

# CH402 Chemical Engineering Process Design

Class Notes L9

Heat Exchanger Design – You are expected to know this!

Problem 14-15 using CHEMCAD

“3-Step” Heat Exchanger Design Method

(use desktop computer unless laptops have updated price index)

# Problem Statement 14-15

The overhead vapor from the C2 splitter in Figure 3-13 is partially condensed in E-601. The process conditions for the vapor entering the condenser are

|                 |       |
|-----------------|-------|
| Temperature, °C | -30.1 |
| Pressure, kPa   | 1945* |

Species Flow rates, kg/s

|                               |        |
|-------------------------------|--------|
| CH <sub>4</sub>               | 0.003  |
| C <sub>2</sub> H <sub>6</sub> | 0.0626 |
| C <sub>2</sub> H <sub>4</sub> | 64.53  |

\* Value has been changed from the book value. The authors report 2944 kPa.

A shell-and-tube heat exchanger is to be used to condense 73.5 % of the overhead vapor. Use an appropriate software package (based on TEMA guidelines) to obtain the overall heat transfer coefficient and the area required for the condensation if the tubes have an outside diameter of 0.0127 m and an inside diameter of 0.0094 m. Assuming that the maximum length of the tubes is 3.05 m long, **how many tubes** will be required and what **shell diameter** is recommended? Propylene at -46 °C and 125 kPa serves as the coolant for the condensation process.

Additional Questions: (1) Identify the **largest resistance** to heat transfer in the exchanger and, (2) determine the **total purchase cost** of the exchanger in Feb. 2026.

# Process Background - Conventional Ethylene Process – Fig. 3-7.

page 91

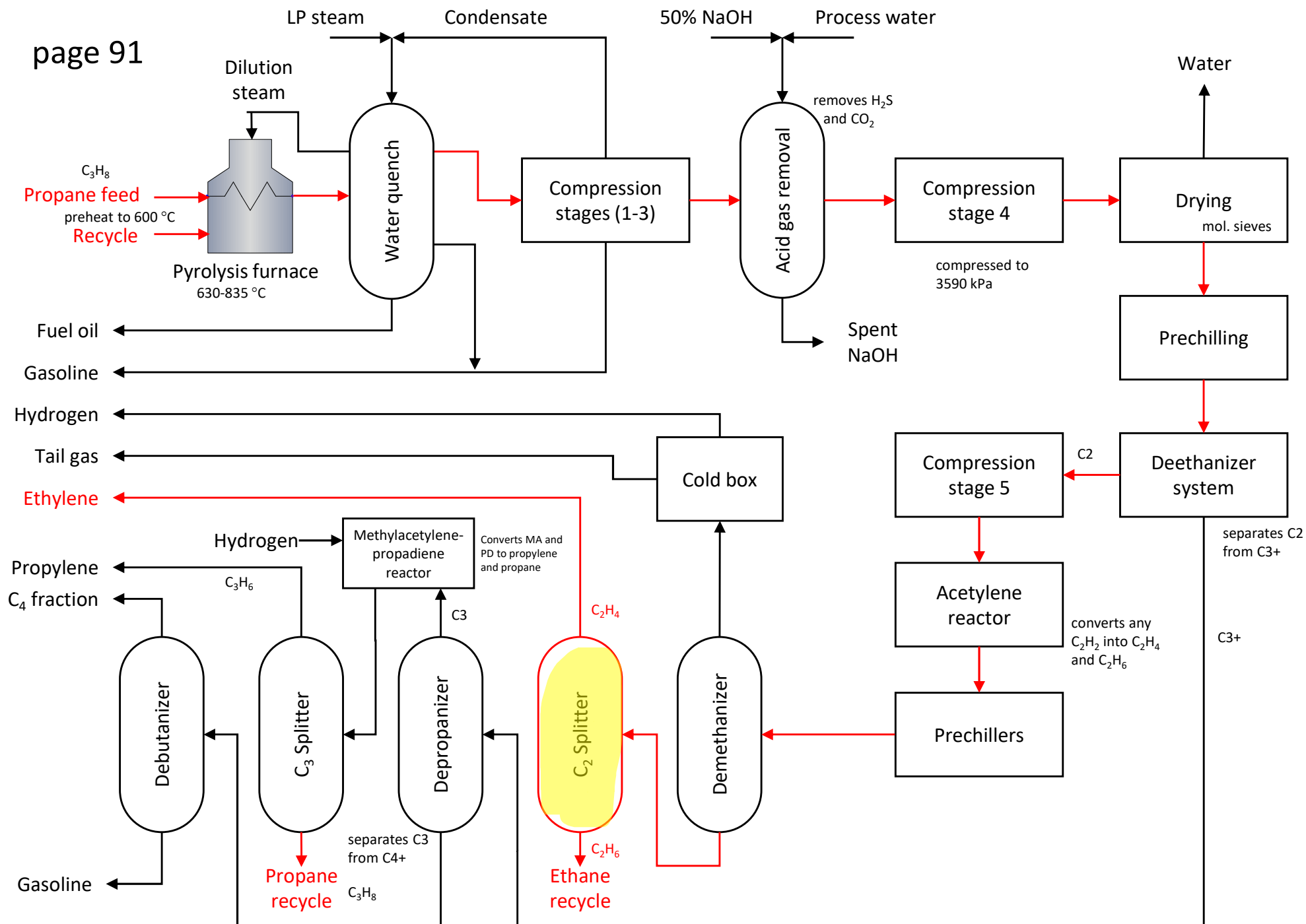


Figure 3-13. Product Separation Section

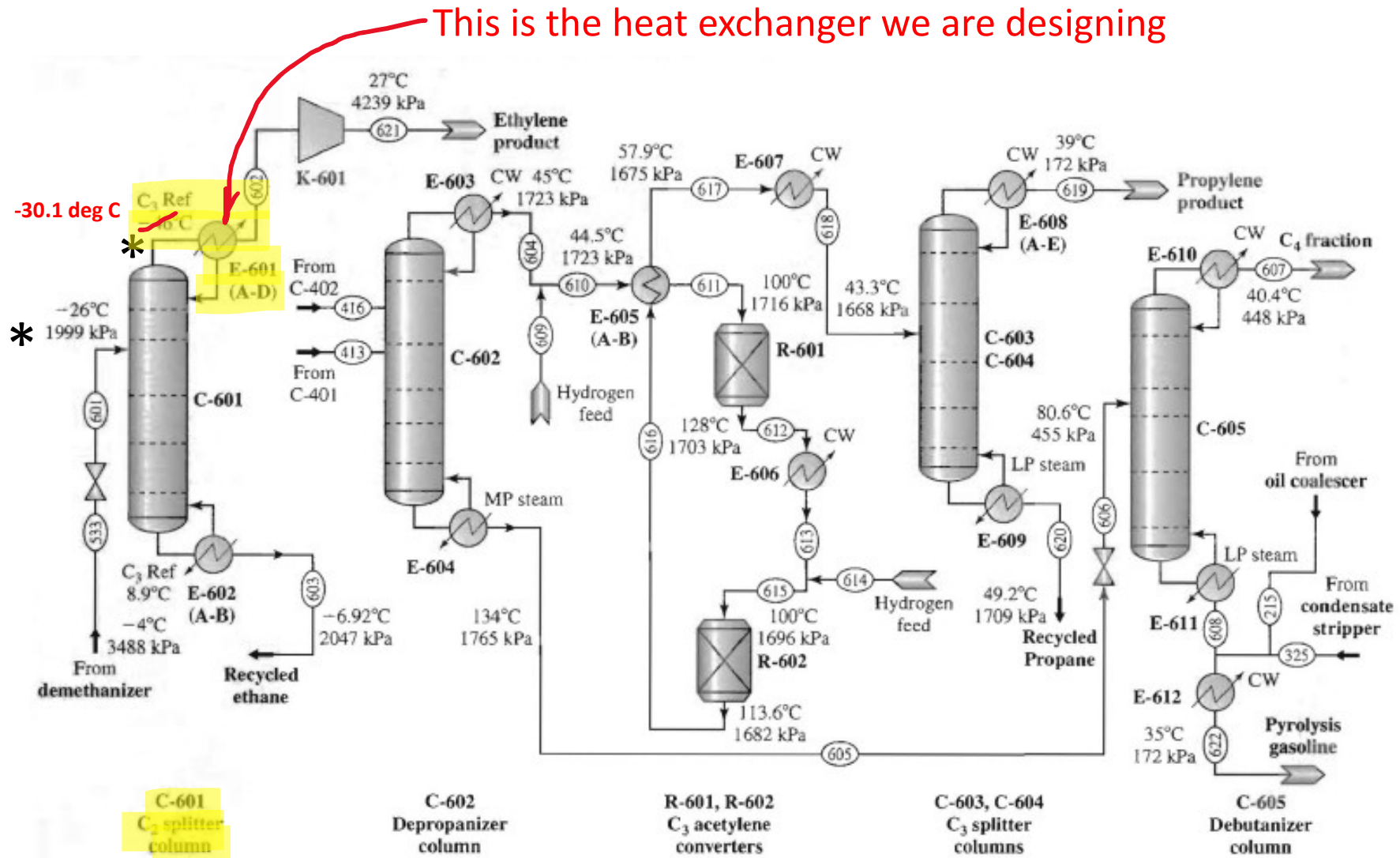


Figure 3-13. Product separation section.

**Change engineering units**

**Change CEPCI to Feb 2026 for PS5**

CHEMCAD 8.1.0 - [Untitled]

File Home Drawing View Thermophysic Component D Specification Analysis Sizing **Tools** CC-THERM

Steady State Dynamic

Run All Run from Initial State

Charts Reports

Property Set Stream Property Report Viewer MS Excel

Results

Engineering Units

System Profiles

English Default Profile

**Common SI**

Formal SI

Metric

User Profiles

ALT SI

Research

Current Flowsheet Settings: Custom Save As

Fundamental

Time **sec**

Mole/Mass kg

Temperature C

Pressure **kPa**

Enthalpy J

Work **kJ**

Fluid Flow

Liquid Volume Rate m3/h

Vapor Volume Rate m3/h

Vapor Density kg/m3

Liquid Density/Con... kg/m3

Crude Flow Rate m3/h

Velocity m/sec

Fluid Properties

Heat Capacity kJ/kg-K

Specific Heat kJ/kg

Heat Transfer Coef... W/m2-K

Thermal Conductivity W/m-K

Viscosity N-s/m2

Surface Tension N/m

Stream Flow Units

Total Flow Default mole/r

Component Flow Default mole/r

Stream Edit Automatic con

VBA Flow Units

Flow unit option for some VBA functions.

Mole

Vapor Reference Temperature

This is the reference for determining standard vapor volume flow rate.

Default 0.00 C

Custom

Atmospheric Pressure Reference

This is the reference for determining gauge pressure.

Default 101.3249817 kPa

Custom

Pipe Table Selection

Default pipe table for Pipe, Onifice, and line sizing tool.

ASME (B36.10M-2015, B36.19M-2004)

Set Default Delete

Help

Cancel Apply

Palette

All UnitOps : Grayscale

Heat Exchangers **Gray**

Feed Product

Fired Heater Heat Exchanger

Multi-Stream Exchanger

Miscellaneous : Grayscale

Piping and Flow : Grayscale

Reactors : Grayscale

Separators : Grayscale

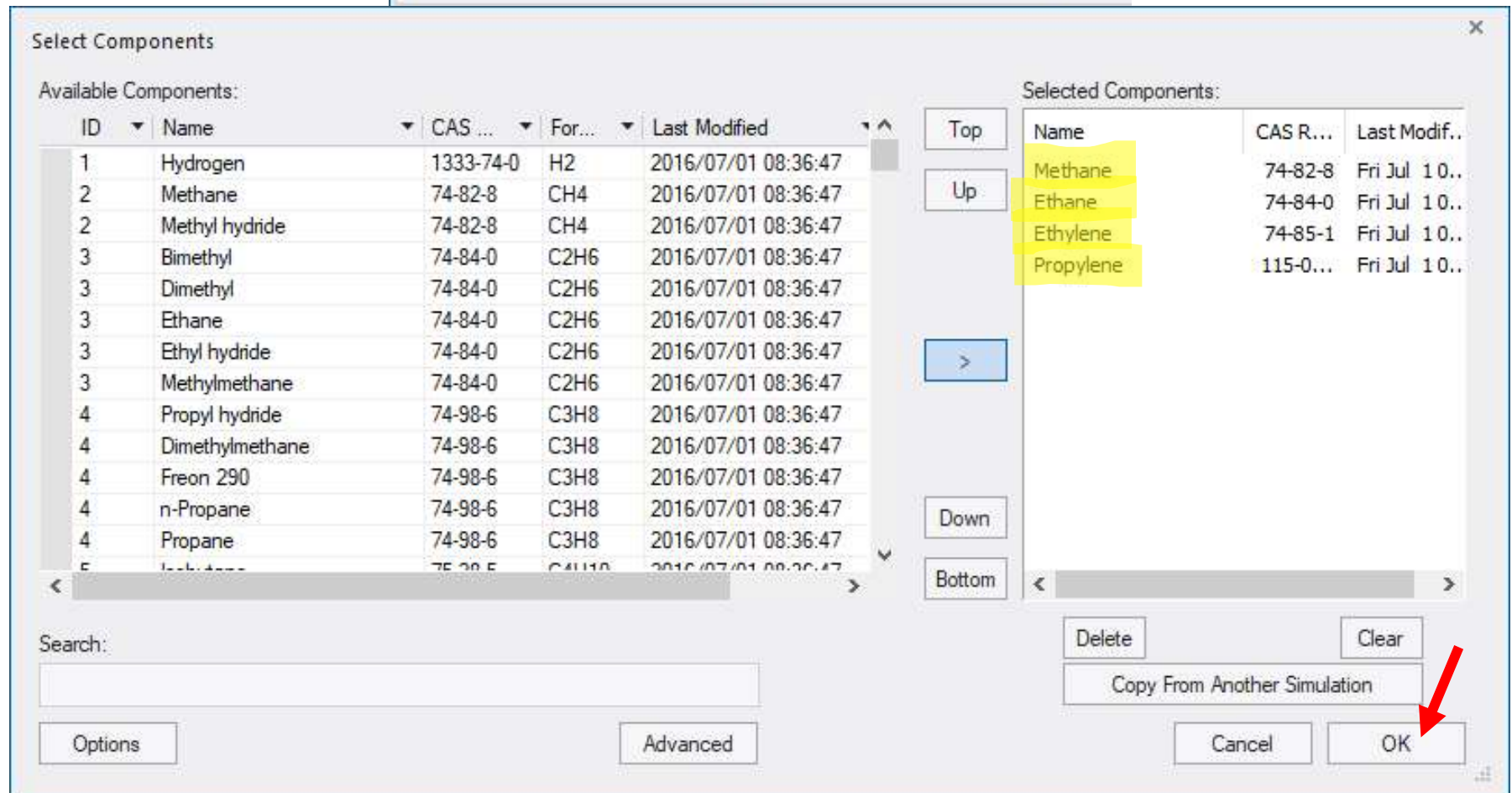
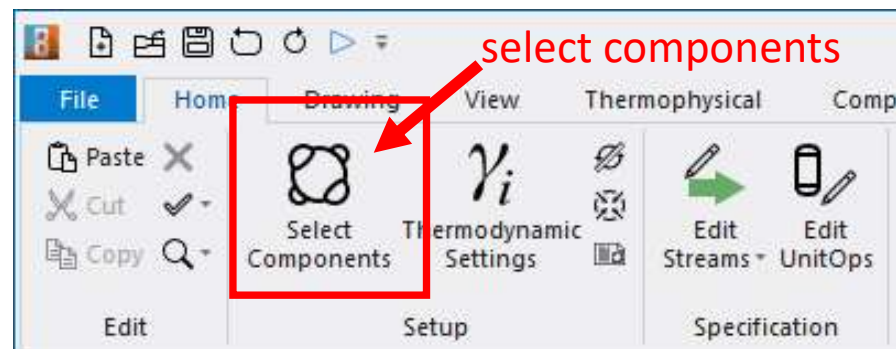
Solids handling : Grayscale

Steady State

100.0%

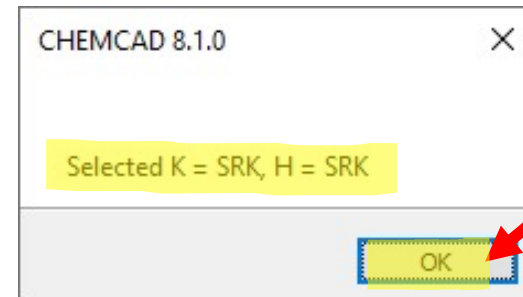
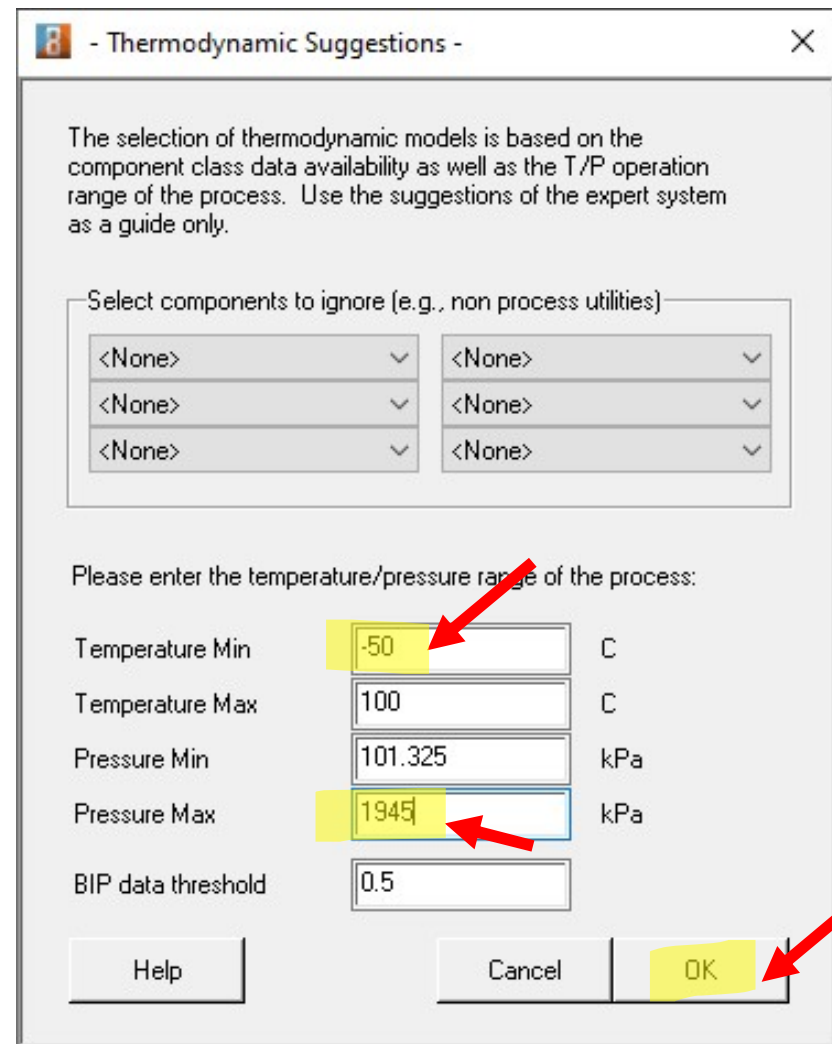
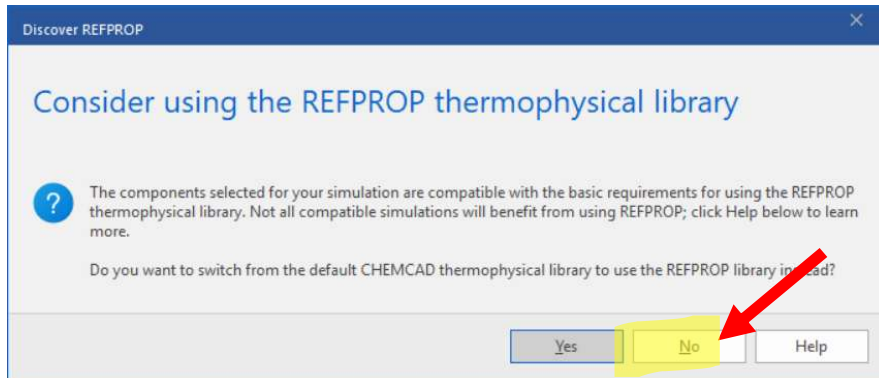
On my computer, I have Common SI set as the default.





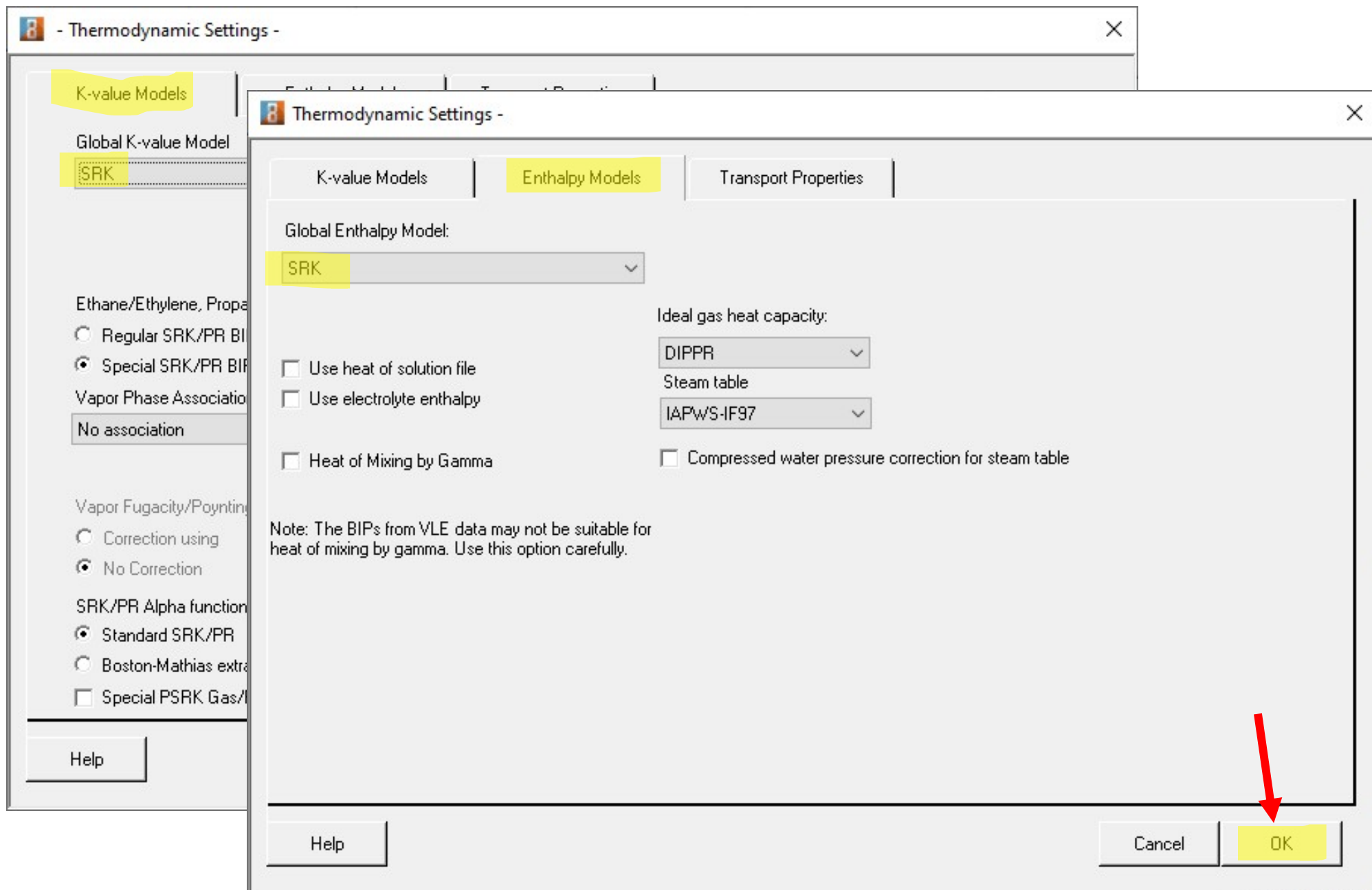
“Thermodynamic Suggestions” window launches automatically when you click OK.

# Thermodynamic Suggestions



SRK is good!

Thermodynamic suggestions: Check defaults in both tabs and click OK.





**Draw flowchart and solve m/e balances.**

Step 1 – Lesson 8, slide 3.

Overhead vapor

Coolant – tube side

Heat Exchanger #4

Pro tip 1: default fonts can be set in the “drawing” tab by clicking “font”

Pro tip 2: connect streams in the order shown here. Your streams should be numbered the same. This helps troubleshooting.

Steady State

124.0%

# Set Feed Stream 1: Propylene

(Propylene at -46 °C and 125 kPa is available as a coolant.)

Place propylene coolant tubeside (Stream 1)

Tube-side coolant in a condenser is a good idea.

| Stream No.      | 1         | 3            |
|-----------------|-----------|--------------|
| Stream Name     |           |              |
| Temp C          | -46       | -30.1        |
| Pres kPa        | 125       | 1945.806     |
| Vapor Fraction  | 0         | 1            |
| Enthalpy J/sec  | -77463.29 | 1.114613e+08 |
| Total flow      | 1         | 64.5956      |
| Total flow unit | kg/sec    | kg/sec       |
| Comp unit       | kg/sec    | kg/sec       |
| Methane         | 0         | 0.003        |
| Ethane          | 0         | 0.0626       |
| Ethylene        | 0         | 64.53        |
| Propylene       | 1         | 0            |

Two specs needed:  
Set temperature and  
vapor fraction.

We don't know the  
propylene flow rate.  
Set it to 1 kg/s.

CHEMCAD will solve for the  
actual flow rate later.

# Complete Specs on Heat Exchanger and Coolant Flow Rate

Heat Exchanger (HTXR) -

Specifications | Misc. Settings | Cost Estimations

Simulation mode: 0 Enter specifications (CHEMCAD simulation)

Utility option: 3 Calculate flow of stream 1

Pressure drop: (default = 0)

Stream 1 kPa

Stream 3 kPa

ID: 1

Temperature stream 4 C

Vapor fraction stream 2 0.995

Vapor fraction stream 4 0.265

Subcooling stream 2 C

Superheat stream 4 C

Heat duty (specified) J/sec

Delta temperature specifications:

Minimum delta temperature C

Hot outlet - cold inlet C

Hot inlet - cold outlet C

Stream 2 - stream 4 C

Stream 2 - stream 1 C

Stream 4 - stream 3 C

Heat transfer coefficient and area specification:

Specifying both U and A counts as a single thermal specification.

Heat transfer coefficient (U) W/m<sup>2</sup>-K

Area (per shell) m<sup>2</sup>

Help Cancel OK

**Note 1:** The largest “thermal reservoir” in the coolant is the latent heat of the phase transition. Any further warming of the coolant beyond the phase change will involve relatively small enthalpy changes.

Click OK, then Run

# Run the Simulation and Confirm Results (1/3)

The screenshot displays the CHEMCAD 8.1.0 software interface. The main window shows a process flow diagram with four streams (1, 2, 3, 4) and a central unit. Stream 1 is highlighted in green. The 'Steady State' button is highlighted in blue, and a red arrow points to it. The 'Edit Streams' dialog box is open, showing the properties for Stream 1. The 'Flash' tab is selected. The 'Propylene' component is highlighted in yellow, and a red arrow points to its value, 35.29116. A text box at the bottom right of the dialog box states: 'Double-click stream 1 to check results'.

Steady State

| Stream No.      | 1        |
|-----------------|----------|
| Stream Name     |          |
| Temp C          | -46      |
| Pres kPa        | 125      |
| Vapor Fraction  | 0        |
| Enthalpy J/sec  | -2733769 |
| Total flow      | 35.29116 |
| Total flow unit | kg/sec   |
| Comp unit       | kg/sec   |
| Methane         | 0        |
| Ethane          | 0        |
| Ethylene        | 0        |
| Propylene       | 35.29116 |

Double-click stream 1 to check results

## Confirm Results (2/3)

Heat Exchanger (HTXR) -

Specifications | Misc. Settings | Cost Estimations

Simulation mode: 0 Enter specifications (CHEMCAD simulation)

Utility option: 3 Calculate flow of stream 1

Pressure drop: (default = 0)

Stream 1 kPa

Stream 3 kPa

Enter two specifications, the flowrate of stream 1 will be recalculated

|                         |       |       |
|-------------------------|-------|-------|
| Temperature stream 2    |       | C     |
| Temperature stream 4    |       | C     |
| Vapor fraction stream 2 | 0.995 |       |
| Vapor fraction stream 4 | 0.265 |       |
| Subcooling stream 2     |       | C     |
| Subcooling stream 4     |       | C     |
| Superheat stream 2      |       | C     |
| Superheat stream 4      |       | C     |
| Heat duty (specified)   |       | J/sec |

Delta temperature specification

Minimum delta temperature

Hot outlet - cold inlet

Hot inlet - cold outlet

Stream 2 - stream 4

Stream 2 - stream 1

Stream 4 - stream 3

Heat transfer coefficient and area specification:

Specifying both U and A count

Heat transfer coefficient (U) W/m<sup>2</sup>-K

Area (per shell) m<sup>2</sup>

Help Cancel OK

Given

Note: there is no P-drop

Note: there is no A or U

Double-click heat exchanger  
to confirm results



# Confirm Results (3/3)

Heat Exchanger (HTXR) -

Specifications | Misc. Settings | Cost Estimations

ID: 1

Type: 0 Countercurrent

No. of Zones

Max. Percent of Pressure Drop

For evaporator utility side operating temp:

Utility operating T

Shells in Series

No. of SS Passes

No. of TS Passes

☐ Include holdup in dynamic calculation

Stream 1-2 holdup

Stream 3-4 holdup

Backcalc mode (for Autocalc): 0 No back calculation

Calculated Results

Calc Ht Duty: 1.56566e+07 J/sec

LMTD (End points): 14.2801 C

LMTD Corr Factor: 1

Calc U

Calc Area (Total)

Tube fouling

Shell fouling

Pinch Flag

Wt. LMTD

125 kPa

1945.81 kPa

For more comprehensive heat exchanger design and rating, please contact us regarding our CC-THERM program.

Help Cancel OK

Numbers in gray fields were calculated by CHEMCAD

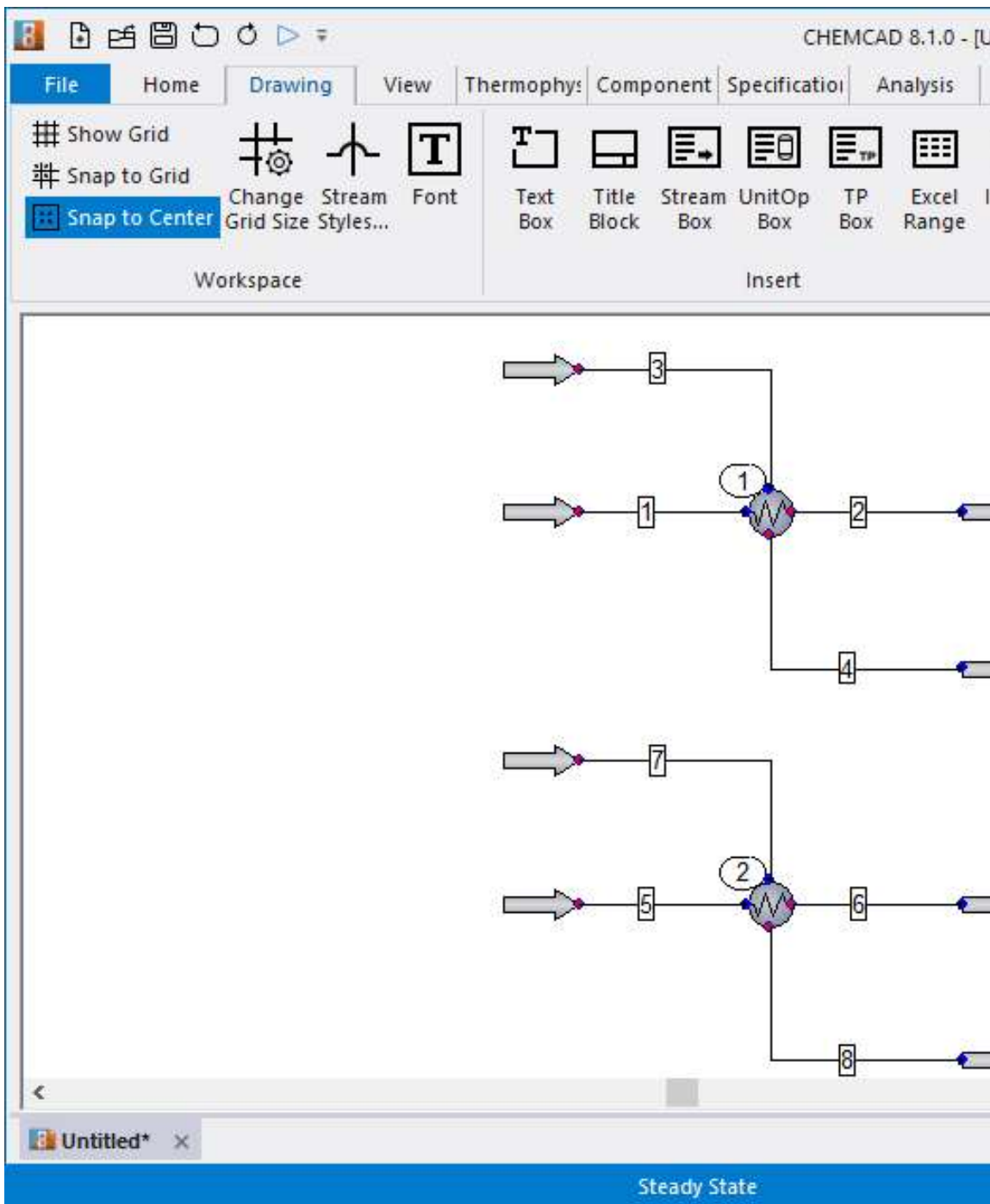


# STOP HERE

Confirm results in slides 12 to 14 before proceeding

Step 1 (L8 Slide 3) is complete:

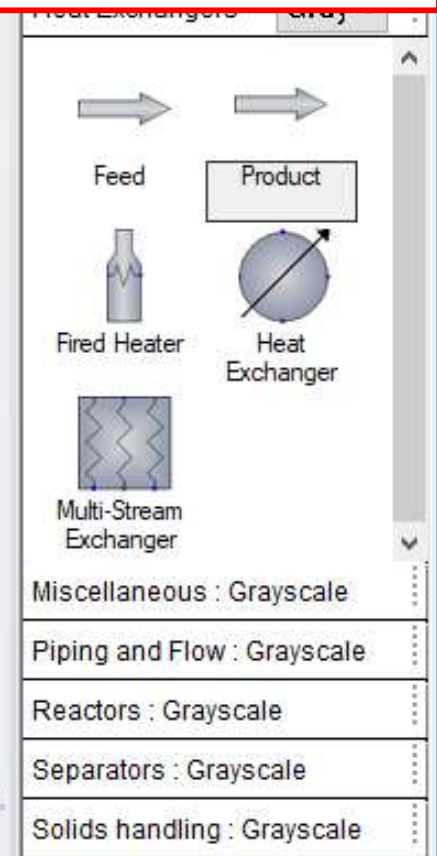
Determined the flow rates and heat transfer rates  
necessary to meet the given conditions.

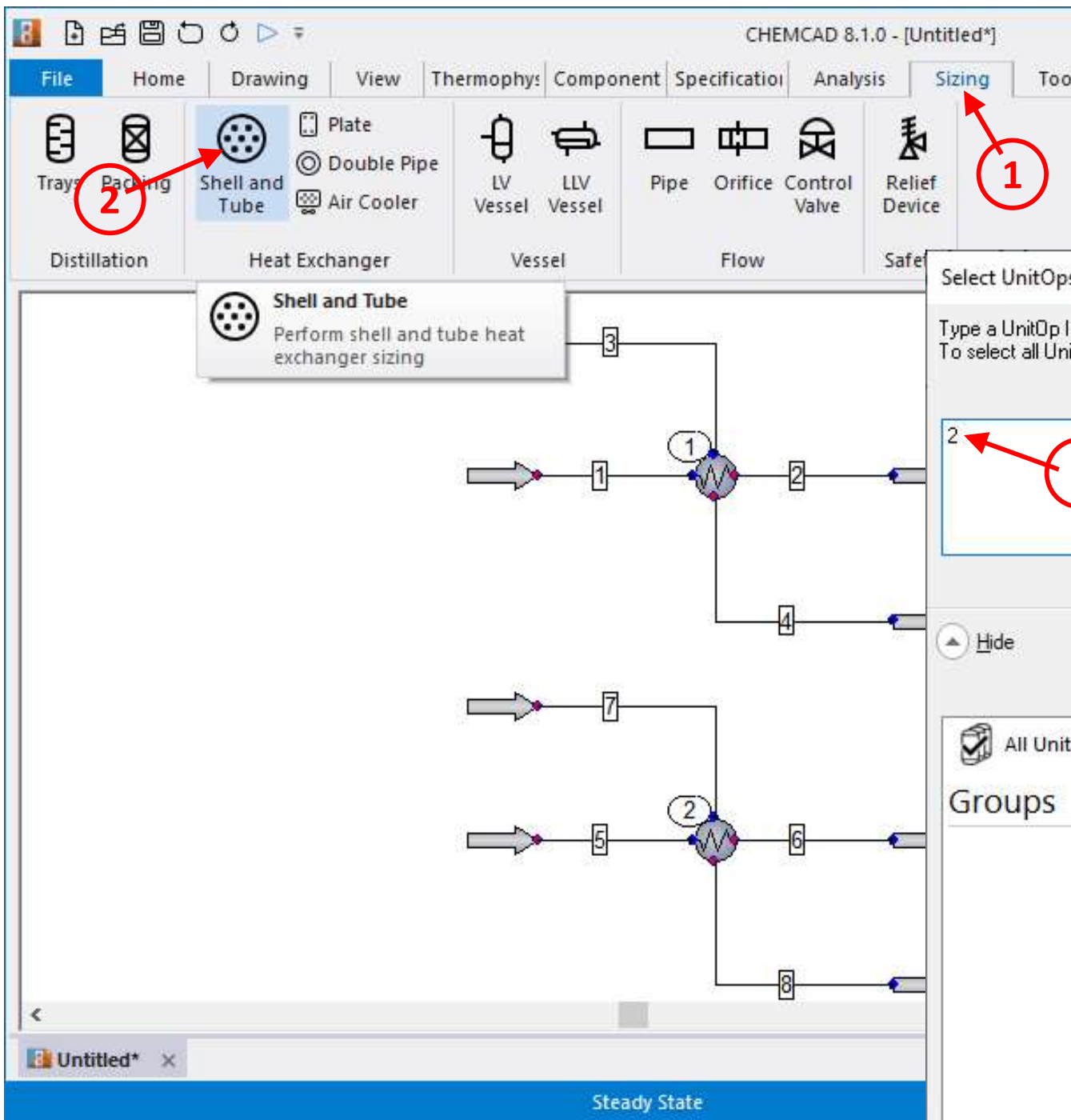


Save your simulation at this point.

Make a copy of the first exchanger and paste it to make a second exchanger. This is REQUIRED.

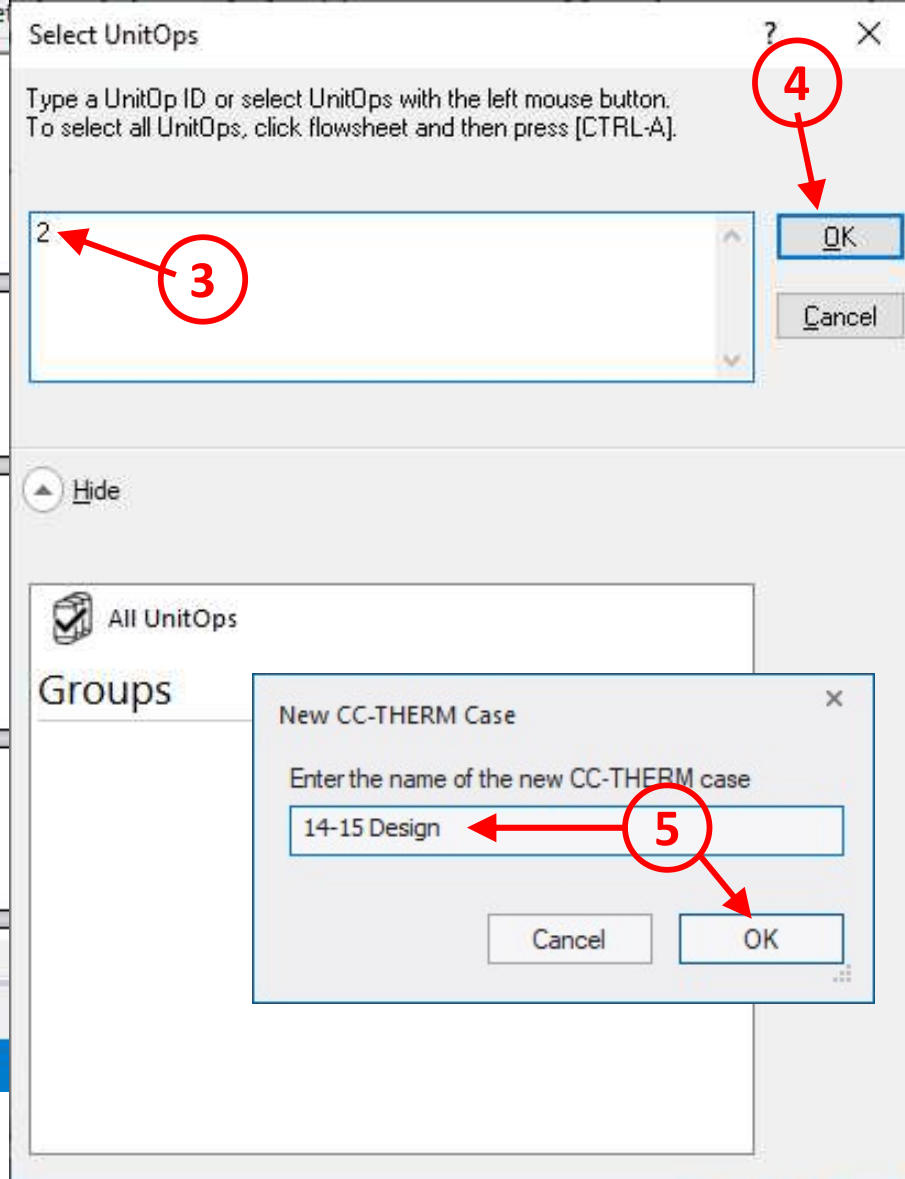
This is a backup of your work to safeguard against mistakes.





Click "Sizing," then "Shell-and-tube."

This initiates steps 2-5 of the design process (L8 slide 5).



123456

FileHomeDrawingViewThermophysicComponent DSpecificationAnalysisSizingToolsCC-THERM

UnitOp ID 2Type Shell and Tube

Case14-15 Design

General

Enter Stream InformationMaterialsTubeNozzle  
Heat Curve SpecificationLabelShellClearance  
Edit Heat CurveSimulation

Select

4

7

5

2

6

8

CLICK THE CENTER OF THE GEAR WHEEL.

Select Tube-side Inlet Stream

Please select the stream entering the exchanger tube side.

5

2

3

OK

Cancel

Hide

All Streams

Feed Streams

Product Streams

Cut Streams

Groups

Lesson9\_AY232\_Trial1\*Lesson9\_AY232\_Trial1\_1

Steady StateK:SRK H:SRK

1

CLICK THE CENTER OF THE GEAR WHEEL.

2

3

TEMA Type AEL Exchanger. Take all defaults.

General Specifications

General Information   Modeling Methods

TEMA class/ standard: TEMA R

Orientation: Horizontal

TEMA front end head: A - Channel Removable Cover

TEMA shell type: E - One Pass

TEMA rear end head type: L - Fixed Tubesheet (A head)

Tube Side

Stream name:

Process type: Forced Evaporation

Fouling factor: 0.0001761094  $\text{m}^2\text{-K/W}$

Optional h Coeff.:   $\text{W/m}^2\text{-K}$

Shell Side

Horiz Condensation

0.0001761094  $\text{m}^2\text{-K/W}$

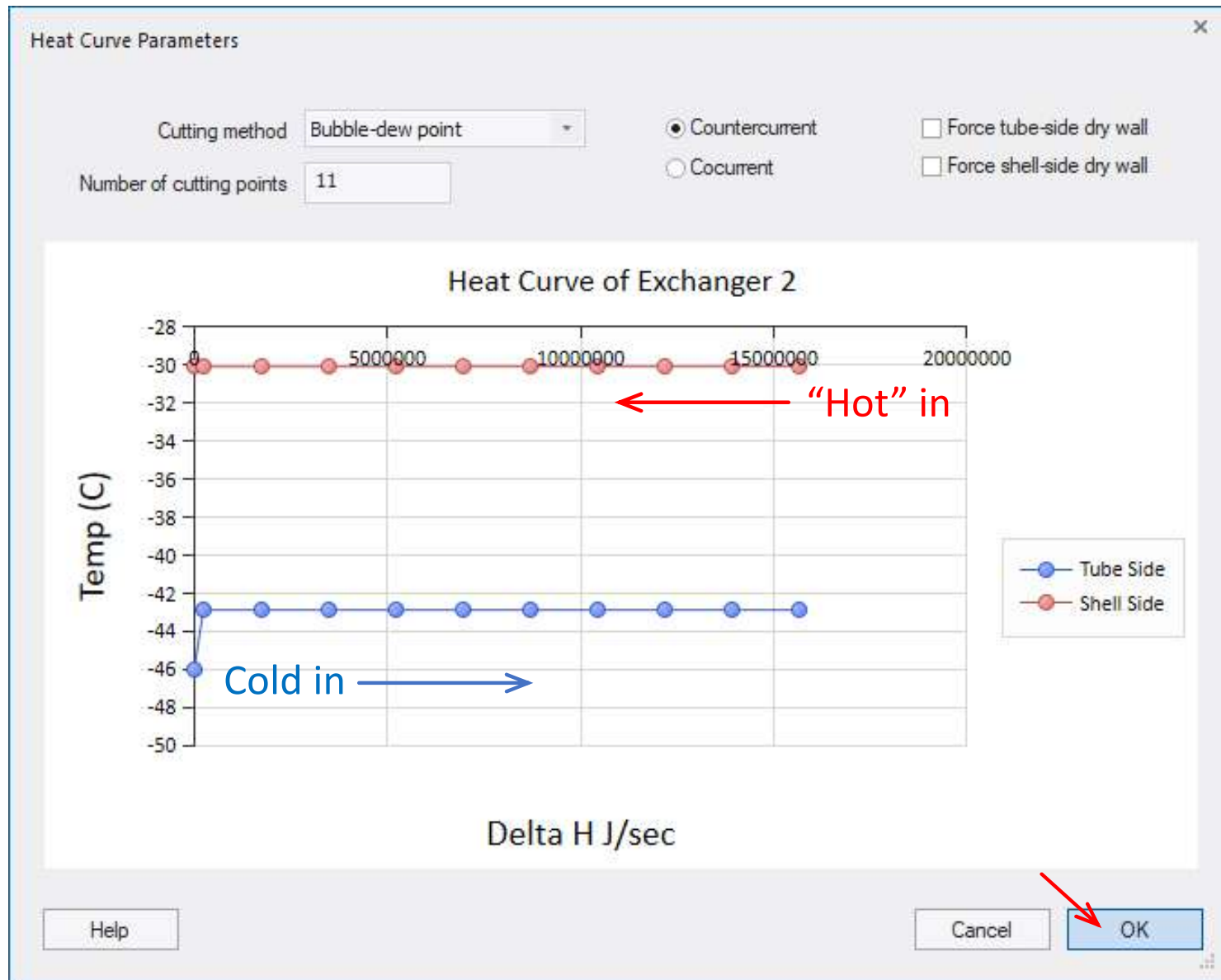
$\text{W/m}^2\text{-K}$

For fouling rating calculations: Calculate tube-side fouling only

Help   Cancel   OK

3

Heating-cooling curve can be seen by clicking “Heat Curve Specification.”



Bumping up the cold feed pressure to 125 kPa drops the first data point so I can identify the cold inlet in the heating-colling curve.



CHEMCAD 8.1.0 - [Lesson9\_AY232\_Trial1\*]

File Home Drawing View Thermophysic Component D Specification Analysis Sizing Tools CC-THERM Style Help

UnitOp ID 2 Type Shell and Tube Case 14-15 Design Select

General Enter Stream Information Materials Heat Curve Specification Label Simulation Mode Design Constraints Reboiler Specifications

Tube Nozzle Shell Clearance Baffle Miscellaneous Geometry Run Results

Design Constraints

Design Criteria

|   |           |       |
|---|-----------|-------|
| Allowable tube pressure drop            | 34.473801 | kPa   |
| Allowable shell pressure drop           | 34.473801 | kPa   |
| Allowable tube velocity                 | 76.199997 | m/sec |
| Allowable shell velocity                | 76.199997 | m/sec |
| Prefer tube length/shell diameter ratio | 12        |       |
| Minimum excess %                        |           |       |

Sizing nozzle

- ☒ Tube, inlet
- ☒ Tube, outlet
- ☒ Shell, inlet
- ☒ Shell, outlet

Limits of Design Variables

|                | Lower Limits | Upper Limits |                     |
|----------------|--------------|--------------|---------------------|
| Tube Length    | 3            | 3.1          | m                   |
| Shell Diameter | 0.1524       | 6            | m                   |
| Baffle Cut     | 15           | 45           | Percent of diameter |
| Baffle Spacing | 0.050799999  | 3.175        | m                   |

☐ Optimize number of tube passes

Help Cancel OK

Lesson9\_AY232\_Trial1\* Lesson9\_AY232\_Trial1\_1 Steady State

Diagram showing a process flow with streams 4, 5, 6, 7, and 8, and a reboiler unit. Red circles and arrows indicate key elements: 1. Design Constraints dropdown menu; 2. Tube Length input field; 3. Upper Limits header; 4. Shell Diameter input field; 5. OK button.

CHEMCAD 8.1.0 - [Lesson9\_AY232\_Trial1\*]

File Home Drawing View Thermophysic Component D Specification Analysis Sizing Tools CC-THERM Style Help

UnitOp ID 2 Type Shell and Tube Case 14-15 Design

General Enter Stream Information Materials Heat Curve Specification Label Simulation Mode

Configuration

Tube Nozzle Shell Clearance Baffle Miscellaneous Geometry Run Results

Tube Access tube specifications

Heat Exchangers Gray

Feed Product

Fired Heater Heat Exchanger

Multi-Stream Exchanger

Miscellaneous : Grayscale

Piping and Flow : Grayscale

Reactors : Grayscale

Separators : Grayscale

Solids handling : Grayscale

Steady State K:SRK H:SRK 128.0%

### Tube Specifications

Number of tubes \* 1396

Number of tube passes \* 1

Tube outer diameter .0127 m

Tube wall thickness 0.00165 m

Tube length \* m

Roughness factor 1.5748e-06 m

Tube pattern Rotated Triangular (60) m

Tube pitch 0.023812501 m

Trufin tube code Plain tube

Turbulator No Turbulator

Tubesheet thickness 0.01905 m

Number of tubesheets 2

\* Field may be recalculated when design calculation is run

Help Cancel OK

1

2

3

4

5

FileHomeDrawingViewThermophysiComponentSpecificationAnalysisSizingToolsCC-THERMStyleHelp

UnitOp ID 2  
Case 14-15 Design

Type Shell and Tube

General

Enter Stream Information  
Heat Curve Specification  
Edit Heat Curve

Materials  
Label  
Simulation Mode

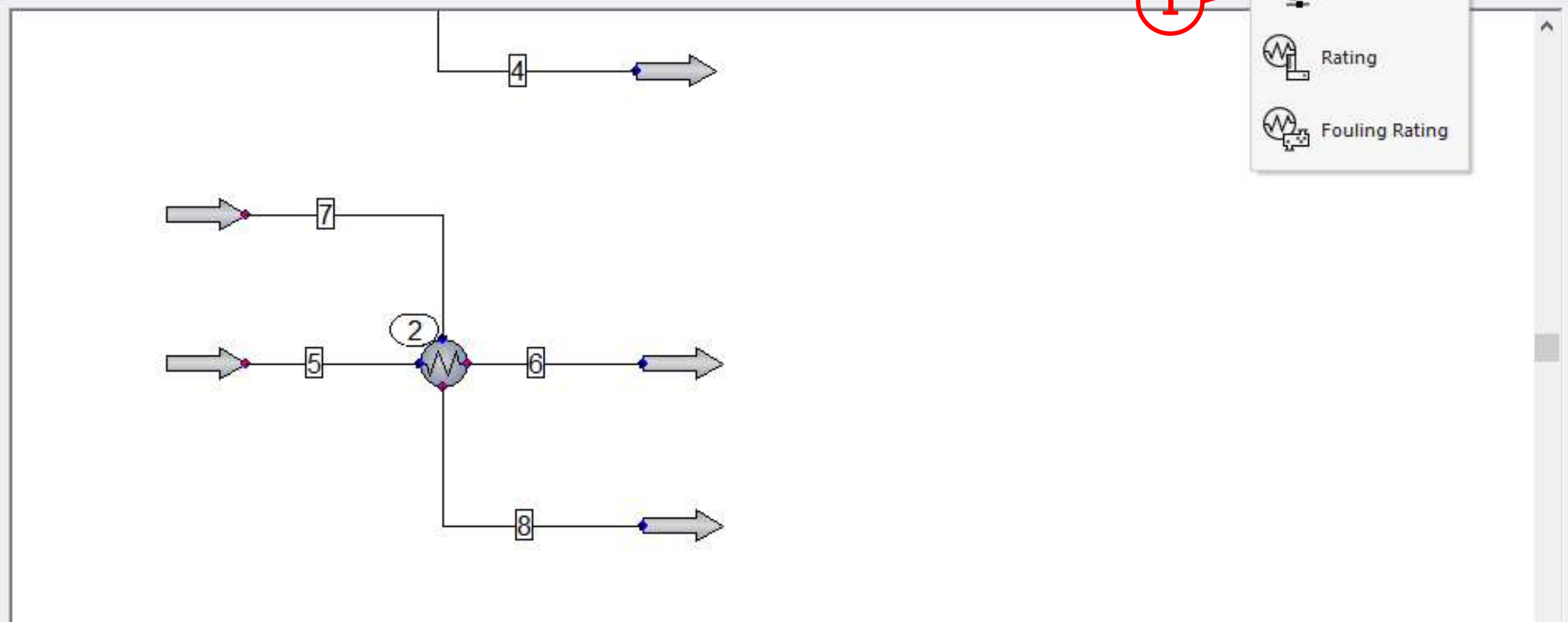
Tube  
Shell  
Baffle

Calculate

Charts  
Reports

Design  
Rating  
Fouling Rating

Configuration



Lesson9\_AY232\_Trial1b\*

Iteration 46

Steady State

100.0%

should see 46 iterations

CHEMCAD NXT 1.2.0 - [Untitled\*]

File Home Drawing View Thermophys Component Specification Analysis Sizing Economics Tools **CC-THERM** ^ Style Help

UnitOp ID 2 Type Shell and Tube

Case 14-15 Design

Select

General

Enter Stream Information Materials  
Heat Curve Specification Label  
Edit Heat Curve Simulation Mode

Configuration

Tube  
Shell  
Baffle (...) **Design**  
Geometry

Design  
Rating  
Fouling Rating

1 dropdown

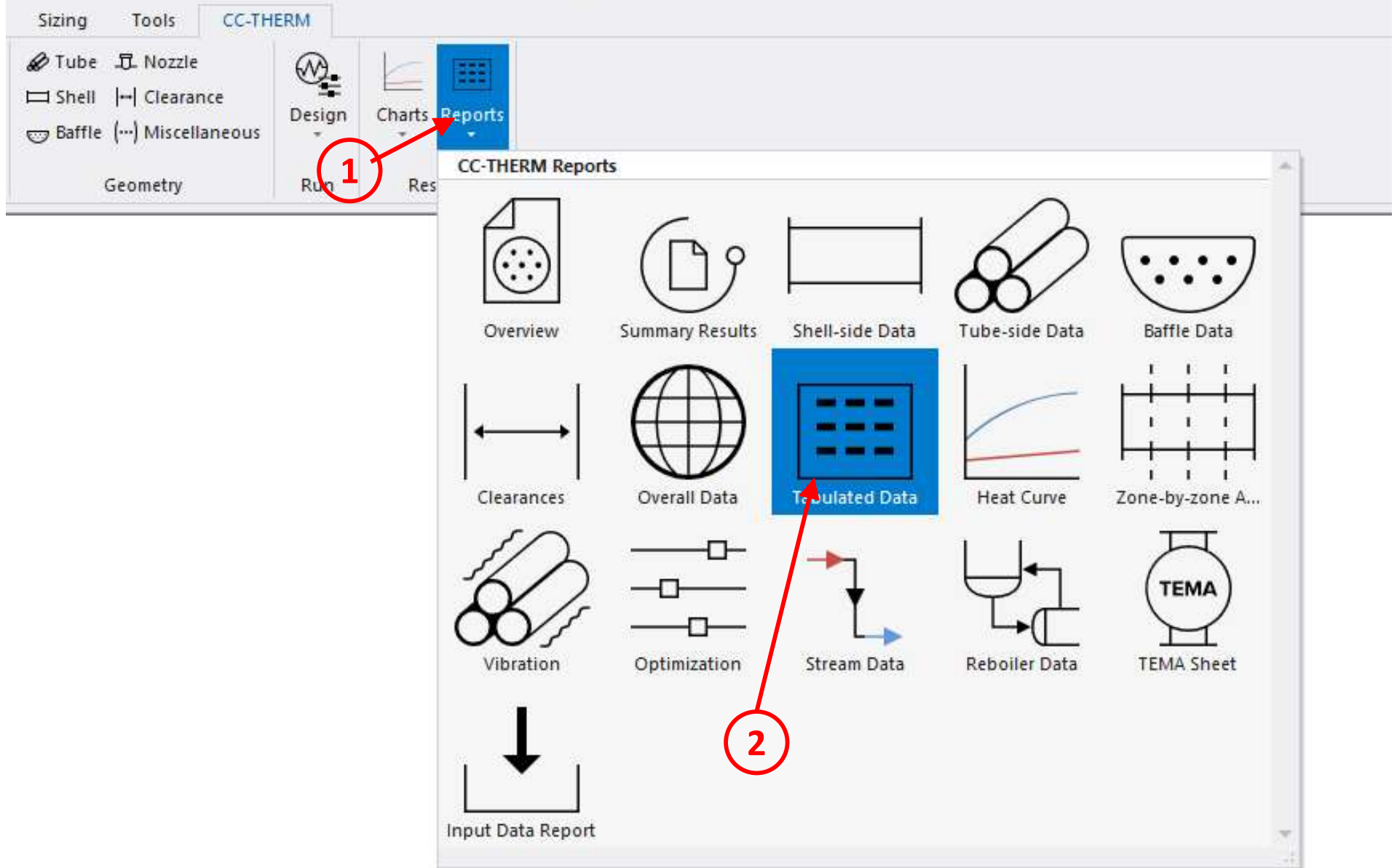
should see 44 iterations

Iteration 44

Steady State K:SRK H:SRK

196.0%





# Design Results – CHEMCAD NXT 1.2.0

## TABULATED ANALYSIS

### Overall Data:

|                |       |                  |           |             |          |
|----------------|-------|------------------|-----------|-------------|----------|
| Area Total     | m2    | 2348.77          | % Excess  |             | 6.13     |
| Area Required  | m2    | 2157.83          | U Calc.   | W/m2-K      | 566.94   |
| Area Effective | m2    | 2290.05          | U Service | W/m2-K      | 534.21   |
| Area Per Shell | m2    | 2290.05          | Heat Duty | J/sec       | 1.57E+07 |
| Weight LMTD C  | 12.80 | LMTD CORR Factor | 1.0000    | CORR LMTD C | 12.80    |

### Shell:

|               |   |                   |                           |      |
|---------------|---|-------------------|---------------------------|------|
| Shell O.D.    | m | 3.68              | Orientation               | H    |
| Shell I.D.    | m | 3.66              | Shell in Series           | 1    |
| Bonnet I.D.   | m | 3.66              | Shell in Parallel         | 1    |
| Type          |   | AEL               | Max. Heat Flux Btu/ft2-hr | 0.00 |
| Imping. Plate |   | Impingement Plate | Sealing Strip             | 5    |

### Tubes:

|                      |   |           |                        |         |
|----------------------|---|-----------|------------------------|---------|
| Number               |   | 19314     | Tube Type              | Bar:    |
| Length               | m | 3.05      | Free Int. Fl Area      | m2 0.00 |
| Tube O.D.            | m | 0.013     | Fin Efficiency         | 0.000   |
| Tube I.D.            | m | 0.009     | Tube Pattern           | TRI60   |
| Tube Wall Thk.       | m | 0.002     | Tube Pitch             | m 0.024 |
| No. Tube Pass        |   | 1         |                        |         |
| Inner Roughness      | m | 0.0000016 |                        |         |
| Number of tubesheets |   | 2         | Tubesheet thickness, m | 0.019   |

### Resistances:

|  |        |         |
|--|--------|---------|
| Shell-side Film  | m2-K/W | 0.00068 |
| Shell-side Fouling   | m2-K/W | 0.00018 |
| Tube Wall  | m2-K/W | 0.00004 |
| Tube-side Fouling  | m2-K/W | 0.00018 |
| Tube-side Film   | m2-K/W | 0.00047 |
| Reference Factor (Total outside area/inside area based on tube ID) |        | 1.351   |

Answers to first three questions are found here. How many tubes? Shell diameter? Largest resistance?



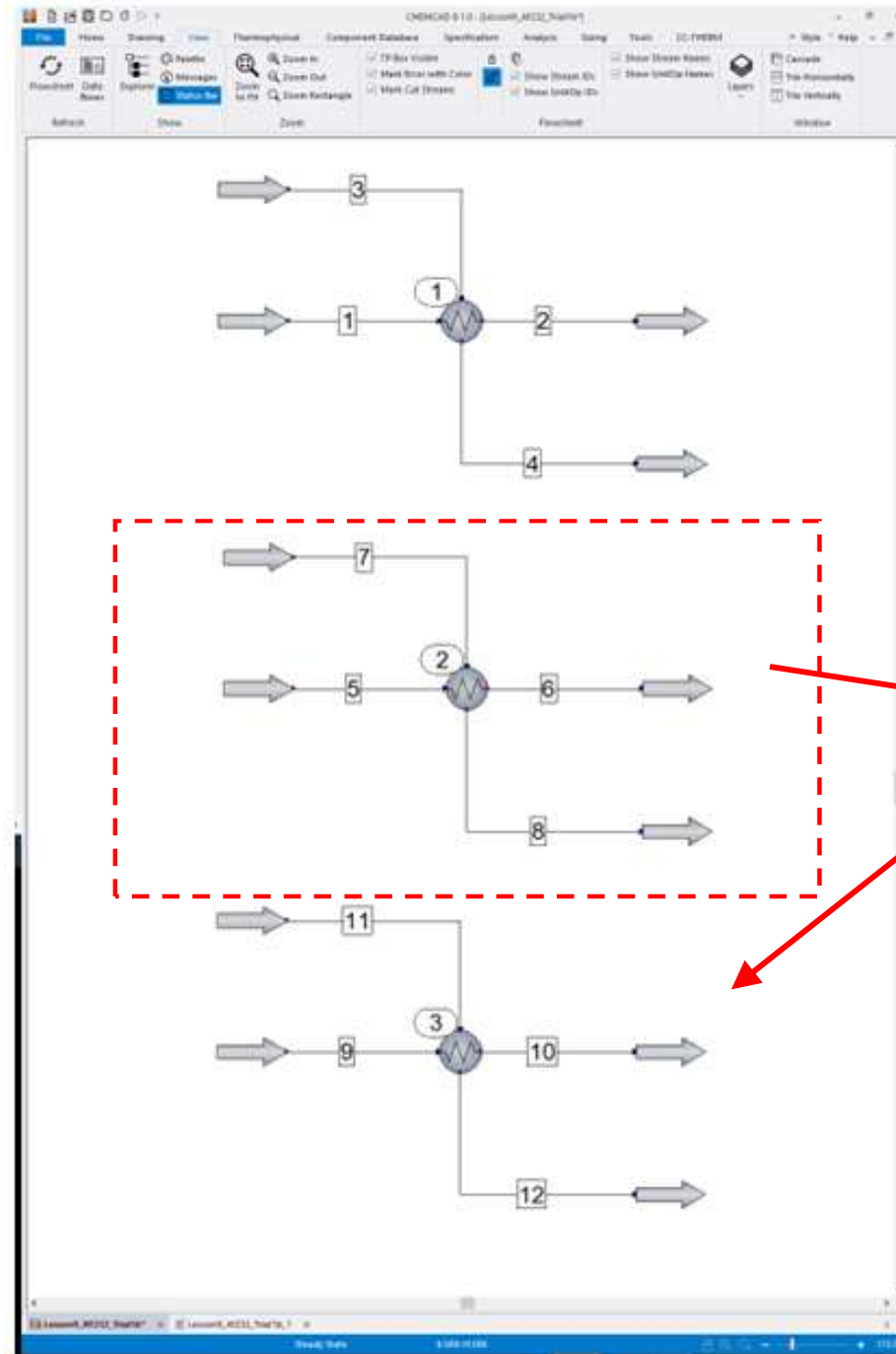
# STOP HERE

Confirm results in slide 25 and save your simulation before proceeding

Steps 2-5 of L8 Slide 3 are now complete:

Type of exchanger, geometric details, overall U, thermal driving force, area, and P-drops.

# Exchanger Simulation



Copying and pasting is an important step.

It preserves the design work down in exchanger 2 as a backup.

copy this and paste here

Setting the "Simulation Mode" to "1 Shell & tube simulation initiates step 6 of the design process (L8 slide 3).

CH EMCAD 8.1.0 - [Lesson9\_AY232\_Trial3\*]

File Home Drawing View Thermophys Component Specification Analysis Sizing To

Flowsheet Data Boxes Explorer Palette Messages Status Bar

Refresh Show Zoom Zoom to Fit

TP Box Visible Mark Error with Color Mark Cut Streams Show Stream IDs Show UnitOp IDs

Flowsheet Window

double-click

1

3

11

9

10

12

- Heat Exchanger (HTXR) -

Specifications Misc. Settings Cost Estimations

Simulation mode: 1 Shell & tube simulation

Click OK to proceed to CC-THERM data entry.  
Outlet conditions will be rigorously calculated by CC-THERM.  
Change simulation mode to "Enter specifications" to use the specifications below

|                          |  |       |                                 |
|--------------------------|--|-------|---------------------------------|
| Temperature stream 10    |  | C     | Delta temperature specification |
| Temperature stream 12    |  | C     | Minimum delta temperature       |
| Vapor fraction stream 10 |  |       | Hot outlet - cold inlet         |
| Vapor fraction stream 12 |  |       | Hot inlet - cold outlet         |
| Subcooling stream 10     |  | C     | Stream 10 - stream 12           |
| Subcooling stream 12     |  | C     | Stream 10 - stream 9            |
| Superheat stream 10      |  | C     | Stream 12 - stream 11           |
| Superheat stream 12      |  | C     | Heat transfer coefficient and a |
| Heat duty (specified)    |  | J/sec | Specifying both U and A count   |

Heat transfer coefficient (U)  
Area (per shell)

Help Cancel OK

Lesson9\_AY232\_Trial3\* Lesson9\_AY232\_Trial1b\_1

Steady State

# Heat Exchanger Before Running

Heat Exchanger (HTXR) -

Specifications | Misc. Settings | Cost Estimations

Simulation mode: 1 Shell & tube simulation

Pressure drop: (default = 0)

Stream 5 kPa

Stream 7 kPa

ID: 2

Click OK to proceed to CC-THERM data entry.  
Outlet conditions will be rigorously calculated by CC-THERM.  
Change simulation mode to "Enter specifications" to use the specifications below

|                         |  |       |
|-------------------------|--|-------|
| Temperature stream 6    |  | C     |
| Temperature stream 8    |  | C     |
| Vapor fraction stream 6 |  |       |
| Vapor fraction stream 8 |  |       |
| Subcooling stream 6     |  | C     |
| Subcooling stream 8     |  | C     |
| Superheat stream 6      |  | C     |
| Superheat stream 8      |  | C     |
| Heat duty (specified)   |  | J/sec |

Delta temperature specifications:

|                           |  |   |
|---------------------------|--|---|
| Minimum delta temperature |  | C |
| Hot outlet - cold inlet   |  | C |
| Hot inlet - cold outlet   |  | C |
| Stream 6 - stream 8       |  | C |
| Stream 6 - stream 5       |  | C |
| Stream 8 - stream 7       |  | C |

Heat transfer coefficient and area specification:  
Specifying both U and A counts as a single thermal specification.

|                               |  |                     |
|-------------------------------|--|---------------------|
| Heat transfer coefficient (U) |  | W/m <sup>2</sup> -K |
| Area (per shell)              |  | m <sup>2</sup>      |

Help Cancel OK

Heat Exchanger (HTXR) -

Specifications | Misc. Settings | Cost Estimations

ID: 3

**1** ☒ Run the costing report after running the unit

Cost model: Shell and tube

Exchanger type: Fixed head

Evaporator type: Forced circulation

Design pressure: kPa

Install factor:

Material factor:

Pressure factor:

Type factor:

Material selection for this model

Shell and tube

Carbon steel

Calculated Results

|                        |  |    |
|------------------------|--|----|
| Basic cost             |  | \$ |
| Total purchase cost    |  | \$ |
| Total installed cost   |  | \$ |
| Utility Cost           |  | \$ |
| Purchase Cost Override |  | \$ |

**2** Costs show up here after running.

**3** Please choose from the options below to continue, or click Cancel to exit without changes.

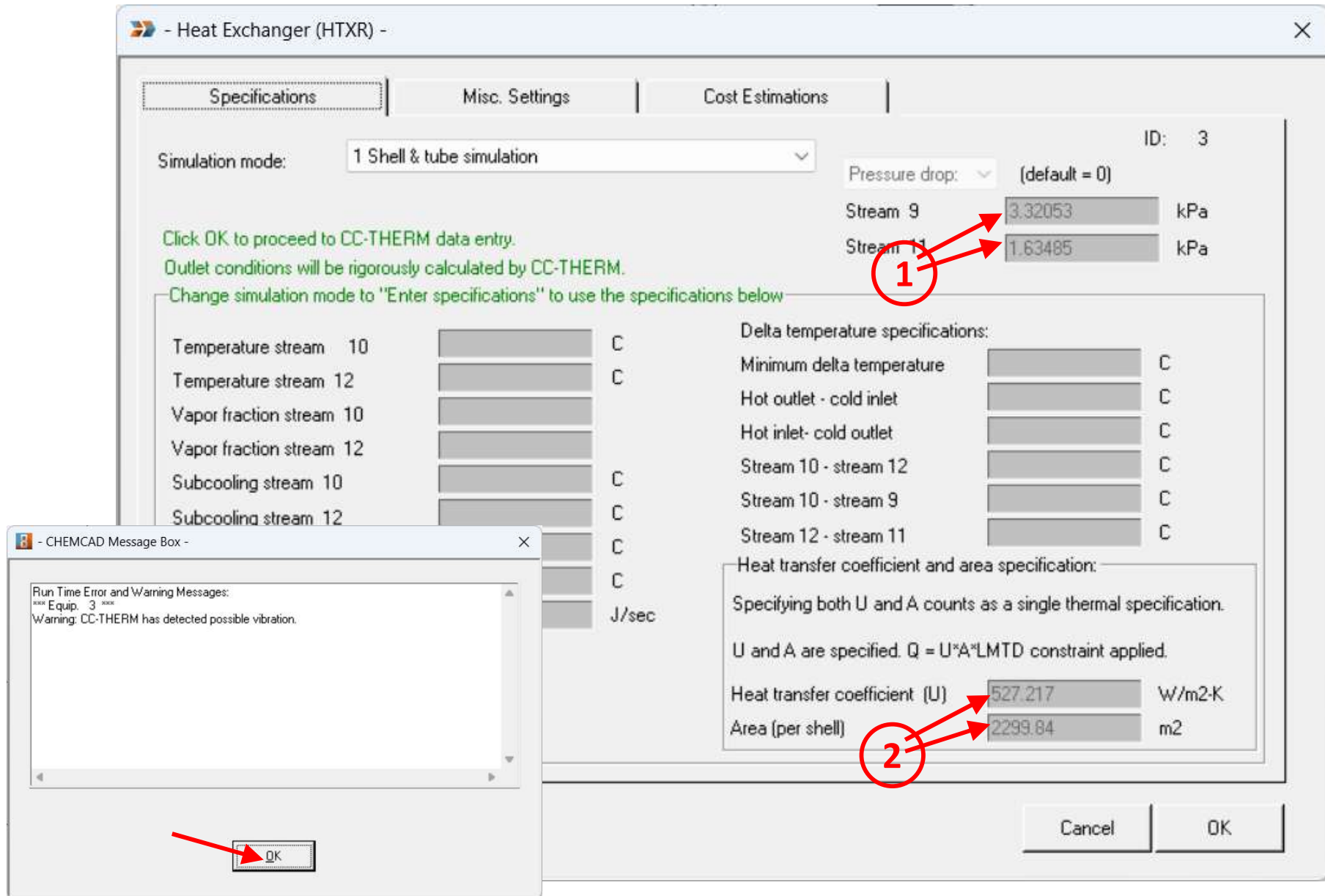
Choose the case to use for this exchanger UnitOp in simulation mode.

14-15 Design

OK Cancel

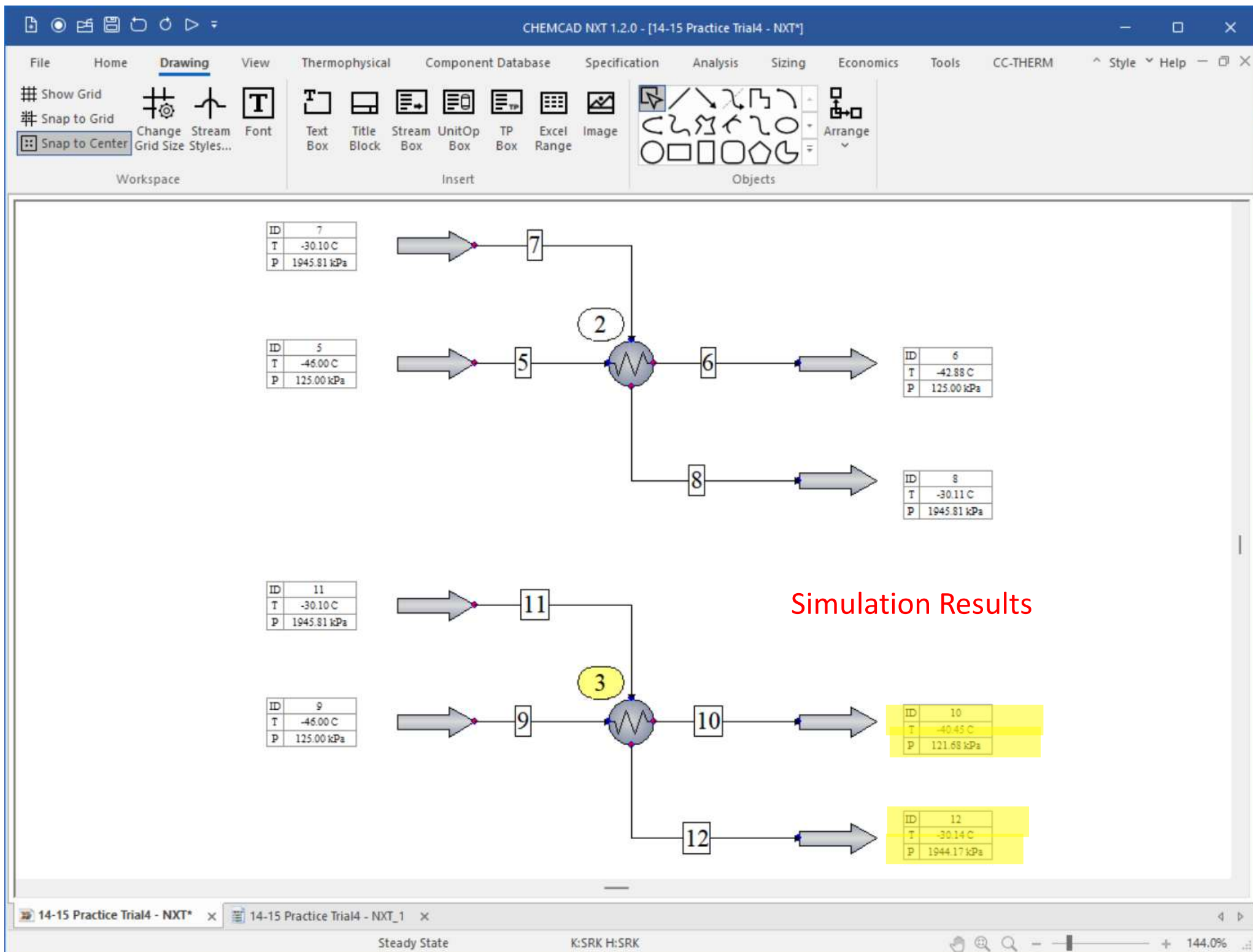
Click OK then run the simulation.

# Heat Exchanger After Running



Click "Run All" in the Home tab





CHEMCAD NXT 1.2.0 - [14-15 Practice Trial4 - NXT\*]

File Home Drawing View Thermophysical Component Database Specification Analysis Sizing Economics Tools CC-THERM Style Help

Save Data Map Save Data Map As View/Edit New Import... Select Costing Edit Cost Index Economics Execute Parser Units Converter Simple Calculator Visual Basic Editor Reaction Rate Regression CO2 Solid Hydrates Environmental Report... TOC/COD... Title Block Designer UnitOp Designer

Data Map

Chemical Engineering Plant Cost Index

Year/Month Selection for the Cost Index

Year 2026 Source Database

Month February } make sure to set this to February 2026

| Type                          | Cost Index |
|-------------------------------|------------|
| CE Index                      | 830.50     |
| Equipment                     | 1045.80    |
| Heat exchangers and tanks     | 815.70     |
| Process machinery             | 1057.50    |
| Pipes, valves, and fittings   | 1410.40    |
| Process instruments           | 620.50     |
| Pumps and compressors         | 1677.10    |
| Electrical equipment          | 917.90     |
| Structural supports and misc. | 1142.00    |
| Construction labor            | 390.30     |
| Buildings                     | 835.10     |
| Engineering and supervision   | 313.20     |

Help Cancel OK

ID 11  
T -30.10 C  
P 1945.81 kPa

ID 9  
T -46.00 C  
P 125.00 kPa

ID 10  
T -40.45 C  
P 121.68 kPa

ID 12  
T -30.14 C  
P 1944.17 kPa

14-15 Practice Trial4 - NXT\* 14-15 Practice Trial4 - NXT\_1

Steady State K:SRK H:SRK

196.0%

CHEMCAD NXT 1.2.0 - [14-15 Practice Trial4 - NXT\*]

File Home Drawing View Thermophysical Component Database Specification Analysis Sizing Economics **Tools** CC-THERM ^ Style v Help - □ X

Save Data Map Save Data Map As View/Edit New Import... Execution Rules

Select Costing Edit Cost Index Economics Sum

Execute Parser Units Converter Simple Calculator Visual Basic Editor Reaction Rate Regression

CO2 Solid Hydrates TOC/COD... Environmental Report...

Title Block Designer UnitOp Designer

Data Map Costing General Environmental Flowsheet

11

9

3

10

12

8

|    |             |
|----|-------------|
| ID | 8           |
| T  | -30.11 C    |
| P  | 1945.81 kPa |

|    |             |
|----|-------------|
| ID | 11          |
| T  | -30.10 C    |
| P  | 1945.81 kPa |

|    |            |
|----|------------|
| ID | 9          |
| T  | -46.00 C   |
| P  | 125.00 kPa |

|    |            |
|----|------------|
| ID | 10         |
| T  | -40.45 C   |
| P  | 121.68 kPa |

|    |             |
|----|-------------|
| ID | 12          |
| T  | -30.14 C    |
| P  | 1944.17 kPa |

14-15 Practice Trial4 - NXT\* 14-15 Practice Trial4 - NXT\_1

HTXR.my Steady State K:SRK H:SRK

196.0%

# Cost Results

Heat Exchanger (HTXR) -

Specifications | Misc. Settings | Cost Estimations

ID: 3

☒ Run the costing report after running the unit

Cost model: Shell and tube

Exchanger type: Fixed head

Evaporator type: Forced circulation

Design pressure: kPa

Install factor: 2

Material factor: 1

Pressure factor: 1.28102

Type factor: 0.819535

Material selection for this model

Shell and tube

Carbon steel

Calculated Results

|                        |            |        |
|------------------------|------------|--------|
| Basic cost             | 317634     | \$     |
| Total purchase cost    | 810750     | \$     |
| Total installed cost   | 1.6215e+06 | \$     |
| Utility cost           |            | \$/sec |
| Purchase cost override |            | \$     |

317634 \$

767912 \$

1.53582e+06 \$

CC NXT 1.2.0

Help Cancel OK

Answer to last question is found here (total purchase cost in Feb 2026).

# STOP HERE

Finished.

Submit CHEMCAD file, tabulated results report,  
and answers to the four (4) questions