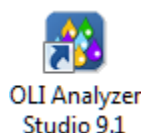This document describes how to generate the OLI Engine: PIPESIM PVT File from within OLI Studio: ScaleChem. The OLI Engine: PIPESIM PVT File license is available upon request for clients of OLI Studio 9.1 Build 3 or later versions.

✓ Launch the software

When the software launches, the screen opens to the OLI Studio interface. The initial screen shows several panes or boxes, which clients can minimize, pin, and move using the corner icons, or by selecting View > Toolbars from the Menu Bar.

Relevant for this example are the Navigator, Actions, and Description/Definition panes. When inputting chemistry into the OLI Studio, clients "add" objects to the Navigator. The Description/Definition pane changes depending on which object is highlighted in the Navigator. Clients double-click an object in the Actions pane to add it to the Navigator or use Streams or Calculations in the menu bar. The Actions pane is also contextual as only certain calculation actions are available for active objects.
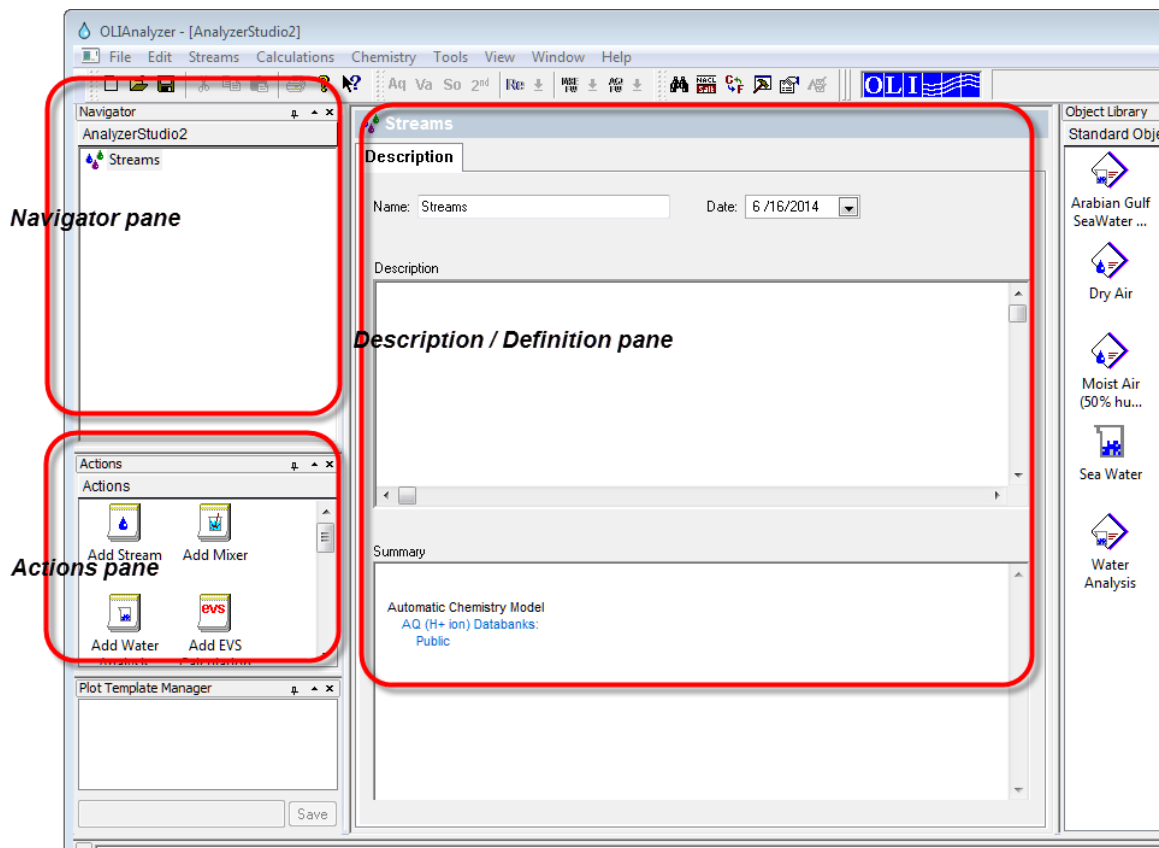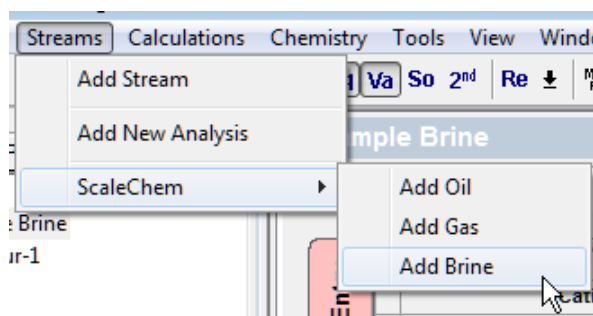

Initial OLI Studio Screen

To generate the OLI Engine: PIPESIM PVT File, clients will first need to build the chemistry associated with their application. In the example case presented here, we will add a hypothetical brine sample.

✓ In the Actions pane, double-click the Add Brine Analysis icon or select Streams > ScaleChem > Add Brine from the menu bar
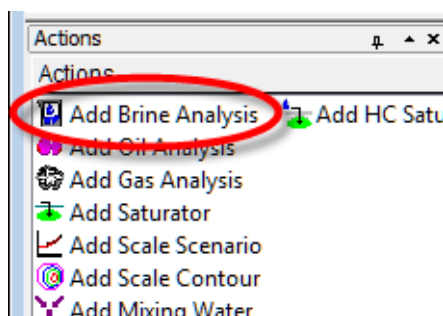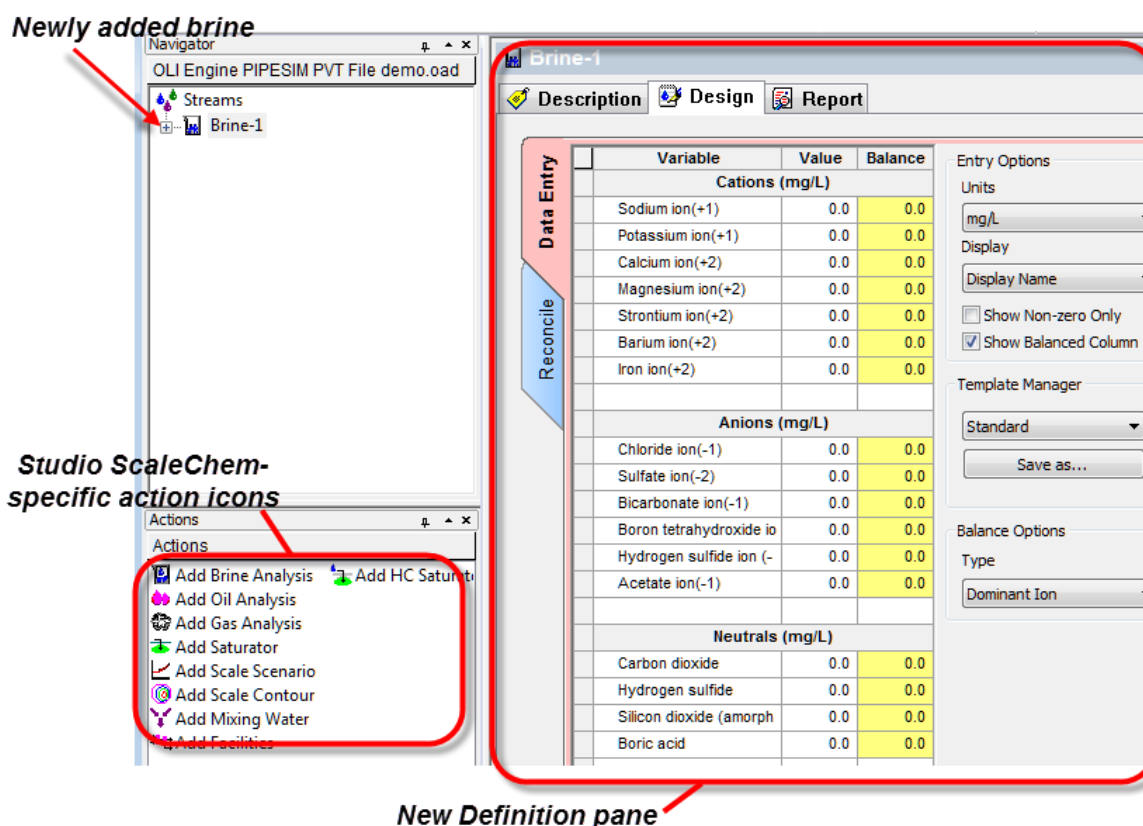

Add Brine Analysis icon in Actions pane   *Add Brine from the menu bar*

After adding the object, it appears as branch within the Global Streams icon in the Navigator pane. The Actions pane now shows only OLI Studio: ScaleChem-specific action icons.

The Definition pane has also changed and now shows three tabs: Description, Design, and Report. After adding an object, the software opens to the Design tab, which is where clients enter brine chemistry.

The Design tab has two vertical tabs: Data Entry and Reconcile. Clients enter cations and anions, and select a balance option in the Data Entry tab. Clients select a reconciliation type and enter measured (or reported or initial) conditions in the Reconcile tab.

Note that Data Entry list of ions represents common ions. A broader list is available using the Expanded option in the Template Manager dropdown menu. Also note that ion names can be shown with the Formula view using the Display dropdown menu.

For this sample, we will add ions in the Data Entry tab and keep the other options at default.

✓ Find the following ions in the Data Entry (shown with their formula and display name views) and give them appropriate concentration in the Value column

Cations		Value (mg/L)
Na+1	Sodium ion(+1)	36000
K+1	Potassium ion(+1)	300
Ca+2	Calcium ion(+2)	786
Anions		
Cl-1	Chloride ion(-1)	57000
SO4--2	Sulfate ion(-2)	198
HCO3-1	Bicarbonate ion(-1)	55
B(OH)4-1	Boron tetrahydroxide ion(-1)	.8

When finished, the screen will look like the one below (after selecting the Show Non-zero Only box).

Variable	Value	Balance
Cations (mg/L)		
Sodium ion(+1)	36000.0	36000.0
Potassium ion(+1)	300.000	300.000
Calcium ion(+2)	786.000	786.000
Anions (mg/L)		
Chloride ion(-1)	57000.0	57000.0
Sulfate ion(-2)	198.000	198.000
Bicarbonate ion(-1)	55.0000	55.0000
Boron tetrahydroxide	0.80000	0.80000

Entry Options
Units
mg/L
Display
Display Name
☑ Show Non-zero Only
☑ Show Balanced Column
Template Manager
Standard

✓ Select the Reconcile tab

✓ In the ph-Aqueous row, enter a pH of 7.67

✓ In the Density-Aqueous (g/ml) row, enter 1064

| pH - Aqueous	7.67000
Alkalinity - Aqueous (mg HCO3/L)	0.0
Density - Aqueous (g/ml)	1.06400

✓ Press the Calculate button or press the <F9> key

Although we will not evaluate these results in this example, clients can view reconciliation calculation results in the Calculated column, the Summary box in the Report tab.

Reconciliation Options
Reconciliation Type ⦿ Equilibrium Calculation
  ◯ CO2 Fraction in Gas
  ◯ pH Alkalinity Reconcile
☐ Allow solids to form
Calculate

Properties	Measured	Calculated
Temperature (°C)	25.0000	
Pressure (atm)	1.00000	
pH - Aqueous	7.67000	7.51581
Alkalinity - Aqueous (mg HCO3/L)	0.0	54.2847
Density - Aqueous (g/ml)	1.06400	1.06083
Elec Cond, specific - Aqueous (mho/m)	0.0	12.5984
Total Dissolved Solids (mg/L)	0.0	94339.8
Composition Adjustments		
Add Charge Balance (mg/L Chloride ion(-1))		0.0204036

Clients can add additional chemistry using the Gas Analysis and Oil Analysis objects. This example will only use the Brine Analysis, which is renamed to "Sample Brine."

✓ Double-click the Add Scale Contour icon in the Actions pane or select Calculations > ScaleChem > Add Contour from the Menu bar

Scale Contour icon in Actions pane

Add Contour in Menu bar
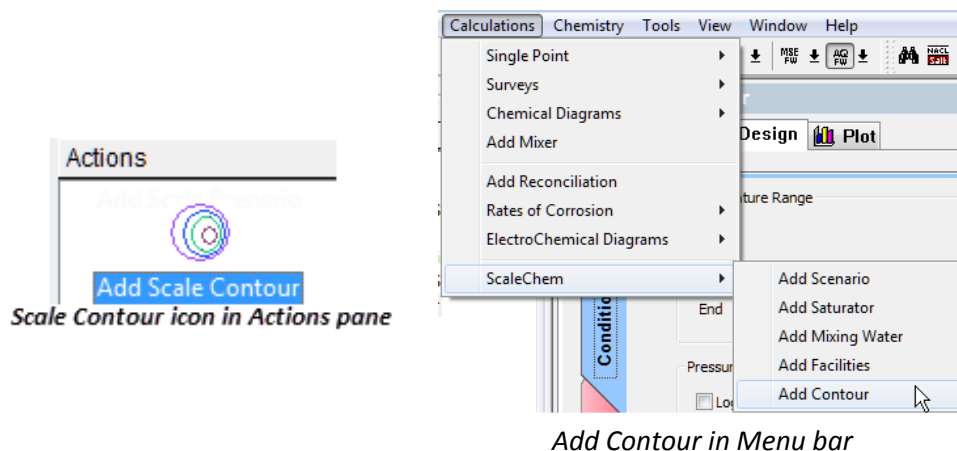
✓ Select the new Contour object in the Navigator Pane

✓ Select the Design tab, then the vertical Inlets tab
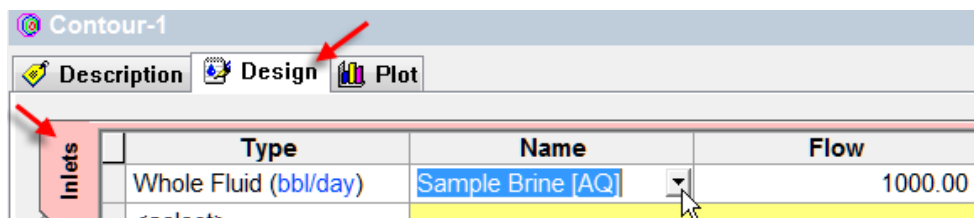
✓ Chose inlets by selecting the bottom right corners of the cell

✓ Select Whole Fluid as the Type, select Sample Brine as the Name, and 1000 for the Flow

Type refers to how the client wants to input in the chemistry. If a gas or oil analysis were added, then clients could select these as Types. In this example, we input the Sample Brine as a Whole Fluid.

Name refers to the specific name of the object. The letters inside the brackets next the names of objects refer to the thermodynamic framework these objects were created with. AQ refers to the Aqueous Framework while MSE refers to the Mixed Solvent Electrolyte Framework.

Flow corresponds to default units for the selected type, which in this case is Whole Fluid in bbl/day. Clients can change units by selecting the Units Manager icon in the toolbar, or selecting any hyperlinked (blue-lettered) units.

We will continue to use arbitrary values, specifically for the Flow, in this example.

✓ Select the Conditions tab and specify the temperature and pressure range and units
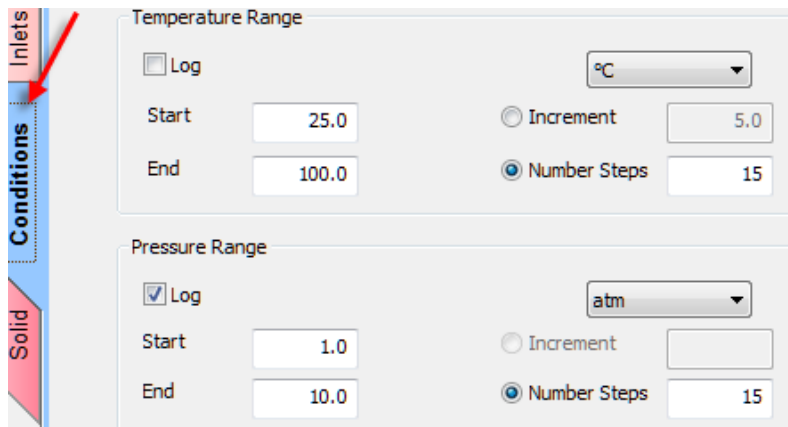
✓ On the bottom of the Conditions tab, select the Create PVT Files box, pick a calculation order, and specify the destination folder

The Calculation Order refers to an internal OLI Engine option to select whether temperature or pressure is the outer loop of the calculation code. Selecting either option will not change the thermodynamics of the system. Most cases should benefit by selecting temperature as the outer loop.
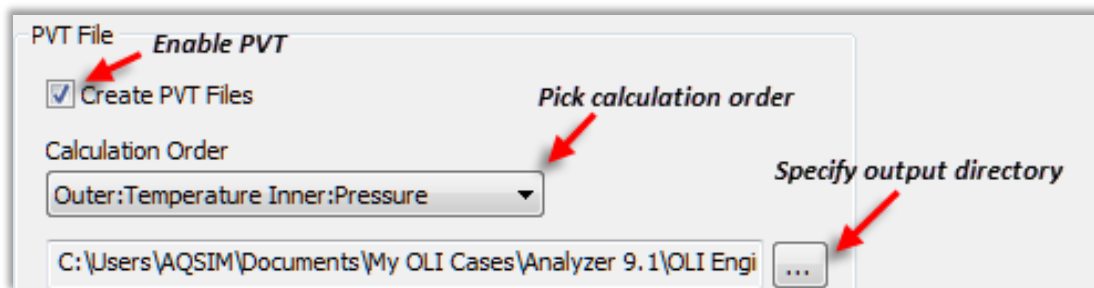
✓ Select which solids, if any, are allowed to form using the vertical Solids tab
✓ Select the Calculate button or press the <F9> key

Once the calculation is complete, the software places the PVT files in the specified directory.

In addition to using PIPESIM, clients can view the OLI Engine: PIPESIM PVT File using a Text editor, such as MS Notepad.

```
OLI Engine PIPESIM PVT File d_xp.pvt - Notepad
File   Edit   Format   View   Help
*FHEAD Studio-SC........Version 9.1 (16-May-2014), C, 2, 42, NOGO,  45, X
*FLUIDNAME  Contour-1
!
!----------------------------------------------------------------------------------------------------------------
!
! Scenario: C:\Users\AQSIM\Documents\My OLI Cases\Analyzer 9.1\OLI Engine PIPESIM PVT File demo_Contour-
! Aqueous chemistry model
!
! Stock Tank Properties:
!   Watercut    : 100.00 %
!   Gas-Oil Ratio :   0.0 scf/STB
!
!-- Inflows (mol) ----------------------------
!     H2O          344883.89
!     CO2              5.97
!     HCL          10650.58
!     SO3             13.65
!     K2O             25.41
!     NAOH         10373.26
!     B2O3             0.03
!     CAO            129.92
!
!----------------------------------------------------------------------------------------------------------------
!
*MOLWEIGHT  19.19639
```

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