

Appendix K

UniSim (Honeywell) Software

UniSim[®] Design R360.1 simulation software is an intuitive and interactive process modeling that allows engineers to create steady-state and dynamic models for plant design, performance monitoring, troubleshooting, operational improvement, business planning and asset management. Further, it provides users with Honeywell's domain expertise in process simulation and operator training. Using industry-specific unit operating models and powerful tools to optimize operating parameters for feedstock changes, UniSim Design allows the steady-state simulation of oil and gas, refining, chemical and petrochemical processes.

In this book, UniSim Design simulation software is employed to verify some of the design calculations. Appendix-K shows the steps in creating a simulation run using UniSim Design R360.1

Step 1. Double click on UniSim icon to display the simulation window as shown in Figure K-1.

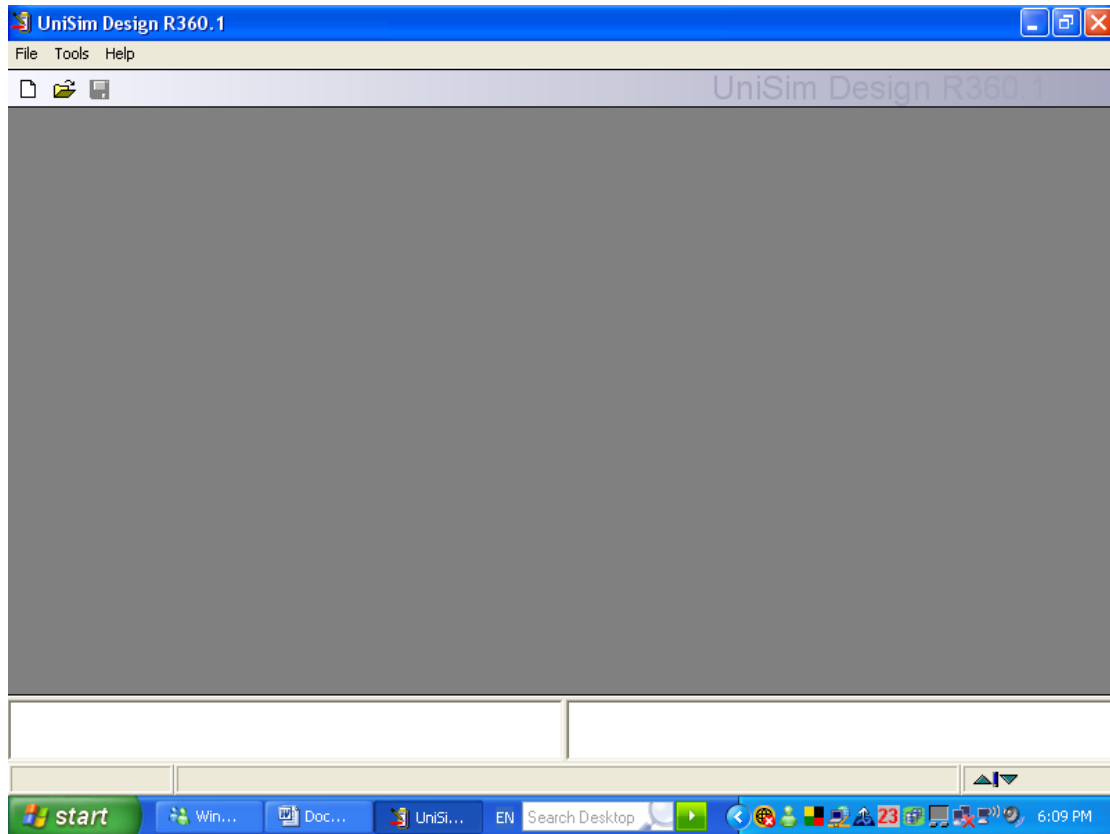


Figure K-1. Snap shot of UniSim design window.

Step. 2. From the Tools menu, select Preferences to set up the default units as shown in Figure K-2.

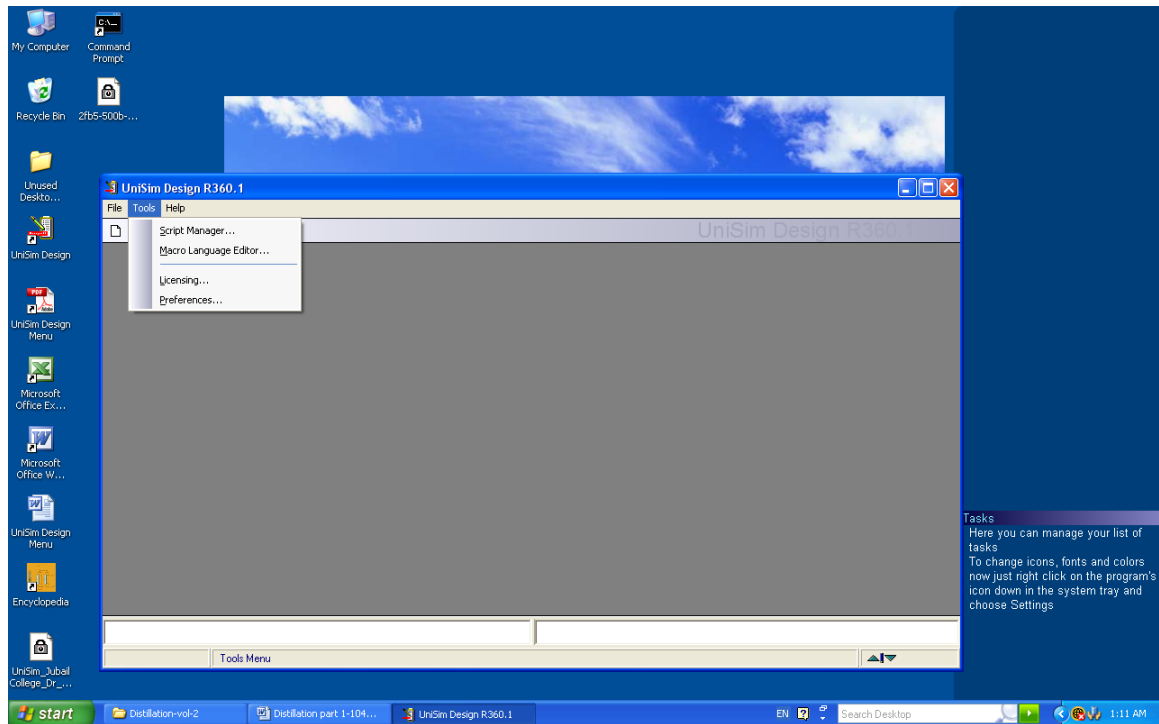


Figure K-2. Snap shot of UniSim design window.

Step. 3. Select the Variables tab on the Session Preferences window

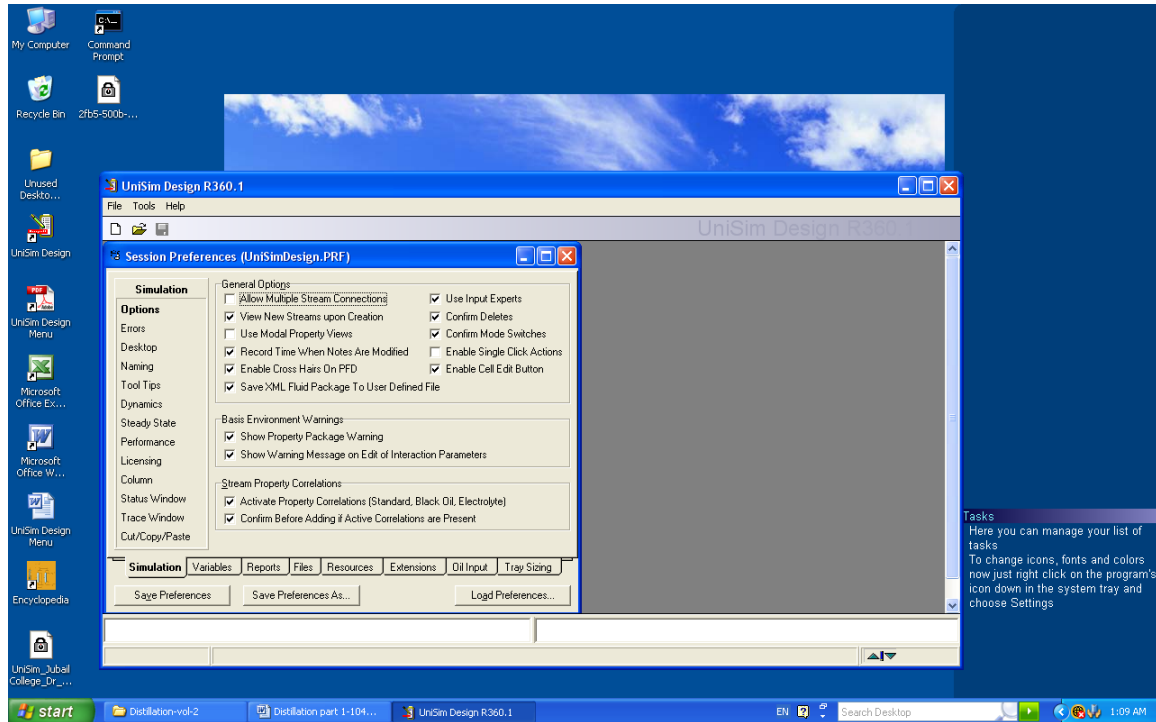


Figure K-3. Snap shot window of the Session Preference window.

Step. 4. Set up the units as default in the Session Preferences Window. Select New User from the list in **Available Unit Set**, Select the units S.I./Field from Display Units and click on “**Save Preference As**” as shown in Figure K-4.

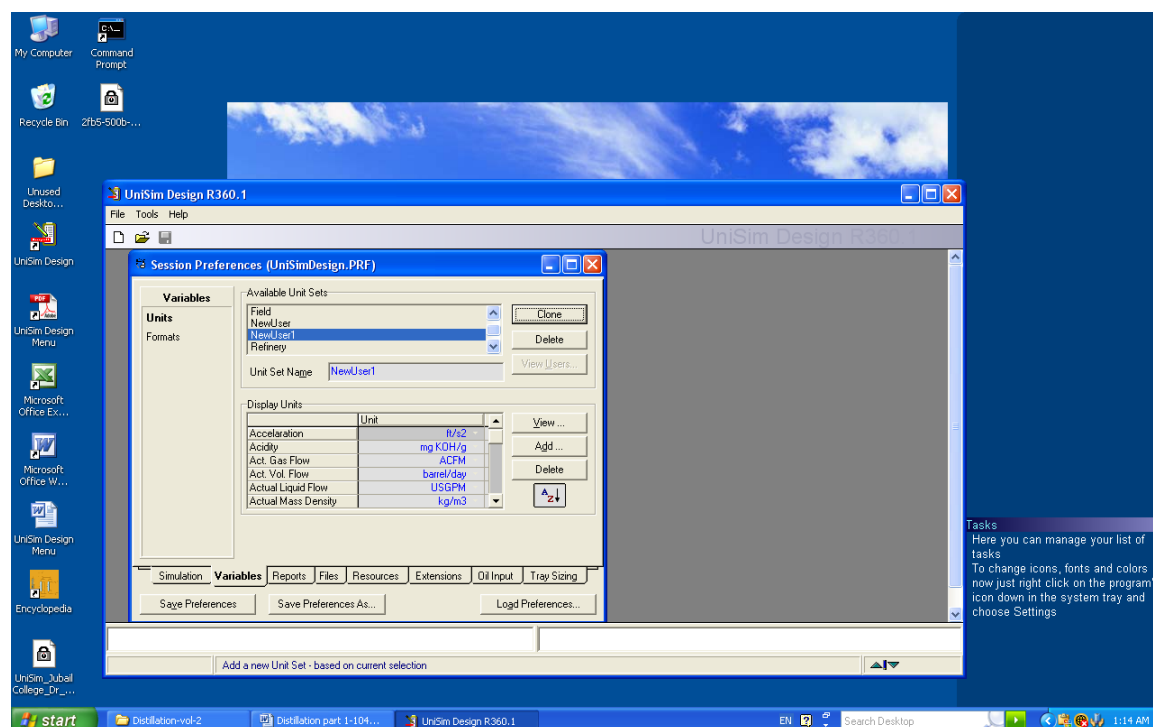


Figure K-4. Snap shot window of variables in the Session Preferences.

Step. 5. Click on File menu, select New and click on Case in the menu. This allows for a new simulation problem using UniSim Design R370 software as shown in Figure K-5.

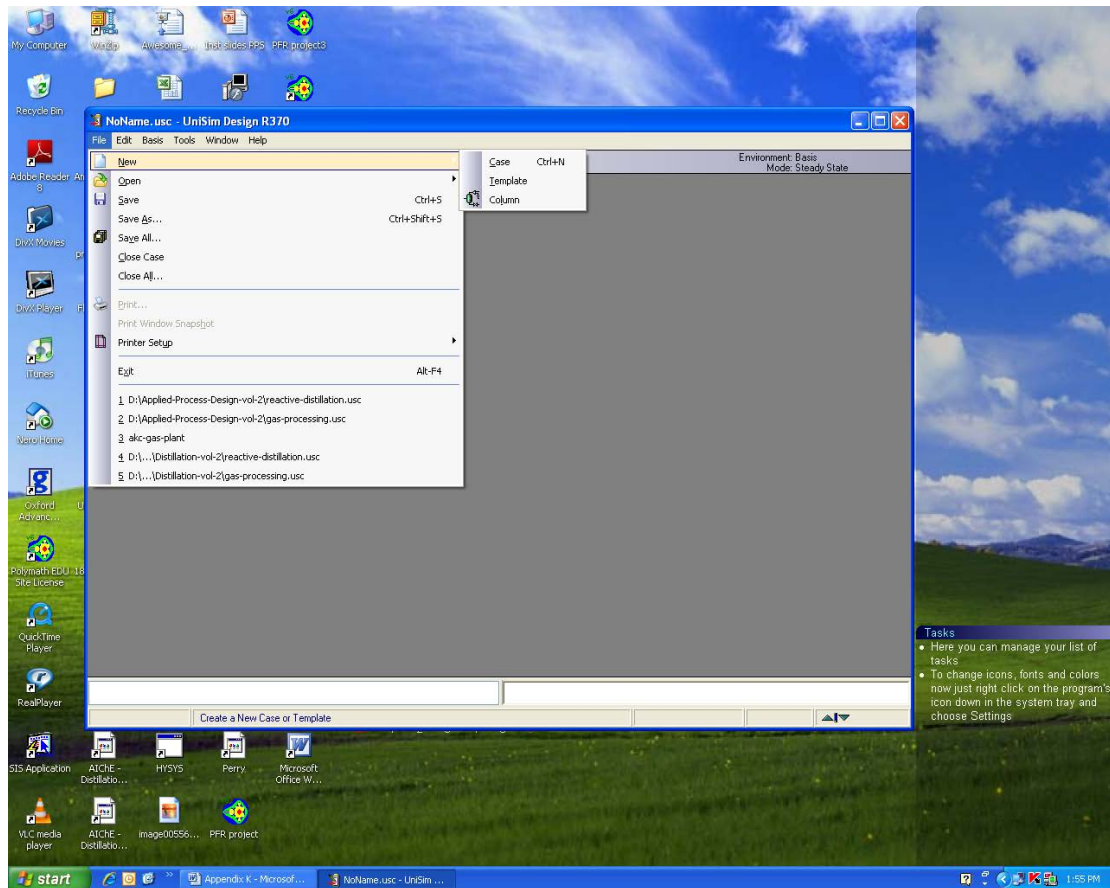


Figure K-5. Snap shot of creating a new simulation design.

Step. 6. Select the Component List View window by clicking on the tab button. Click on the Add Pure button to select the components as highlighted in Figure K – 6.

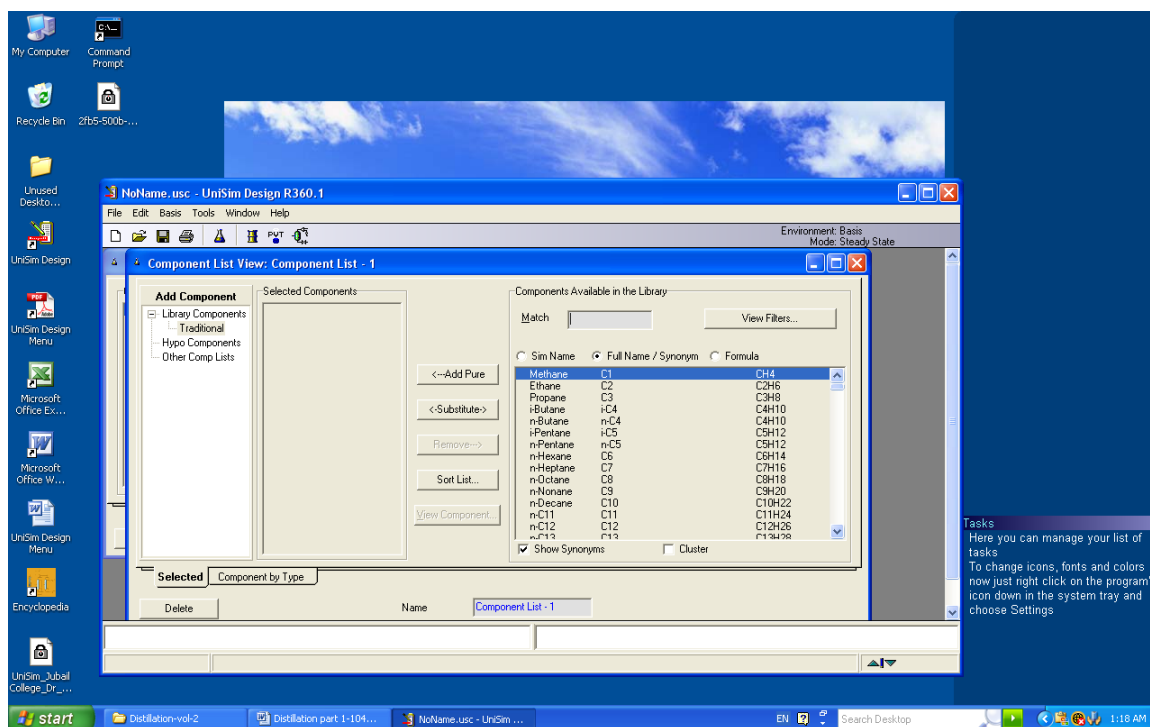


Figure K-6. Snapshot of the Component List View window showing the components.

Step 7. The Simulation Basis Manager window appears as shown in Figure K-7. Click on Fluid Pkgs tab as shown in Figure K-6. Then click on the Add button to select the components.

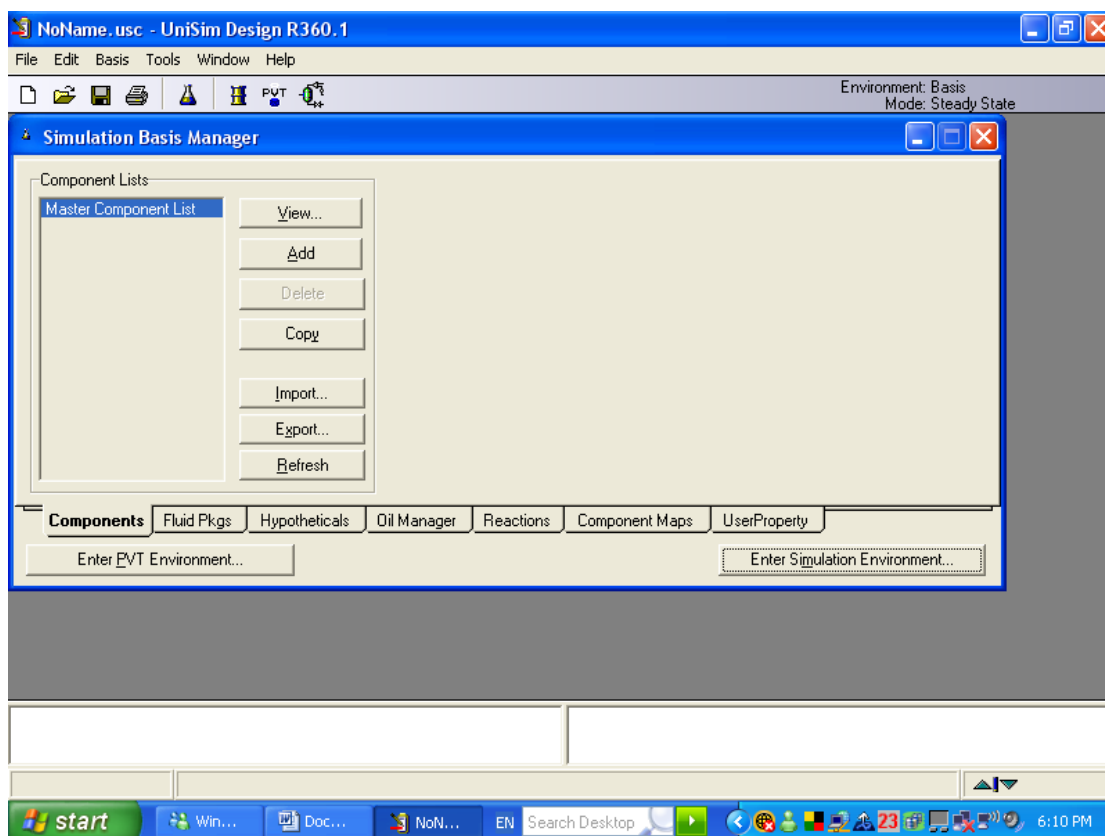


Figure K-7. Snapshot window of Simulation Basis Manager

Step 8. Click on the Add Pure button to select the components as highlighted in Figure K-8. Close the window

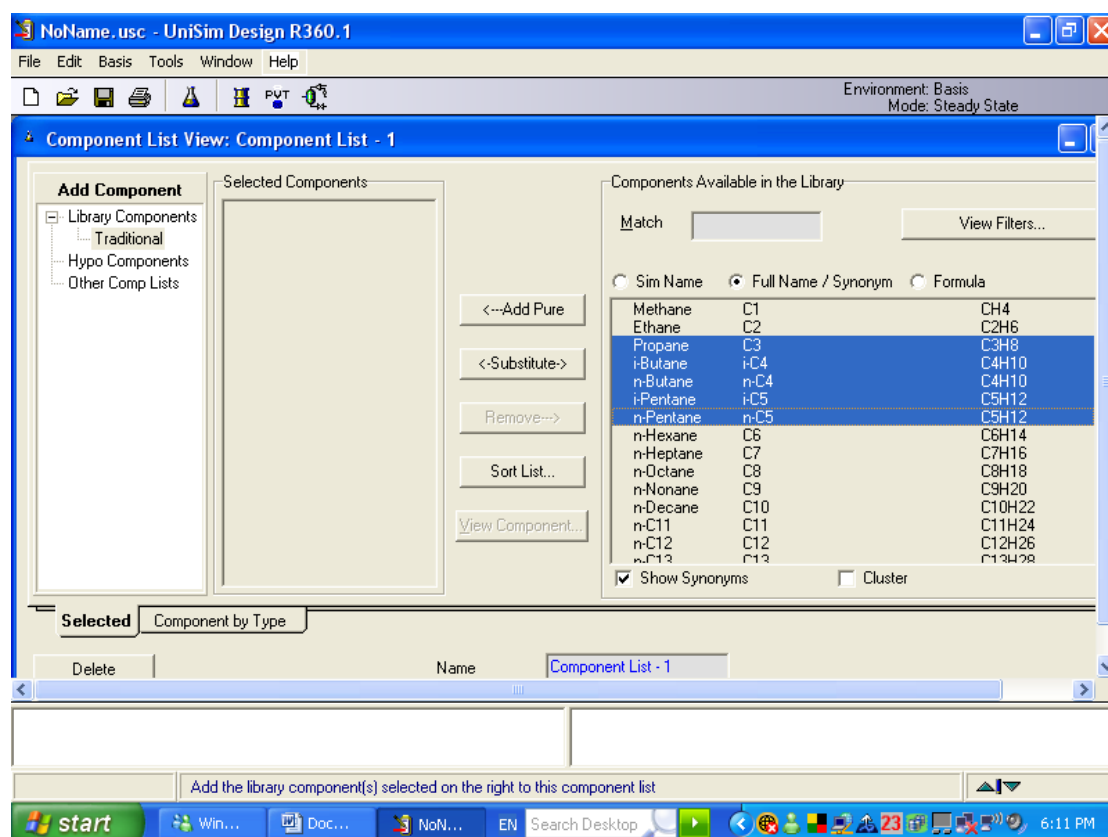


Figure K-8. Snapshot of the component List View window showing the components.

Step 9. The Simulation Basis Manager window appears as shown in Figure K-9. Click on Fluid Pkgs tab as shown in Figure K-9. Then click on the **Add** button.

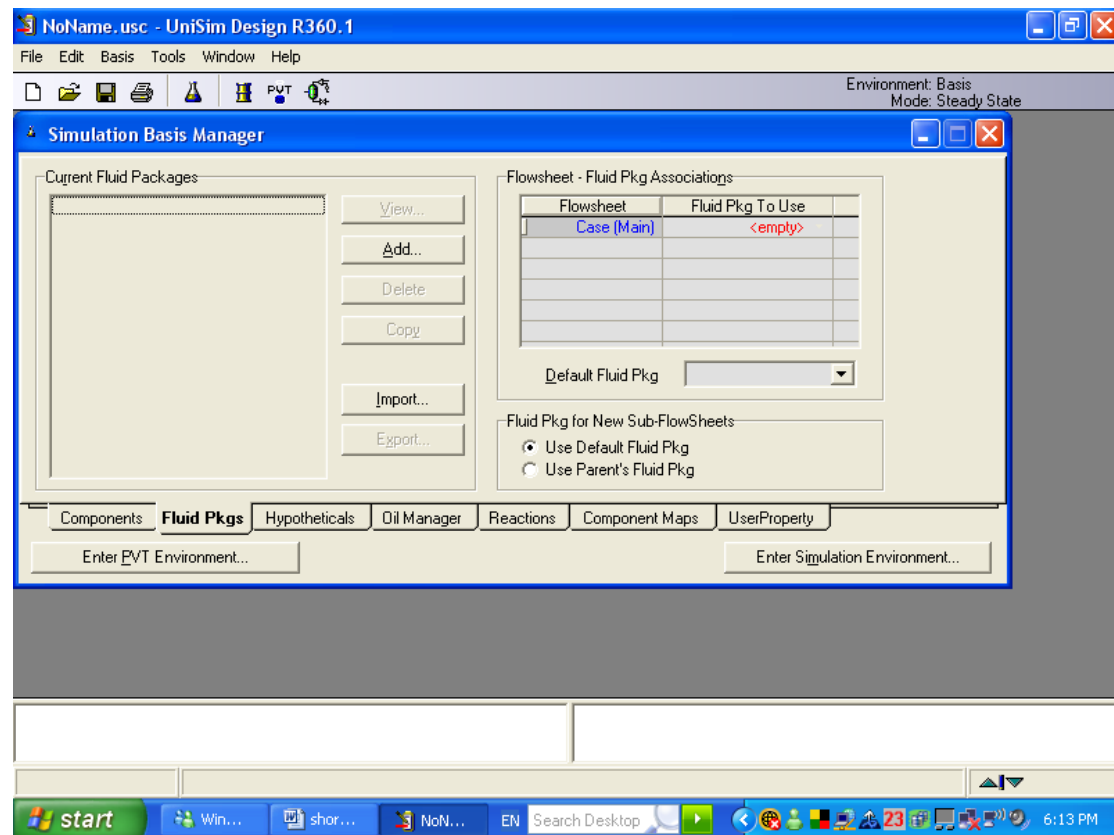


Figure K-9. Snapshot of Simulation Basis Manager window.

Step 10. Choose the required property package from the **Property Package Selection** menu. For this example, choose **Peng Robinson** as shown in Figure K-10. Select **EOSs** from **Property Package Filter** and close the window.

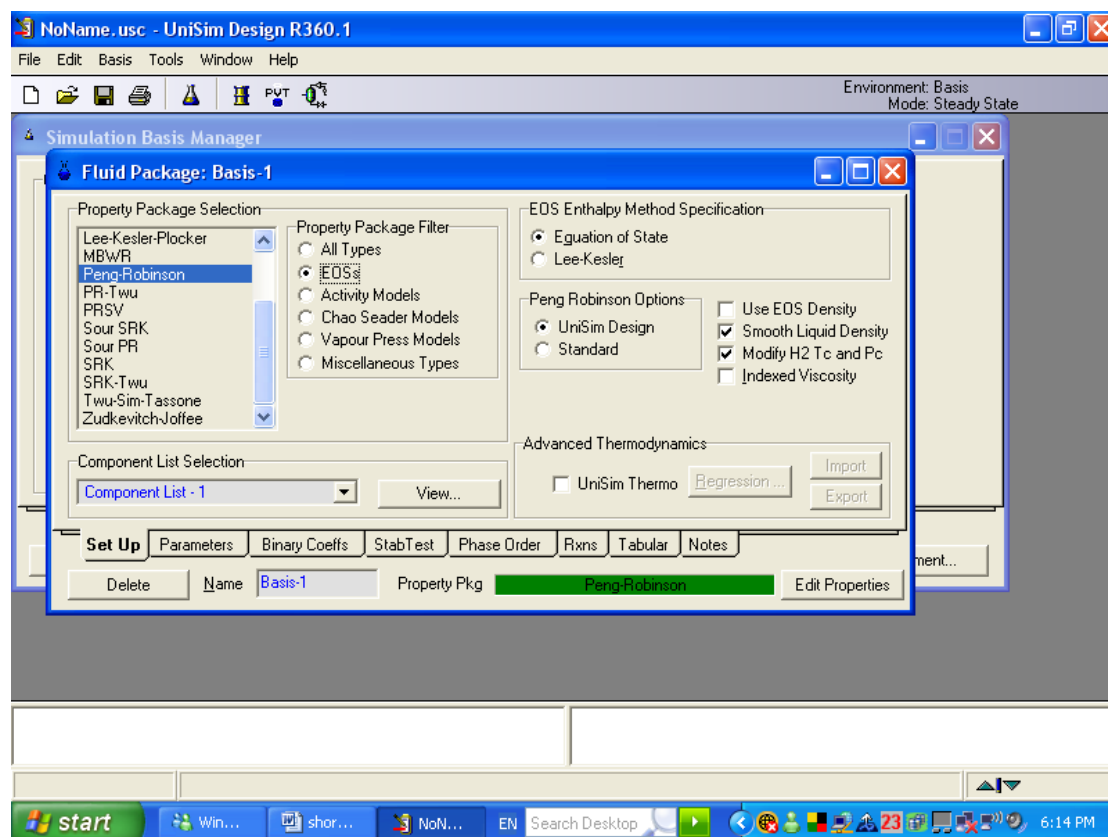


Figure K-10. Snapshot of Simulation Basis Manager window listing Property Package Selection.

Step 11. Close the window and return to the Simulation Basis Manager window as shown in Figure K-11. Click on **Enter Simulation Environment** button as shown in Figure K-11.

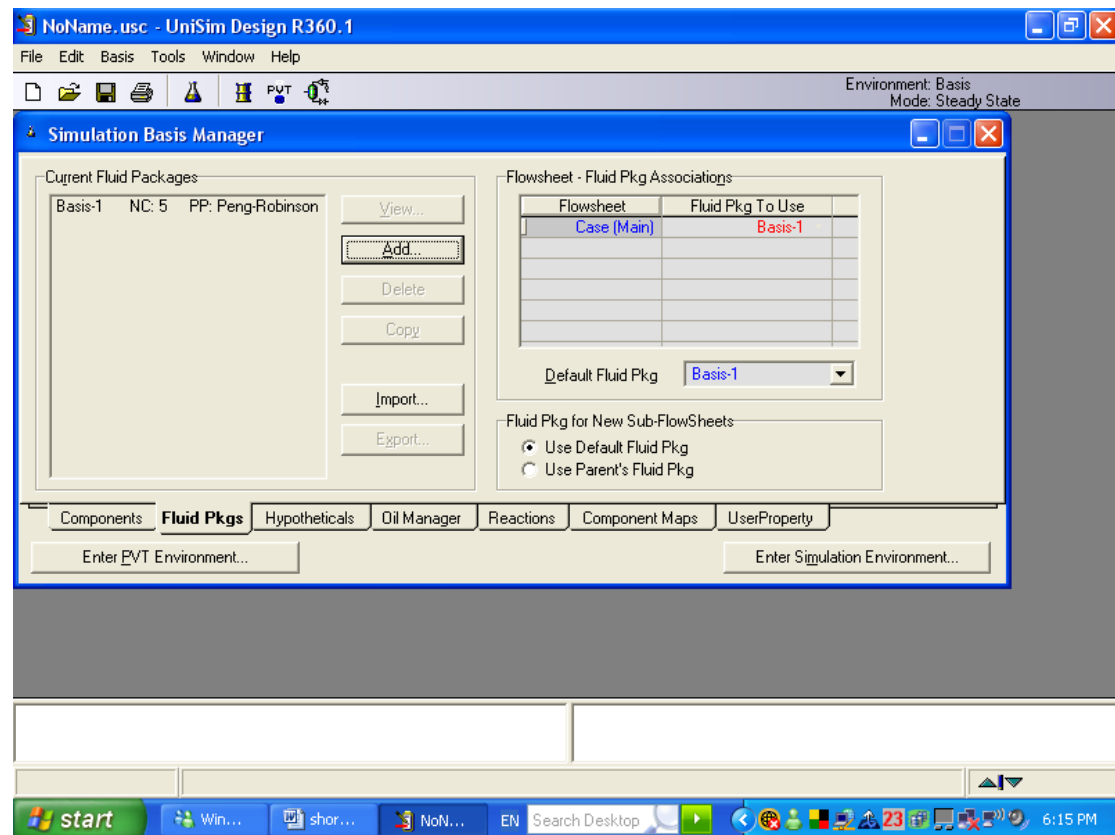


Figure K-11. Snapshot of Simulation Basis Manager window.

Step. 12. Here, the Process Flow Diagram (PFD) window appears, then from the palette, double click on the **blue** arrow and place it on the PFD window. Next, select the shortcut distillation icon in the palette by double clicking on it and place this on the PFD window as shown in Figure K-12. This is named **T-100**. Double clicking on the arrow -1 gives the worksheet window.

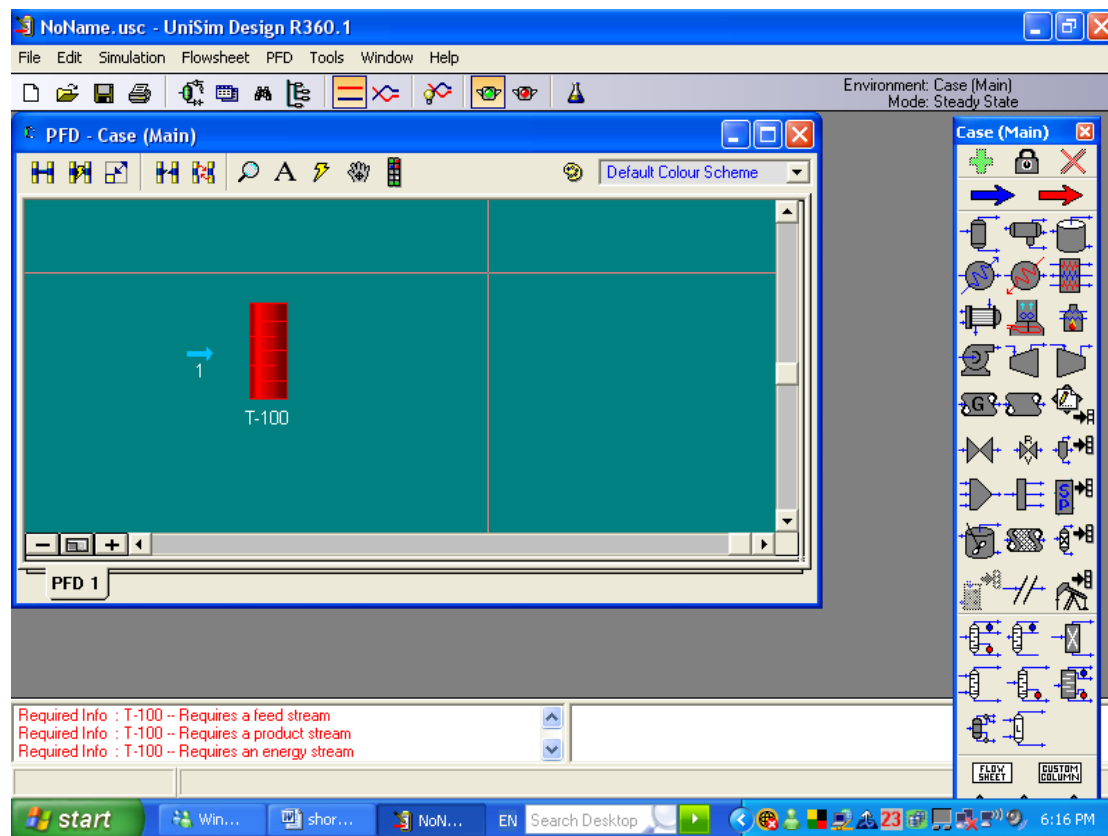


Figure K-12. Snapshot of the feed stream 1 and distillation column T-100.

Step 13. Enter the **Stream Name**, **Pressure**, **Molar flow** from **Conditions** menu in the Worksheet of the Feed window as shown in FigureK-13.

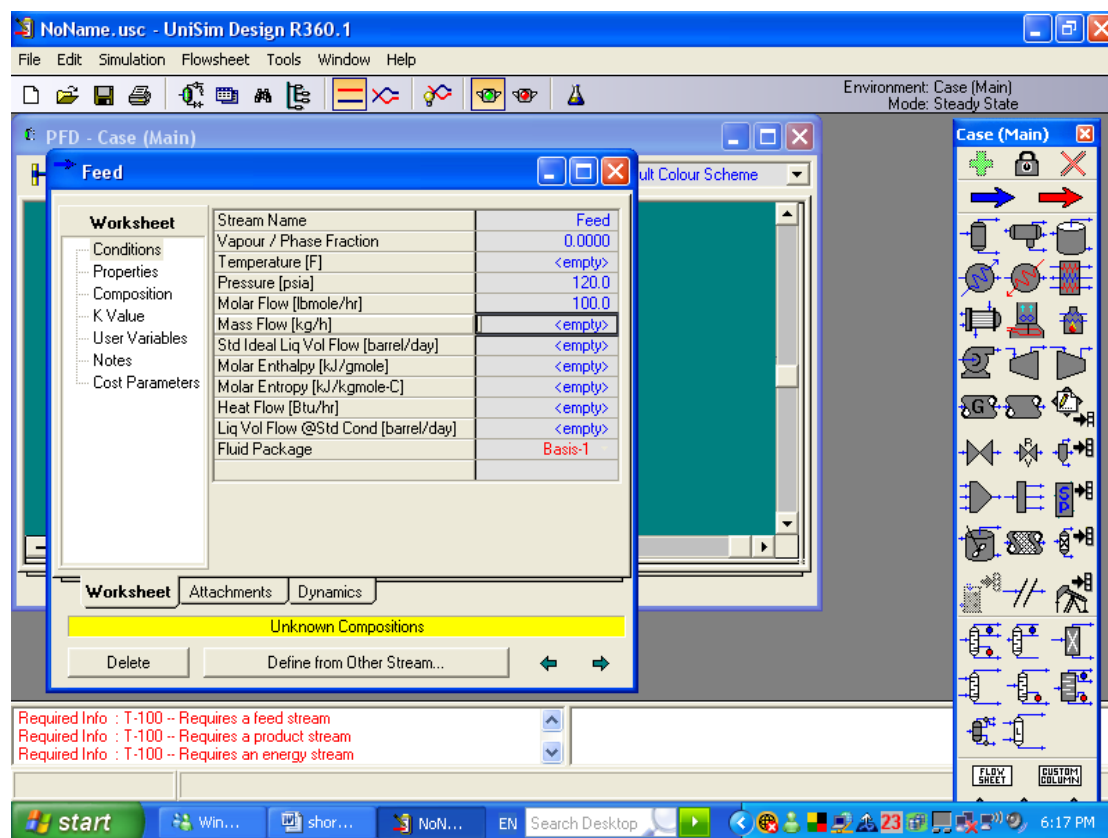


Figure K-13. Snapshot of the Feed window showing the **Worksheet** parameters.

Step 14. Next, select Composition menu from the Worksheet in the Feed window. This provides the five components $C_3 - C_5$ that were previously selected for this example.

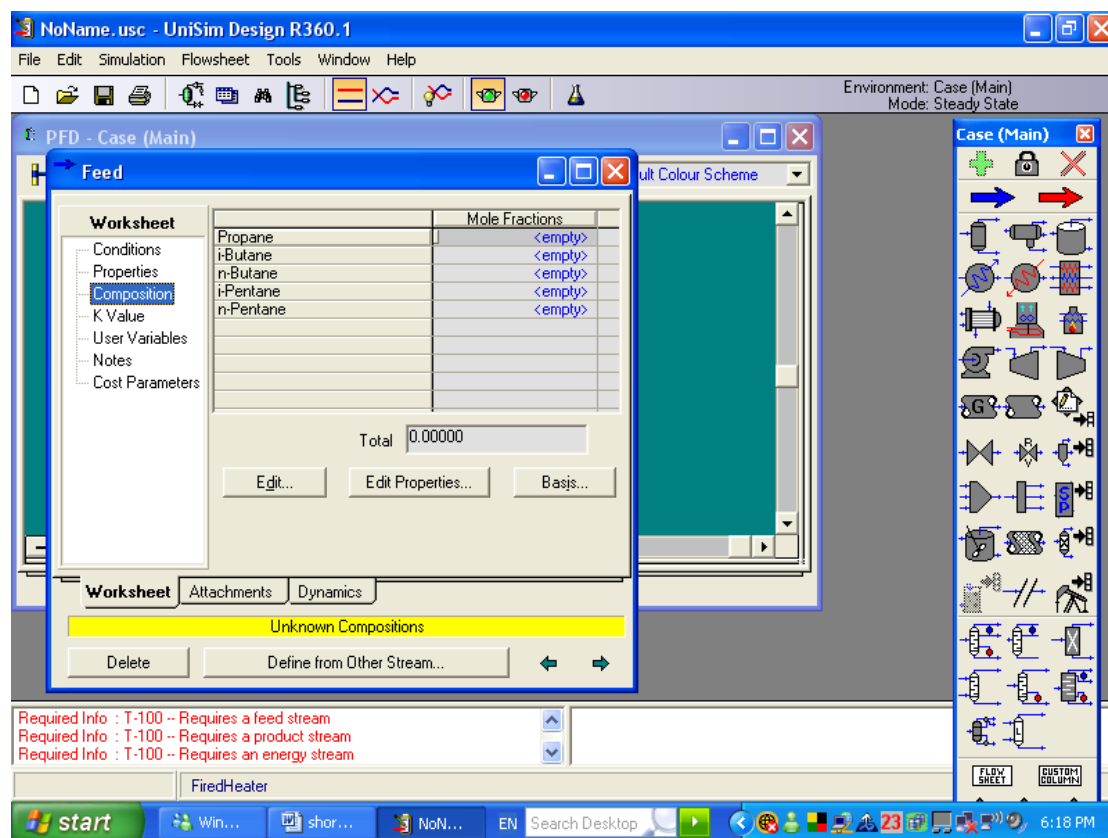


Figure K-14. Snapshot of the Feed window with the selected five components.

Step 15. Select **Mole fraction** tab from **Input Composition for Stream: Feed** window and input the data values of the components as shown in Figure K-15. Click on **OK** button to close the window.

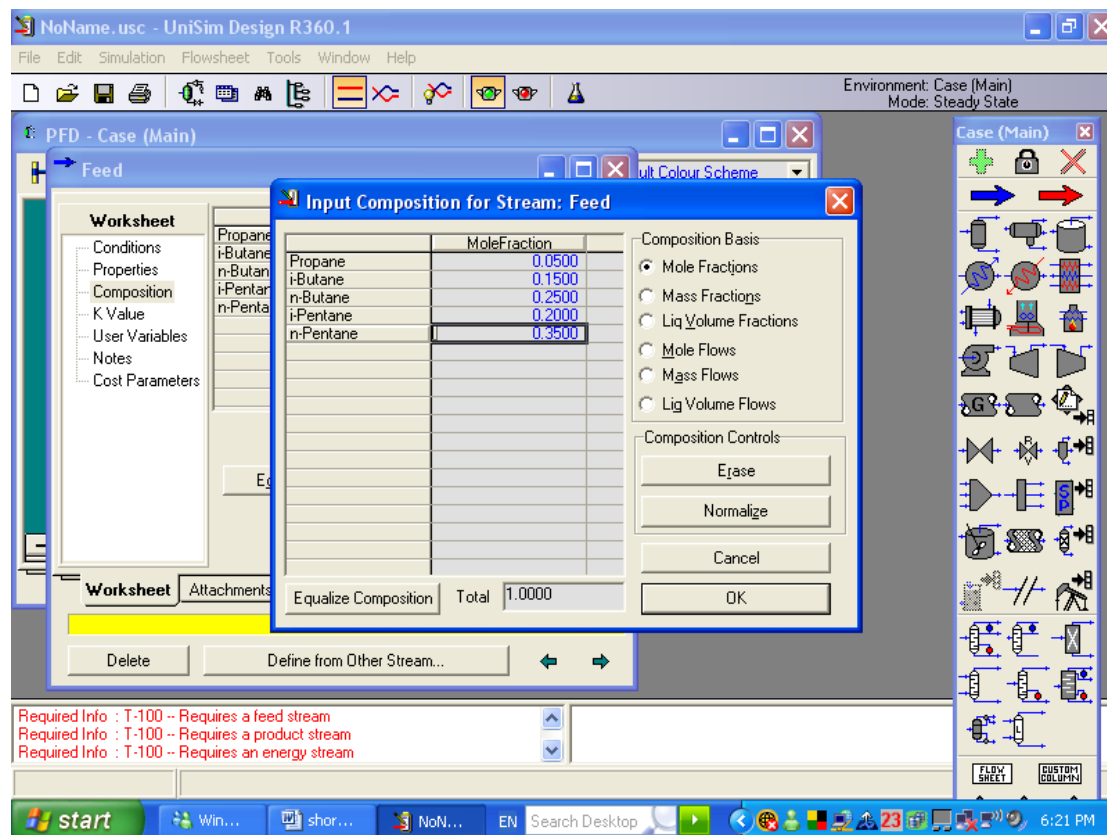


Figure K-15. Snapshot of **Input Composition For Stream: Feed** window.

Step 16. The total Mole fraction is 1.0 as shown in Figure K-16. Close this window and double click on the column icon on the PFD window.

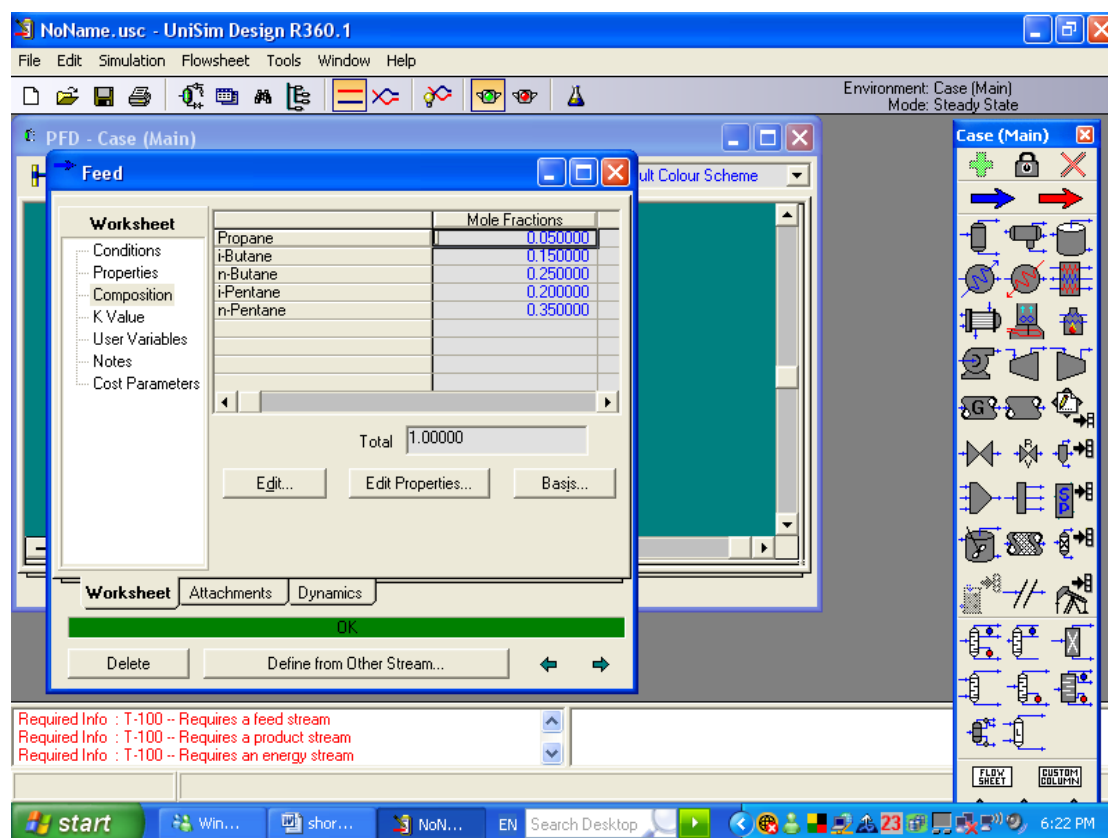


Figure K-16. Snapshot of the Feed window showing the total mole fraction of the components.

Step 17. Double clicking on the Red icon of the column shows the Column window as shown in Figure K-17. Click on the Design tab and enter the different streams: Feed, Distillate, Bottoms, Reb-Q, Cond-Q. Choose Liquid button for Top Product Phase from Connections as shown in Figure K-17.

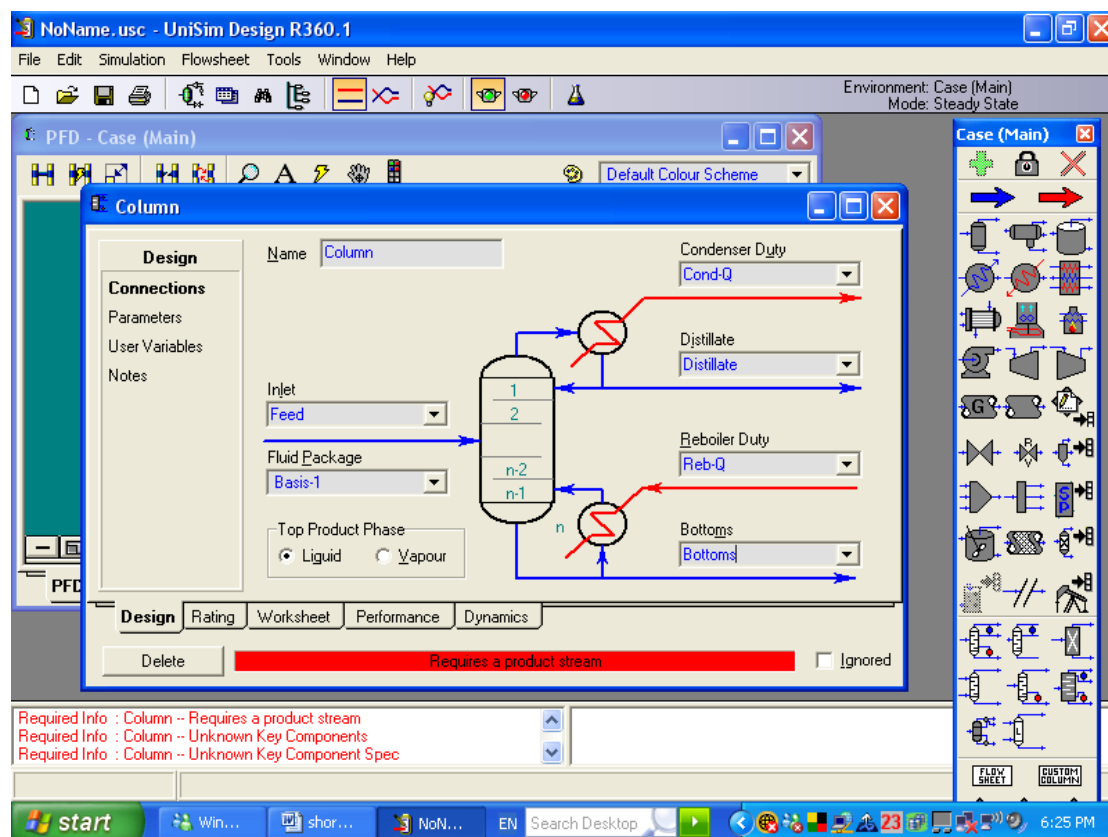


Figure K-17. Snapshot of **Column** window from **Design** tab in **Connections** menu.

Step 18. Next, select the Parameter menu from Design window. Select light key in Bottoms and its Mole fraction tab, Heavy key in Distillate and its corresponding Mole fraction tab as shown in Figure K-18. Notice the highlighted red comments displayed “**Unknown Key Components**” at the bottom of the window.

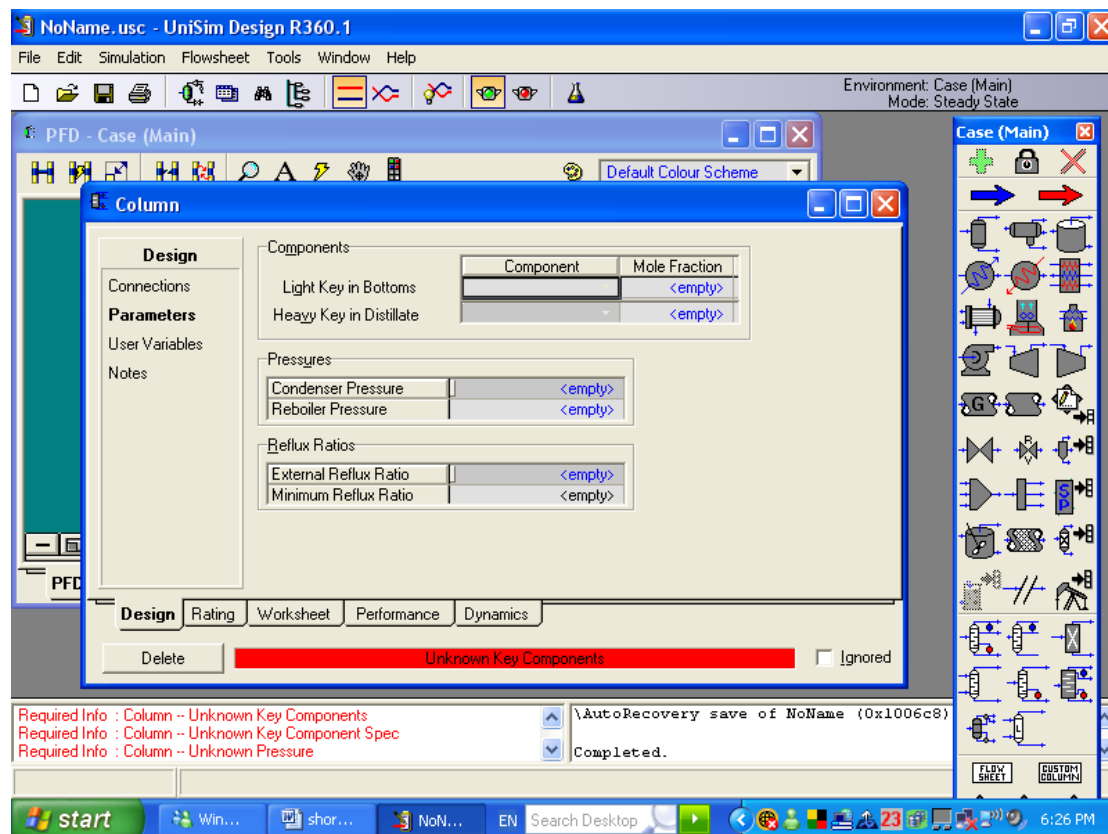


Figure K-18. Snapshot of **Column** window showing **Parameters** menu.

Step. 19. Input the Parameter values and notice the highlighted red comments displayed “**Unknown Pressure**” as shown in Figure K-19

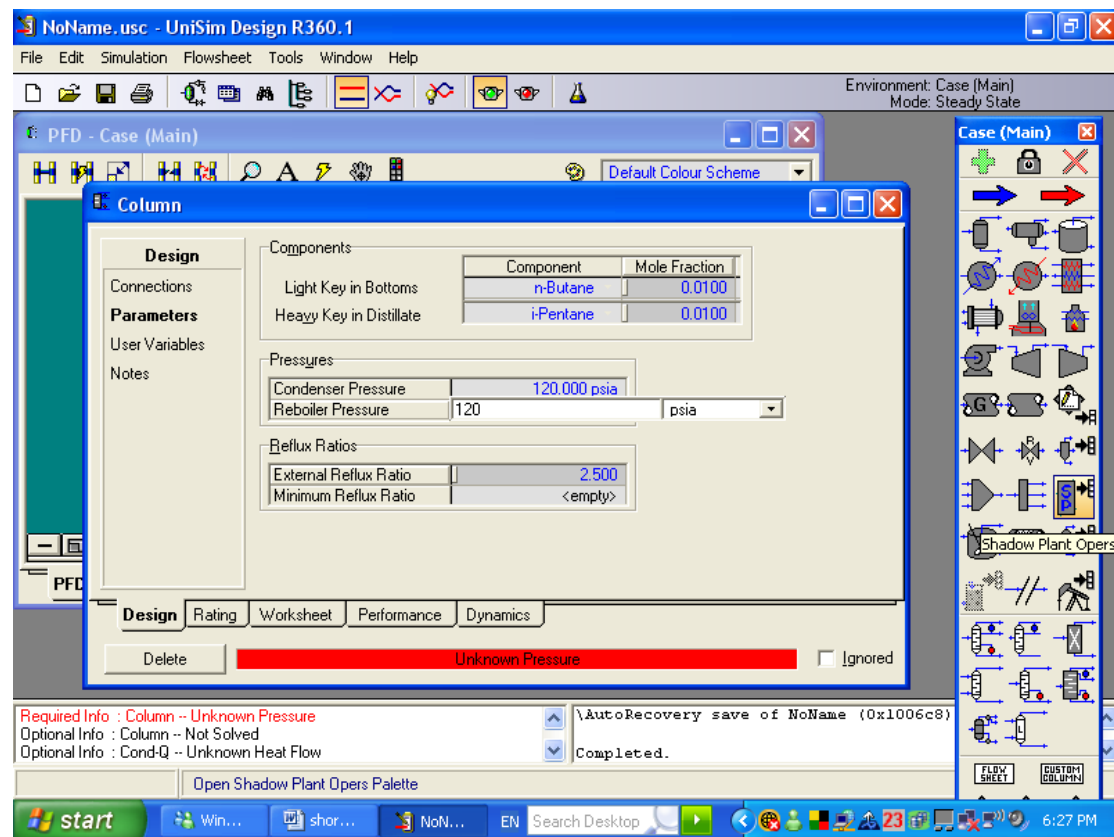


Figure K-19. Further snapshot of **Column** window showing **Parameters** menu.

Step 20. Next, select **Parameters** from the **Design** window. Select Light Key in Component name from the list in Component “**Light key in Bottoms**” (e.g. n-Butane) and enter its value under Mole fraction label. Select Heavy Key component name from the list in Component “**Heavy Key in Distillate**” (e.g. i-Pentane) and enter its corresponding value under Mole fraction label. Enter Condenser and Reboiler Pressure (*NB: The value of Reboiler pressure is greater than the value of Condenser pressure*). Enter the value of External Reflux Ratio. This gives a highlighted green comment “**OK**” as shown in Figure K-20.

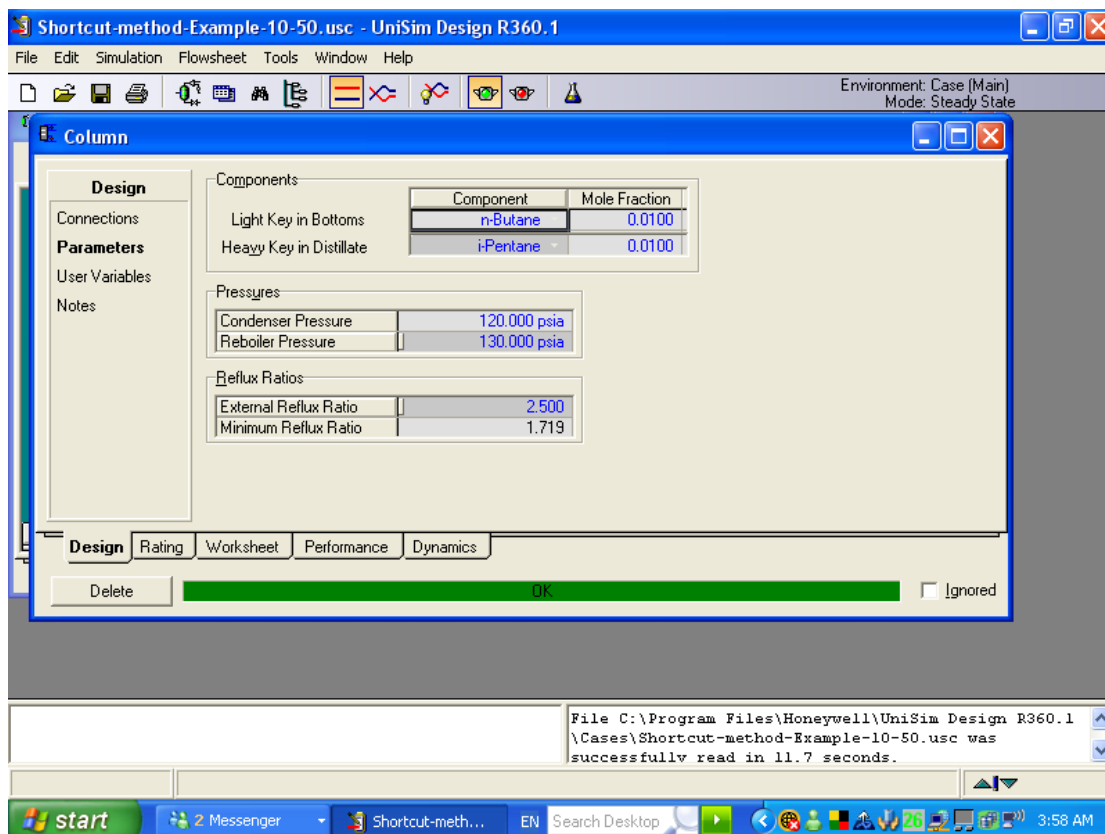


Figure K-20. Snapshot of Column window with required Parameters.

Step21. The PFD window shows the results of shortcut simulation with **Feed**, **Distillate** and **Bottoms** and their corresponding values of **Temperature**, **Pressure** and **Molar flow rate** as shown in Figure K-21.

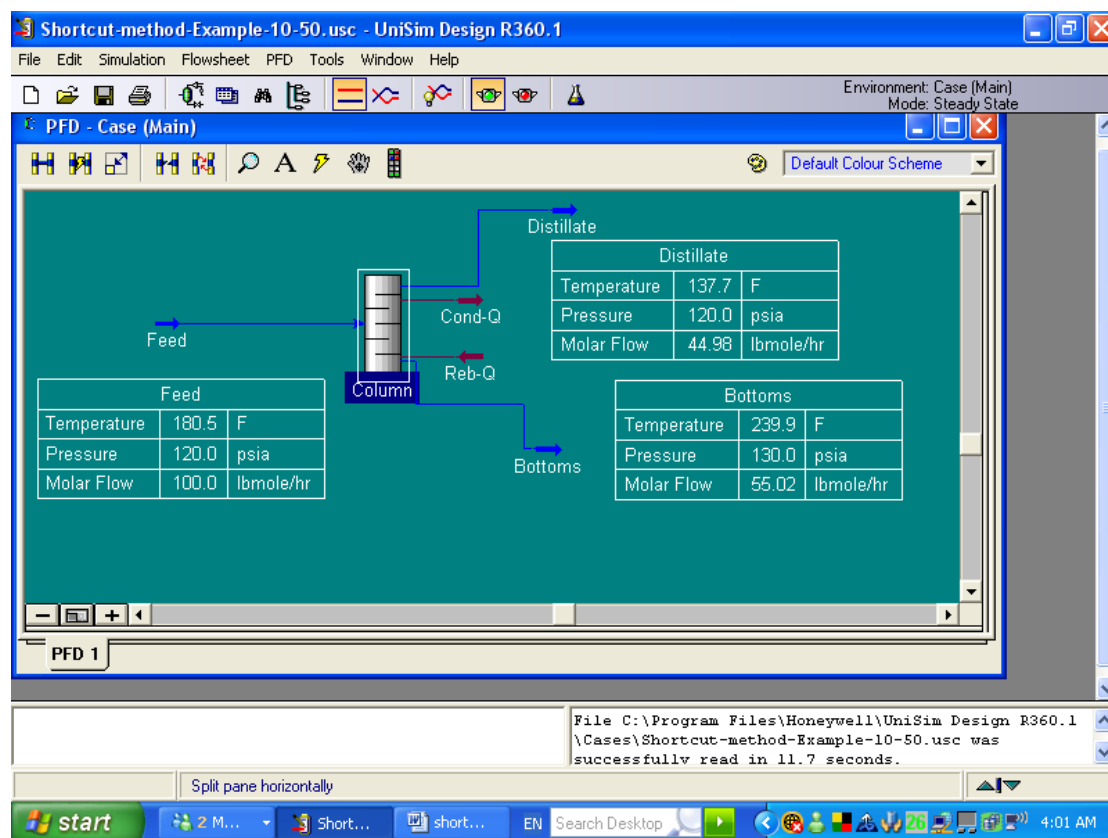


Figure K-21. Snapshot of PFD window showing the shortcut method simulation results.

Step 22. A summary of the printout of the data sheet can be obtained by right clicking on the column icon in Figure K-22 to display a menu with **Print Datasheet** as shown in Figure K-22. Then click on the **Print Datasheet** menu.

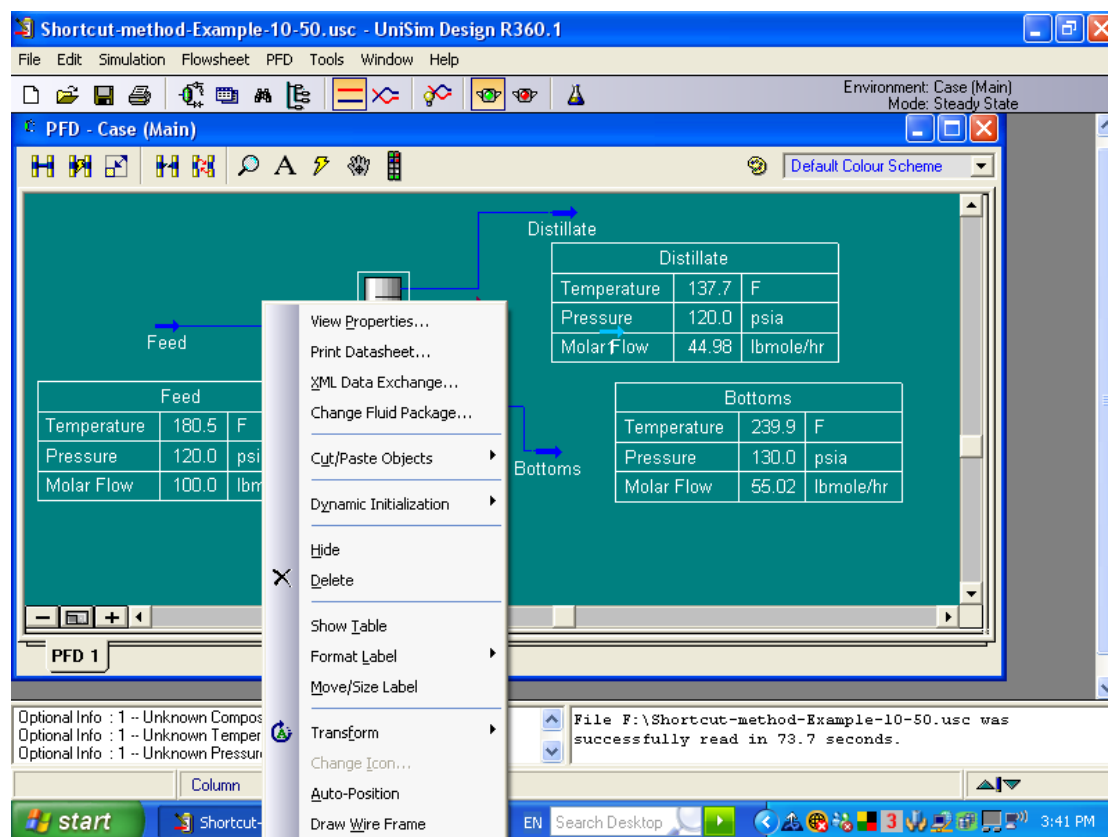


Figure K-22. Snapshot of PFD window showing the **Print Datasheet** menu.

Step 23. Click on **Print Datasheet** to display “Select Data block(s) to Print for Shortcut Column” window as shown in Figure K-23. Click on **Preview** button to view the Shortcut Column datasheet results or alternatively on **Print** button to print the hard copy of the results.

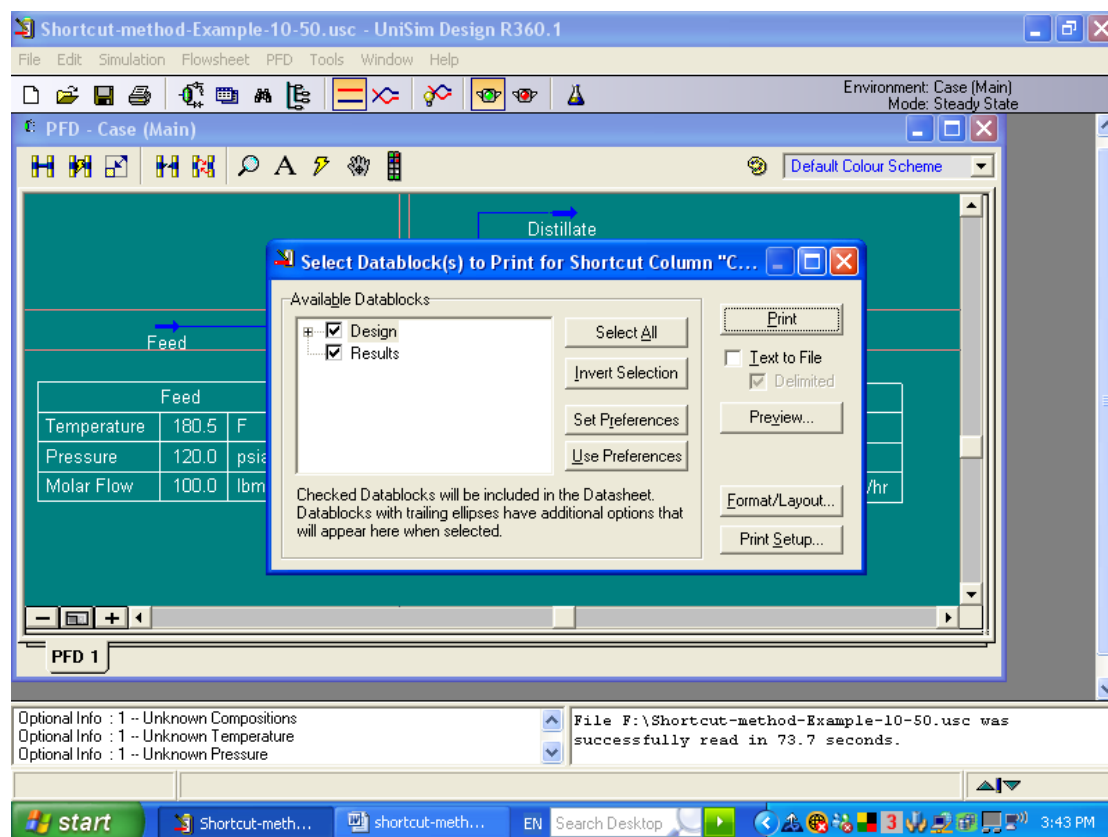


Figure K-23. Snapshot of **Select Data block(s) to Print for Shortcut Column** window.

Step 24. Display results of the Shortcut Column simulation.

Report Preview - Datasheet

Format/Layout...Print Setup...UpdatePrintClose

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Honeywell

HONEYWELL
Calgary, Alberta
CANADA

Case Name: F:\Shortcut-method-Example-10-50.usc

Unit Set: NewUser1

Date/Time: Friday Oct 3 2008, 15:58:18

Shortcut Column: Column

Connections

Feed	Condensor Duty	Distillate	Reboiler Duty	Bottoms
Feed	Cond-Q	Distillate	Reb-Q	Bottoms

Parameters

	Component	Mole Fraction
Light Key	n-Butane	1.000e-002
Heavy Key	i-Pentane	1.000e-002

Pressures (psia)	Reflux Ratios		
Condenser Pressure	120.0	External Reflux Ratio	2.500
Reboiler Pressure	130.0	Minimum Reflux Ratio	1.719

User Variables

Results Summary

Trays / Temperatures	Flows		
Minimum # of Trays	12.05	Rectify Vapour (lbmole/hr)	157.4
Actual # of Trays	22.34	Rectify Liquid (lbmole/hr)	112.5
Optimal Feed Stage	11.14	Stripping Vapour (lbmole/hr)	157.4
Condenser Temperature (F)	137.7	Stripping Liquid (lbmole/hr)	212.5
Reboiler Temperature (F)	239.9	Condenser Duty (Btu/hr)	1.224e+006
		Reboiler Duty (Btu/hr)	1.309e+006

startShortcut-me...shortcut-met...ENSearch Desktop3:56 PM

Figure K-24. Snapshot of shortcut Column simulation from Honeywell UniSim ® software.