

2. Bullets Numbered Lists

Problem Statement:

You have been tasked to construct a simulation for the treatment of an NGL feed. The NGL will be processed in a depropanizer column for the recovery of desired hydrocarbon products. The feed contains light gases which must be separated before feeding the depropanizer column.

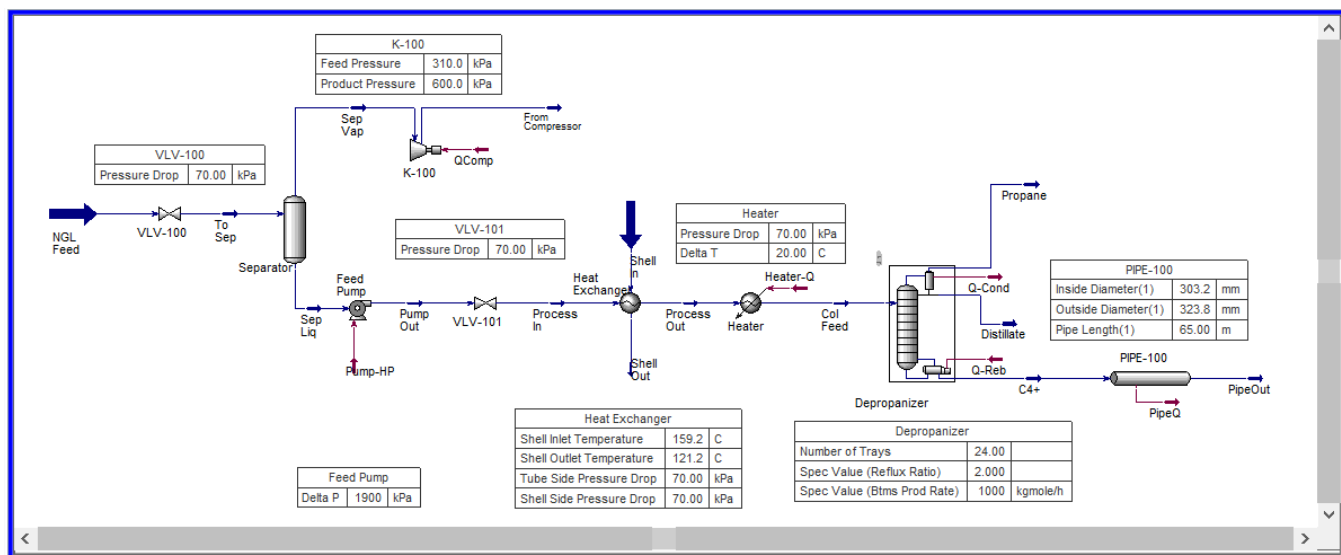
Process Description:

NGL is first separated from vapor in a 2-phase separator. The light gases from the separator will be compressed before exporting to the pipeline. The liquid product from the separator is pumped to a heat exchanger and then to a heater before feeding the depropanizer column. The column will separate most light gases (ethane and propane). The bottom liquid product will be transported to a third-party facility for further fractionation. You will not be simulating the third-party facility.

The depropanizer has 24 stages, a reboiler, a partial condenser, and has an operating pressure of 18.25 bar_g. The specification of the column is adjusted such that the top product contains mostly light products (ethane and propane).

The necessary input for building the flowsheet is provided in the Input Data section. Starting with a new case, you will add the components, select the correct fluid package, and build the flowsheet as shown below. After building the flowsheet, answer questions 1-16 below.

Flowsheet:



Input data

1. Stream data

NGL Feed	Composition (Mole fraction)	Ethane	0.01
		Propane	0.43
		i-Butane	0.07
		n-Butane	0.12
		i-Pentane	0.05
		n-Pentane	0.04
		n-Hexane	0.28
	Temperature [C]	15	
	Pressure [kPa]	380	
	Std Ideal Liq Vol Flow [m³/h]	200	
Fluid Pkg - Basis 1	Peng Robinson		
Shell In	Composition (Mole fraction)	Ethane	0.00
		Propane	0.00
		i-Butane	0.00
		n-Butane	0.03
		i-Pentane	0.11
		n-Pentane	0.11
		n-Hexane	0.75
	Temperature [C]	159.2	
	Pressure [kPa]	1170	
	Std Ideal Liq Vol Flow [m³/h]	55	
Fluid Pkg - Basis 1	Peng Robinson		

2. Unit Operation data

VLV-100	Control Valve
Delta P [kPa]	70
Separator	Separator
Delta P – Inlet [kPa]	0
Delta P – Vapour Outlet [kPa]	0
Feed Pump	Pump
Delta P [kPa]	1900
VLV-101	Control Valve
Delta P [kPa]	70

Heat Exchanger	Heat Exchanger
Heat Exchanger Model	Simple Weighted
Shell Side Delta P [kPa]	70
Tube Side Delta P [kPa]	70
Shell Out T [°C]	121.2
Heater	Heater
Delta P [kPa]	70
Delta T [°C]	20
K-100	Compressor
Out Pressure [kPa]	600
Adiabatic Efficiency [%]	75
Depropanizer	Distillation Column Template
Number of stages	24
Column feed stage	12
Top stage pressure [kPa]	1925
Bottom stage pressure [kPa]	2070
Condenser type	Partial
Condenser Delta P [kPa]	0
Reboiler Configuration & Type	Once-through, Regular HYSYS Reboiler
Reboiler Delta P [kPa]	0
Reflux Ratio - Specification	2
Bottom Product rate [kgmole/h]	1000
Distillate rate [kgmole/h]	0
PIPE-100	Pipe Segment
Length [m]	65
Nominal diameter [mm]	Schedule 40 – 300mm
Ambient Temperature [°C]	36
Estimate HTC	Pipe wall. Inner HTC, Outer HTC, Not insulated