

Generate PT Envelope with Aspen Plus® V8.0

1. Lesson Objectives

- Learn how to generate PT envelopes in Aspen Plus

2. Prerequisites

- Aspen Plus V8.0

3. Background

It is very important to know the phase conditions of a mixture at a given temperature and pressure. For example, the phase conditions of a fluid in a heat exchanger have an impact on the heat transfer rate. Formation of bubbles (vapor phase) in inlet streams can also be very damaging to pumps. The phase conditions of a fluid in a pipe can impact pipeline calculations.

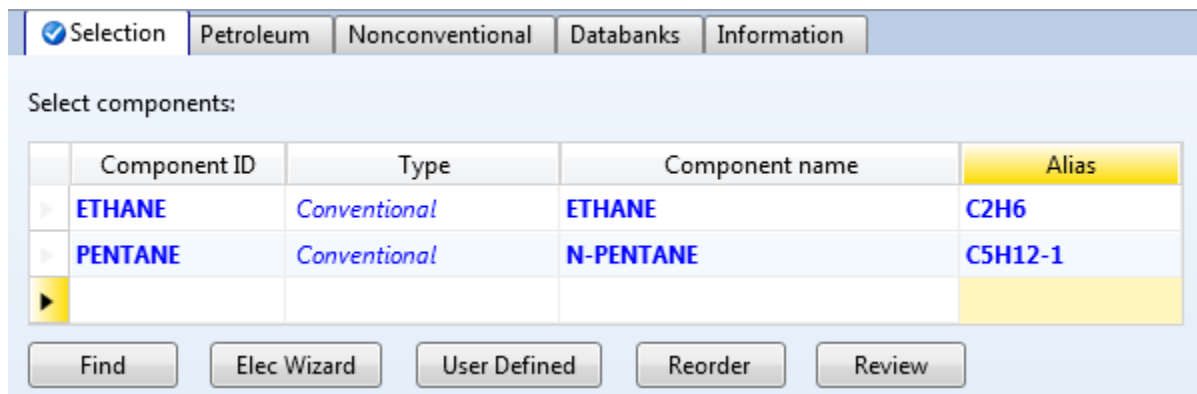
The PT envelope for a given mixture provides a complete picture of phase conditions for a given mixture.

The examples presented are solely intended to illustrate specific concepts and principles. They may not reflect an industrial application or real situation.

4. Aspen Plus Solution

If you are unfamiliar with how to start Aspen Plus, select components, or define methods, consult **Get Started Guide for New Users of Aspen Plus.pdf** for instructions.

- 4.01. Create a new simulation in Aspen Plus using the **Blank Simulation** template. The **Components | Specification | Selection** sheet is displayed. Enter **ETHANE** and **PENTANE** for **Component ID**. Enter **C5H12-1** for **Alias** for **Pentane**.



4.02. Go to the **Methods | Specifications | Global** sheet. Select **PENG-ROB** for **Base method** as shown below.

The screenshot shows the 'Global' sheet with the following settings:

- Property methods & options:**
 - Method filter: COMMON
 - Base method: PENG-ROB
 - Henry components: (empty)
- Petroleum calculation options:**
 - Free-water method: STEAM-TA
 - Water solubility: 3
- Electrolyte calculation options:**
 - Chemistry ID: (empty)
 - Use true components
- Method name:** PENG-ROB
- Modify options:**
 - Modify
 - EOS: ESPRSTD
 - Data set: 1
 - Liquid gamma: (empty)
 - Data set: (empty)
 - Liquid molar enthalpy: HLMX106
 - Liquid molar volume: VLMX20
 - Heat of mixing
 - Poynting correction
 - Use liquid reference state enthalpy

4.03. Click the **Next Input** button (or press the **F4** key) so that the binary interaction parameters are filled automatically on the **Methods | Parameters | Binary Interaction | PRKBV-1** sheet.

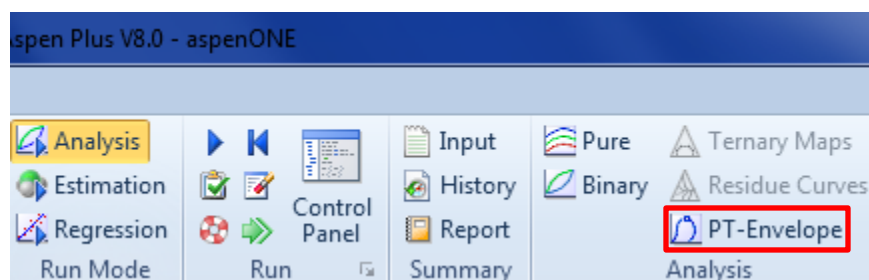
The screenshot shows the 'PRKBV' sheet with the following data:

Parameter: PRKBV Data set: 1

Temperature-dependent binary parameters

Component i	ETHANE	
Component j	PENTANE	
Temperature units	C	
Source	EOS-LIT	
Property units		
KAIJ	0.0078	
KBIJ	0	
KCIJ	0	
TLOWER	-273.15	
TUPPER	726.85	

- 4.04. On the **Home** tab of the ribbon, click the **Analysis | PT-Envelope** button.



- 4.05. The **Analysis | PTENV-1 | Input | System** sheet is displayed. Select **Mass** from the drop-down list and confirm that the unit is **kg/hr**. Enter **50** and **50** for **ETHANE** and **PENTANE** value fields, respectively. In the **Optional specifications** frame, enter **100** for **Maximum points**.

The screenshot displays the 'System' sheet of the PTENV-1 analysis. The 'Mass' unit is selected, and the flow rates for ETHANE and PENTANE are set to 50 kg/hr. The 'Optional specifications' section shows 'Maximum points' set to 100. The 'Assumptions' section includes 'Water not allowed' and 'Vapor-Liquid equilibrium'. The 'Vapor fraction branches' section has 'Dew/Bubble point curves' checked.

Component	Flow
ETHANE	50
PENTANE	50

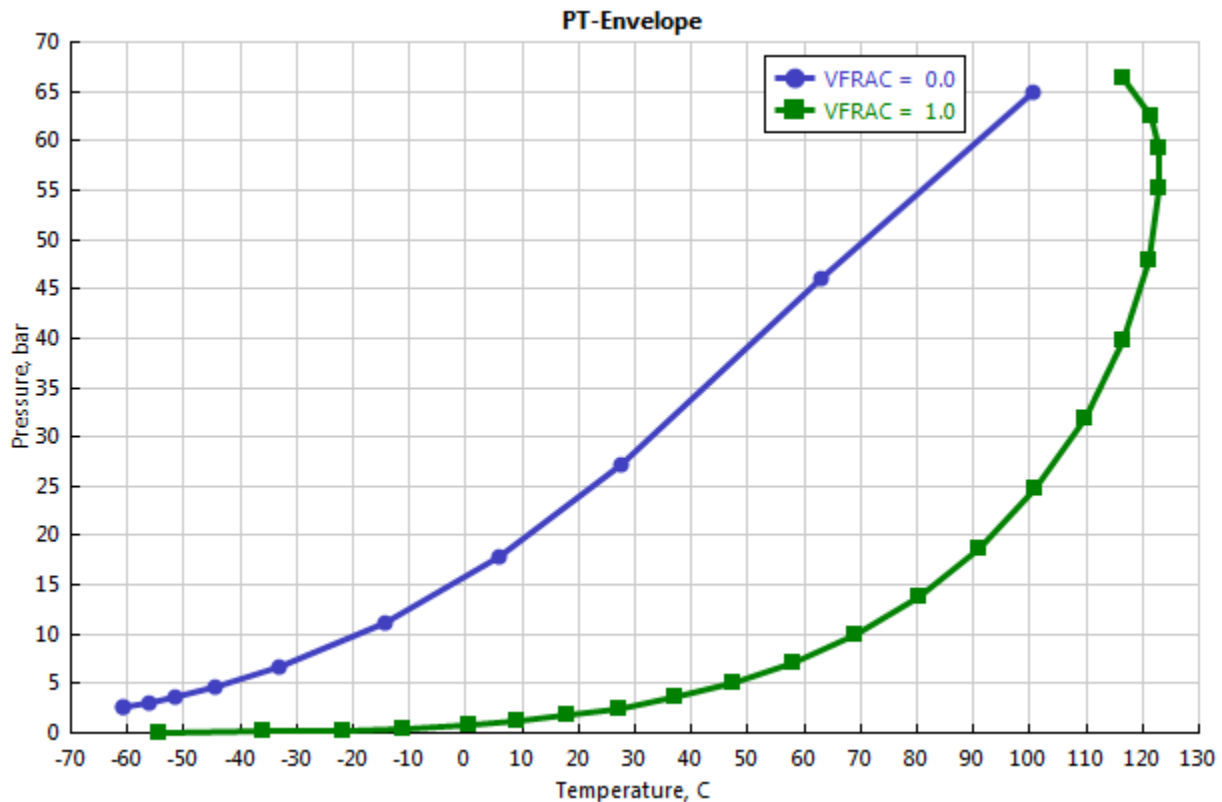
Optional specifications

Maximum points: 100 Initial pressure: bar

Termination red. temp.: 0 Initial temperature: C

Run analysis

- 4.06. Click the **Run analysis** button. The PT envelope for the ethane/n-pentane mixture is generated. Note that the green line represents saturated liquid and the blue line represents saturated vapor. The area between the lines represents the 2-phase region.



5. Conclusions

With the PT envelope of a mixture, we can determine its phase conditions for a given temperature and pressure.

6. Copyright

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