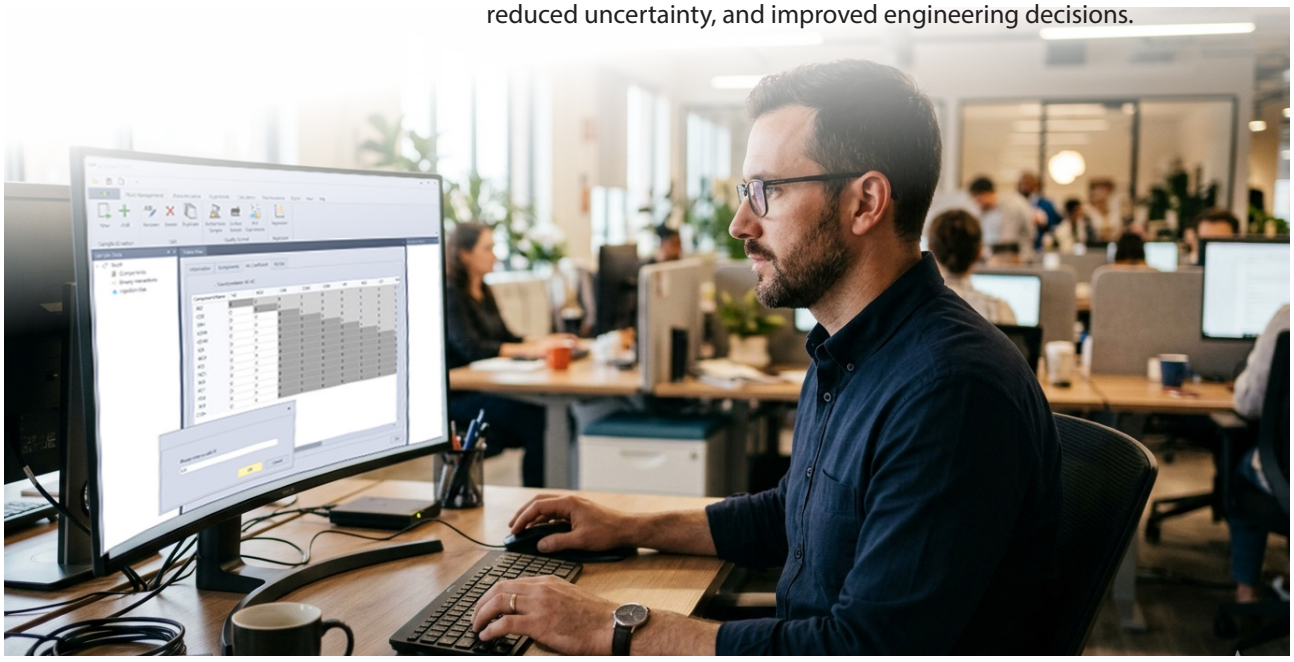
Activation of binary interaction coefficients for improved EOS matching, better phase behavior, and more reliable PVT results.

NUMERICAL STABILITY INDICATION

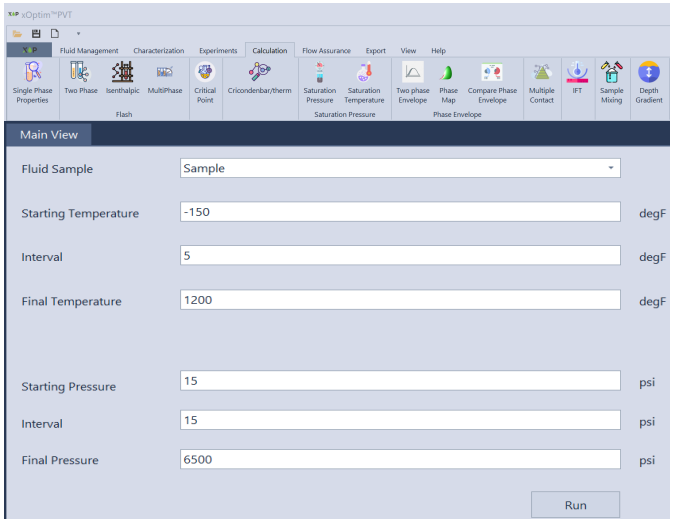
Early detection of numerical or algorithmic instability to alert potential issues and avoid misleading results.

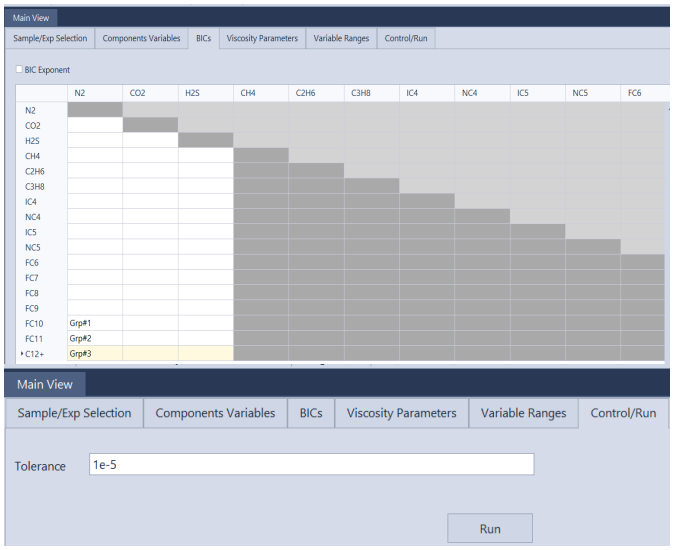
MORE ACCURATE & REPRESENTATIVE RESERVOIR EVALUATION

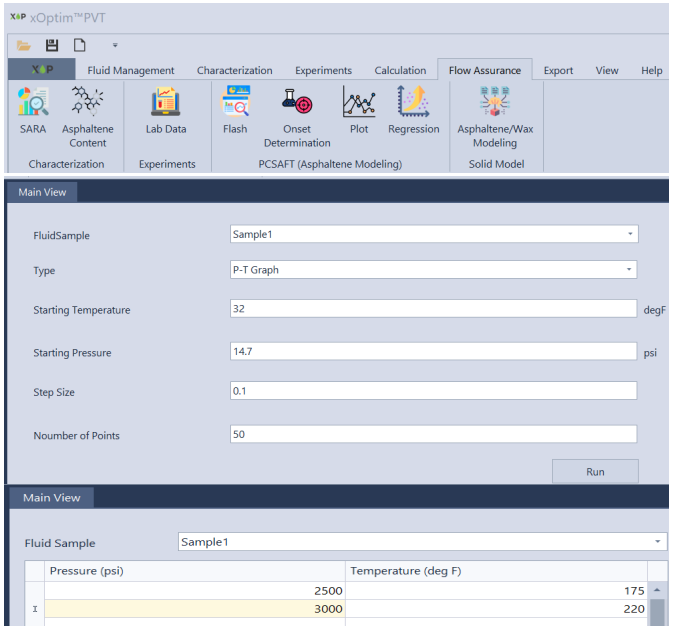
More reliable PVT data leads to better reservoir characterization, reduced uncertainty, and improved engineering decisions.



Key Capabilities







OVERVIEW

xOptim™PVT delivers a comprehensive suite of thermodynamic calculations, fluid characterization tools, and flow assurance modules all within a single, integrated environment.

Phase Behavior Modeling

- Plot phase envelopes with full quality lines
- Generate phase maps for complex fluid systems
- Critical point determination
- Cricondentherm and cricondenbar calculation
- Single-phase property calculation

Flash Calculations

- Two-phase and multiphase flash
- Isenthalpic flash
- Saturation pressure and temperature determination

EOS Parameter Regression

Tune equation-of-state models to laboratory data including:

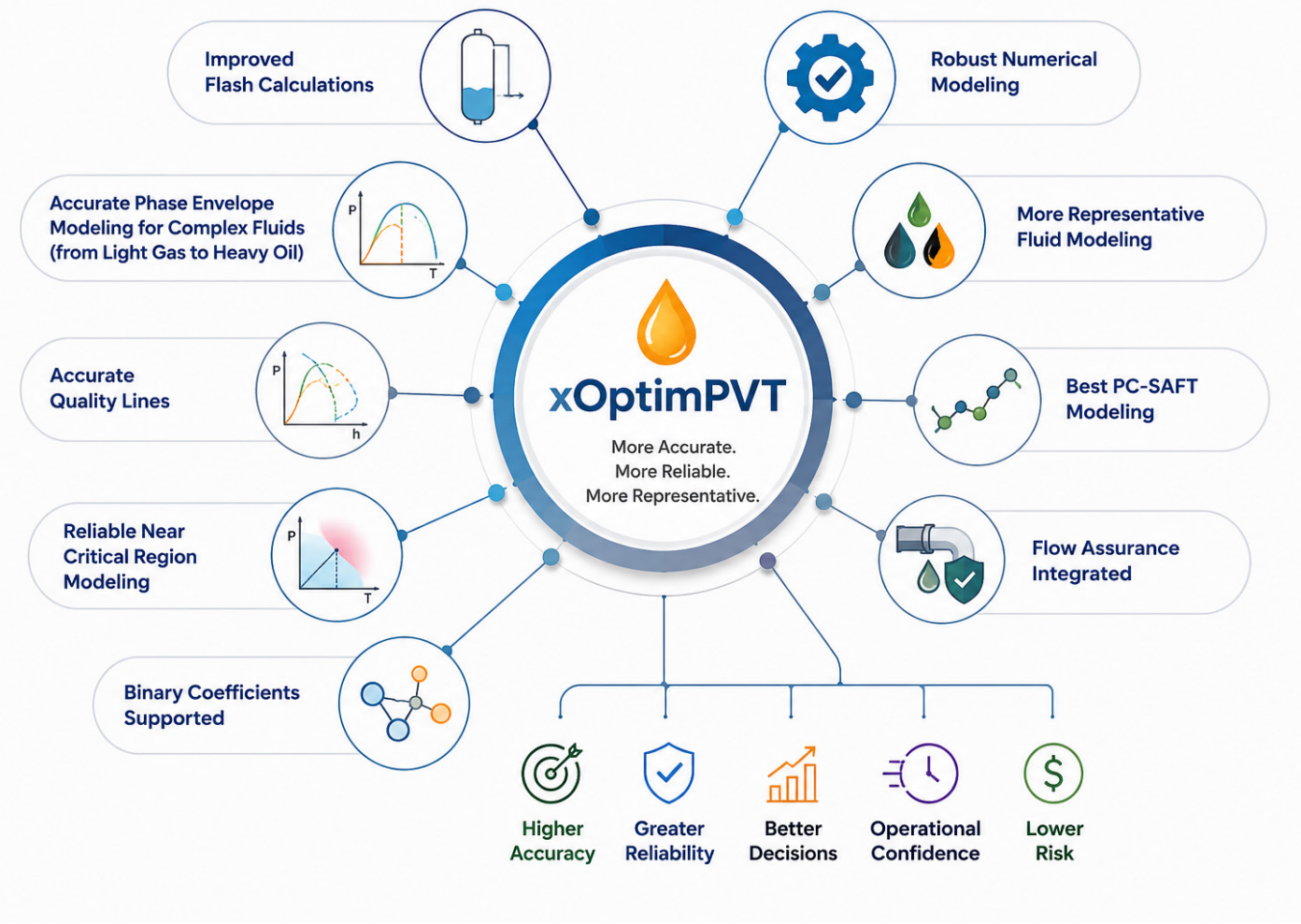
- Constant composition expansion (CCE)
- Constant volume depletion (CVD)
- Differential liberation (DL)
- Separator tests, swelling tests, slim tube experiments
- Viscosity measurements and EOR studies

Flow Assurance Module

- Asphaltene precipitation
- Wax formation and paraffin buildup analysis
- SARA analysis and asphaltene content determination
- PC-SAFT equation of state for asphaltene/ wax systems
- Gas hydrate modeling
- Scale precipitation for Geothermal brines (January 2027)

How We Outperform

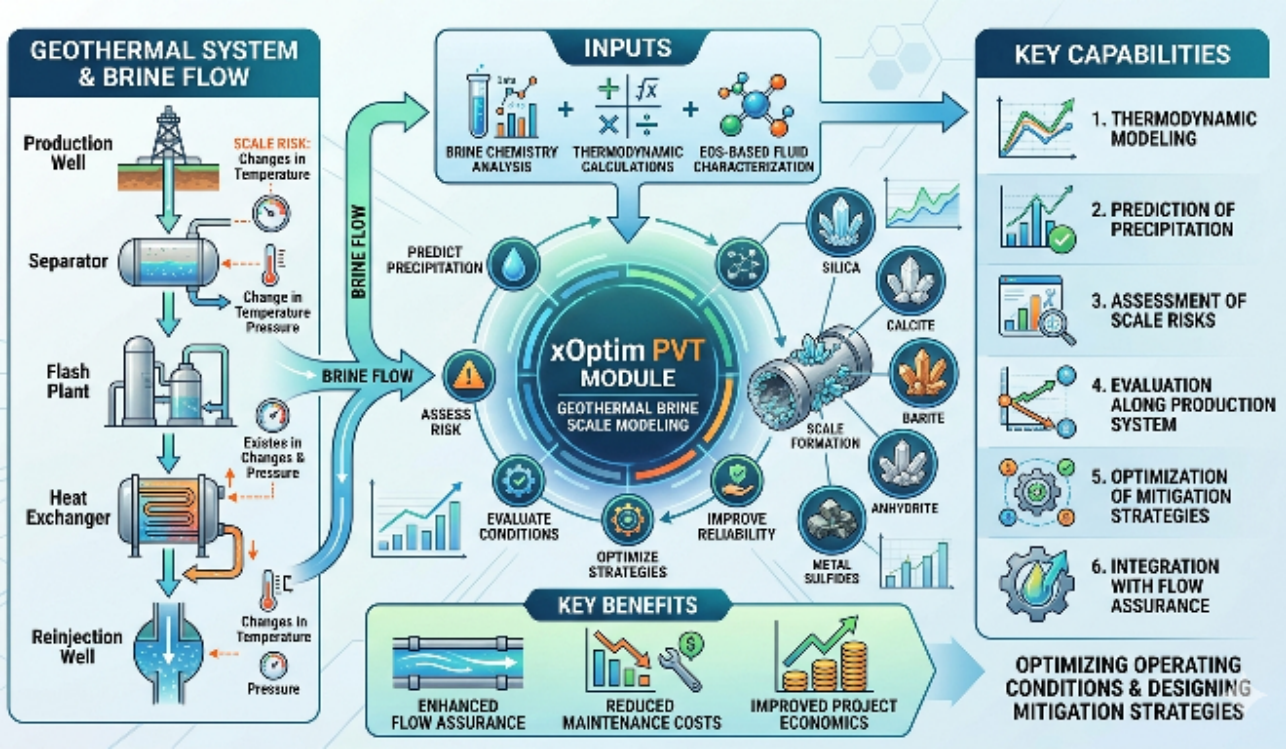
Most conventional PVT software tools struggle with complex, real-world reservoir fluid systems. When fluid behavior becomes non-linea, near critical conditions, with activated binary interaction coefficients, or in volatile and condensate systems, competing tools fail to converge or produce reliable results.



Geothermal brine scale modeling is an advanced feature of the xOptim PVT module that enables the prediction and management of mineral scale deposition during geothermal energy production. By combining comprehensive brine chemistry analysis with thermodynamic calculations and Equation of State (EOS)-based fluid characterization, the software evaluates the risk of scale formation resulting from changes in temperature, pressure, and fluid composition throughout the production system. The module predicts the precipitation of common geothermal scales such as silica, calcite, barite, anhydrite, and metal sulfides, helping engineers optimize operating conditions, design mitigation strategies, and improve the long-term reliability of geothermal wells and surface facilities. This capability supports enhanced flow assurance, reduced maintenance costs, and improved geothermal project economics.

Features:

- Thermodynamic modeling of geothermal brine behavior under reservoir and surface conditions.
- Prediction of scale precipitation due to pressure, temperature, and chemical composition changes.
- Assessment of silica, carbonate, sulfate, and sulfide scale formation risks.
- Evaluation of scaling tendencies along the entire production and reinjection system.
- Optimization of scale mitigation strategies, including chemical treatment and operating conditions.
- Integration with flow assurance workflows for improved geothermal asset performance and reliability.

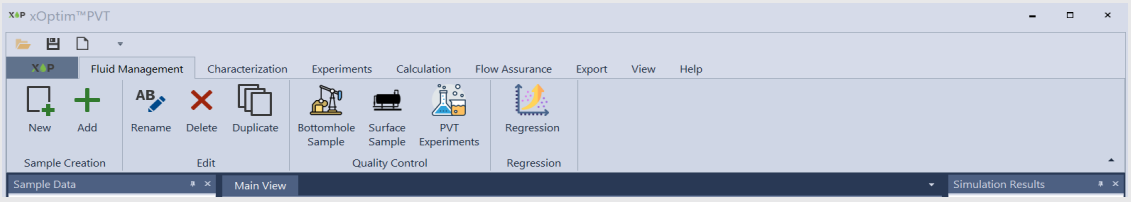


(To be in January 2027)

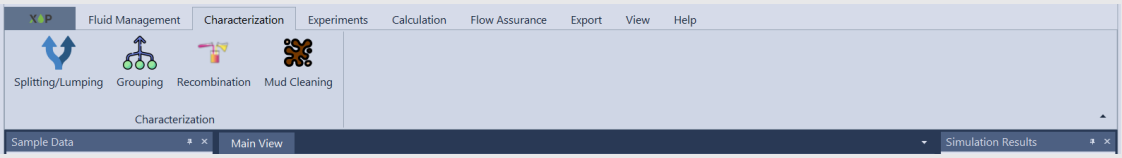
Software Environment

xOptim™PVT

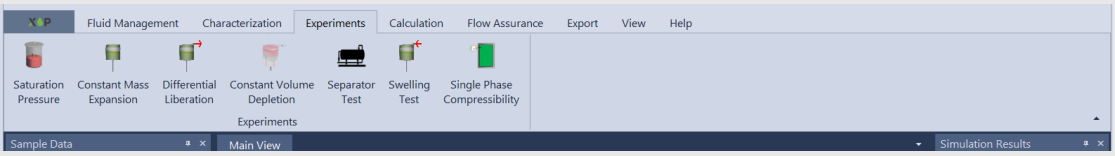
Fluid Management



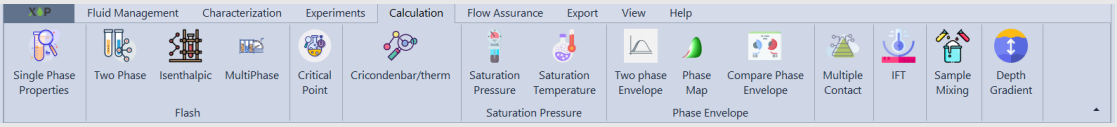
Characterization



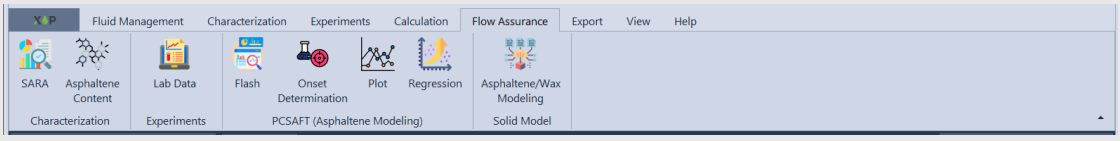
Experiments



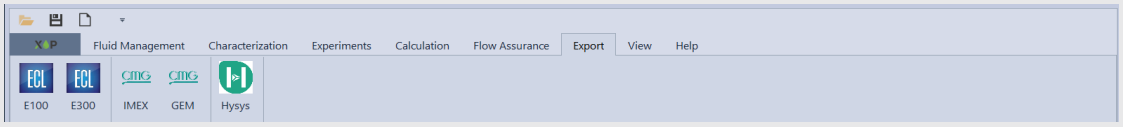
Calculation



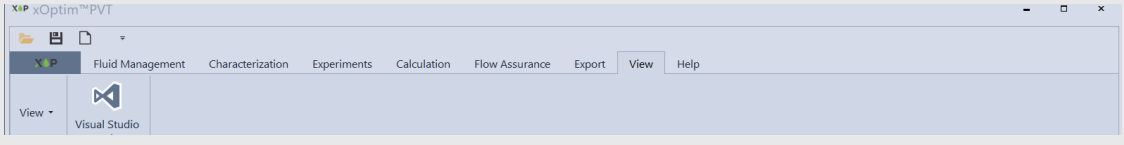
Flow Assurance



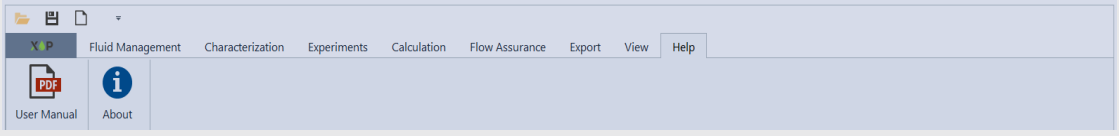
Export



View



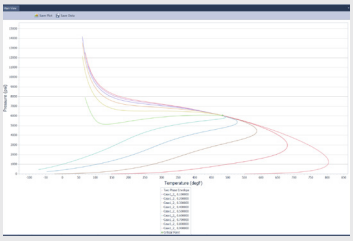
Help

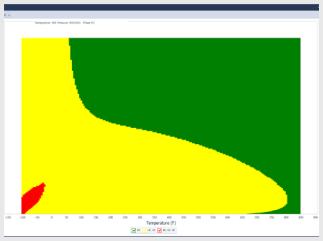


Verification & Case Studies

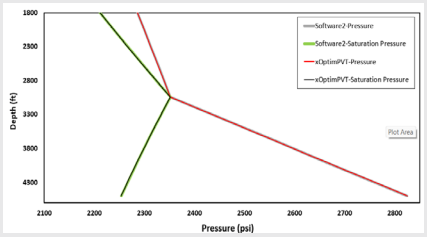
Volatile oils

Component	Mole %
N2	0.33
CO2	2.43
CH4	67.22
C2H6	5.85
C3H8	2.69
IC4	0.59
NC4	1.56
IC5	0.89
NC5	0.9
FC6	3.14
FC7	2.29
FC8	2.46
FC9	1.97
FC10	1.45
FC11	1.09
C12+	5.14

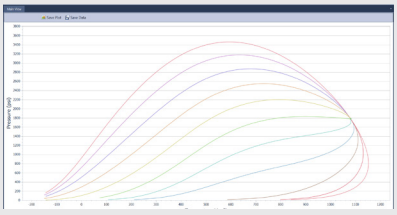


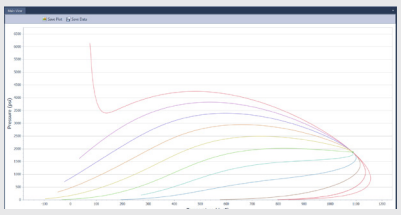


Isothermal

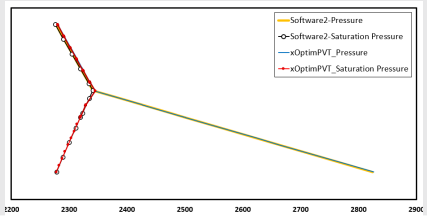


Black Oil

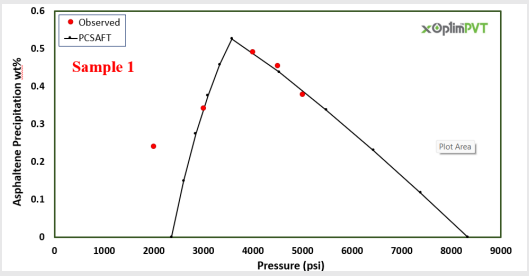


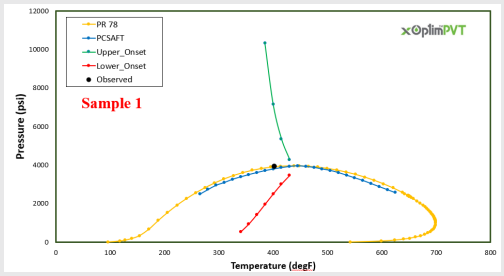


Thermal



Flow Assurance Asphaltene/Wax





Licening and Maintenance

xOptim™PVT licenses are available as Site licenses, which are convenient for multiple users at the same Site who can access a license server on the network. Site licenses are run using the FLEXlm license manager. Standalone licenses are also available as a dongle that can be plugged into the USB port of a computer. Calsep offers a maintenance arrangement for an annual fee. This fee covers any updates in **xOptim™PVT**, bug fixes, access to Client Area on Calsep.com and superior technical support from Calsep consultants. To run PVTsim, minimum hardware requirements include: 1 GB RAM and 1 GB free disk space, a minimum resolution of 1920 x 1080 with 125% scaling, 64-bit Windows 10 or Windows 11.

Modules and Models We Present

Module	Basic	PVT Lab	Reservoir	Production & Flow Assurance	Full Package
Base	✓	✓	✓	✓	✓
OBM Cleaning		✓	✓	✓	✓
QC		✓	✓		✓
Flash & Units				✓	✓
Basic PVT Simulation & Regression	✓	✓	✓	✓	✓
EOR and Multifluid PVT & Regression		✓	✓		✓
Property Generation		✓	✓	✓	✓
Composition Estimation			✓		✓
Asphaltene				✓	✓
Wax				✓	✓
Hydrate				✓	✓
Scale (January 2027)					✓

Headquarter: 5000 Gulf Freeway, Bldg.4, Room 230,
UH Division of Energy and Innovation, Houston, Texas 77023

+1 (346) 574 -7825

info@sedagrp.com