

# KM 331 PROSES BENZETİM PROGRAMLARI DERS NOTLARI [1-4]

## Kaynaklar

1. Chemcad User Guide and Tutorial, Chemstations, Inc. Version 6.1.
2. Aspen Technology, Inc., Aspen HYSYS ® Version 7.
3. ChemCad Eğitim Notları , Chemstations, Inc- Houston,TX,USA.
4. A Guide for Getting Started in Aspen HYSYS  
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# Separation Columns

Recovery of natural-gas liquids (NGL) from natural gas is quite common in natural gas processing. Recovery is usually done to:

- Produce transportable gas (free from heavier hydrocarbons which may condense in the pipeline).
- Meet a sales gas specification.
- Maximize liquid recovery (when liquid products are more valuable than gas).

HYSYS can model a wide range of different column configurations. In this simulation, an NGL Plant will be constructed, consisting of three columns:

- De-Methanizer (operated and modelled as a Reboiled Absorber column)
- De-Ethanizer (Distillation column)
- De-Propanizer (Distillation column)

**Learning Outcomes:** At the end of this chapter, the user will be able to:

- Add columns using the Input Experts.
- Add extra specifications to columns.

**Prerequisites:** Before beginning this chapter, the users need to know how to:

- Navigate the PFD
- Add Streams in the PFD or the Workbook
- Add and connect Unit Operations

### **Defining the Simulation Basis**

1. Start a new case.
2. Select the **Peng Robinson** EOS.
3. Add the components:  $N_2$ ,  $CO_2$ ,  $C_1 - C_8$ .
4. Enter the **Simulation Environment**.

## Adding the Feed Streams

1. Add a **Material Stream** with the following data:

In this cell...	Enter...
Name	Feed1
Temperature	-95°C (-140°F)
Pressure	2275 kPa (330 psia)
Flowrate	1620 kgmole/h (3575 lbmole/hr)
Component	Mole Fraction
N <sub>2</sub>	0.0025
CO <sub>2</sub>	0.0048
C <sub>1</sub>	0.7041
C <sub>2</sub>	0.1921
C <sub>3</sub>	0.0706
i-C <sub>4</sub>	0.0112
n-C <sub>4</sub>	0.0085
i-C <sub>5</sub>	0.0036
n-C <sub>5</sub>	0.0020

Add another **Material Stream** with the following data:

<b>In this cell...</b>	<b>Enter...</b>
Name	Feed2
Temperature	-85°C (-120°F)
Pressure	2290 kPa (332 psia)
Flowrate	215 kgmole/h (475 lbmole/hr)
Component	Mole Fraction
N <sub>2</sub>	0.0057
CO <sub>2</sub>	0.0029
C <sub>1</sub>	0.7227
C <sub>2</sub>	0.1176
C <sub>3</sub>	0.0750
i-C <sub>4</sub>	0.0204
n-C <sub>4</sub>	0.0197
i-C <sub>5</sub>	0.0147
n-C <sub>5</sub>	0.0102
C <sub>6</sub>	0.0037
C <sub>7</sub>	0.0047
C <sub>8</sub>	0.0027

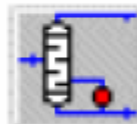
## Adding De-Methanizer

The De-Methanizer is modelled as a reboiled absorber operation, with two feed streams and an energy stream feed, which represents a side heater on the column.

1. Add an **Energy** stream with the following values:

In this cell...	Enter...
Name	Ex Duty
Energy Flow	2.1e+06 kJ/h (2.0e+06 Btu/hr)

2. Double-click on the **Reboiled Absorber** icon on the Object Palette. The first Input Expert view appears.



Reboiled Absorber Column  
icon

3. Complete the view as shown below:

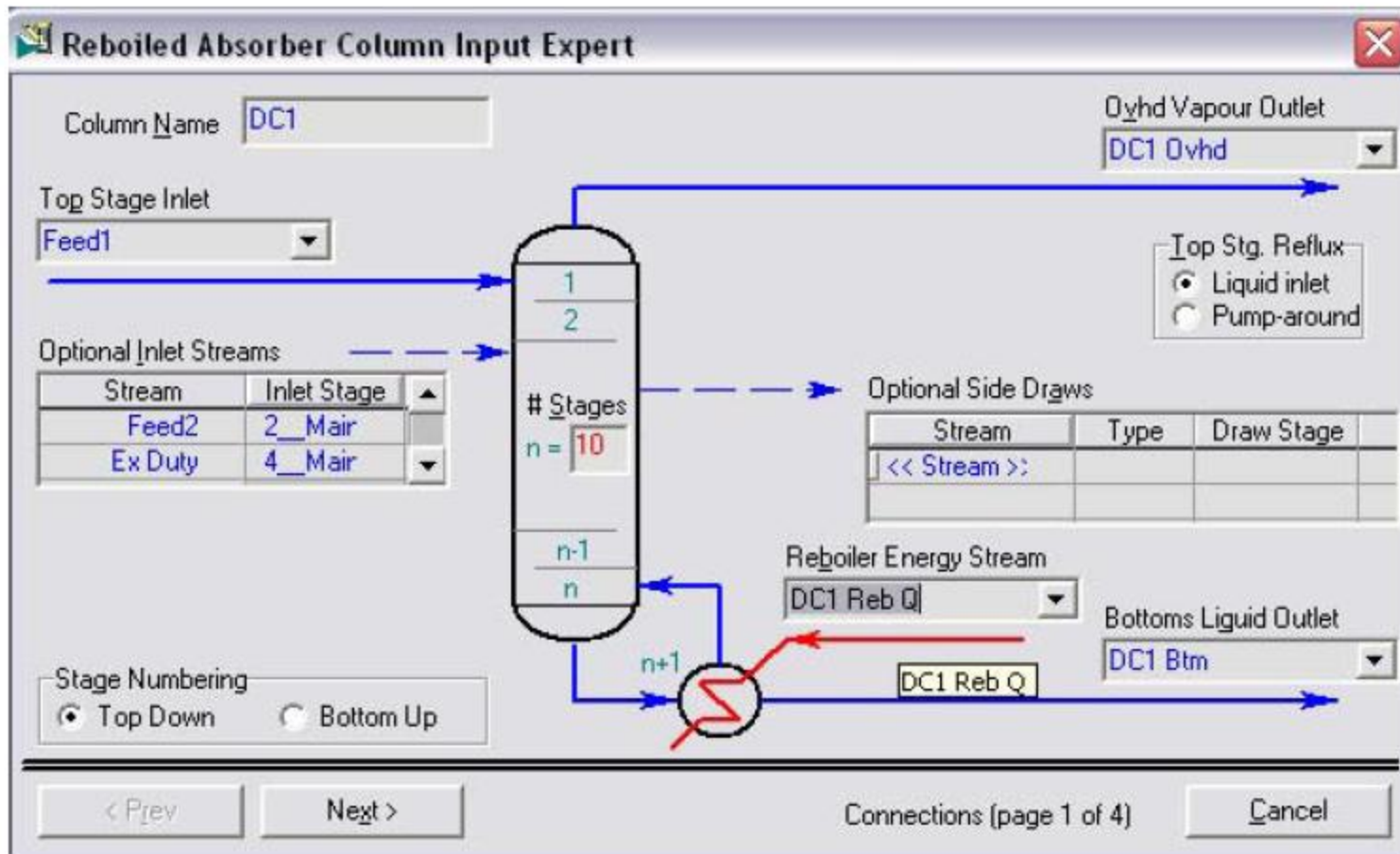
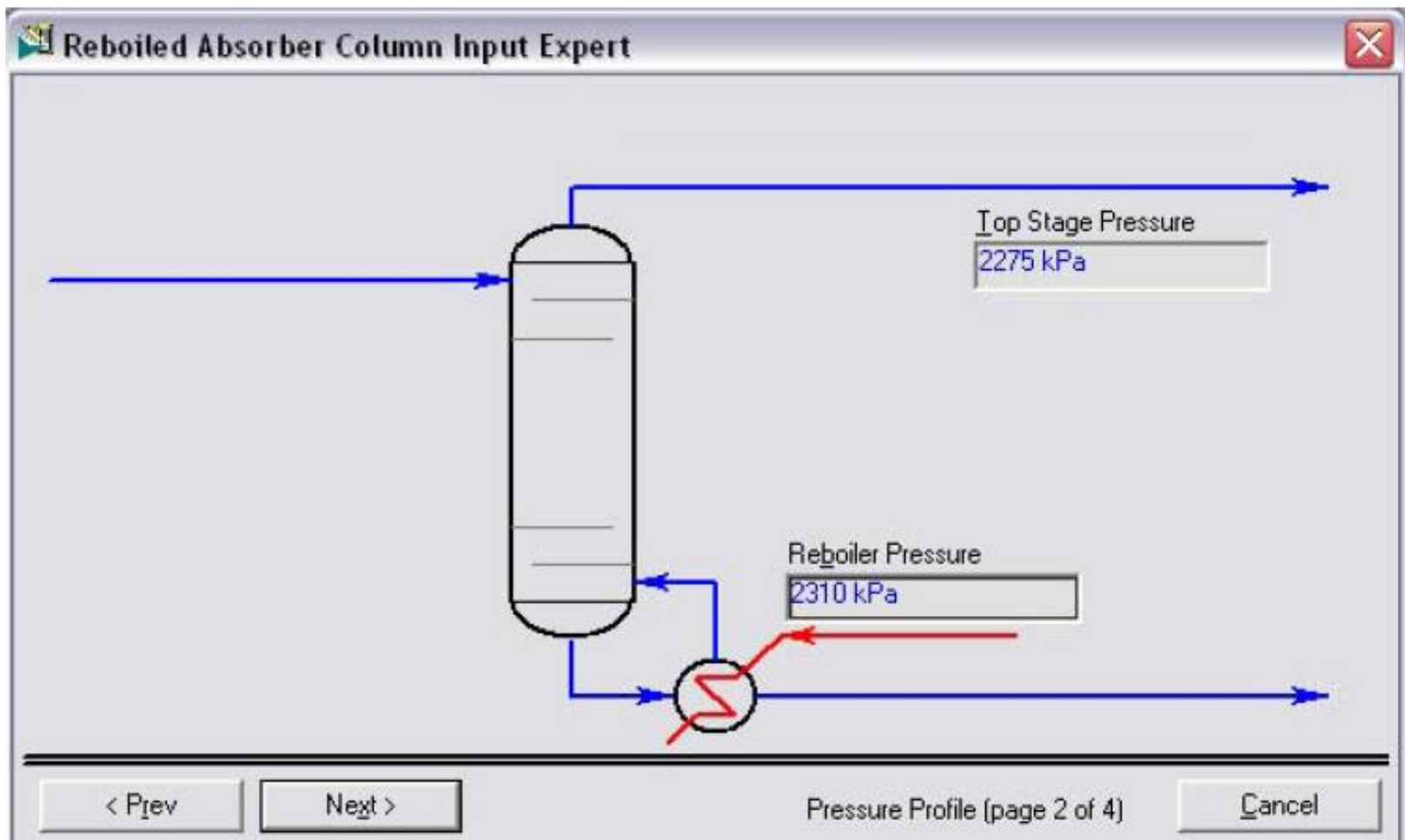


Figure 12-5

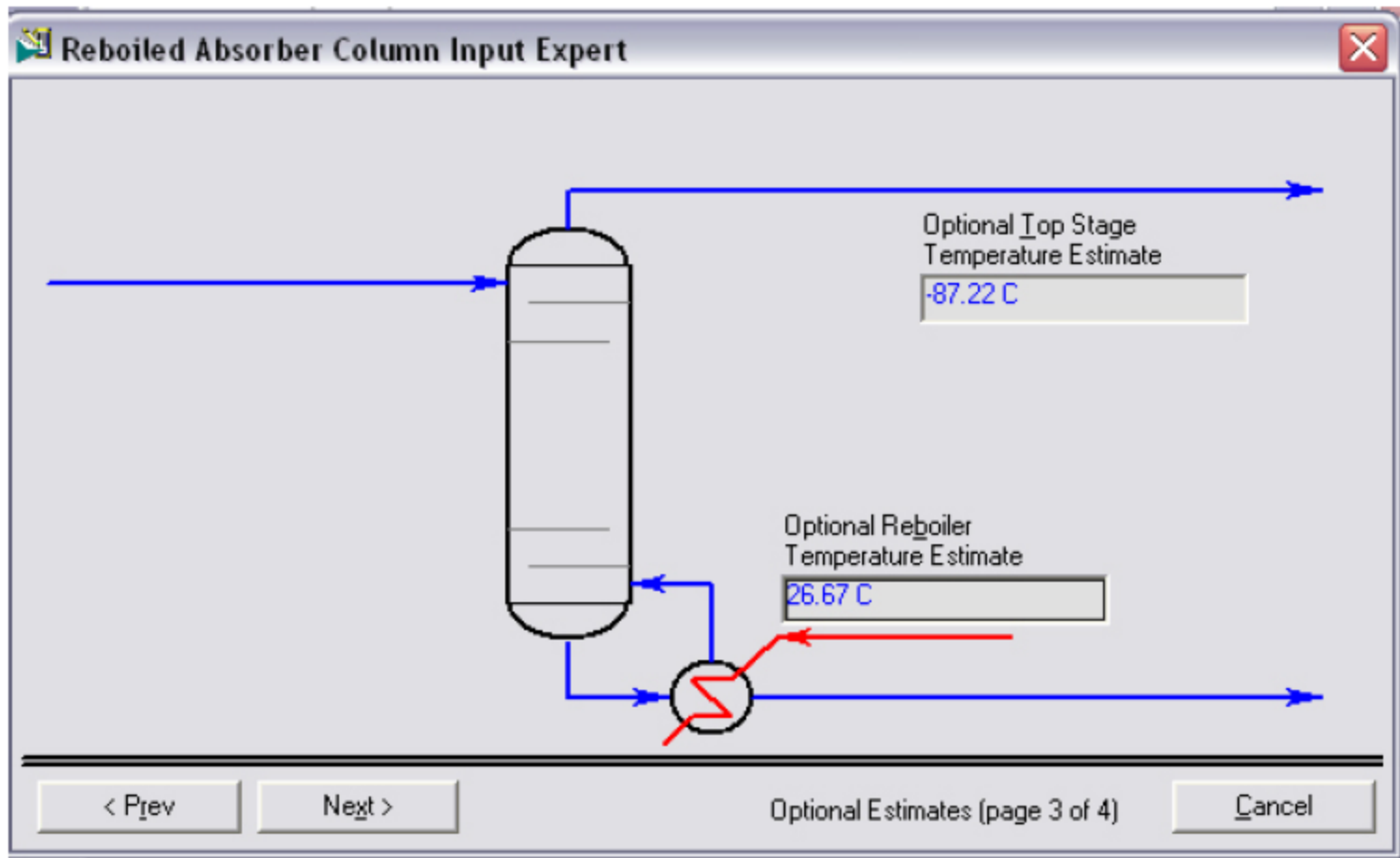
4. Click the **Next** button to proceed to the next page.
5. Supply the following information to the Pressure Estimates page. If you are using field units, the values will be **330 psia** and **335 psia**, for the Top Stage Pressure and Reboiler Pressure, respectively.



**Figure 12-6**

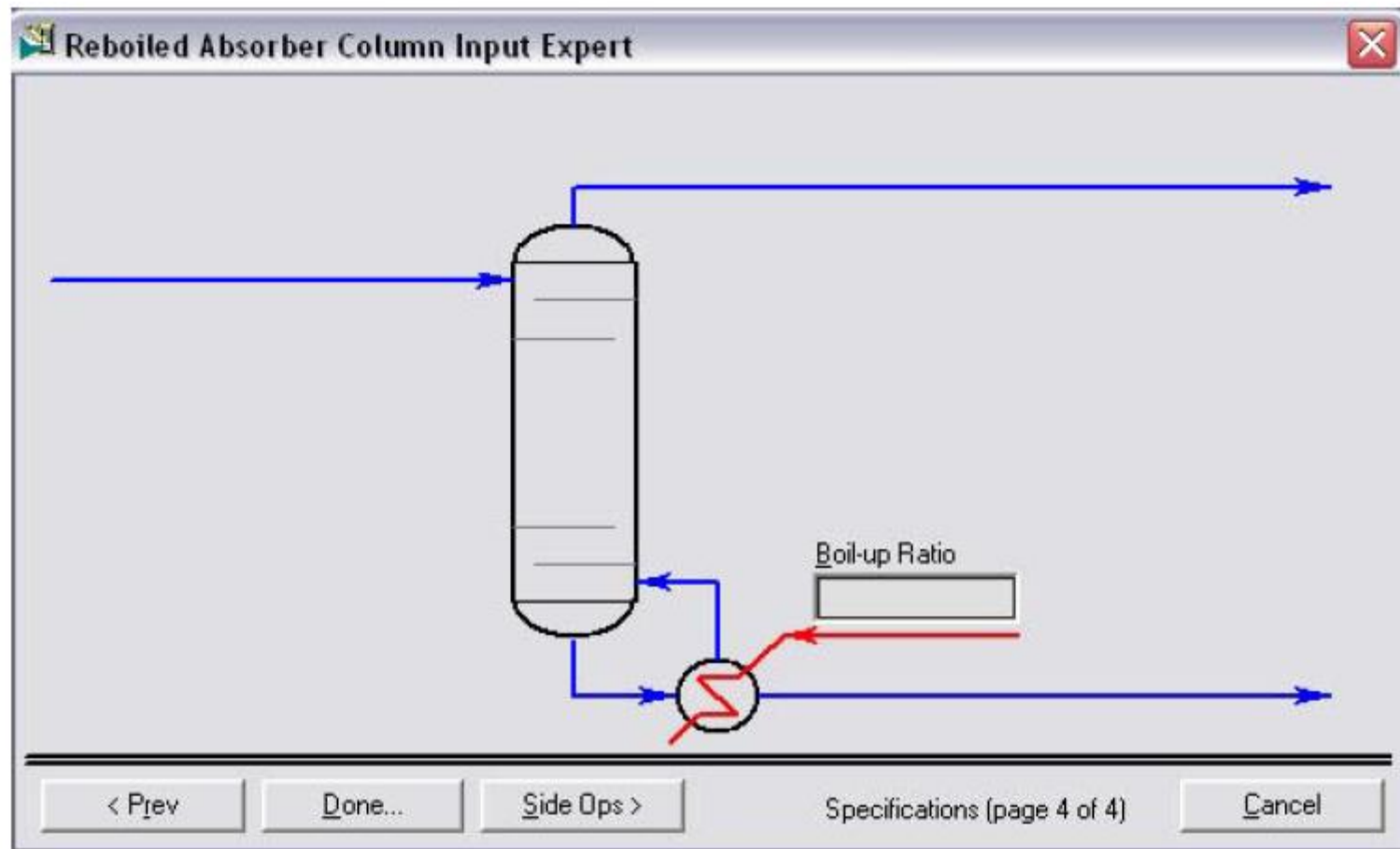
6. Click the **Next** button to proceed to the next page.
7. Enter the temperature estimates shown below. In field units, the top stage temperature estimate will be **-125°F**, and the reboiler temperature estimate will be **80°F**.





**Figure 12-7**

8. Click the **Next** button to continue.
9. For this case, no information is supplied on the last page of the Input Expert, so click the **Done** button.



**Figure 12-8**

When you click the **Done** button, HYSYS will open the Column property view. Access the **Monitor** page on the **Design** tab.

## Monitor page on the Design tab.

Column: DC1 / COL1 Fluid Pkg: Basis-1 / Peng-Robinson

**Design**

Connections

**Monitor**

Specs

Specs Summary

Subcooling

Notes

Optional Checks

Iter	Step	Equilibrium	Heat / Spec

Profile

Temp  
 Press  
 Flows

Specifications

	Specified Value	Current Value	Wt. Error	Active	Estimate	Current
Ovhd Prod Rate	<empty>	<empty>	<empty>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>
Btms Prod Rate	<empty>	<empty>	<empty>	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>
Boilup Ratio	<empty>	<empty>	<empty>	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>

Degrees of Freedom

Unconverged
 Update Outlets  Ignored

Figure 12-9

Before you converge the column, make sure that the specifications are as shown above. You will have to enter the value for the Ovhd Prod Rate specification. The specified value is **1338 kgmole/h** (2950 lbmole/hr). Once this value is entered, the column will start running and should converge.



**Design**

Connections

**Monitor**

Specs

Specs Summary

Subcooling

Notes

Optional Checks

Input Summary

View Initial Estimates...

Iter	Step	Equilibrium	Heat / Spec
1	1.0000	0.046431	0.427867
2	1.0000	0.002999	0.005085
3	1.0000	0.000279	0.002086
4	1.0000	0.000016	0.000572
5	1.0000	0.000001	0.000152

Profile

- Temp
- Press
- Flows



Specifications

	Specified Value	Current Value	Wt. Error	Active	Estimate	Current
Overhd Prod Rate	1338 kgmole/h	1.34e+003	-0.0000	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>
Btms Prod Rate	<empty>	497	<empty>	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>
Boilup Ratio	<empty>	1.90	<empty>	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>

View...

Add Spec...

Group Active

Update Inactive

Degrees of Freedom 0

**Design**

Parameters

Side Ops

Rating

Worksheet

Performance

Flowsheet

Reactions

Dynamics

Delete

Column Environment...

Run

Reset

Converged

Update Outlets

Ignored