



## Absorber Simulation





Example: In order to eliminate CO<sub>2</sub> from a gas stream with flowrate of 300 kmole/hr. and composition of 20 mole% CO<sub>2</sub> and 80% methane, a packing column functioning as absorber is used. In this regard, 2000 kmole/hr. pure propylene carbonate is used as solvent. The operating temperature and pressure are 60C and 6090 kPa respectively. Determine the mole fraction of CO<sub>2</sub> in outlet gas stream. Use Sour PR as the fluid package.

How to simulate:

### 1. Add the components to the component list

Source Databank: HYSYS

Select: Pure Components Filter: All Families

Search for: Search by: Full Name/Synonym

Simulation Name	Full Name / Synonym	Formula
Ethane	C2	C2H6
Propane	C3	C3H8
i-Butane	i-C4	C4H10
n-Butane	n-C4	C4H10
i-Pentane	i-C5	C5H12
n-Pentane	n-C5	C5H12
n-Hexane	C6	C6H14
n-Heptane	C7	C7H16
n-Octane	C8	C8H18
n-Nonane	C9	C9H20
n-Decane	C10	C10H22
n-C11	C11	C11H24

Status: OK

### 2. Select Sour PR as the Fluid Package.

Set Up Binary Coeffs StabTest Phase Order Tabular Notes

Package Type: HYSYS Component List Selection: Component List - 1 [HYSYS Databanks] View

Property Package Selection

- Kabadi-Danner
- Lee-Kesler-Plöcker
- MBWR
- NBS Steam
- NRTL
- Peng-Robinson
- PR-Twu
- PRSV
- Sour PR**
- Sour SRK
- Sour Water
- SRK
- SRK-Twu
- Sulsim (Sulfur Recovery)
- Twu-Sim-Tassone
- UNIQUAC
- Wilson
- Zudkevitch-Joffe

Options

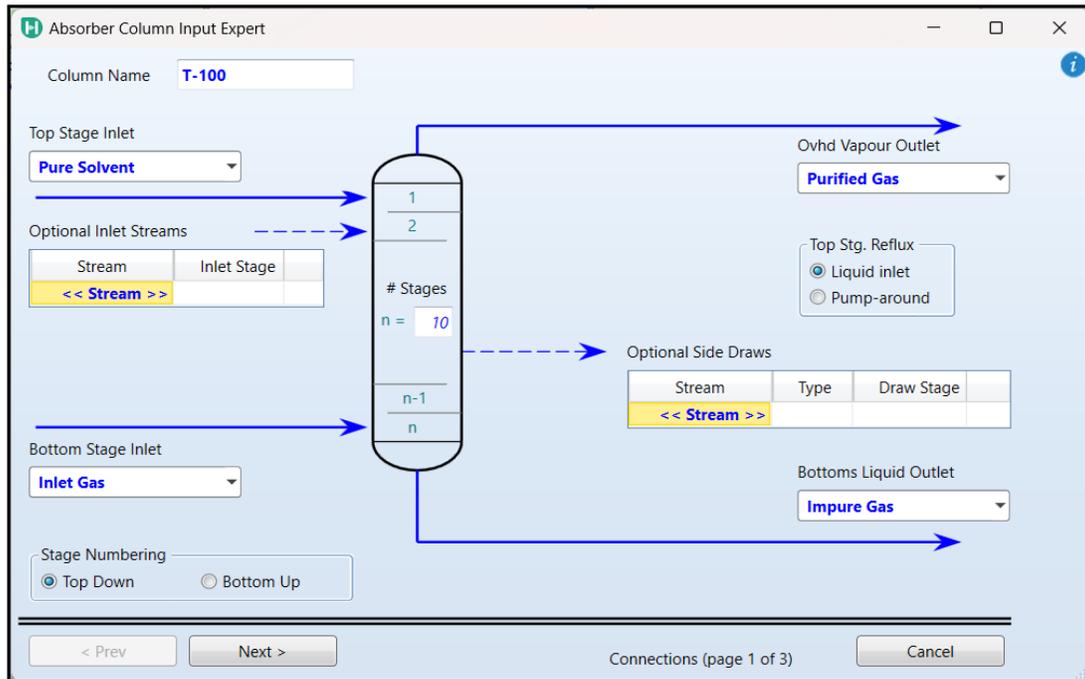
Enthalpy	Property Package EOS
Density	Costald
Modify Tc, Pc for H2, He	Modify Tc, Pc for H2, He
Viscosity Method	HYSYS Viscosity
Peng-Robinson Options	HYSYS
EOS Solution Methods	Cubic EOS Analytical Method
Phase Identification	Default
Surface Tension Method	HYSYS Method
Thermal Conductivity	API 12A3.2-1 Method

Parameters

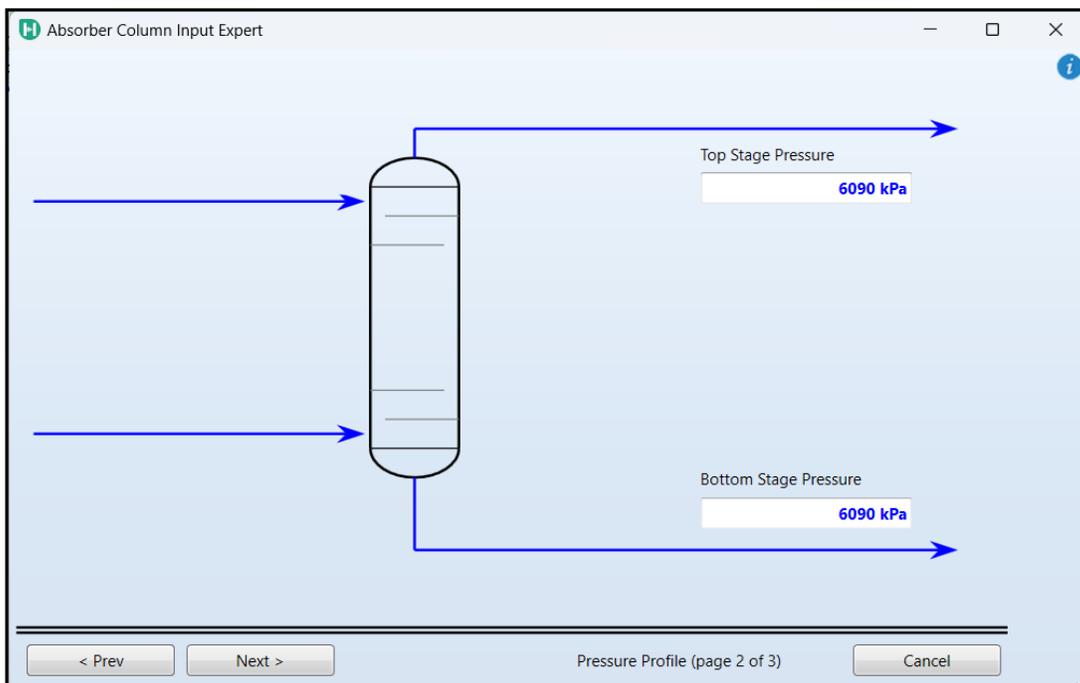
Property Pkg: OK Edit Properties



3. Enter Simulation Environment and select an Absorber from Model Palette/Separator. Define streams Pure Solvent, Inlet Gas, Purified Gas, Impure Gas. Then click Next.

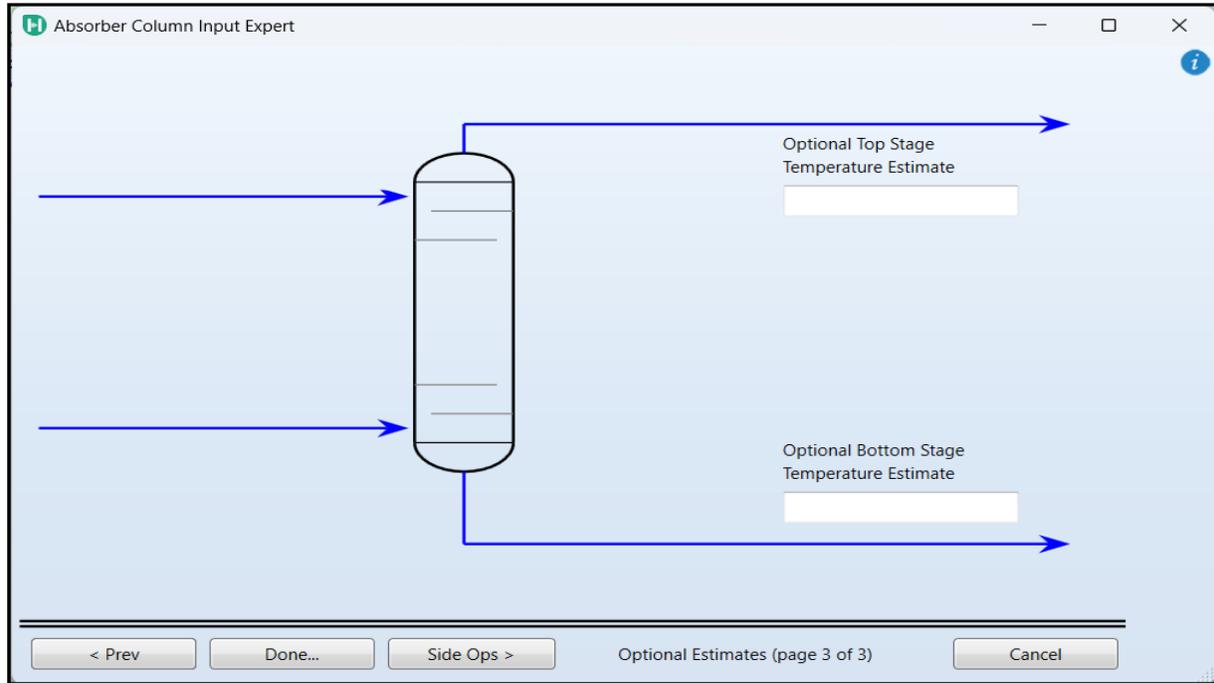


4. Specify the top and bottom stage.





5. Let Aspen decide for the page and click Done.



6. Now go to Worksheet and provide the operating condition and composition.

Name	Pure Solvent @COL1	Inlet Gas @COL1	Purified Gas @COL1	Impure Gas @COL1
Vapour	<empty>	<empty>	<empty>	<empty>
Temperature [C]	60.00	60.00	<empty>	<empty>
Pressure [kPa]	6090	6090	6090	6090
Molar Flow [kgmole/h]	2000	304.5	<empty>	<empty>
Mass Flow [kg/h]	<empty>	<empty>	kg/h <empty>	<empty>
Std Ideal Liq Vol Flow [m3/h]	<empty>	<empty>	<empty>	<empty>
Molar Enthalpy [kJ/kgmole]	<empty>	<empty>	<empty>	<empty>
Molar Entropy [kJ/kgmole-C]	<empty>	<empty>	<empty>	<empty>
Heat Flow [kJ/h]	<empty>	<empty>	<empty>	<empty>



Column: T-100 / COL1 Fluid Pkg: Basis-1 / Sour PR

Design Parameters Side Ops Internals Rating Worksheet Performance Flowsheet Reactions Dynamics

**Worksheet**

	Pure Solvent	Inlet Gas	Purified Gas	Impure Gas
Conditions				
Properties				
Compositions				
PF Specs				
CO2	0.0000	0.2000	<empty>	<empty>
Methane	0.0000	0.8000	<empty>	<empty>
C3=Carbonate	1.0000	0.0000	<empty>	<empty>

Delete Column Environment... Run Reset **Unconverged**  Update Outlets  Ignored

## 7. Results

Column: T-100 / COL1 Fluid Pkg: Basis-1 / Sour PR

Design Parameters Side Ops Internals Rating Worksheet Performance Flowsheet Reactions Dynamics

**Worksheet**

	Pure Solvent	Inlet Gas	Purified Gas	Impure Gas
Conditions				
Properties				
Compositions				
PF Specs				
CO2	0.0000	0.2000	0.0000	0.0275
Methane	0.0000	0.8000	0.9999	0.0684
C3=Carbonate	1.0000	0.0000	0.0001	0.9041

Delete Column Environment... Run Reset **Converged**  Update Outlets  Ignored

Based on the results, 99% of purified gas is methane which is our desired objective in the example.

