# OLI Studio: ScaleChem

OLI Studio: ScaleChem is simulation software that predicts scaling problems during oil and gas production. ScaleChem simulates fluid production from the reservoir to the sales point, and computes the phase mass balance, scale tendencies, and scale mass of production fluids at each location in the production line.

Key ScaleChem attributes include:
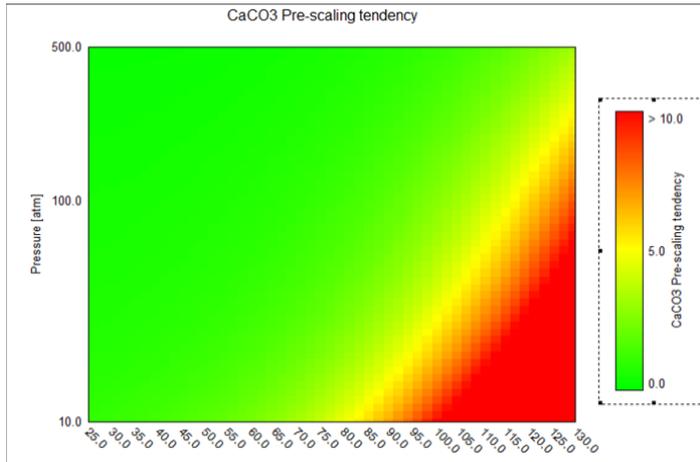
✓ Process-oriented, allowing step-by-step visualization of the application

✓ Full phase equilibrium, including vapor, brine, oil and multiple solid phases

✓ Quantitative partitioning of acid gases and volatile fatty acids across the vapor-brine-oil phases

✓ Mix and separate calculations that can be used to model production facilities

✓ Database that covers non-standard scales and exotic chemistry.

✓ Professionally-maintained software (not subject to academia transitions)

Capabilities and Features

ScaleChem Standard, and now Studio: ScaleChem are an industry standard for production chemistry simulation. Co-developed with Shell and built on OLI's mechanistic standard-state and excess Gibbs energy models, ScaleChem calculates saturation ratios and excess solute for hundreds of solid phases, including the standard oilfield scales.   Other key capabilities include:

✓ State-of-science activity model capable of predicting MEG- and MeOH-containing fluids to 100% solvent

✓ Equation of state that reaches 3000+ bar and 350 °C, or all production wells in existence.

✓ Mass balance calculations from the simulation input to the final calculation

✓ Phase equilibrium calculations used to perform four-phase reservoir saturation, from which a whole fluid reservoir composition is determined

✓ Mixing and separating phases, vapor, gas, oil, and solids during production facilities processing

✓ Contour plots to study produced brine properties across a broad temperature and pressures range

✓ Saturation ratios and excess solute calculated at user specified conditions plus formatted reports and solid formation is given at each point

✓ Compatibility testing of brines using the stream Mixing function

✓ Seamless interface to OLI Studio: Corrosion Analyzer for additional studies

✓ Pure component, assay, and pseudocomponent representation of the oil phase, plus phase partitioning of H_2O, CO_2, H_2S, and organic acids in the oil.

✓ Ion input for Zn^{+2}, Pb^{+2}, Al^{+3}, F^{-1}, $Fe^{+2/+3}$, SiO_2, and Ra^{+2} as part of an 80-element database, plus the corresponding solid phases.

✓ Chemical capabilities for completion fluids, like $ZnBr_2$, Cs formate, $CaBr_2$.

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Calculation Functions

ScaleChem is unique among OLI Studio tools in that it is designed specifically for *predicting mineral scale risk during oil and gas production*. Thus, the nine ScaleChem objects are optimized to help clients answer questions quickly and comprehensively. These objects fall into three general categories listed below.

Data entry objects	Equilibrium Saturation	Scale Assessment
Brine Analysis	(Reservoir) Saturator	Scale Scenario
Gas Analysis	Hydrocarbon Saturation	Scale Contour
Oil Analysis		Facilities
		Mixing Waters

Applications

The comprehensive thermodynamic framework and the flexible and optimized interface allows for many types of production chemistry calculations. Here are a few examples.

✓ Evaporative scaling of NaCl during high gas-water ratio production

✓ Reservoir saturation in dolomitic reservoirs enabling more accurate predictions in Permian fields

✓ Gas-lift injection, and effects of gas composition and hydration on scaling

✓ Mixing multiple waters at a gathering location and impact of varying flow rates

✓ Seawater injection and ion-stripping due to precipitation and adsorption reactions (also requires Stream Analyzer and DynaChem)

✓ Early-, mid-, and late-life studies, including changes in reservoir conditions and phase flow rates

✓ Ultra-HPHT reservoir fluid compositions that are part of future asset development
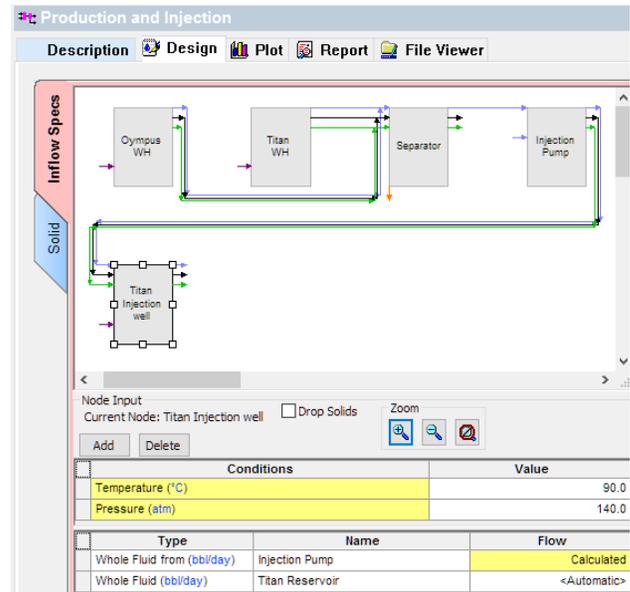
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Components of the OLI Studio include:

OLI Studio: Stream Analyzer for in-depth chemistry studies of your electrolyte chemistry
OLI Studio: Corrosion Analyzer for the electrochemistry of aqueous corrosion
OLI Studio: ScaleChem in-depth chemistry studies for oilfield applications