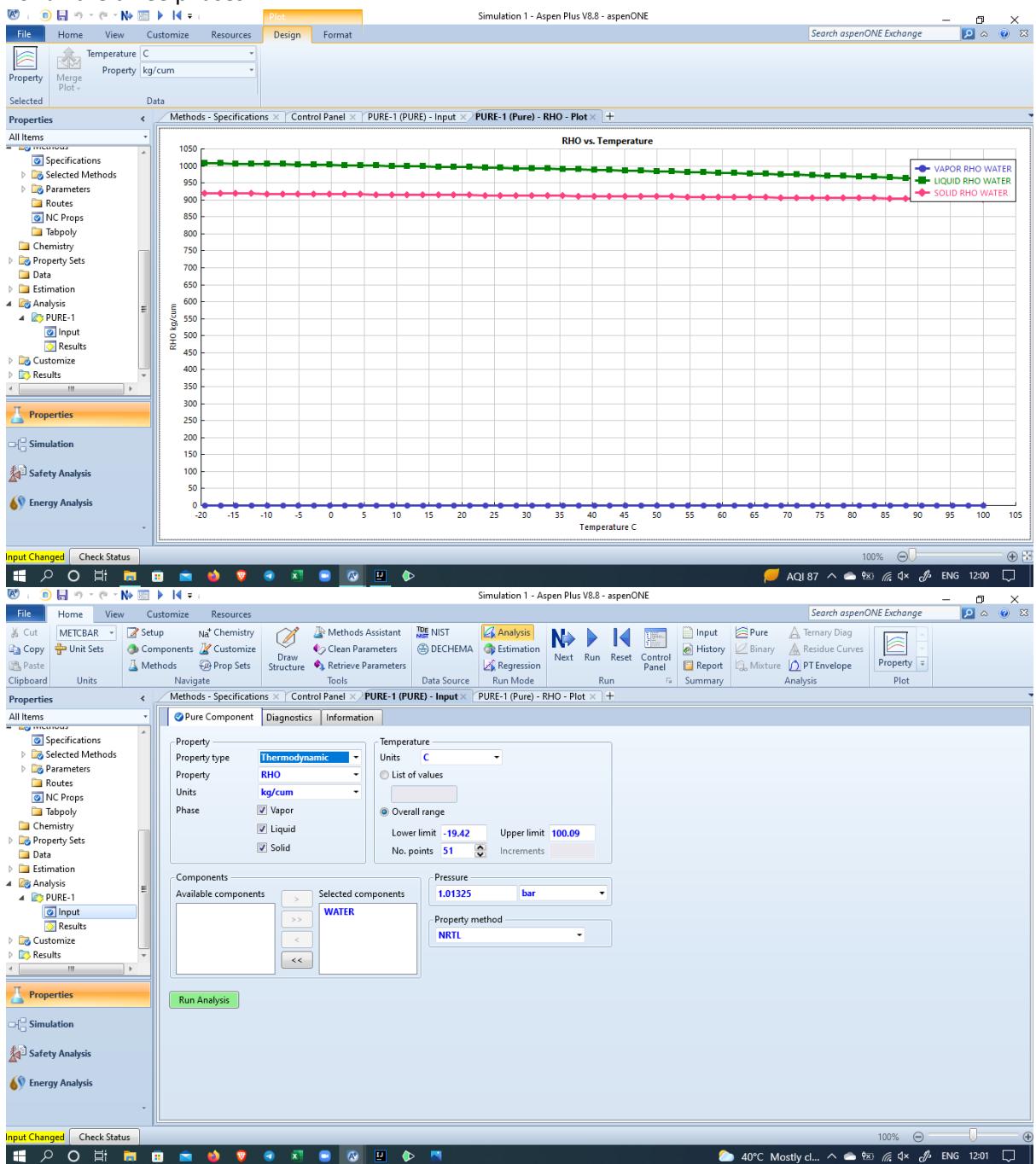


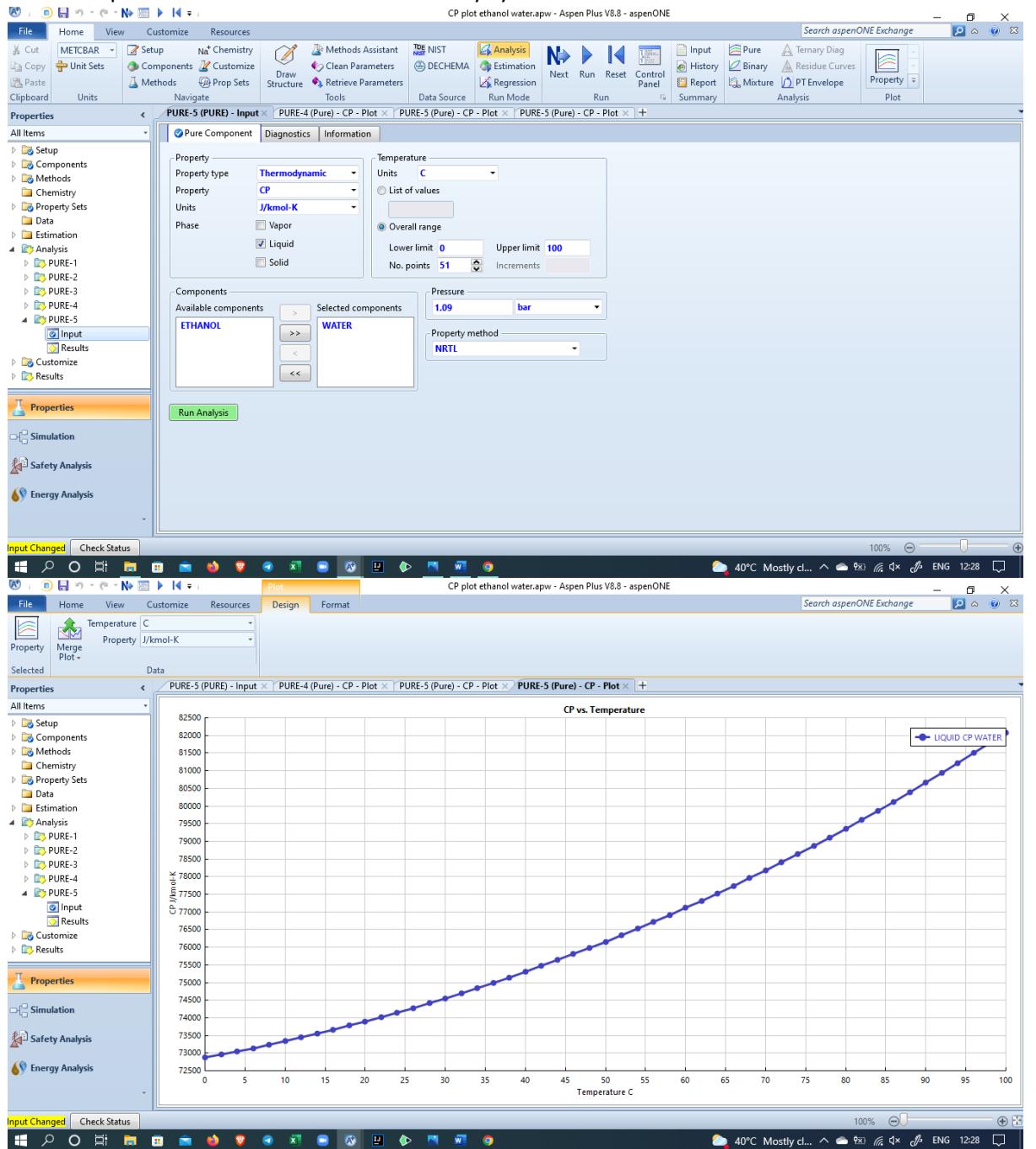
ASSIGNMENT 1

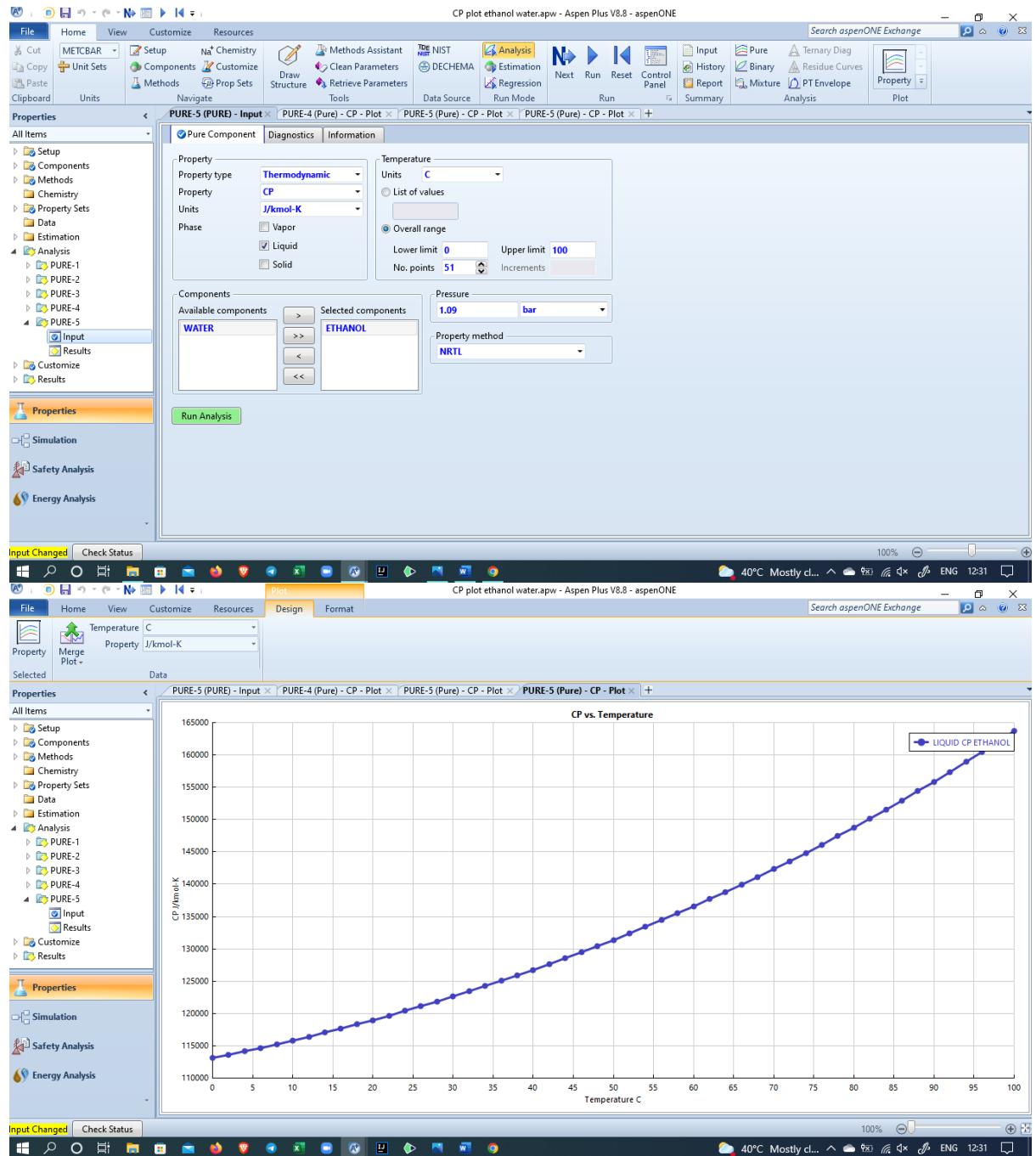
1. Pure (property graph and merging of graphs for property comparison) and Binary analysis (Txy, Pxy & xy diagram)

For all the three phases:

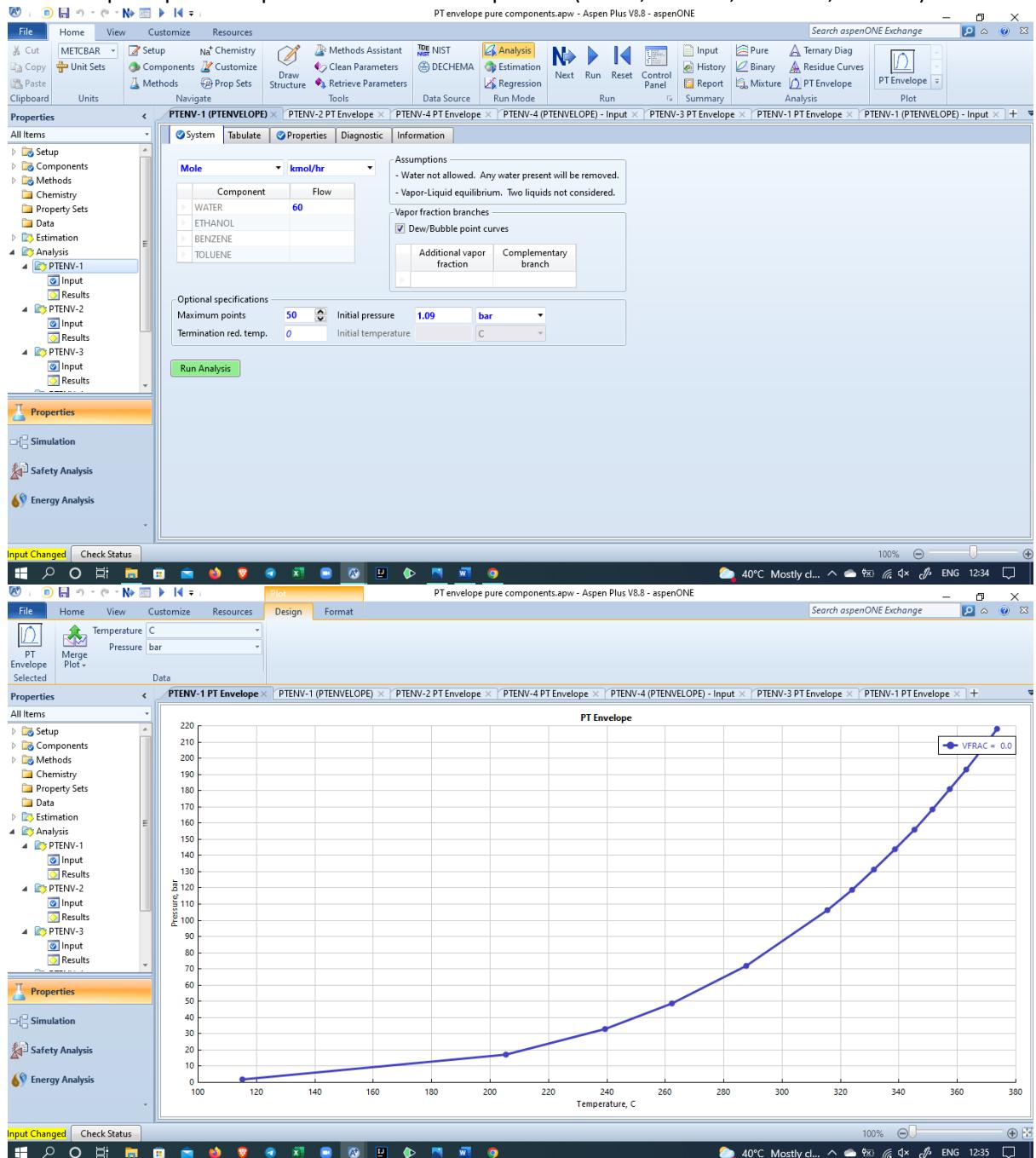


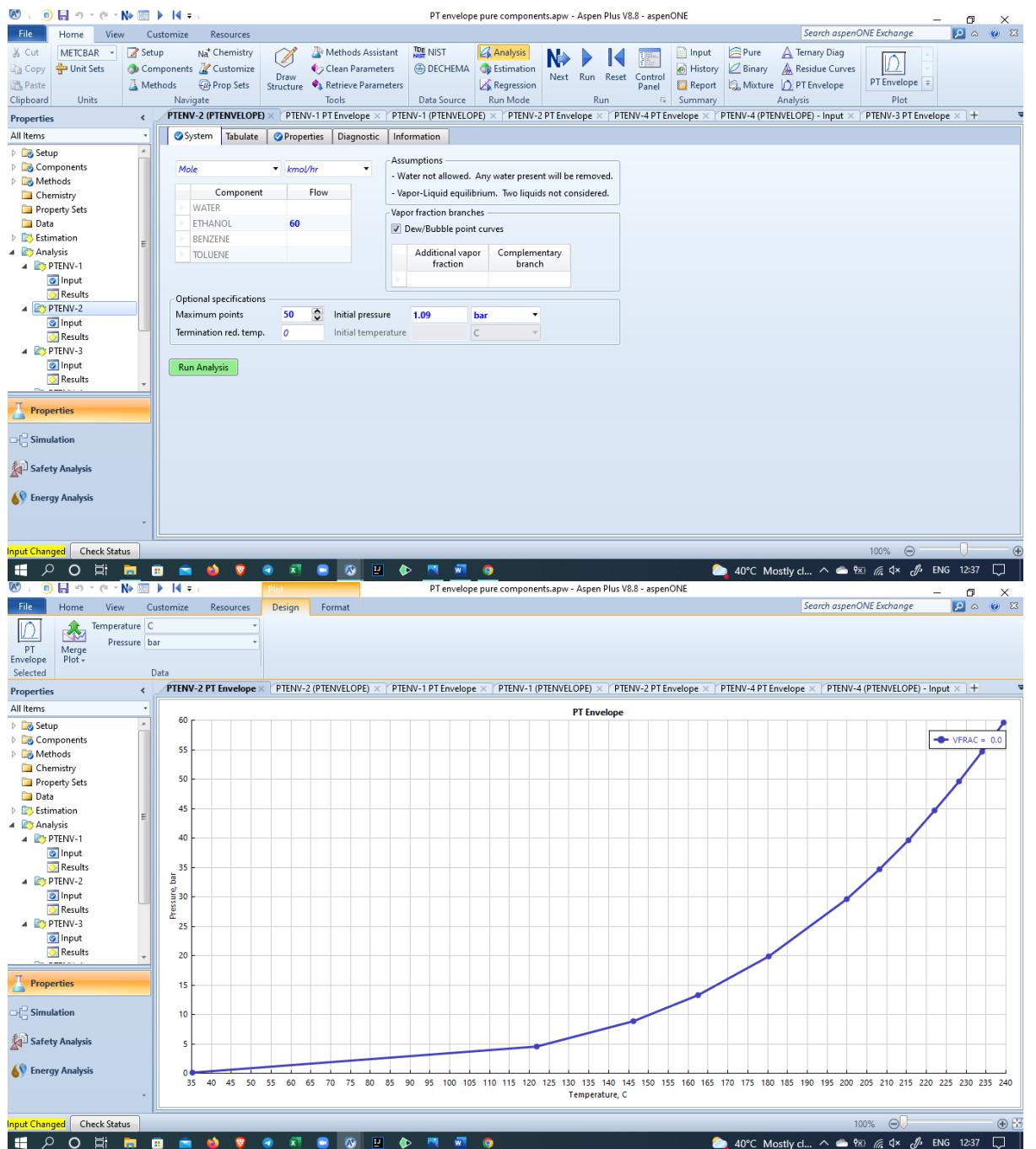
CP vs Temperature of water and ethanol binary system

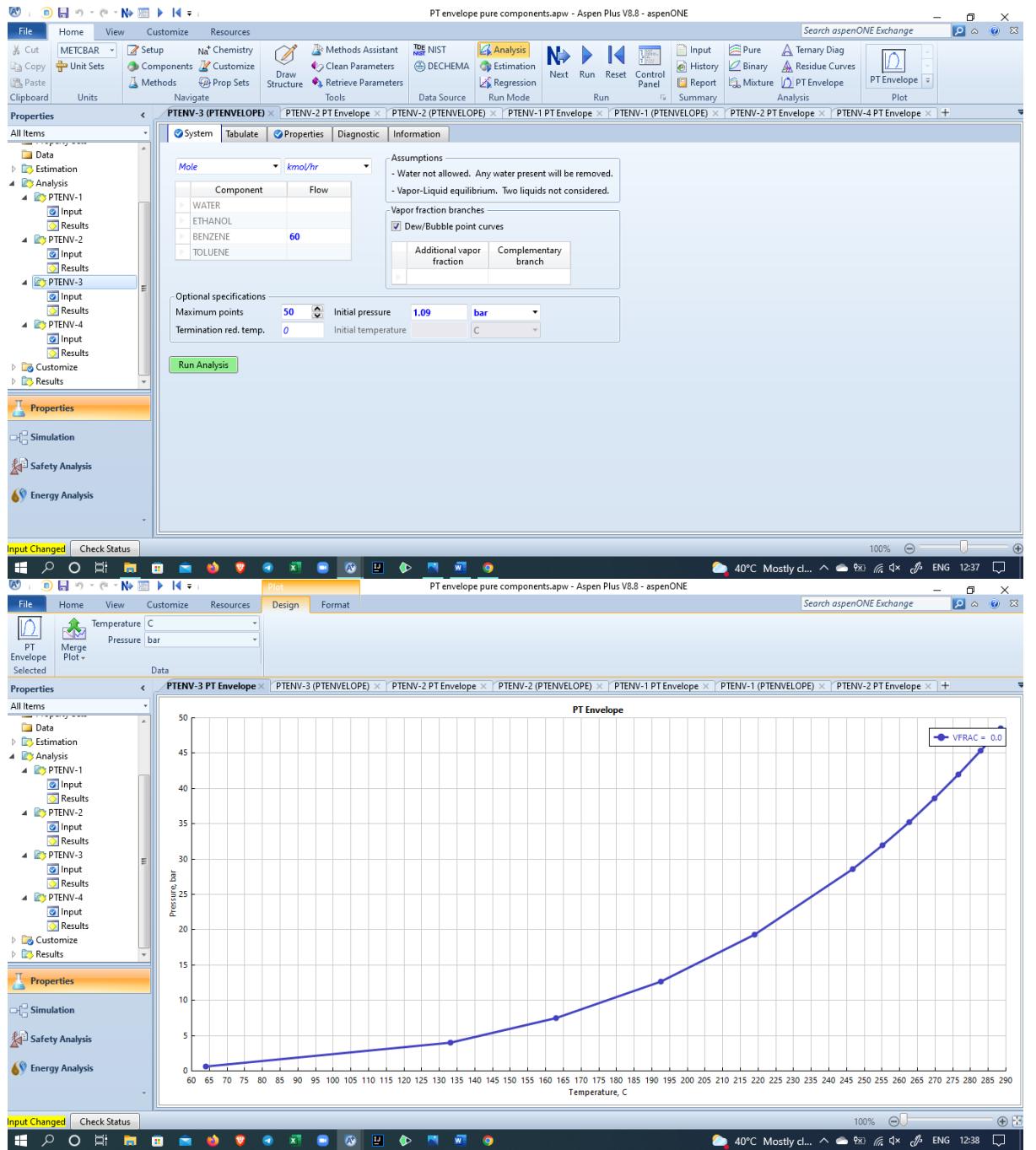


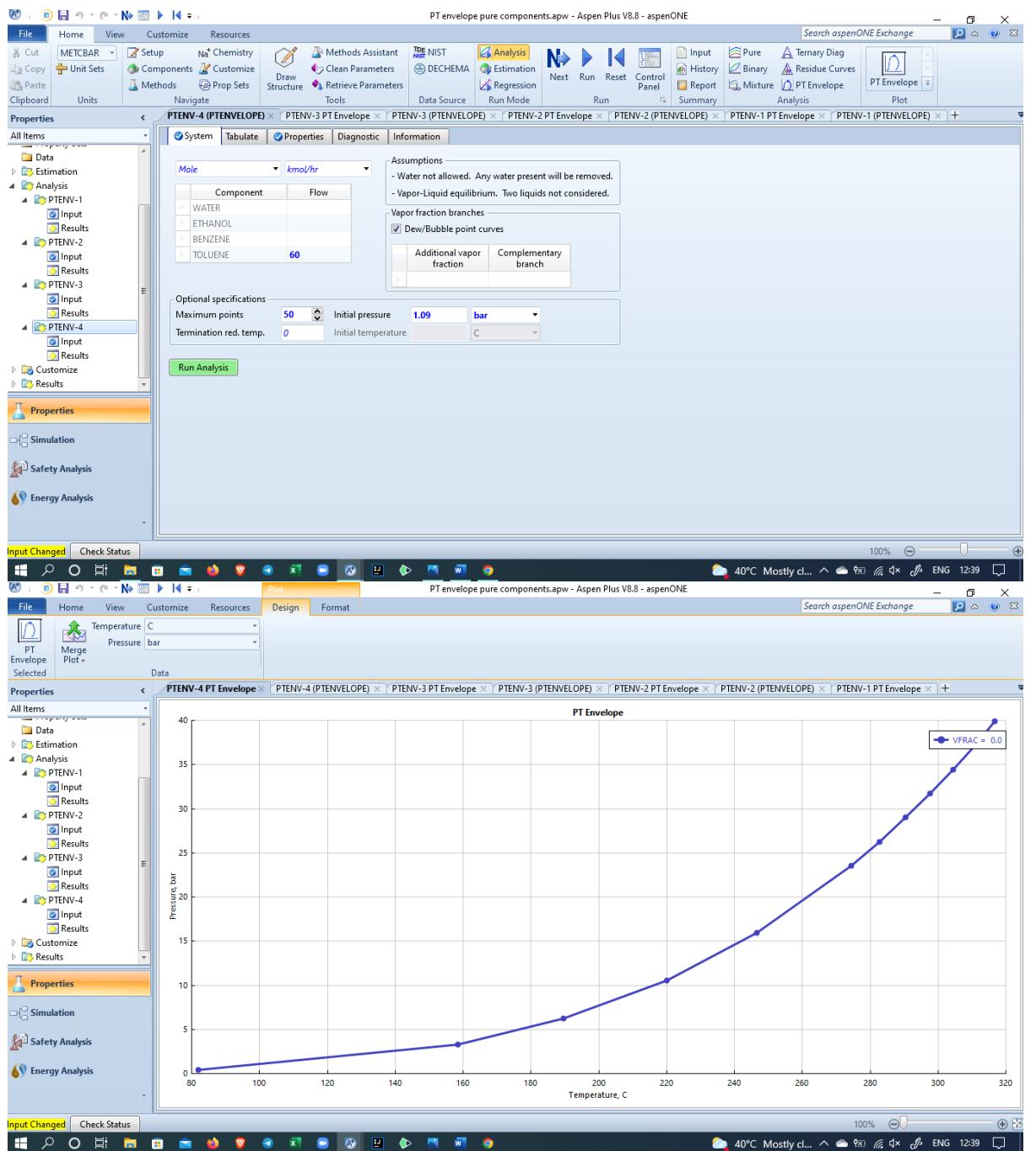


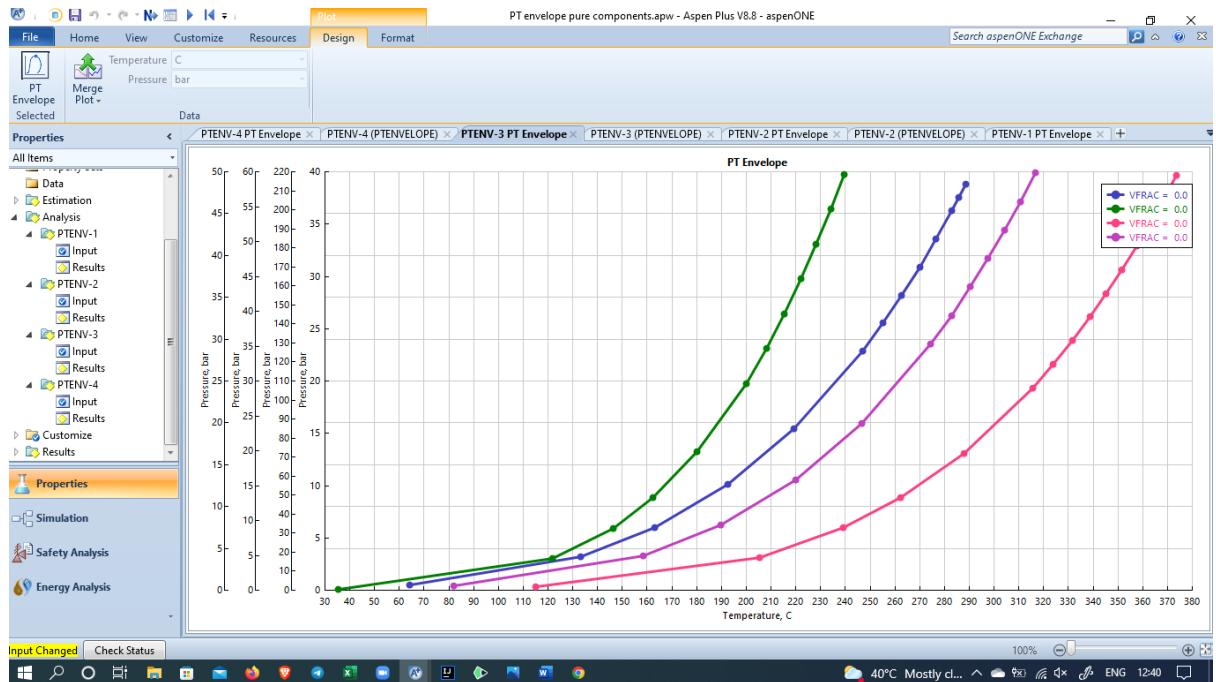
PT envelope of pure components and their comparison (water, ethanol, benzene, toluene)





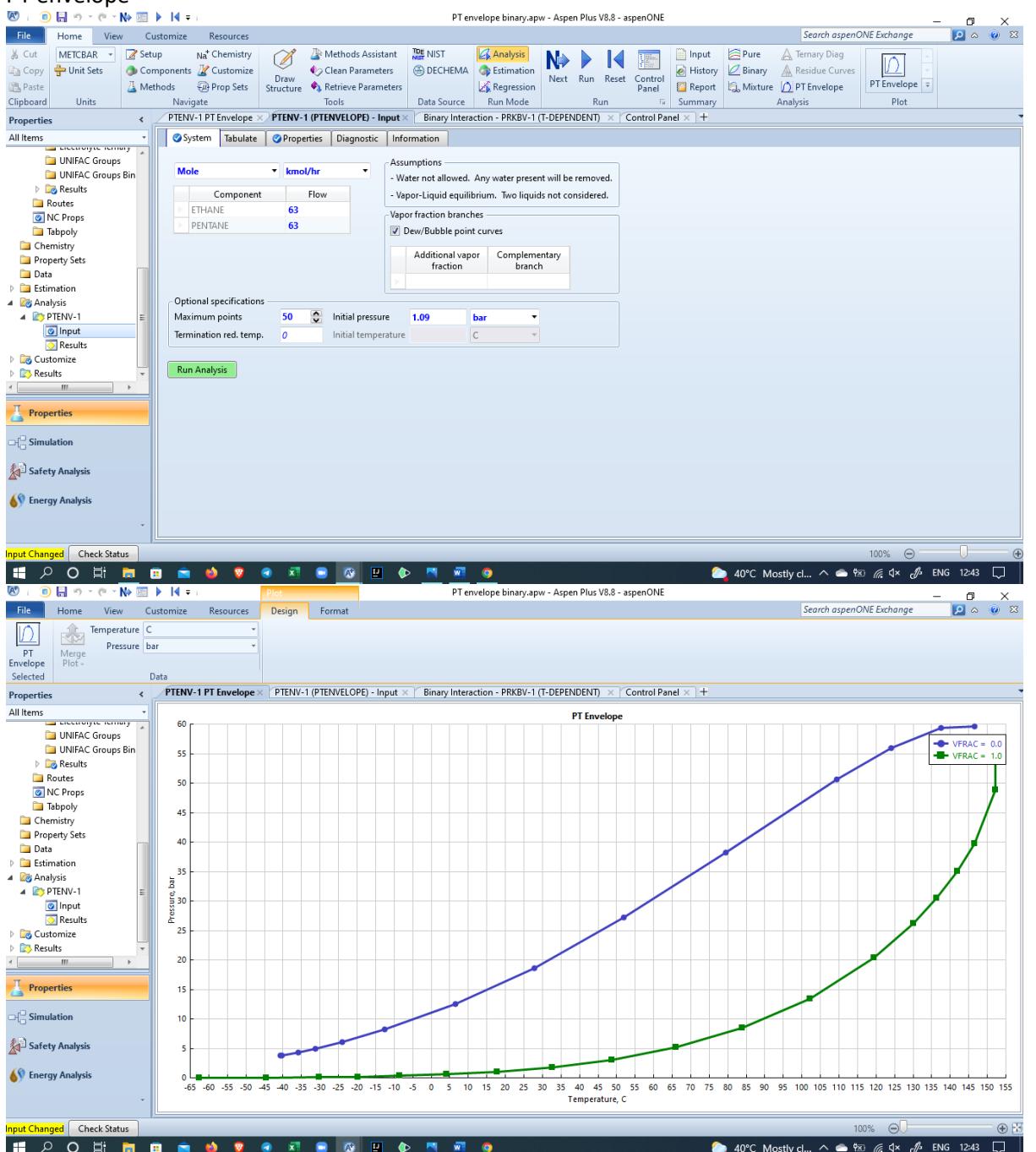




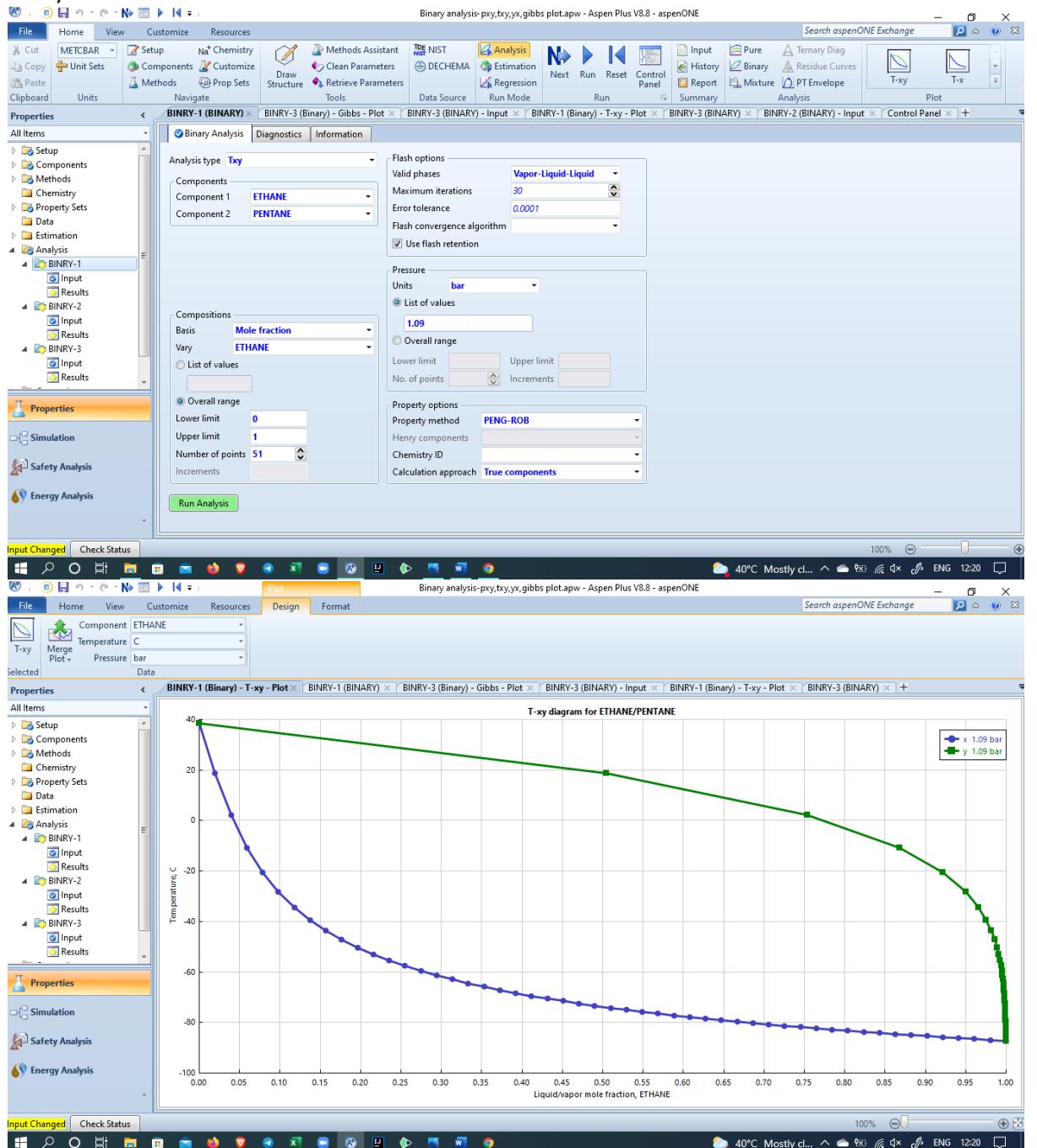


For binary system of ethane and pentane

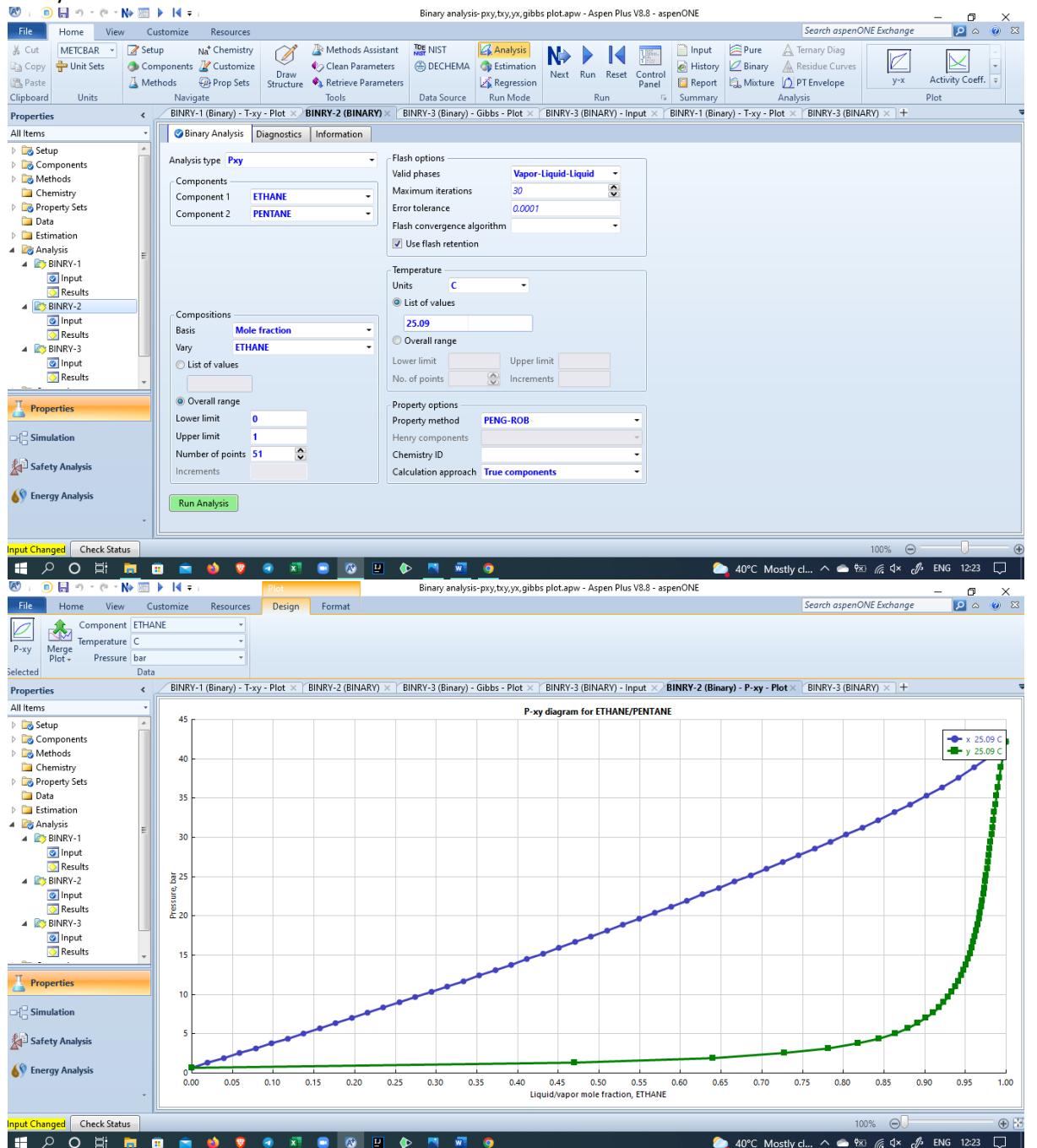
PT envelope



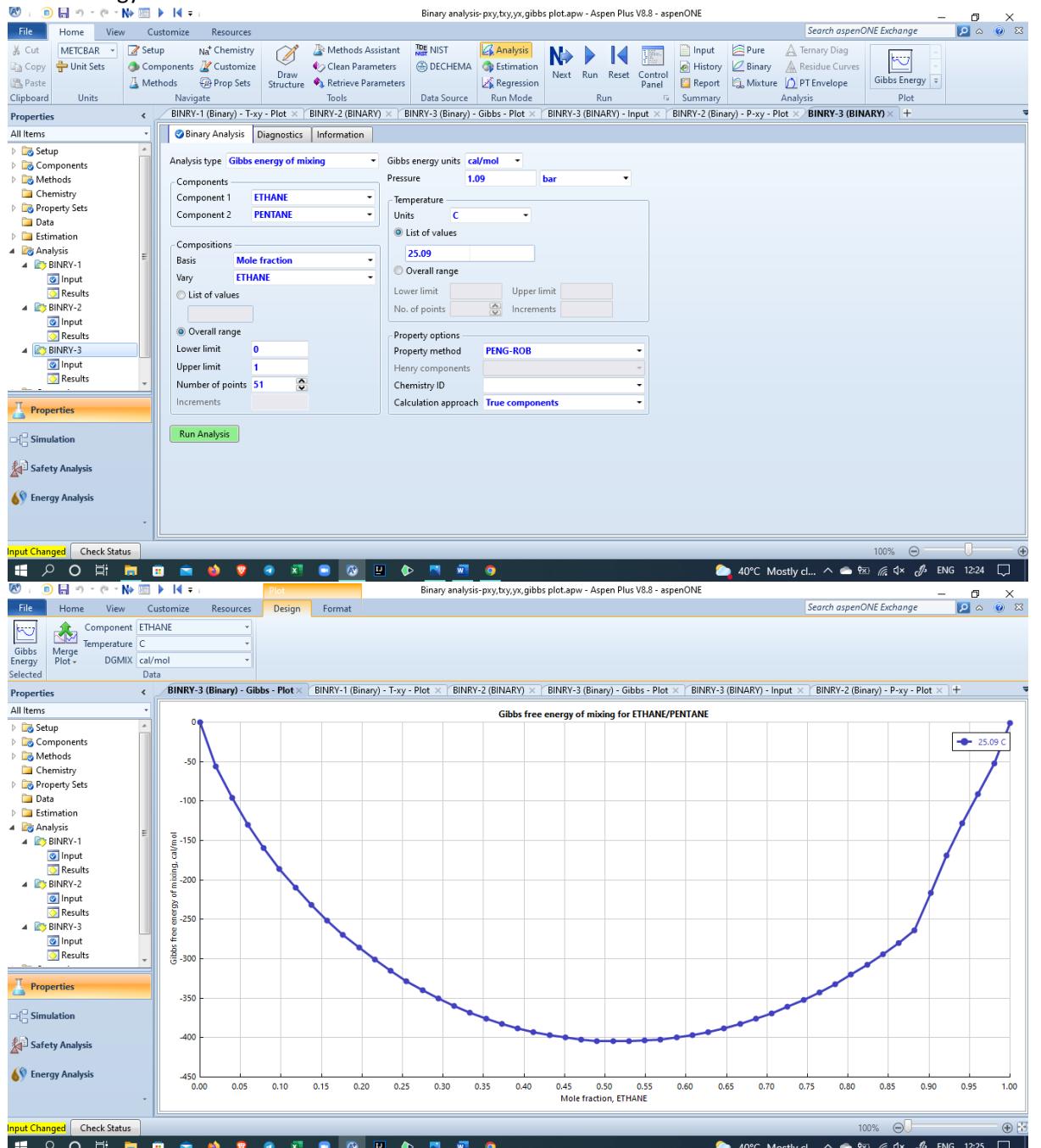
T - xy Plot



P - xy Plot

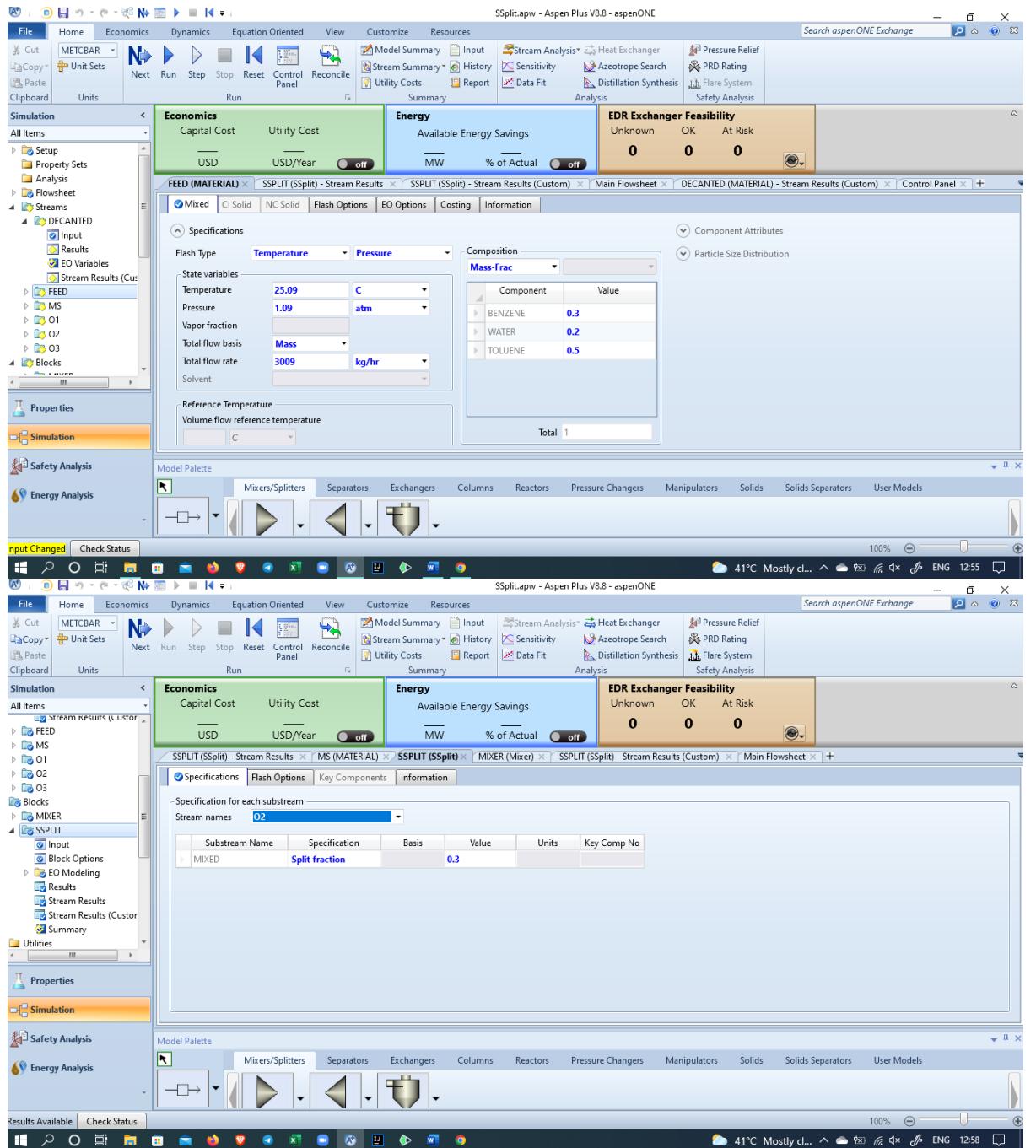


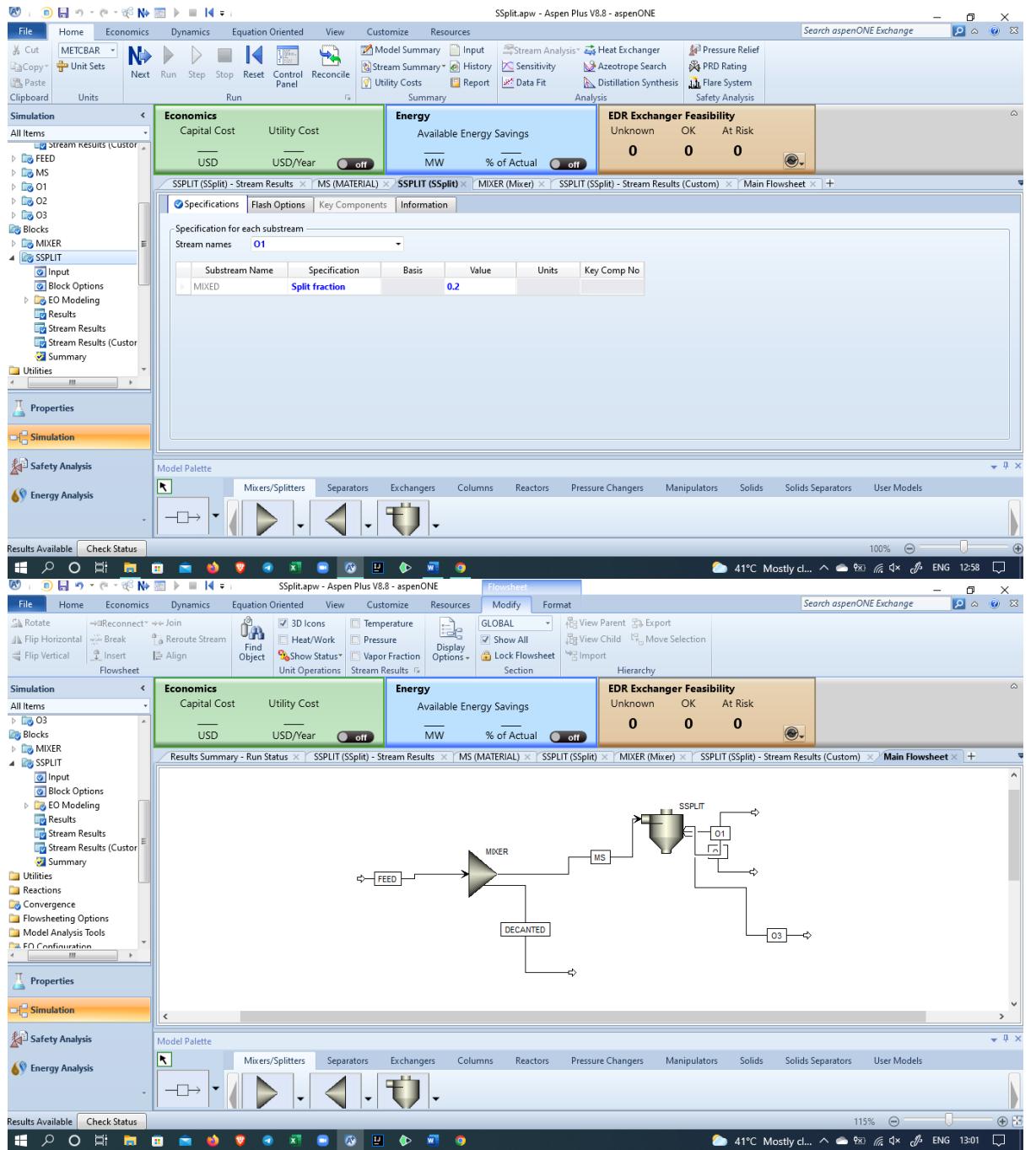
Gibbs Energy Plot



2. Mixer/Splitters (Mixer, Fsplit, SSplit) with decanted stream

SSplit:





Heat and Material Balance Table					
Stream ID		MS	O2	O1	O3
From		MIXER	SSPLIT	SSPLIT	SSPLIT
To		SSPLIT			
Phase		LIQUID	LIQUID	LIQUID	LIQUID
Substream: MIXED					
Mole Flow	kmol/hr				
BENZENE		11.55624	3.466872	2.311248	5.778120
WATER		.1254230	.0876269	.0250846	.0627115
TOLUENE		16.32832	4.898495	3.265664	8.164161
Total Flow	kmol/hr	28.00998	8.402995	5.601997	14.00499
Total Flow	kg/hr	2409.460	722.8379	481.8919	1204.730
Total Flow	l/min	47.08198	14.12460	9.416397	23.54099
Temperature	C	39.07626	39.07626	39.07626	39.07626
Pressure	bar	1.104448	1.104448	1.104448	1.104448
Vapor Frac		0.0	0.0	0.0	0.0
Liquid Frac		1.000000	1.000000	1.000000	1.000000
Solid Frac		0.0	0.0	0.0	0.0
Enthalpy	cal/mol	6699.435	6699.435	6699.435	6699.435
Enthalpy	cal/gm	77.88098	77.88098	77.88098	77.88098
Enthalpy	cal/sec	52125.29	15637.99	10425.06	26062.65
Entropy	cal/mol-K	-69.77271	-69.77271	-69.77271	-69.77271
Entropy	cal/gm-K	-.8111083	-.8111083	-.8111083	-.8111083
Density	md/cc	9.91532E-3	9.91532E-3	9.91532E-3	9.91532E-3
Density	gm/cc	.8529305	.8529305	.8529305	.8529305
Average MW		86.02145	86.02145	86.02145	86.02145
Liq Vol 60F	l/min	45.90932	13.77280	9.181865	22.95466

3. Separators (Flash2, Flash3, Decantor, Sep)
MIXER AND FLASH (INPUT – Naphthalene, Toluene, Water and Air)

Flash2:

Flash2.apw - Aspen Plus V8.8 - aspenONE

Economics Capital Cost Utility Cost **Energy** Available Energy Savings **EDR Exchanger Feasibility**

USD USD/Year off MW % of Actual off Unknown OK At Risk 0 0 0

Specifications

Flash Type: Temperature Pressure

State variables:

- Temperature: 25.09 C
- Pressure: 2.08 atm
- Vapor fraction: Mass
- Total flow basis: Mass
- Total flow rate: 1009 kg/hr
- Solvent: AIR

Composition: Mole-Frac

Component	Value
NAPHT-01	0.18
TOLUENE	0.26
WATER	0.56
AIR	

Reference Temperature: Volume flow reference temperature (C) Component concentration reference temperature (C)

Model Palette

Input Changed Check Status

Flash2.apw - Aspen Plus V8.8 - aspenONE

Economics Capital Cost Utility Cost **Energy** Available Energy Savings **EDR Exchanger Feasibility**

USD USD/Year off MW % of Actual off Unknown OK At Risk 0 0 0

Specifications

Flash Type: Temperature Pressure

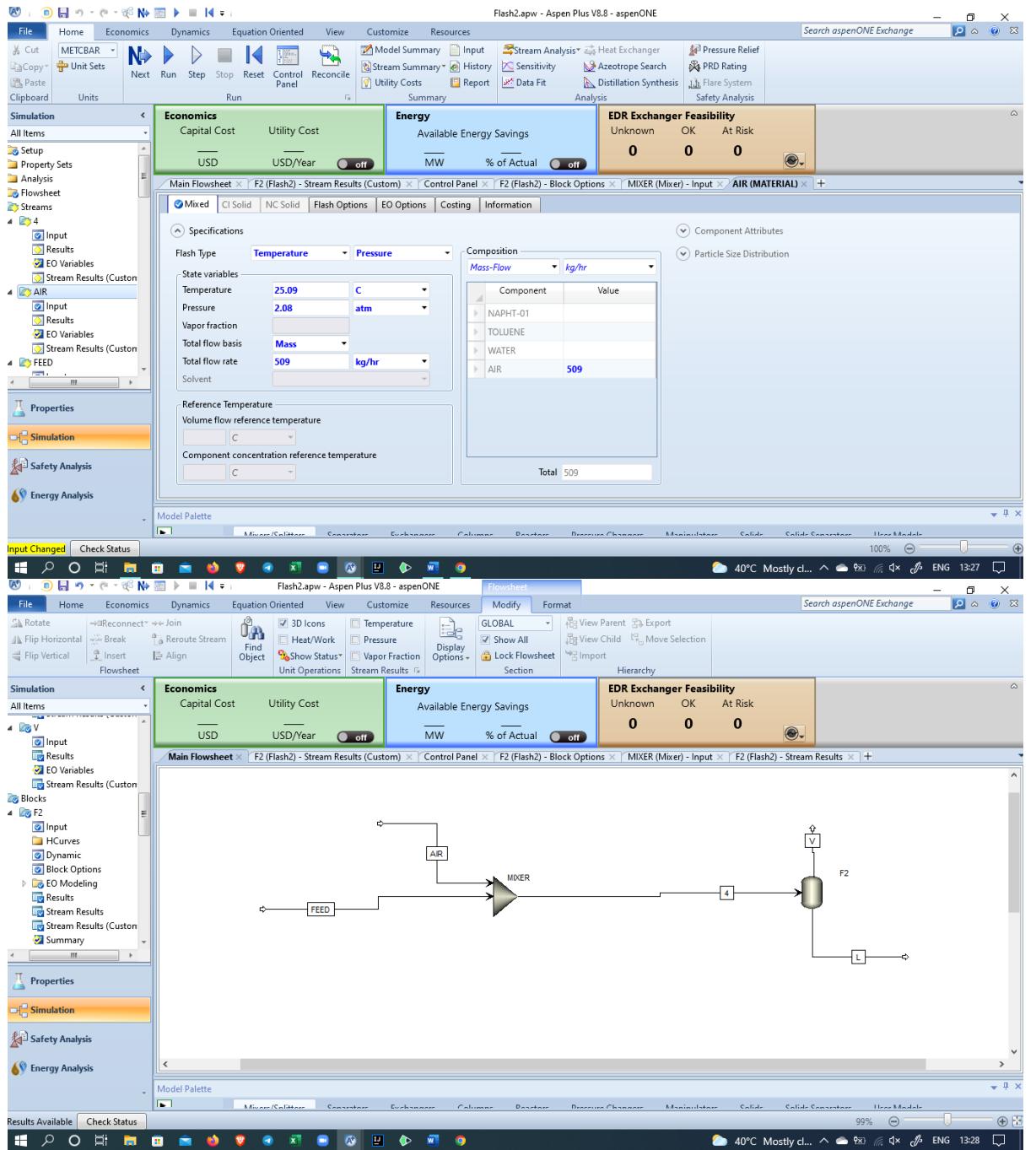
Flash specifications:

- Temperature: 50.09 C
- Pressure: 1.78 atm
- Duty: cal/sec
- Vapor fraction:

Valid phases: Vapor-Liquid

Model Palette

Input Changed Check Status



Heat and Material Balance Table			
Stream ID	4	V	L
From	MIXER	F2	F2
To	F2		
Phase	MIXED	VAPOR	LIQUID
Substream: MIXED			
Mole Flow	kmd/hr		
NAPHT-01		3.179826	8.31814E-3
TOLUENE		4.593083	1.860972
WATER		9.892793	1.975104
AIR		17.58149	17.56838
Total Flow	kmd/hr	35.24719	21.41277
Total Flow	kg/hr	1518.000	716.7397
Total Flow	l/min	3480.461	5317.866
Temperature	C	17.04840	50.09000
Pressure	bar	2.107560	1.803585
Vapor Frac		.5151049	1.000000
Liquid Frac		.4848951	0.0
Solid Frac		0.0	0.0
Enthalpy	cal/mol	-16636.53	-4053.541
Enthalpy	cal/gm	-386.2918	-121.1005
Enthalpy	cal/sec	-1.6289E+5	-24110.43
Entropy	cal/mol-K	-29.92602	-5.271236
Entropy	cal/gm-K	-.6948670	-.1574795
Density	mol/cc	1.68786E-4	6.71095E-5
Density	gm/cc	7.26915E-3	2.24633E-3
Average MW		43.06726	33.47253
Liq Vol 60F	l/min	26.49866	13.53208
			12.96658

Decanter (P – xylene and water):

Decanter.apw - Aspen Plus V8.8 - aspenONE

File Home Economics Dynamics Equation Oriented View Customize Resources

Decanter.apw - Aspen Plus V8.8 - aspenONE

Cut Copy Paste Clipboard Units

Streams Blocks DECANTER

Economics Capital Cost Utility Cost USD USD/Year off

Energy Available Energy Savings MW % of Actual off

EDR Exchanger Feasibility Unknown OK At Risk 0 0 0

Main Flowsheet DECANTER (Decanter) - Stream Results (Custom) Control Panel FEED (MATERIAL) DECANTER (Decanter)

Specifications Calculation Options Efficiency Entrainment Utility Information

Decanter specifications

Pressure	1.09	bar
Temperature	40.09	°C
Duty	cal/sec	

Key components to identify 2nd liquid phase

Available components	>	Key components
P-XYL-01	>>	
WATER	<	
<<		

Key component threshold for 2nd liquid phase

Component mole fraction

Model Palette Mixers/Splitters Separators Exchangers Columns Reactors Pressure Changers Manipulators Solids Solids Separators User Models

Input Changed Check Status

File Home Economics Dynamics Equation Oriented View Customize Resources

Decanter.apw - Aspen Plus V8.8 - aspenONE

41°C Mostly cl... ENG 13:16

Streams Blocks DECANTER

Economics Capital Cost Utility Cost USD USD/Year off

Energy Available Energy Savings MW % of Actual off

EDR Exchanger Feasibility Unknown OK At Risk 0 0 0

Main Flowsheet DECANTER (Decanter) - Stream Results (Custom) Control Panel FEED (MATERIAL) FEED (MATERIAL) DECANTER (Decanter) - Properties

Mixed CI Solid NC Solid Flash Options EO Options Costing Information

Specifications

Flash Type	Temperature	Pressure
State variables		
Temperature	30.09	°C
Pressure	1.09	atm
Vapor fraction		
Total flow basis	Mass	
Total flow rate	2009	kg/hr
Solvent		

Composition

Mass-Frac	
Component	Value
P-XYL-01	0.5
WATER	0.5

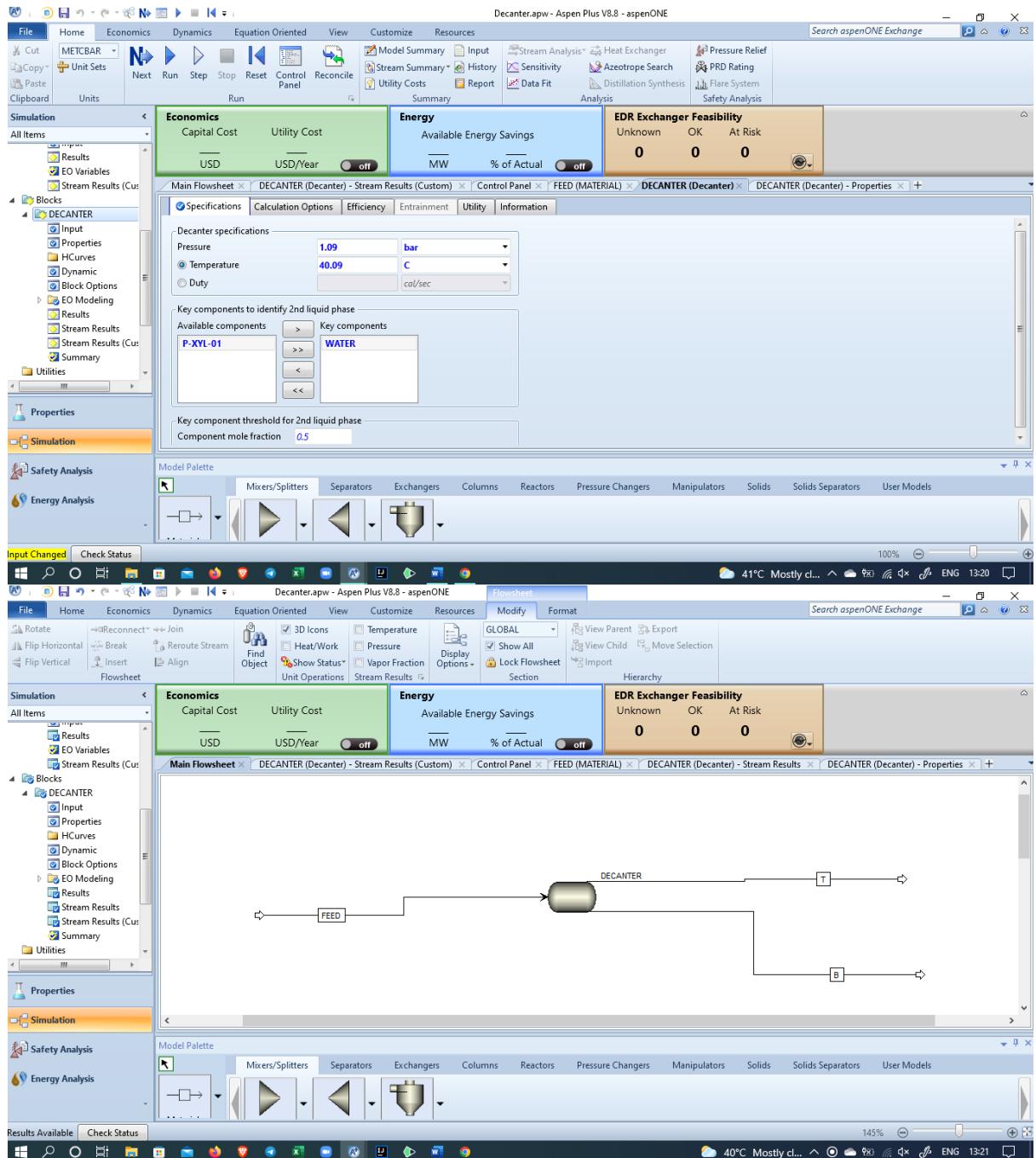
Component Attributes Particle Size Distribution

Reference Temperature Volume flow reference temperature

Model Palette Mixers/Splitters Separators Exchangers Columns Reactors Pressure Changers Manipulators Solids Solids Separators User Models

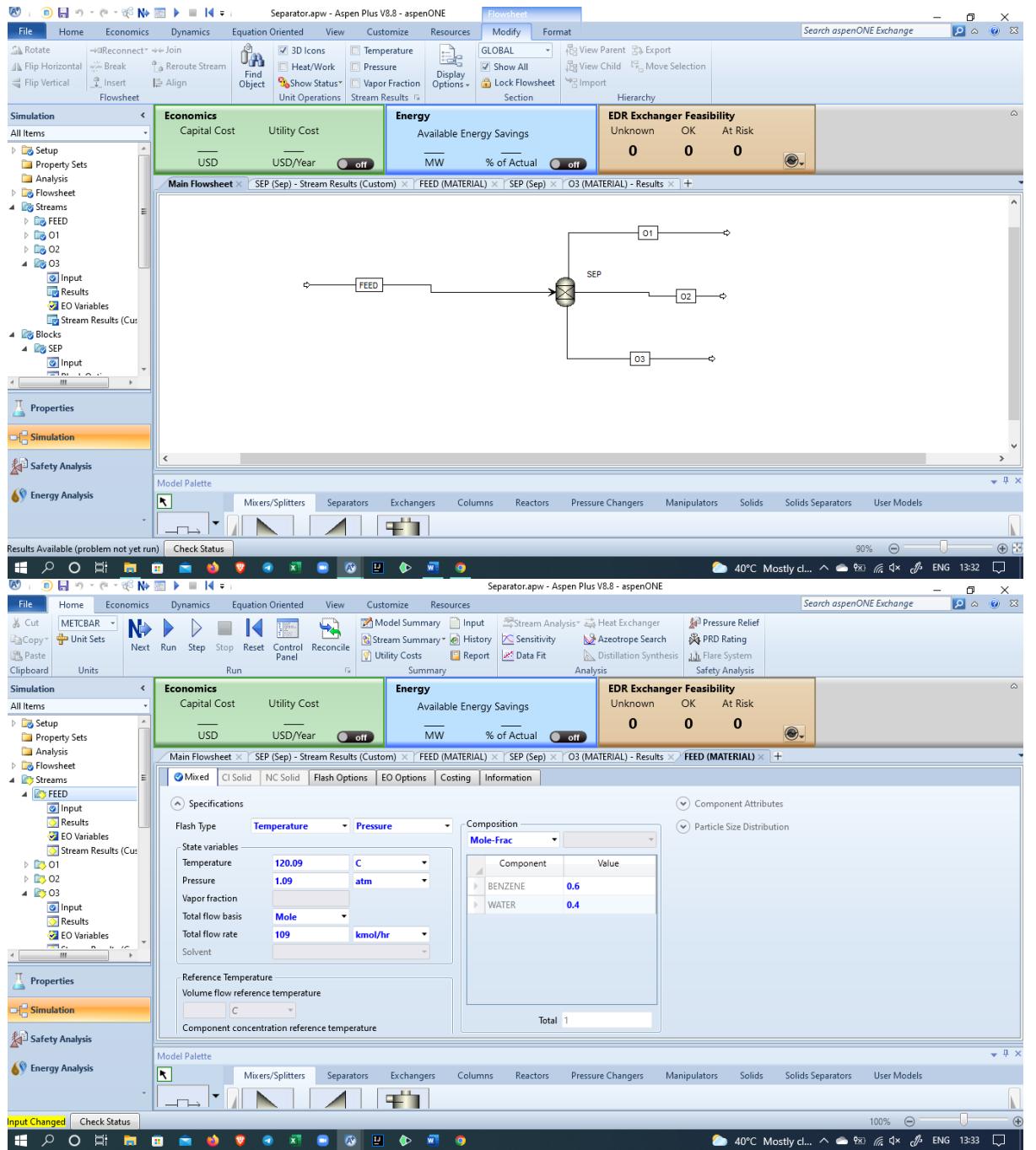
Input Changed Check Status

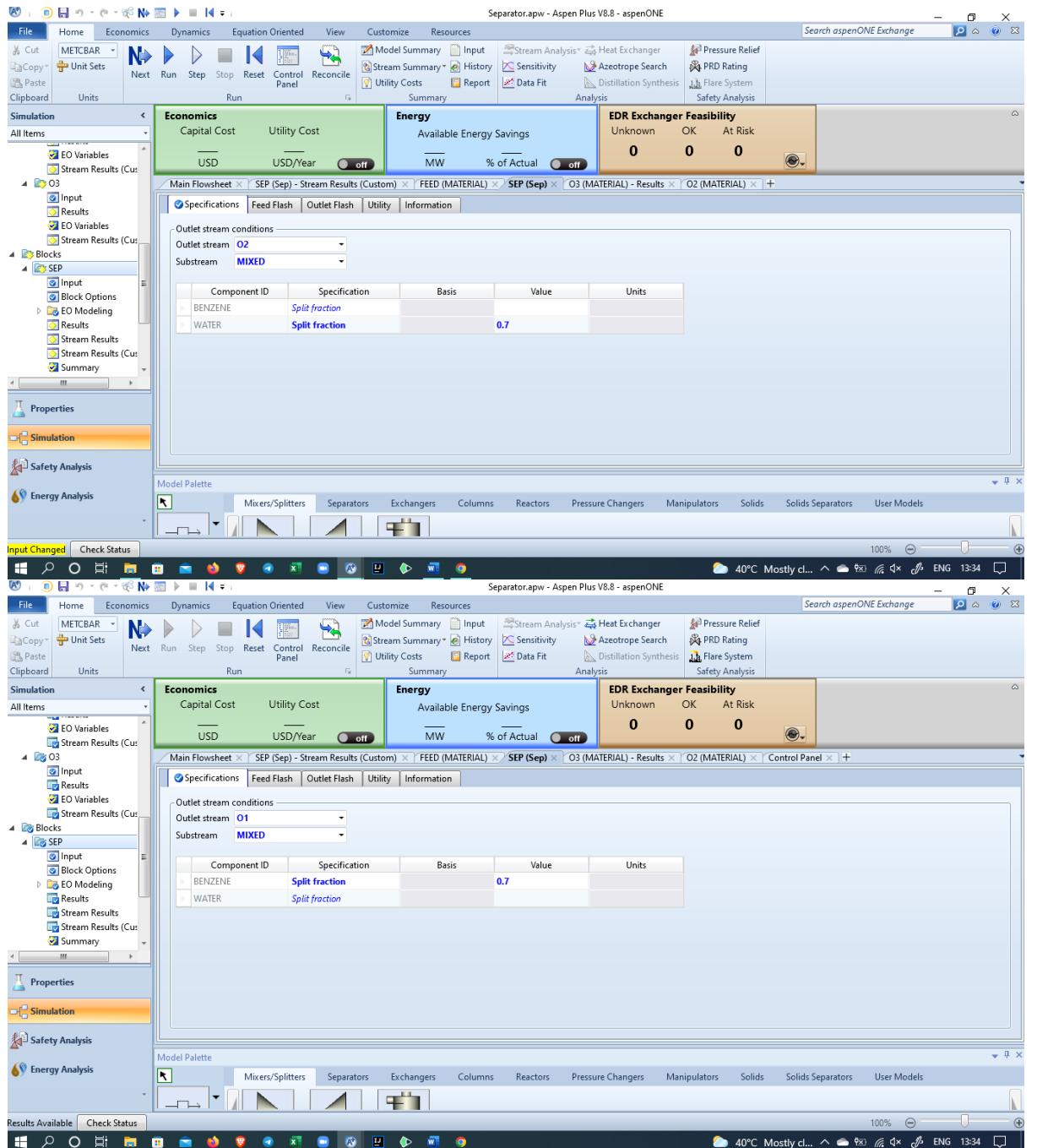
41°C Mostly cl... ENG 13:18



Heat and Material Balance Table				
Stream ID		FEED	T	B
From			DECANTER	DECANTER
To		DECANTER		
Phase		LIQUID	LIQUID	LIQUID
Substream: MIXED				
Mole Flow	kmol/hr			
P-XYL-01		9.461473	9.459261	2.21188E-3
WATER		55.75822	.0256322	55.73259
Total Flow	kmol/hr	65.21970	9.484893	55.73480
Total Flow	kg/hr	2009.000	1004.727	1004.273
Total Flow	l/min	35.80393	19.73824	17.09263
Temperature	C	30.09000	40.09000	40.09000
Pressure	bar	1.104443	1.090000	1.090000
Vapor Frac		0.0	0.0	0.0
Liquid Frac		1.000000	1.000000	1.000000
Solid Frac		0.0	0.0	0.0
Enthalpy	cal/mol	-59057.16	-5317.363	-67990.20
Enthalpy	cal/gm	-1917.217	-50.19734	-3773.297
Enthalpy	cal/sec	-1.0699E+6	-14009.62	-1.0526E+6
Entropy	cal/mol-K	-49.41992	-105.5337	-38.08954
Entropy	cal/gm-K	-1.604357	-.9962667	-2.113880
Density	mol/cc	.0303596	8.00890E-3	.0543458
Density	gm/cc	.9351860	.8483758	.9792455
Average MW		30.80358	105.9292	18.01878
Liq Vol 60F	l/min	36.15592	19.38516	16.77075

SEPARATOR (Input – Benzene and water)

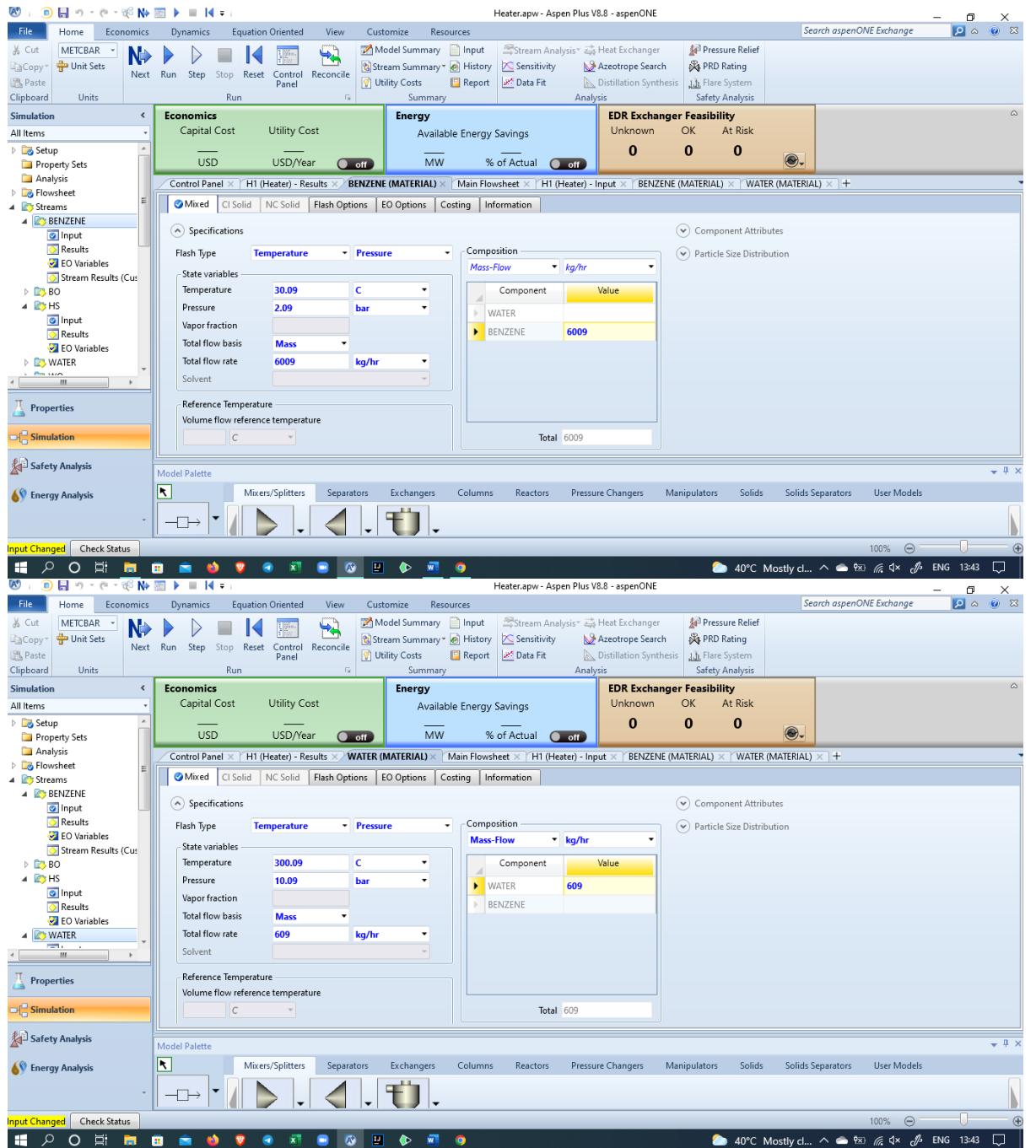




Heat and Material Balance Table					
Stream ID		FEED	O 1	O 2	O 3
From			SEP	SEP	SEP
To		SEP			
Phase		VAPOR	VAPOR	VAPOR	VAPOR
Substream: MIXED					
Mole Flow	kmol/hr				
BENZENE		65.40000	45.78000	0.0	19.62000
WATER		43.60000	0.0	30.52000	13.08000
Total Flow	kmol/hr	109.0000	45.78000	30.52000	32.70000
Total Flow	kg/hr	5894.098	3576.042	549.8263	1768.229
Total Flow	l/min	52929.92	22070.63	14938.12	15878.98
Temperature	C	120.0900	120.0900	120.0900	120.0900
Pressure	bar	1.104443	1.104443	1.104443	1.104443
Vapor Frac		1.000000	1.000000	1.000000	1.000000
Liquid Frac		0.0	0.0	0.0	0.0
Solid Frac		0.0	0.0	0.0	0.0
Enthalpy	cal/mol	-9631.450	21947.72	-57005.80	-9631.450
Enthalpy	cal/gm	-178.1151	280.9717	-3164.303	-178.1151
Enthalpy	cal/sec	-2.9162E+5	2.79102E+5	-4.8328E+5	-87485.67
Entropy	cal/mol-K	-20.87743	-31.31338	-8.573595	-20.87743
Entropy	cal/gm-K	-.3860878	-.4008696	-.4759069	-.3860878
Density	md/cc	3.43221E-5	3.45708E-5	3.40516E-5	3.43221E-5
Density	gm/cc	1.85594E-3	2.70045E-3	6.13449E-4	1.85594E-3
Average MW		54.07430	78.11364	18.01528	54.07430
Liq Vol 60F	l/min	109.5913	67.53244	9.181433	32.87738

4. EXCHANGERS (Heater, HeatX)

HEATER:



Heater.apw - Aspen Plus V8.8 - aspenONE

Economics Capital Cost Utility Cost **Energy** Available Energy Savings **EDR Exchanger Feasibility**

USD	USD/Year	off	MW	% of Actual	off	Unknown	OK	At Risk
0	0	0	0	0	0	0	0	0

Flash specifications

Flash Type: Pressure Duty

Temperature C C C C

Pressure 2.09 bar

Duty 10.09 kW

Vapor fraction

Pressure drop correlation parameter

Always calculate pressure drop correlation parameter

Model Palette

H1 (Heater) - Results

Economics Capital Cost Utility Cost **Energy** Available Energy Savings **EDR Exchanger Feasibility**

USD	USD/Year	off	MW	% of Actual	off	Unknown	OK	At Risk
0	0	0	0	0	0	0	0	0

H2 (Heater) - Results

Economics Capital Cost Utility Cost **Energy** Available Energy Savings **EDR Exchanger Feasibility**

USD	USD/Year	off	MW	% of Actual	off	Unknown	OK	At Risk
0	0	0	0	0	0	0	0	0

Results Available

Heater.apw - Aspen Plus V8.8 - aspenONE

Economics Capital Cost Utility Cost **Energy** Available Energy Savings **EDR Exchanger Feasibility**

USD	USD/Year	off	MW	% of Actual	off
0	0	0	0	0	0

H2 (Heater) - Results **Control Panel** **H1 (Heater) - Results** **Results Summary - Run Status** **Main Flowsheet** **H2 (Heater) - Input** **BENZENE (MATERIAL)** **WATER (MATERIAL)**

Flash specifications

Flash Type: Pressure (Inlet heat stream)

Temperature: C
Temperature change: C
Degrees of superheating: C
Degrees of subcooling: C

Pressure: 10.09 bar
Duty: cal/sec
Vapor fraction:
Pressure drop correlation parameter:
 Always calculate pressure drop correlation parameter

Model Palette: Mixers/Splitters, Separators, Exchangers, Columns, Reactors, Pressure Changers, Manipulators, Solids, Solids Separators, User Models

H2 (Heater) - Results **Control Panel** **H1 (Heater) - Results** **Results Summary - Run Status** **Main Flowsheet** **H1 (Heater) - Input** **BENZENE (MATERIAL)** **WATER (MATERIAL)**

Economics Capital Cost Utility Cost **Energy** Available Energy Savings **EDR Exchanger Feasibility**

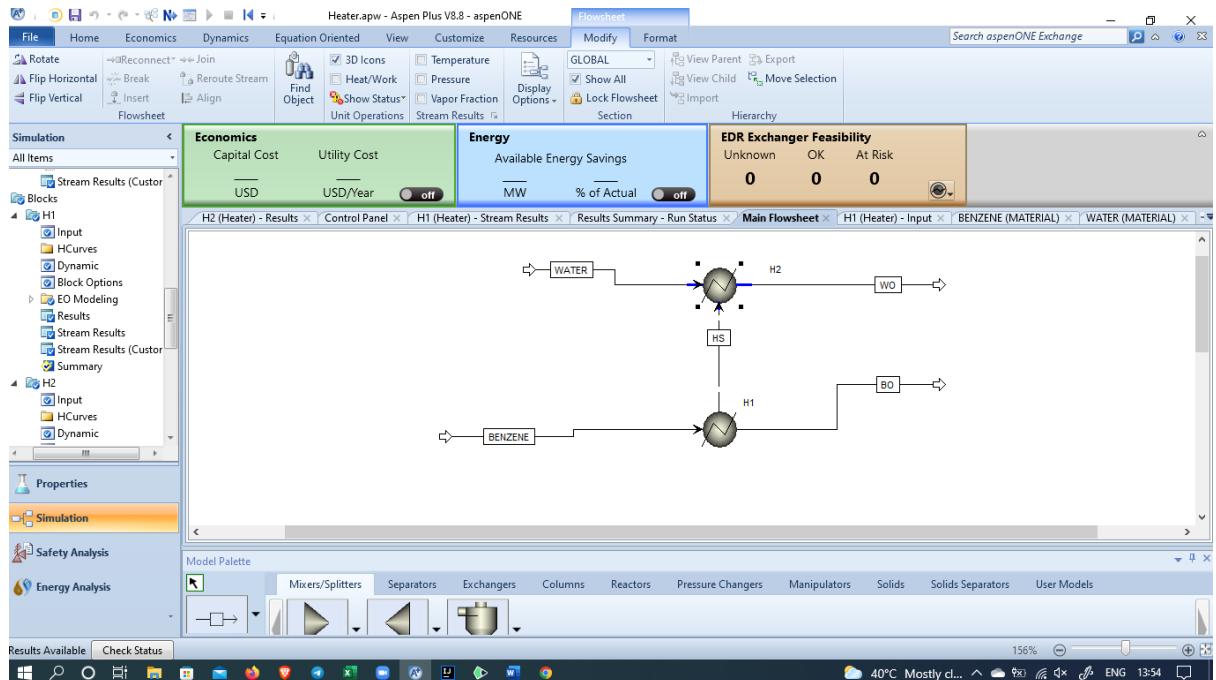
USD	USD/Year	off	MW	% of Actual	off
0	0	0	0	0	0

H2 (Heater) - Results **Control Panel** **H1 (Heater) - Results** **Results Summary - Run Status** **Main Flowsheet** **H1 (Heater) - Input** **BENZENE (MATERIAL)** **WATER (MATERIAL)**

Summary **Balance** **Phase Equilibrium** **Utility Usage** **Status**

Outlet temperature: 33.464 C
Outlet pressure: 2.09 bar
Vapor fraction: 0
Heat duty: 10.09 kW
Net duty: 0 cal/sec
1st liquid / Total liquid: 1
Pressure-drop correlation parameter:

Model Palette: Mixers/Splitters, Separators, Exchangers, Columns, Reactors, Pressure Changers, Manipulators, Solids, Solids Separators, User Models



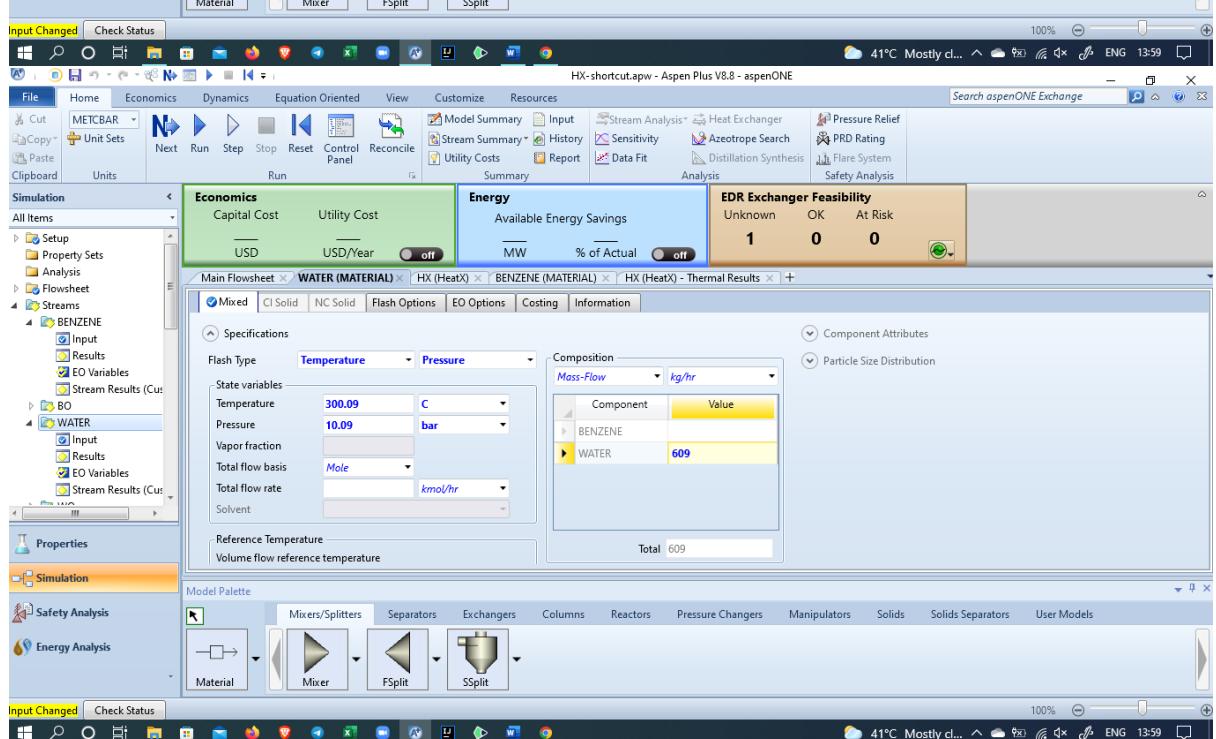
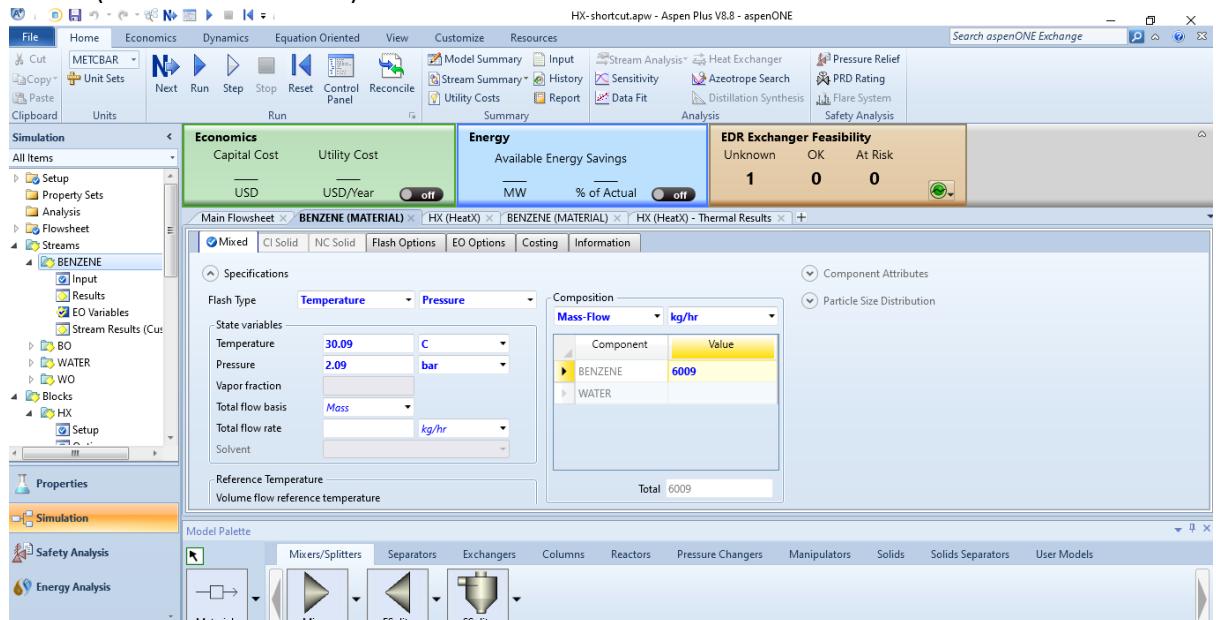
STREAM RESULT FOR H1

Heat and Material Balance Table			
Stream ID		BENZENE	BO
From			H1
To		H1	
Phase		LIQUID	LIQUID
Substream: MIXED			
Mole Flow	kmol/hr		
WATER		0.0	0.0
BENZENE		76.92639	76.92639
Total Flow	kmol/hr	76.92639	76.92639
Total Flow	kg/hr	6009.000	6009.000
Total Flow	l/min	115.5161	115.9709
Temperature	C	30.09000	33.46400
Pressure	bar	2.090000	2.090000
Vapor Frac		0.0	0.0
Liquid Frac		1.000000	1.000000
Solid Frac		0.0	0.0
Enthalpy	cal/mol	11873.84	11986.62
Enthalpy	cal/gm	152.0072	153.4511
Enthalpy	cal/sec	2.53725E+5	2.56135E+5
Entropy	cal/mol-K	-59.87203	-59.50520
Entropy	cal/gm-K	-.7664734	-.7617773
Density	mol/cc	.0110989	.0110554
Density	gm/cc	.8669787	.8635788
Average MW		78.11364	78.11364
Liq Vol 60F	l/min	113.4781	113.4781

STREAM RESULTS FOR H2:

Heat and Material Balance Table			
Stream ID		WATER	WO
From			H2
To		H2	
Phase		VAPOR	VAPOR
Substream: MIXED			
Mole Flow	kmol/hr		
WATER		33.80464	33.80464
BENZENE		0.0	0.0
Total Flow	kmol/hr	33.80464	33.80464
Total Flow	kg/hr	609.0000	609.0000
Total Flow	l/min	2661.323	2522.227
Temperature	C	300.0900	270.1291
Pressure	bar	10.09000	10.09000
Vapor Frac		1.000000	1.000000
Liquid Frac		0.0	0.0
Solid Frac		0.0	0.0
Enthalpy	cal/mol	-55480.69	-55737.34
Enthalpy	cal/gm	-3079.646	-3093.892
Enthalpy	cal/sec	-5.2097E+5	-5.2338E+5
Entropy	cal/mol-K	-9.786615	-10.24643
Entropy	cal/gm-K	-.5432397	-.5687634
Density	mol/cc	2.11703E-4	2.23378E-4
Density	gm/cc	3.81389E-3	4.02422E-3
Average MW		18.01528	18.01528
Liq Vol 60F	l/min	10.16956	10.16956

HEATX (SHORTCUT METHOD)

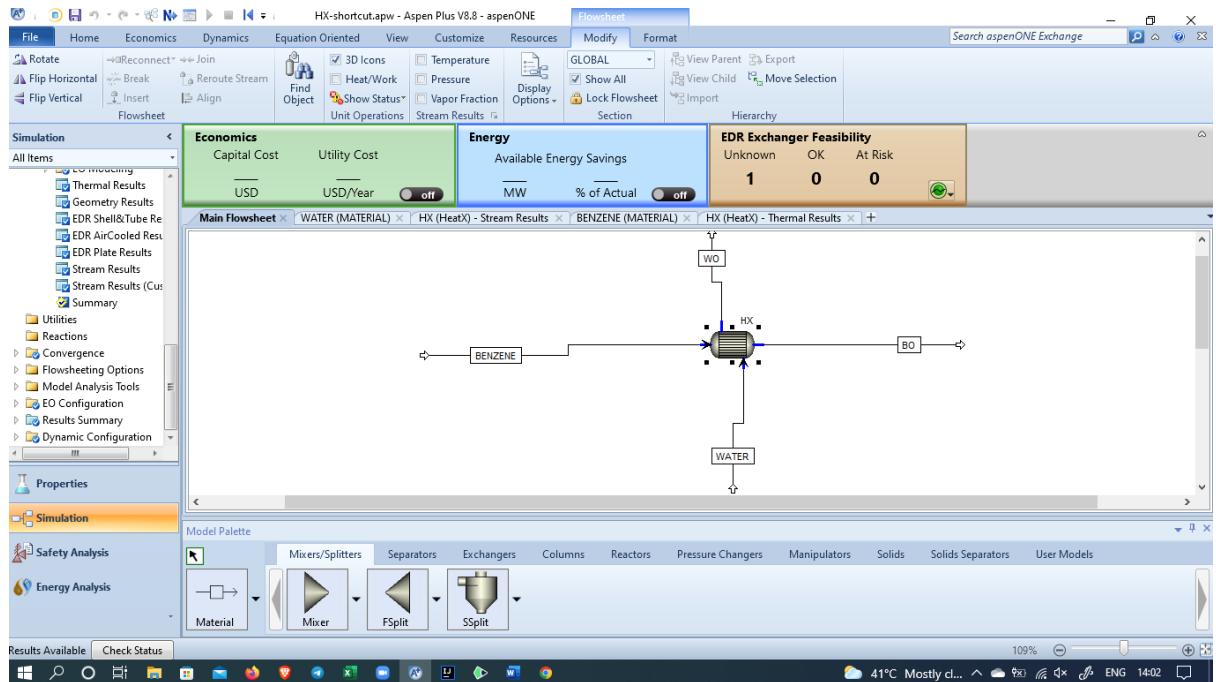


Top Window (Initial State):

Bottom Window (Modified State):

Common Interface Elements:

- Toolbar:** File, Home, Economics, Dynamics, Equation Oriented, View, Customize, Resources.
- Toolbars:** Clipboard, Units, Run, Next, Step, Stop, Reset, Control Panel, Reconcile.
- Panels:**
 - Economics:** Capital Cost, Utility Cost, USD, USD/Year, off.
 - Energy:** Available Energy Savings, MW, % of Actual, off.
 - EDR Exchanger Feasibility:** Unknown, OK, At Risk, 1 0 0.
- Model Palette:** Includes Mixers/Splitters, Separators, Exchangers, Columns, Reactors, Pressure Changers, Manipulators, Solids, Solids Separators, User Models.
- Properties and Simulation Toolbars:** Located on the left side of both windows.
- Status Bar:** Shows system information like temperature (41°C), date (Mostly cl...), and time (14:00).



Heat and Material Balance Table					
Stream ID		BENZENE	WATER	WO	BO
From				HX	HX
To		HX	HX		
Phase		LIQUID	VAPOR	VAPOR	LIQUID
Substream: MIXED					
Mole Flow	kmol/hr				
BENZENE		76.92639	0.0	0.0	76.92639
WATER		0.0	33.80464	33.80464	0.0
Total Flow	kmol/hr	76.92639	33.80464	33.80464	76.92639
Total Flow	kg/hr	6009.000	609.0000	609.0000	6009.000
Total Flow	l/min	115.5161	2661.323	2522.227	115.9709
Temperature	C	30.09000	300.0900	270.1291	33.46400
Pressure	bar	2.090000	10.09000	10.09000	2.090000
Vapor Frac		0.0	1.000000	1.000000	0.0
Liquid Frac		1.000000	0.0	0.0	1.000000
Solid Frac		0.0	0.0	0.0	0.0
Enthalpy	cal/mol	11873.84	-55480.69	-55737.34	11986.62
Enthalpy	cal/gm	152.0072	-3079.646	-3093.892	153.4511
Enthalpy	cal/sec	2.53725E+5	-5.2097E+5	-5.2338E+5	2.56135E+5
Entropy	cal/mol-K	-59.87203	-9.786615	-10.24643	-59.50520
Entropy	cal/gm-K	-.7664734	-.5432397	-.5687634	-.7617773
Density	mol/cc	.0110989	2.11703E-4	2.23378E-4	.0110554
Density	gm/cc	.8669787	3.81389E-3	4.02422E-3	.8635788
Average MW		78.11364	18.01528	18.01528	78.11364
Liq Vol 60F	l/min	113.4781	10.16956	10.16956	113.4781

HEATX (SHELL AND TUBE METHOD)

File Home Economics Dynamics Equation Oriented View Customize Resources

METCBAR Next Run Step Stop Reset Control Panel Reconcile Run Summary Model Summary Input Stream Analysis Heat Exchanger Stream Summary History Sensitivity Azeotrope Search Utility Costs Data Fit Distillation Synthesis Analysis Pressure Relief PRD Rating Flare System Safety Analysis

Search aspenONE Exchange

Simulation

All Items

- Setup
- Property Sets
- Analysis
- Flowsheet
- Streams
 - BENZENE
 - BO
 - WATER
 - WO
- Blocks
 - HX
 - Setup
 - Options
 - EDR Options
 - EDR Browser
 - Geometry

Properties

Simulation

Safety Analysis

Energy Analysis

Economics

Capital Cost Utility Cost

USD USD/Year off

Energy

Available Energy Savings

MW % of Actual off

EDR Exchanger Feasibility

Unknown	OK	At Risk
1	0	0

BENZENE (MATERIAL) HX (HeatX) - Thermal Results HX (HeatX) HX (HeatX) - Stream Results (Custom) Main Flowsheet BO (MATERIAL)

Specifications

Flash Type Temperature Pressure

State variables

Temperature	30.09	C
Pressure	2.09	bar
Vapor fraction		
Total flow basis	Mole	
Total flow rate		kmol/hr
Solvent		

Composition

Mass-Flow kg/hr

Component	Value
BENZENE	6009
WATER	

Total 6009

Activate Windows Go to Settings to activate Windows.

Model Palette

Input Changed Check Status

41°C Mostly cl... 100% ENG 14:57

HX - Shell and tube.apw - Aspen Plus V8.8 - aspenONE

Economics Capital Cost Utility Cost **Energy** Available Energy Savings **EDR Exchanger Feasibility**

USD USD/Year off MW % of Actual off Unknown OK At Risk 1 0 0

HX (HeatX) - Setup **HX (HeatX) - Thermal Results** **HX (HeatX)** **HX (HeatX) - Stream Results (Custom)** **Main Flowsheet** **BO (MATERIAL)**

Model Integrity Hot fluid Shortcut flow direction

- Shortcut
- Detailed
- Shell & Tube
- Kettle Reboiler
- Thermosyphon
- Air Cooled
- Plate

Calculation mode Design

Exchanger specification

Specification	Exchanger duty
Value	10 KW
Exchanger area	sqm
Constant UA	cal/sec-K
Minimum temperature approach	1 C

Reconcile Size Exchanger Specify Geometry Results

Model Palette

Input Changed Check Status

File Home Economics Dynamics Equation Oriented View Customize Resources

Cut Copy Paste Unit Sets METCBAR Next Run Step Stop Reset Control Panel Reconcile Units Run

Clipboard Simulation All Items

Properties **Simulation** **Safety Analysis** **Energy Analysis**

Activate Windows Go to Settings to activate Windows.

HX - Shell and tube.apw - Aspen Plus V8.8 - aspenONE

Economics Capital Cost Utility Cost **Energy** Available Energy Savings **EDR Exchanger Feasibility**

USD USD/Year off MW % of Actual off Unknown OK At Risk 0 1 0

EO Configuration **HX (HeatX) - Thermal Results** **HX (HeatX)** **HX (HeatX) - Stream Results (Custom)** **Main Flowsheet** **BO (MATERIAL)**

Summary Balance Exchanger Details Pres Drop/Velocities Zones Utility Usage Status

Exchanger details

Calculated heat duty	2388.46	cal/sec
Required exchanger area	0.164262	sqm
Actual exchanger area	2.32579	sqm
Percent over (under) design	1315.9	
Average U (Dirty)	0.00574918	cal/sec-sqcm-K
Average U (Clean)	0.00574918	cal/sec-sqcm-K
UA	9.4437	cal/sec-K
LMTD (Corrected)	252.916	C
LMTD correction factor	0.998666	
Thermal effectiveness		
Number of transfer units		
Number of shells in series	1	

Model Palette

Results Available Check Status

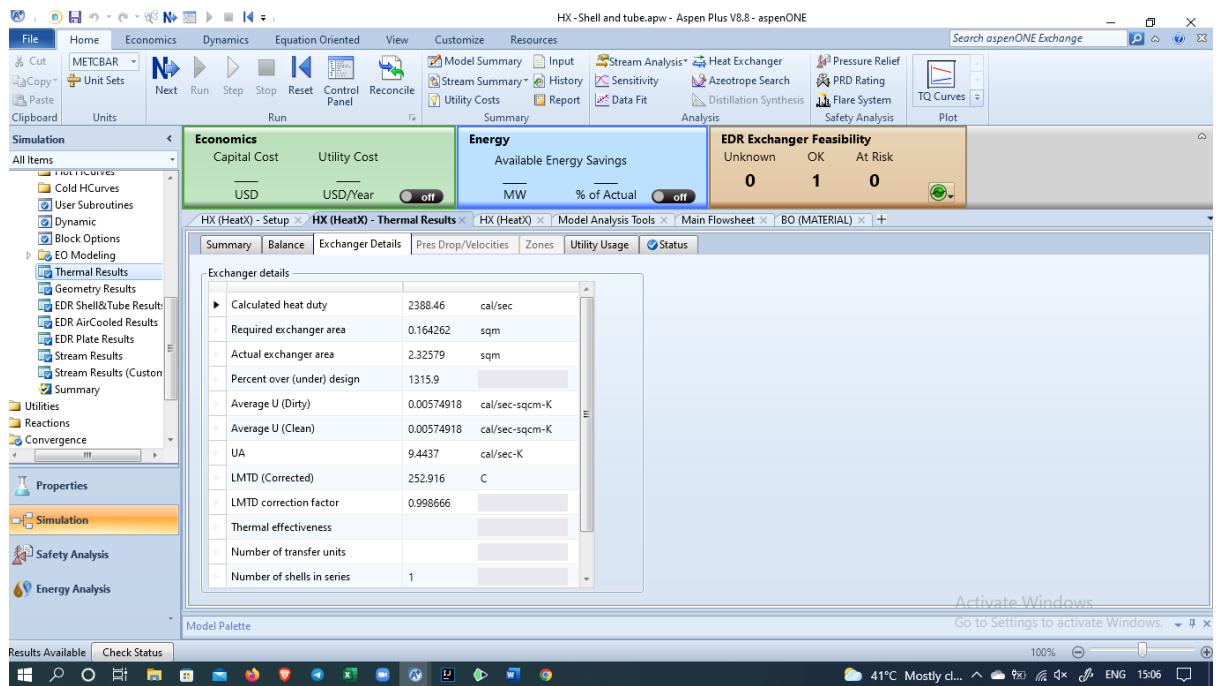
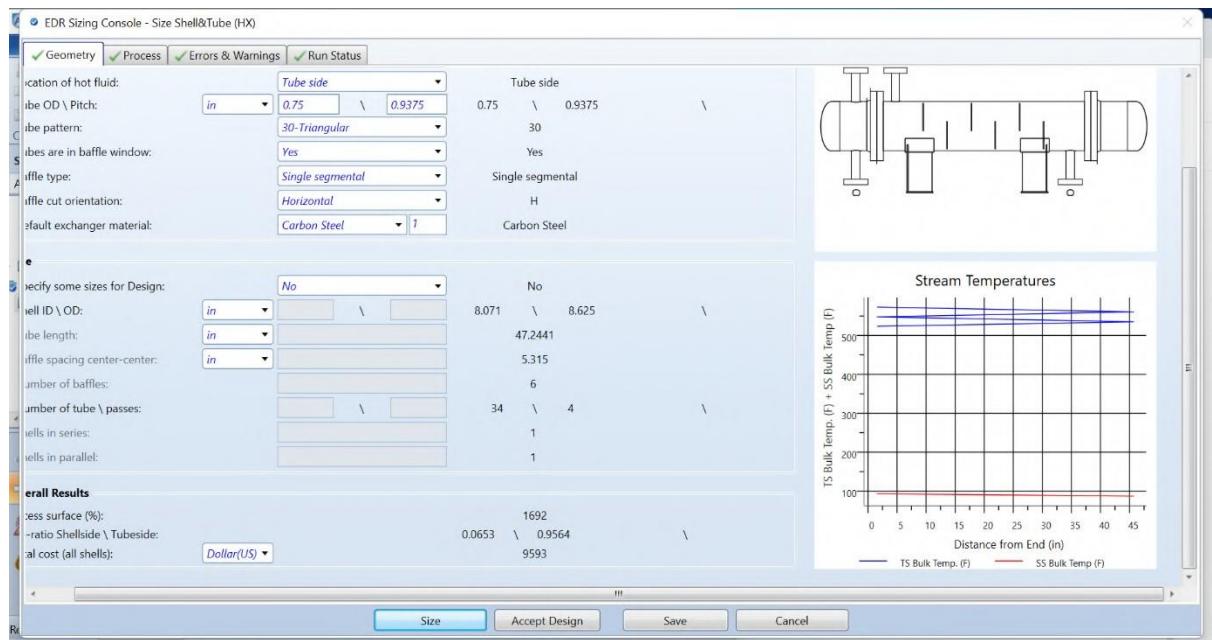
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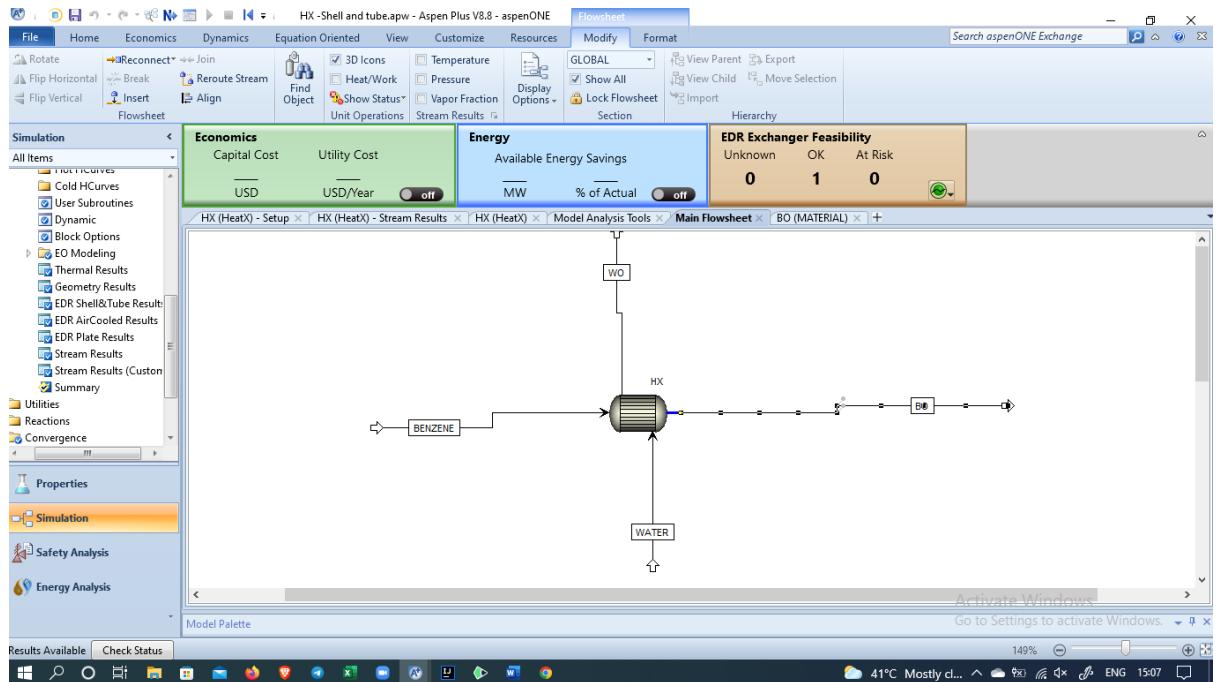
Cut Copy Paste Unit Sets METCBAR Next Run Step Stop Reset Control Panel Reconcile Units Run

Clipboard Simulation All Items

Properties **Simulation** **Safety Analysis** **Energy Analysis**

Activate Windows Go to Settings to activate Windows.

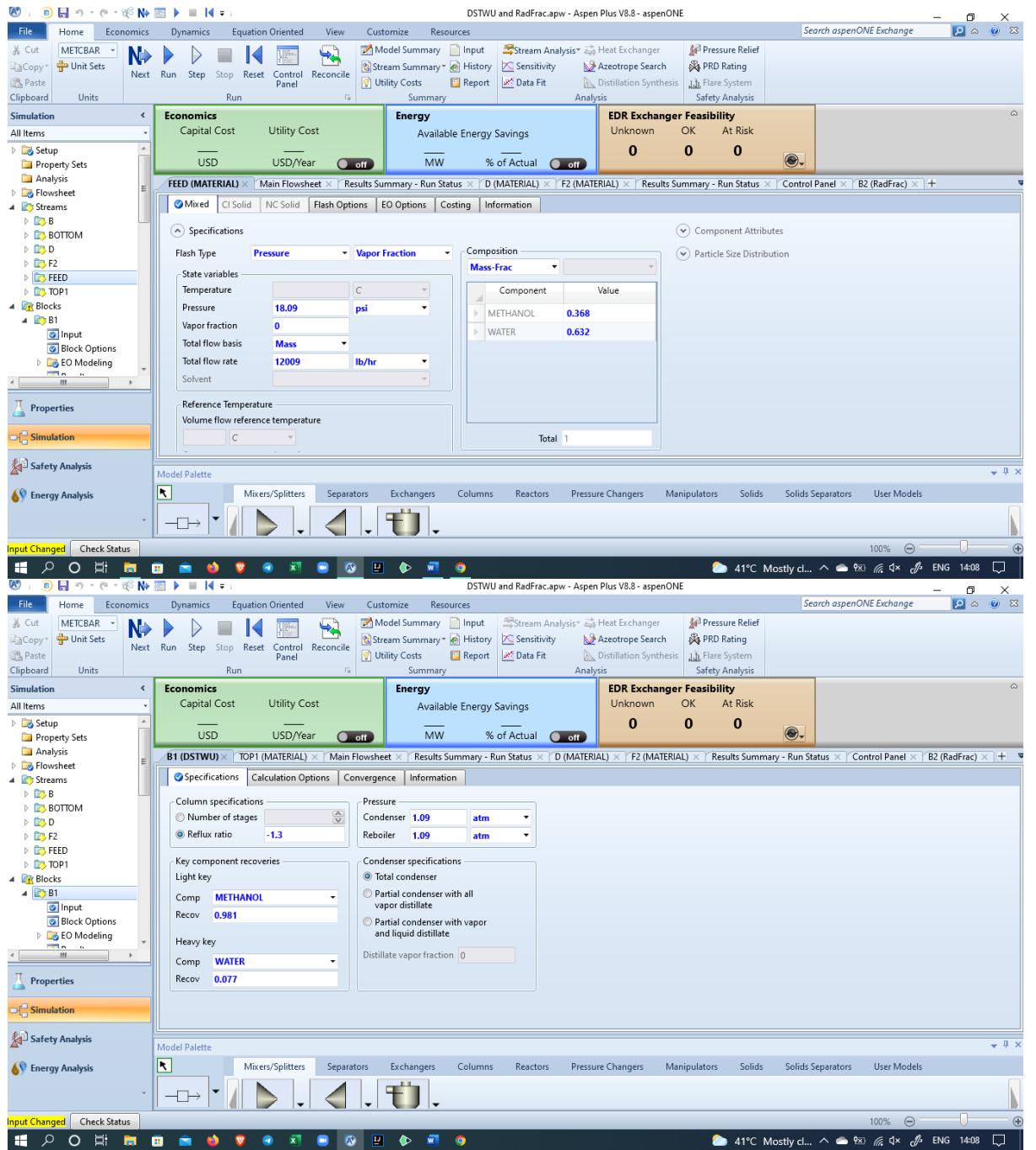




Heat and Material Balance Table					
Stream ID		BENZENE	WATER	WO	BO
From				HX	HX
To		HX	HX		
Phase		LIQUID	VAPOR	VAPOR	LIQUID
Substream: MIXED					
Mole Flow	kmol/hr				
BENZENE		76.92639	0.0	0.0	76.92639
WATER		0.0	33.80464	33.80464	0.0
Total Flow	kmol/hr	76.92639	33.80464	33.80464	76.92639
Total Flow	kg/hr	6009.000	609.0000	609.0000	6009.000
Total Flow	l/min	115.5161	2661.323	2531.215	115.9668
Temperature	C	30.09000	300.0900	270.3976	33.43403
Pressure	bar	2.090000	10.09000	10.05914	1.967638
Vapor Frac		0.0	1.000000	1.000000	0.0
Liquid Frac		1.000000	0.0	0.0	1.000000
Solid Frac		0.0	0.0	0.0	0.0
Enthalpy	cal/mol	11873.84	-55480.69	-55735.05	11985.61
Enthalpy	cal/gm	152.0072	-3079.646	-3093.765	153.4382
Enthalpy	cal/sec	2.53725E+5	-5.2097E+5	-5.2336E+5	2.56114E+5
Entropy	cal/mol-K	-59.87203	-9.786615	-10.23614	-59.50845
Entropy	cal/gm-K	.7664734	-.5432397	-.5681919	-.7618190
Density	mol/cc	.0110989	2.11703E-4	2.22585E-4	.0110558
Density	gm/cc	.8669787	3.81389E-3	4.00993E-3	.8636090
Average MW		78.11364	18.01528	18.01528	78.11364
Liq Vol 60F	l/min	113.4781	10.16956	10.16956	113.4781

5. COLUMNS (DSTWU, Distl, RadFrac):

DSTWU:



DSTWU and RadFrac.apw - Aspen Plus V8.8 - aspenONE

Economics

Capital Cost	Utility Cost
USD	USD/Year

Energy

Available Energy Savings	
MW	% of Actual

EDR Exchanger Feasibility

Unknown	OK	At Risk
0	0	0

B1 (DSTWU) - Results

Summary

Minimum number of stages	4.05759
Number of actual stages	9.06222
Feed stage	5.50086
Number of actual stages above feed	4.50086
Reboiler heating required	338383 cal/sec
Condenser cooling required	329374 cal/sec
Distillate temperature	69.8648 C
Bottom temperature	101.256 C
Distillate to feed fraction	0.299958
HETP	

Model Palette

- Mixers/Splitters
- Separators
- Exchangers
- Columns
- Reactors
- Pressure Changers
- Manipulators
- Solids
- Solids Separators
- User Models

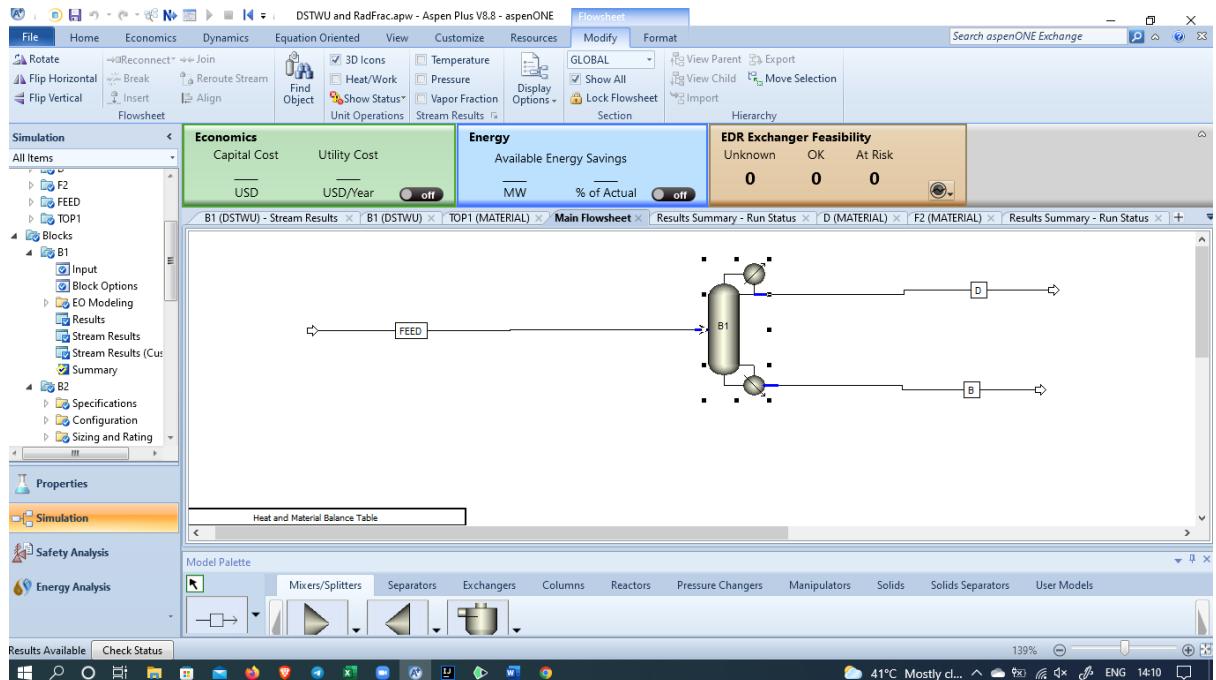
B1 (DSTWU) - Results

Summary

► Minimum reflux ratio	0.608858
Actual reflux ratio	0.791515
Minimum number of stages	4.05759
Number of actual stages	9.06222
Feed stage	5.50086
Number of actual stages above feed	4.50086
Reboiler heating required	338383 cal/sec
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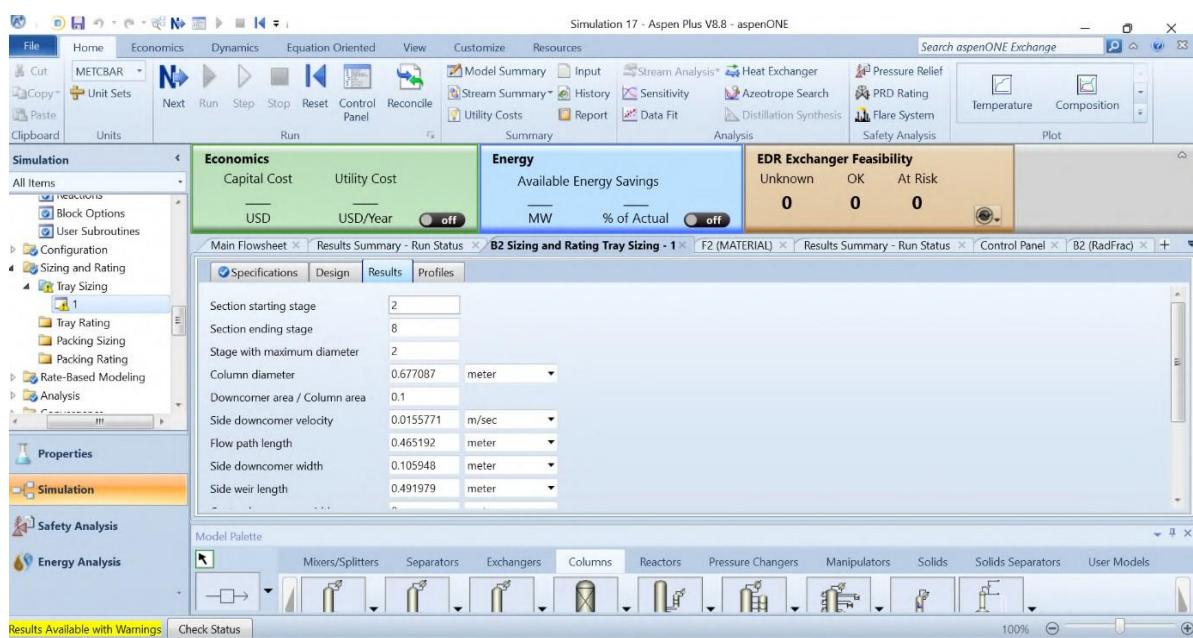
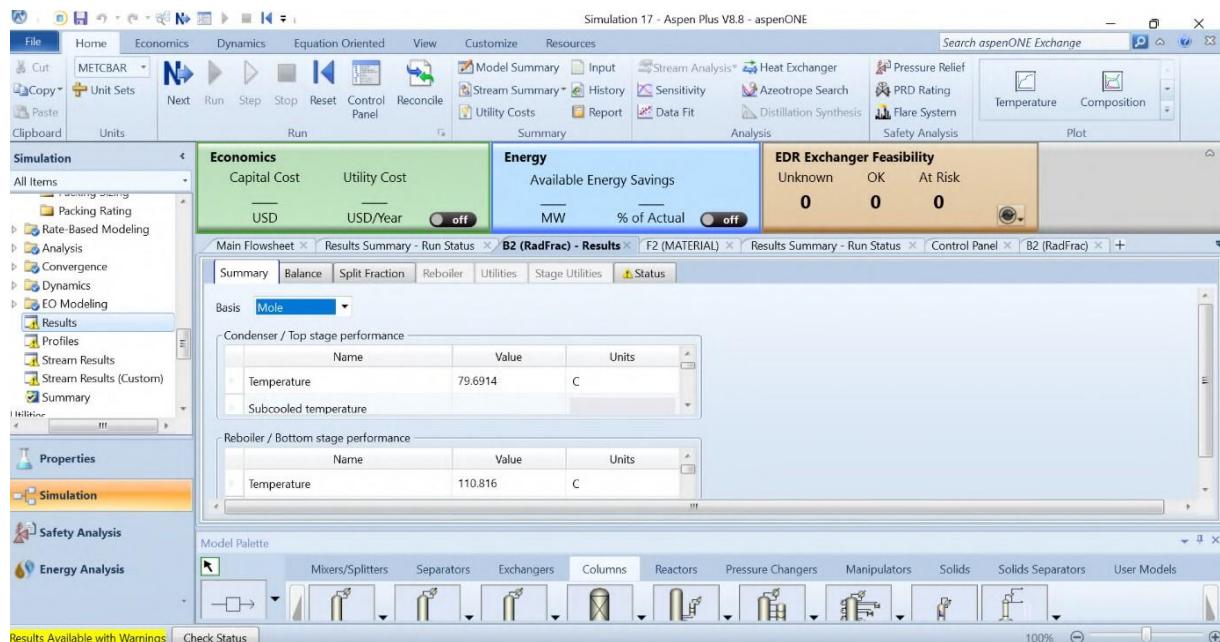
Model Palette

- Mixers/Splitters
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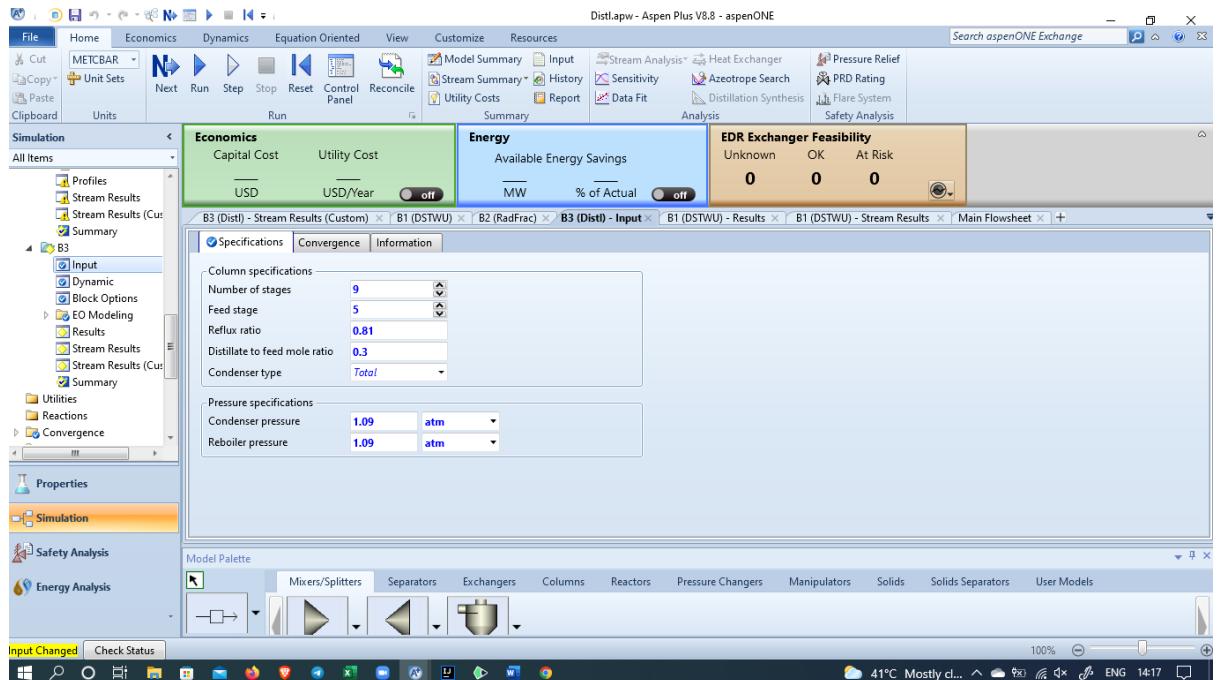
Heat and Material Balance Table				
StreamID		FEED	D	B
From			B1	B1
To		B1		
Phase		LIQUID	LIQUID	LIQUID
Substream: MIXED				
Mole Flow	kmol/hr			
METHANOL		62.56027	61.37163	1.188645
WATER		191.0947	14.71429	176.3804
Total Flow	kmol/hr	253.6550	76.08592	177.5691
Total Flow	kg/hr	5447.191	2231.562	3215.629
Total Flow	l/min	108.5228	49.28023	58.66824
Temperature	C	86.12414	69.86482	101.2561
Pressure	bar	1.247262	1.104443	1.104443
Vapor Frac		0.0	0.0	0.0
Liquid Frac		1.000000	1.000000	1.000000
Solid Frac		0.0	0.0	0.0
Enthalpy	cal/mol	-64308.07	-58099.65	-66785.66
Enthalpy	cal/gm	-2994.582	-1980.929	-3687.946
Enthalpy	cal/sec	-4.5311E+6	-1.2279E+6	-3.2942E+6
Entropy	cal/mol-K	-39.15285	-49.90769	-34.86128
Entropy	cal/gm-K	-1.823199	-1.701621	-1.925062
Density	mol/cc	.0389557	.0257324	.0504444
Density	gm/cc	.8365665	.7547184	.9135065
Average MW		21.47480	29.32950	18.10918
Liq Vol 60F	l/min	99.54338	45.68322	53.86017

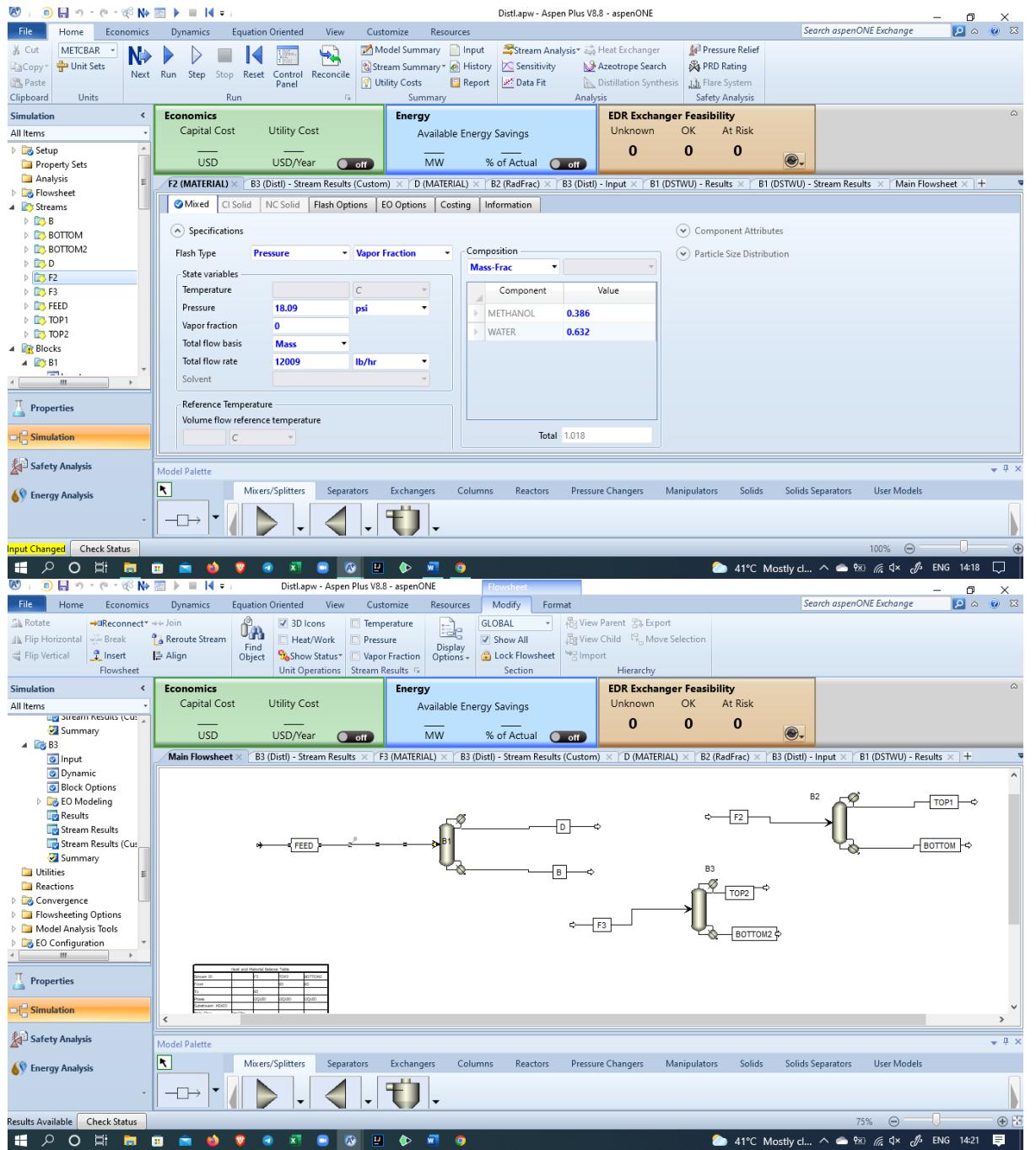
RADFRAC:



Heat and Material Balance Table				
Stream ID		F2	TOP1	BOTTOM
From			B2	B2
To		B2		
Phase		LIQUID	LIQUID	LIQUID
Substream: MIXED				
Mole Flow	kmol/hr			
METHANOL		64.46000	62.62870	1.831307
WATER		187.7158	13.02405	174.6918
Total Flow	kmol/hr	252.1758	75.65275	176.5231
Total Flow	kg/hr	5447.191	2241.391	3205.800
Total Flow	l/min	108.8136	49.61292	58.56676
Temperature	C	85.78352	69.50774	100.6367
Pressure	bar	1.247262	1.104443	1.104443
Vapor Frac		0.0	0.0	0.0
Liquid Frac		1.000000	1.000000	1.000000
Solid Frac		0.0	0.0	0.0
Enthalpy	cal/mol	-64209.59	-57862.60	-66755.86
Enthalpy	cal/gm	-2972.561	-1953.013	-3675.822
Enthalpy	cal/sec	-4.4978E+6	-1.2160E+6	-3.2733E+6
Entropy	cal/mol-K	-39.31285	-50.35700	-34.93166
Entropy	cal/gm-K	-1.819975	-1.699679	-1.923465
Density	mol/cc	.0386250	.0254143	.0502341
Density	gm/cc	.8343302	.7529594	.9122922
Average MW		21.60077	29.62735	18.16080
Liq Vol 60F	l/min	99.80398	46.01979	53.78419

Distl:





Heat and Material Balance Table				
Stream ID		F3	TOP2	BOTTOM2
From			B3	B3
To		B3		
Phase		LIQUID	LIQUID	LIQUID
Substream: MIXED				
Mole Flow	kmol/hr			
METHANOL		62.56027	61.43879	1.121482
WATER		191.0947	14.65746	176.4372
Total Flow	kmol/hr	253.6550	76.09649	177.5585
Total Flow	kg/hr	5447.191	2232.697	3214.497
Total Flow	l/min	108.5228	49.30957	58.63961
Temperature	C	86.12414	69.85175	101.3212
Pressure	bar	1.247262	1.104443	1.104443
Vapor Frac		0.0	0.0	0.0
Liquid Frac		1.000000	1.000000	1.000000
Solid Frac		0.0	0.0	0.0
Enthalpy	cal/mol	-64308.07	-58090.83	-66788.79
Enthalpy	cal/gm	-2994.582	-1979.896	-3689.198
Enthalpy	cal/sec	-4.5311E+6	-1.2279E+6	-3.2941E+6
Entropy	cal/mol-K	-39.15285	-49.92394	-34.85418
Entropy	cal/gm-K	-1.823199	-1.701546	-1.925233
Density	mol/cc	.0389557	.0257206	.0504660
Density	gm/cc	.8365665	.7546530	.9136306
Average MW		21.47480	29.34034	18.10388
Liq Vol 60F	l/min	99.54338	45.71127	53.83211