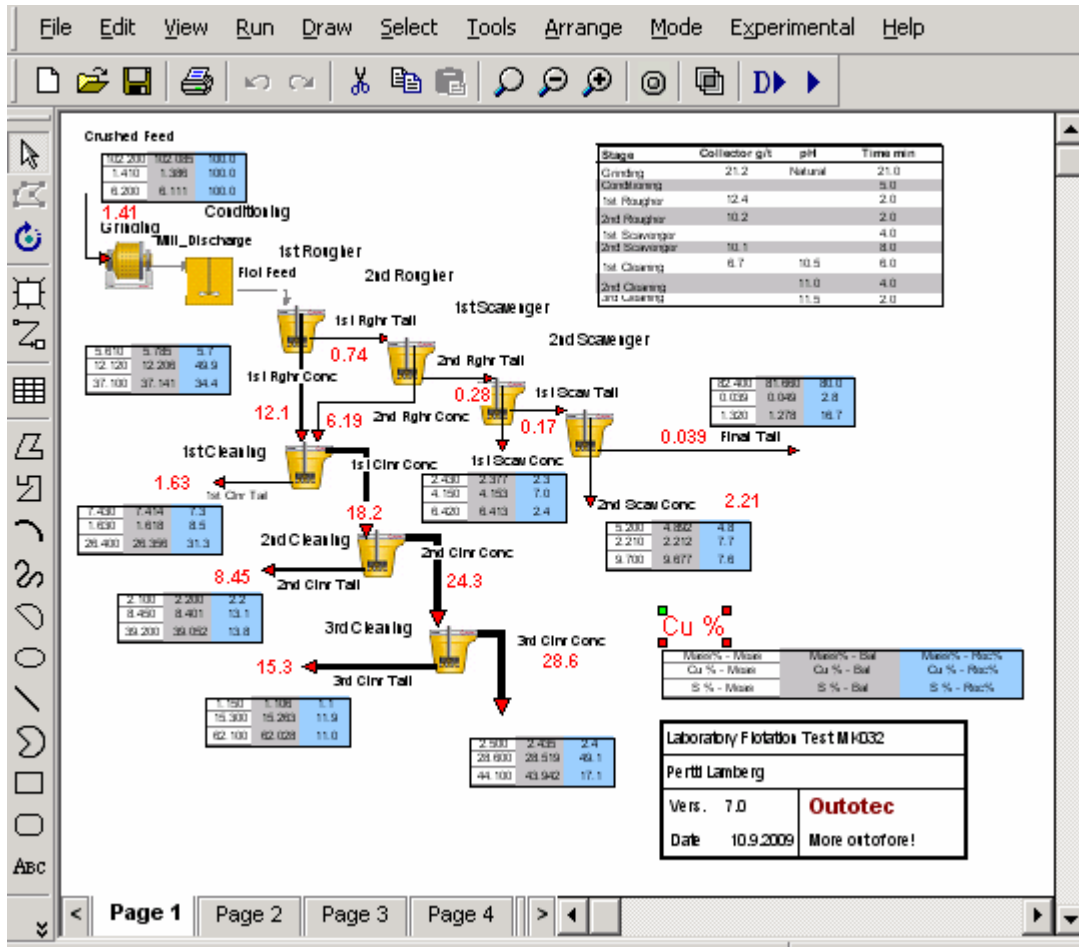


HSC Chemistry® 7.0 User's Guide

Sim Flowsheet Module – Experimental Mode

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47. EXPERIMENTAL MODE

47.1. General

HSC Sim 7.0 has a new Experimental mode that has been designed to process data from laboratory/pilot testwork or from plant surveys. Besides organizing the original measurements it is possible to Mass Balance and Reconcile the experimental data.

The features of the HSC Sim 7.0 are:

- You can use the very same drawing and visualization tools as in the simulation modes (see chapters 42-43).
- You can bring in your chemical assays and other measurements from the process and visualize using Sankey diagrams and flowsheet tables.
- For Mass Balancing and Data Reconciliation there is no need to draw a new flowsheet; HSC Sim 7.0 will create the mass balancing nodes according to your data. You can easily ignore some streams or analyses.

With HSC Sim 7.0 you can solve the following types of mass balance problems:

1. Reconcile measured or estimated component flowrates (1D components).
2. Mass balance and reconcile chemical analyses (1D assays)
3. Mass balance minerals in a minerals processing circuit (1D Minerals)
4. Mass balance size distribution and water balance (1.5D)
5. Mass balance assays and components in 2 or 3 phase systems where bulk composition is not analyzed (2D Components)
6. Mass balance minerals or chemical assays size-by-size (2D Assays)
7. Mass balance particles, MLA assays (3D)

For more information about mass balancing, please see the “48 Sim Mass Balancing” manual.

47.2. Experimental Mode

The Experimental mode has been designed to process data that is produced in laboratory tests or sampled in process surveys. The steps of using Experimental Mode are:

1. Select File – New Process and select Experimental Mode (Figures 1-2)
 - Optionally you can change the mode later to Experimental or you can toggle between one of the simulation modes (Particle, Hydro, Pyro) and the Experimental Mode (Figure 3)
2. Draw the flowsheet (for more details on drawing see the Sim manual: “40 Sim Flowsheet”)
 - Select units tab (Figure 4)
 - Drag and drop on the drawing area
 - Rename the unit using the “Process” tab and NameID field (Figure 5)
 - Draw the Streams and rename them (Figure 6)
 - Check the stream connections (Figure 7)
 - Check for errors (Figure 8)
 - Save the flowsheet (create a new folder) (Figure 9)

3. Select from the menu Experimental – Analyses
4. Create the experimental tables, select Create – Experimental Tables (All) from the menu.
5. Save the Experimental data (File – Save).

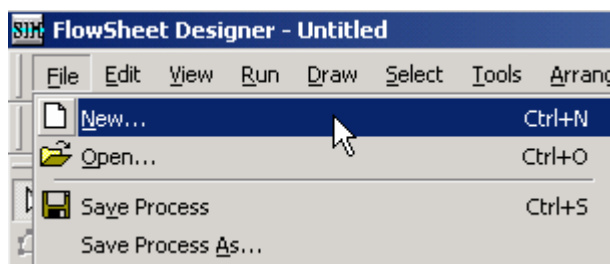


Figure 1. Selecting a new process, File New...

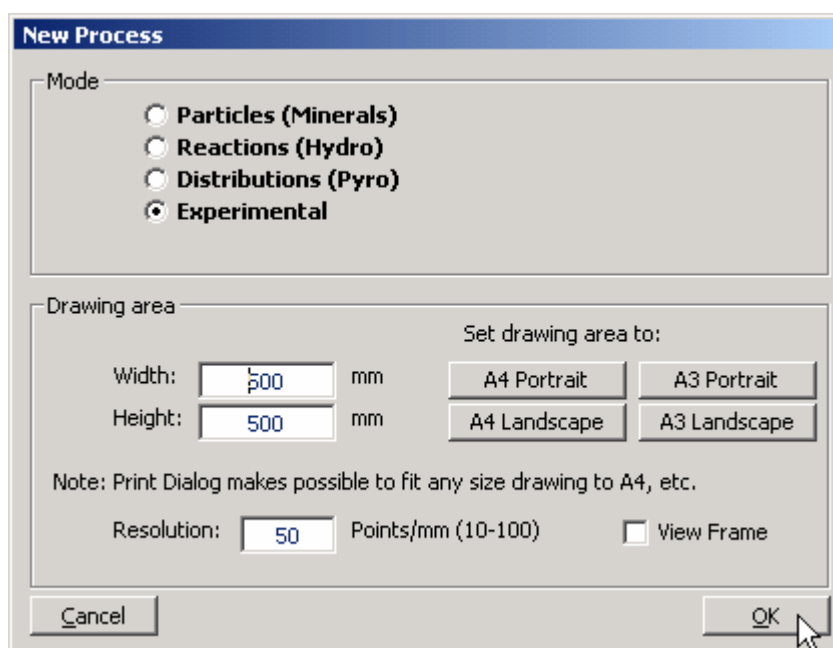


Figure 2. Select Experimental.

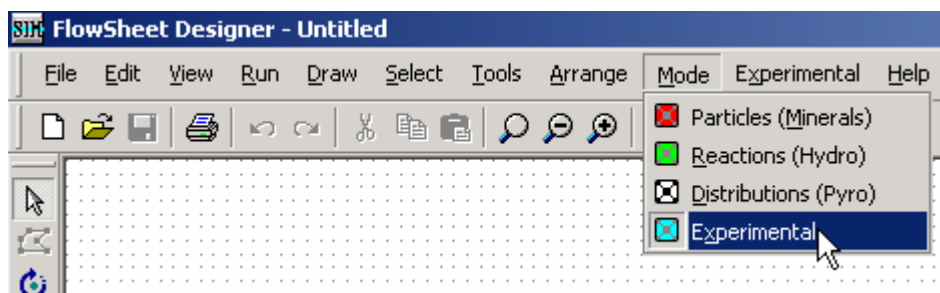


Figure 3. Switching between the simulation modes (Particle / Reactions / Distribution) and the Experimental mode.

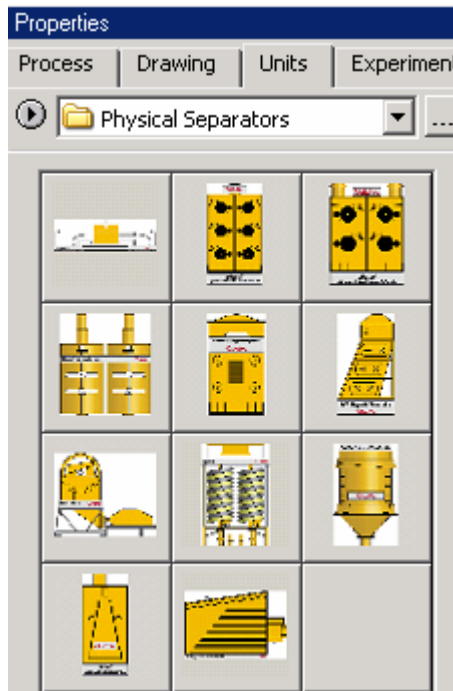


Figure 4. Select units from the "Units" tab.

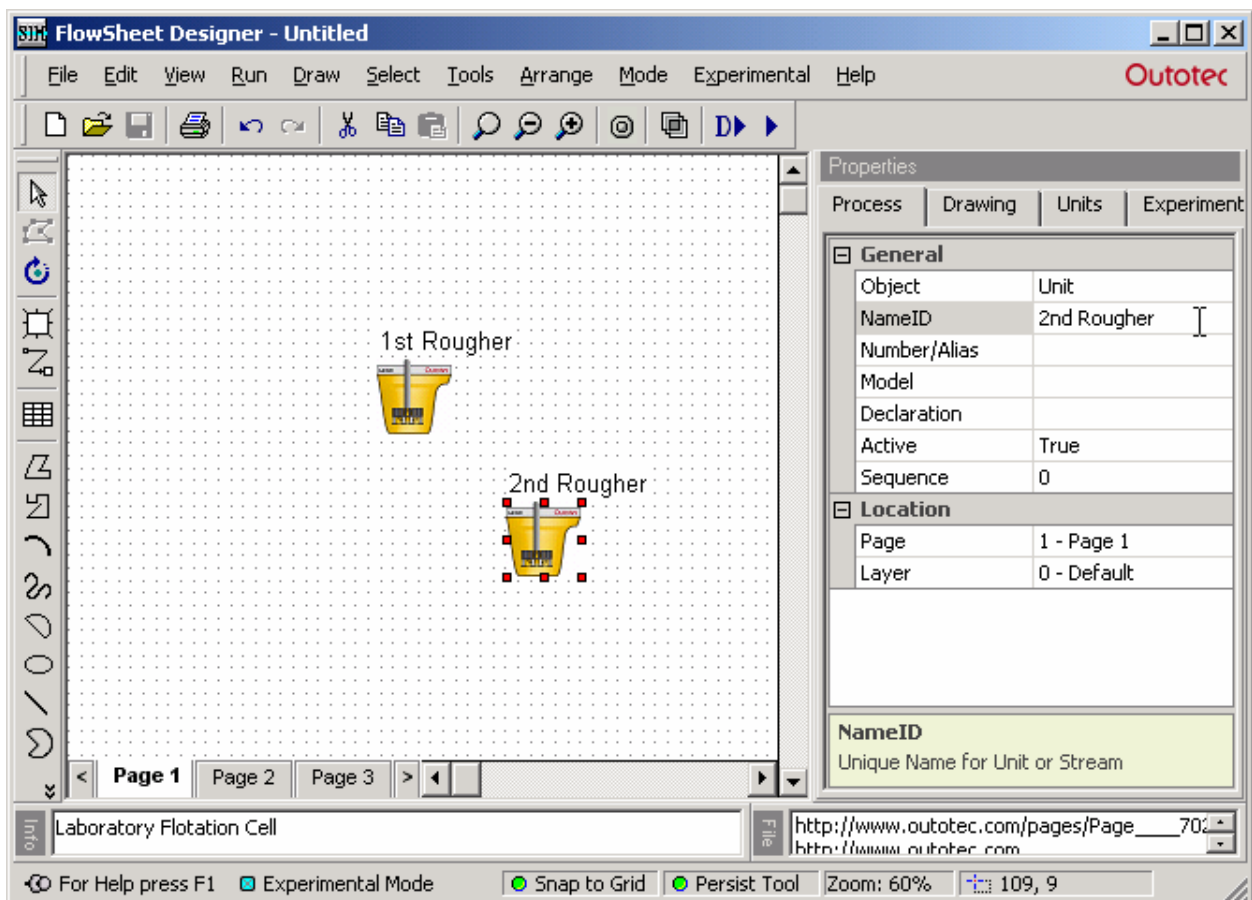


Figure 5. Name the unit, use the "Process" tab and NameID field

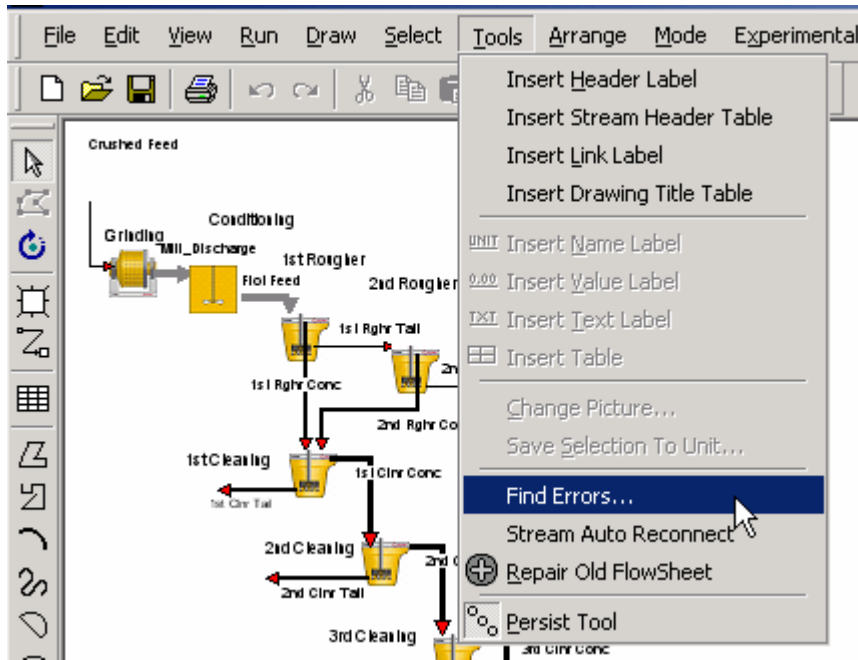


Figure 8. Checking for errors.

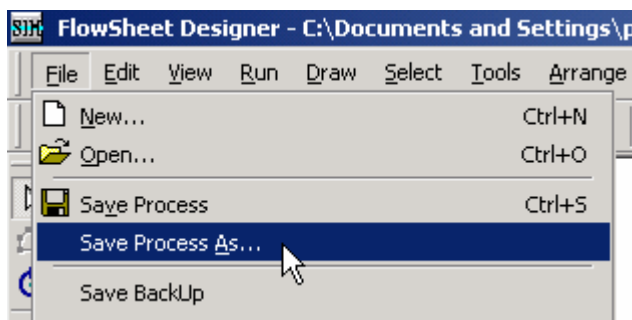


Figure 9. Saving the file, Save Process As...

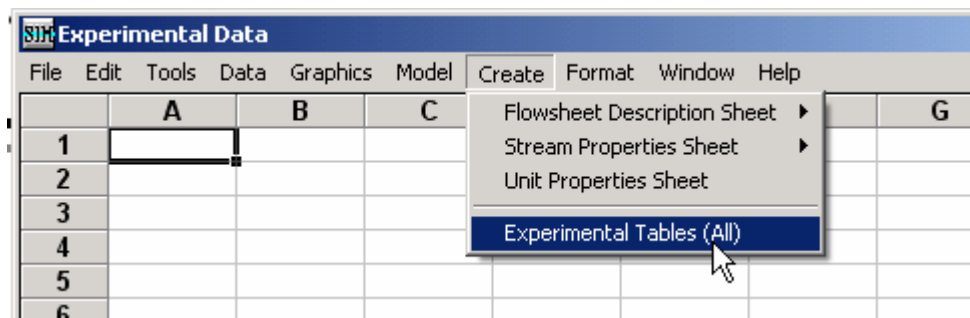


Figure 10. Create – Experimental Tables (All).

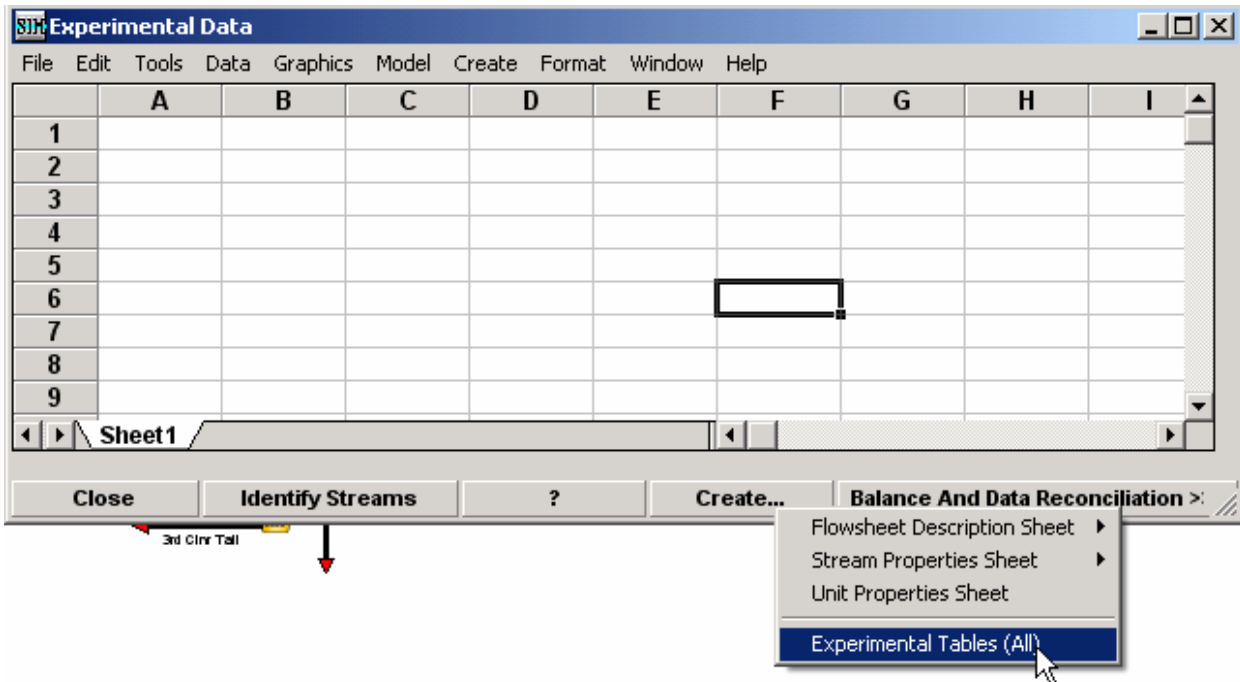


Figure 11. Another option for creating experimental tables is to press the “Create...” button and select then Experimental Tables (All).

	A	B	C	
1	Stream	Source	Destination	Solid
2	Crushed Feed	?	Grinding	
3	Mill_Discharge	Grinding	Conditioning	
4	Flot Feed	Conditioning	1st Rougher	
5	1st Rghr Conc	1st Rougher	1st Cleaning	
6	1st Rghr Tail	1st Rougher	2nd Rougher	
7	2nd Rghr Conc	2nd Rougher	1st Cleaning	
8	1st Scav Conc	1st Scavenger	?	
9	1st Scav Tail	1st Scavenger	2nd Scavenger	
10	2nd Scav Conc	2nd Scavenger	?	
11	Final Tail	2nd Scavenger	?	
12	1st Clar Conc	1st Cleaning	2nd Cleaning	

Figure 12. HSC Sim creates three sheets: Flowsheet, Streams and Units.

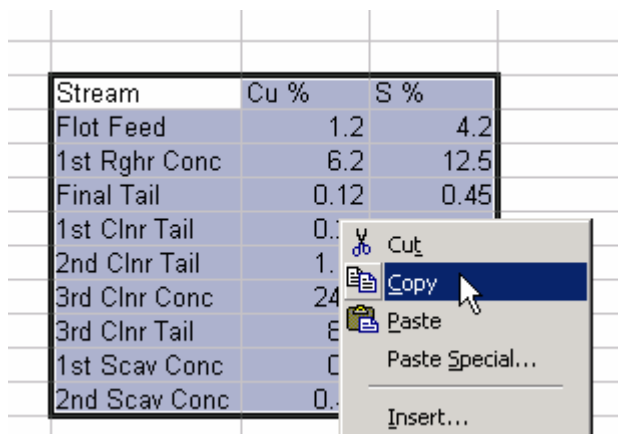
47.3. Bringing in the Experimental Data

You can bring in your experimental data to the HSC Sim for data visualization and mass balancing. The easiest way is to bring the data using the clipboard, another way is to bring the data manually.

47.3.1. Using Clipboard

To bring the data from e.g. Excel to HSC Sim the easiest way is to use the clipboard. To do that:

- Arrange your data in Excel row-wise, each stream is one row
- Use only one header row
- The column including the stream names should be named “Streams”
- The columns including assays should be named using a syntax: element-separator-method-separator-unit, e.g. Cu XRF % (here the separator is space), SiO₂_TOT_%, and Au FA g/t. You can leave the method out if you like, e.g. Cu %, As %, Ag g/t, Au ppm.
- Copy the data into the clipboard, the Stream cell should be the top-left cell selected (Figure 13).
- Select the Streams –sheet (page) and select from the menu Edit – Paste Special Assays (Figure 14)
- You can freeze the panes to see the stream name column and the header column to be always visible as you scroll the data sheet (Figure 15).
- Your data is now arranged in HSC Sim. (Figure 16)
- If HSC has not identified a certain stream, it is pasted last on the list and both the Source and Destination fields are empty (Figure 17-18).
- To re-identify the stream type the correct name and press the “Identify Streams” button (Figure 18).



Stream	Cu %	S %
Flot Feed	1.2	4.2
1st Rghr Conc	6.2	12.5
Final Tail	0.12	0.45
1st Clnr Tail	0.	
2nd Clnr Tail	1.	
3rd Clnr Conc	24	
3rd Clnr Tail	E	
1st Scav Conc	C	
2nd Scav Conc	0.	

Figure 13. Data in Excel, copying into the clipboard.

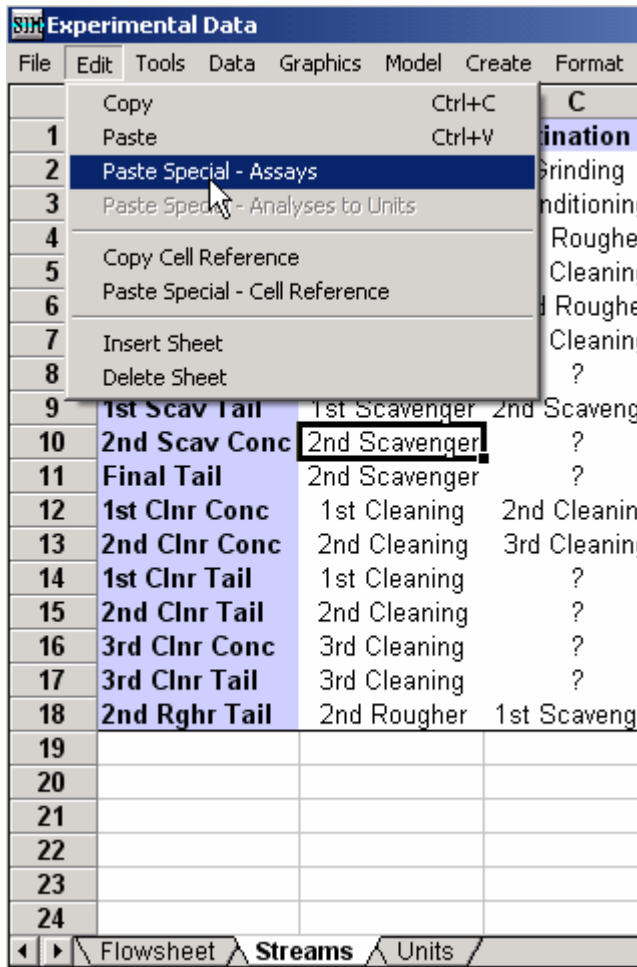


Figure 14. Pasting the assays

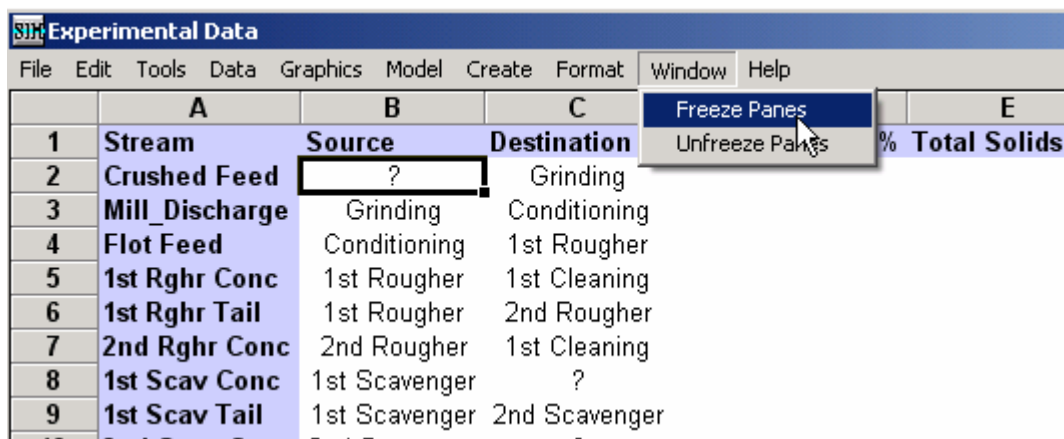


Figure 15. Freezing panes.

SIM Experimental Data					
File Edit Tools Data Graphics Model Create Format Window Help					
	A	I	J	K	L
1	Stream	Note	-	Cu %	S %
2	Crushed Feed				
3	Mill_Discharge				
4	Flot Feed			1.2	4.2
5	1st Rghr Conc			6.2	12.5
6	1st Rghr Tail				
7	2nd Rghr Conc				
8	1st Scav Conc			0.8	1.98
9	1st Scav Tail				
10	2nd Scav Conc			0.42	0.98
11	Final Tail			0.12	0.45
12	1st Clnr Conc				
13	2nd Clnr Conc				
14	1st Clnr Tail			0.25	0.86
15	2nd Clnr Tail			1.12	2.92
16	3rd Clnr Conc			24.2	32.2
17	3rd Clnr Tail			8.5	32.5
18	2nd Rghr Tail				
19					
20					

Figure 16. Data in HSC Sim.

SIM Experimental Data					
File Edit Tools Data Graphics Model Create Format Window Help					
	A	I	J	K	L
1	Stream	Note	-	Cu %	S %
2	Crushed Feed				
3	Mill_Discharge				
4	Flot Feed			1.2	4.2
5	1st Rghr Conc			6.2	12.5
6	1st Rghr Tail				
7	2nd Rghr Conc				
8	1st Scav Conc			0.8	1.98
9	1st Scav Tail				
10	2nd Scav Conc			0.42	0.98
11	Final Tail			0.12	0.45
12	1st Clnr Conc				
13	2nd Clnr Conc				
14	1st Clnr Tail			0.25	0.86
15	2nd Clnr Tail			1.12	2.92
16	3rd Clnr Conc			24.2	32.2
17	3rd Clnr Tail			8.5	32.5
18	2nd Rghr Tail				
19	ROM			1.2	1.1
20					
21					

Figure 17. Unidentified stream: ROM.

SII Experimental Data				
File Edit Tools Data Graphics Model Create Format Windo				
	A	B	C	
1	Stream	Source	Destination	So
2	Crushed Feed	?	Grinding	
3	Mill_Discharge	Grinding	Conditioning	
4	Flot Feed	Conditioning	1st Rougher	
5	1st Rghr Conc	1st Rougher	1st Cleaning	
6	1st Rghr Tail	1st Rougher	2nd Rougher	
7	2nd Rghr Conc	2nd Rougher	1st Cleaning	
8	1st Scav Conc	1st Scavenger	?	
9	1st Scav Tail	1st Scavenger	2nd Scavenger	
10	2nd Scav Conc	2nd Scavenger	?	
11	Final Tail	2nd Scavenger	?	
12	1st Clnr Conc	1st Cleaning	2nd Cleaning	
13	2nd Clnr Conc	2nd Cleaning	3rd Cleaning	
14	1st Clnr Tail	1st Cleaning	?	
15	2nd Clnr Tail	2nd Cleaning	?	
16	3rd Clnr Conc	3rd Cleaning	?	
17	3rd Clnr Tail	3rd Cleaning	?	
18	2nd Rqhr Tail	2nd Rougher	1st Scavenger	
19	ROM			
20				
21				
22				
23				
24				

◀ ▶ \ Flowsheet / Streams / Units /

Close Identify Streams

Figure 18. ROM not identified, the Source and Destination fields are empty (cells B19 and C19). If the name has been given incorrectly, type a new name and press "Identify Stream" button to get the stream to be identified correctly.

47.3.2. Manually

To bring the experimental data in manually, you simply write the corresponding variable name in the first row of the "Streams" spreadsheet (page), e.g. "Au g/t" (Figure 19). Now type in the values for each stream, correspondingly (freeze panes to see the stream name).

The other option is to do it on the flowsheet window as follows:

- Click the stream in the drawing
- On the "Experimental" tab, type in the value directly into the field (Figure 22).
- Press Enter or change the cell to get the value written onto the "Analyses" sheet.
- If the stream values are not visible then in the third combo-box select "Streams" for an active sheet (Figure 21).

Before exiting the program, remember to save. Experimental data will be saved in the file "Analyses.xls" located in the same folder as the drawing. The file "Analyses.xls" is automatically opened once you open the flowsheet file.

J	K	L	M
	Cu %	S %	Au g/t
	1.2	4.2	
	6.2	12.5	

Figure 19. Adding a new variable, i.e. measured property, of the streams, "Au g/t."

	A	J	K	L	M
1	Stream	-	Cu %	S %	Au g/t
2	Crushed Feed				
3	Mill_Discharge				
4	Flot Feed		1.2	4.2	0.85
5	1st Rghr Conc		6.2	12.5	1.4
6	1st Rghr Tail				
7	2nd Rghr Conc				
8	1st Scav Conc		0.8	1.98	
9	1st Scav Tail				

Figure 20. Typing in the values for "Au g/t."

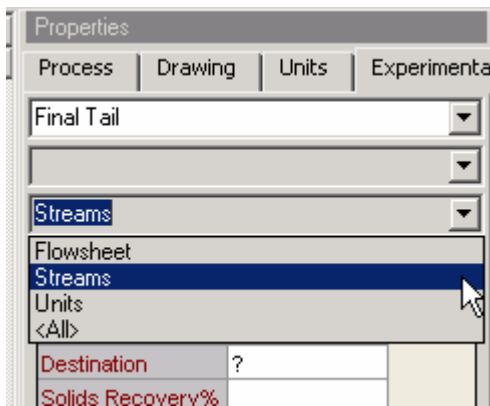


Figure 21. Activate the "Streams" sheet in the "Experimental" tab.



Figure 22. Click the stream in the drawing and on the "Experimental" tab, type in the value directly into the field (for example Au g/t).

47.4. Visualizing the Analyses

47.4.1. Stream Value Labels and Sankey Diagram

Once you have successfully brought your experimental data into "Analyses" you can visualize the analyzed values on the flowsheet. To do that:

- In the bottom right-hand corner press **Visualize** and select "Create Stream Value Labels" (Figure 23)
- HSC Sim will create "Stream Value Labels" and a "Stream Header Label"
- You can change the styles of the objects (select them and use the "Drawing" tab to change font size and color).
- To visualize a variable on the flowsheet with a Sankey diagram: 1) select the variable in the "Analyses" window. Then, select the whole column (Figure 25)
- Click the stream and in the "Experimental" tab select the variable and use the right mouse to select "**Visualize**" (Figure 26).

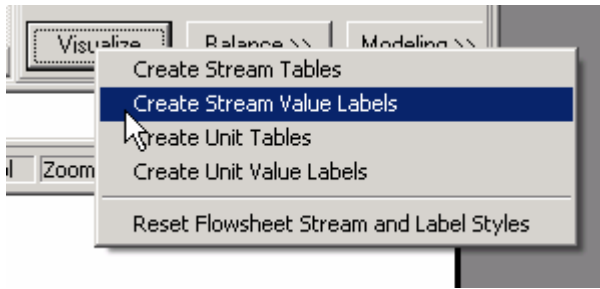


Figure 23. Selecting streams.

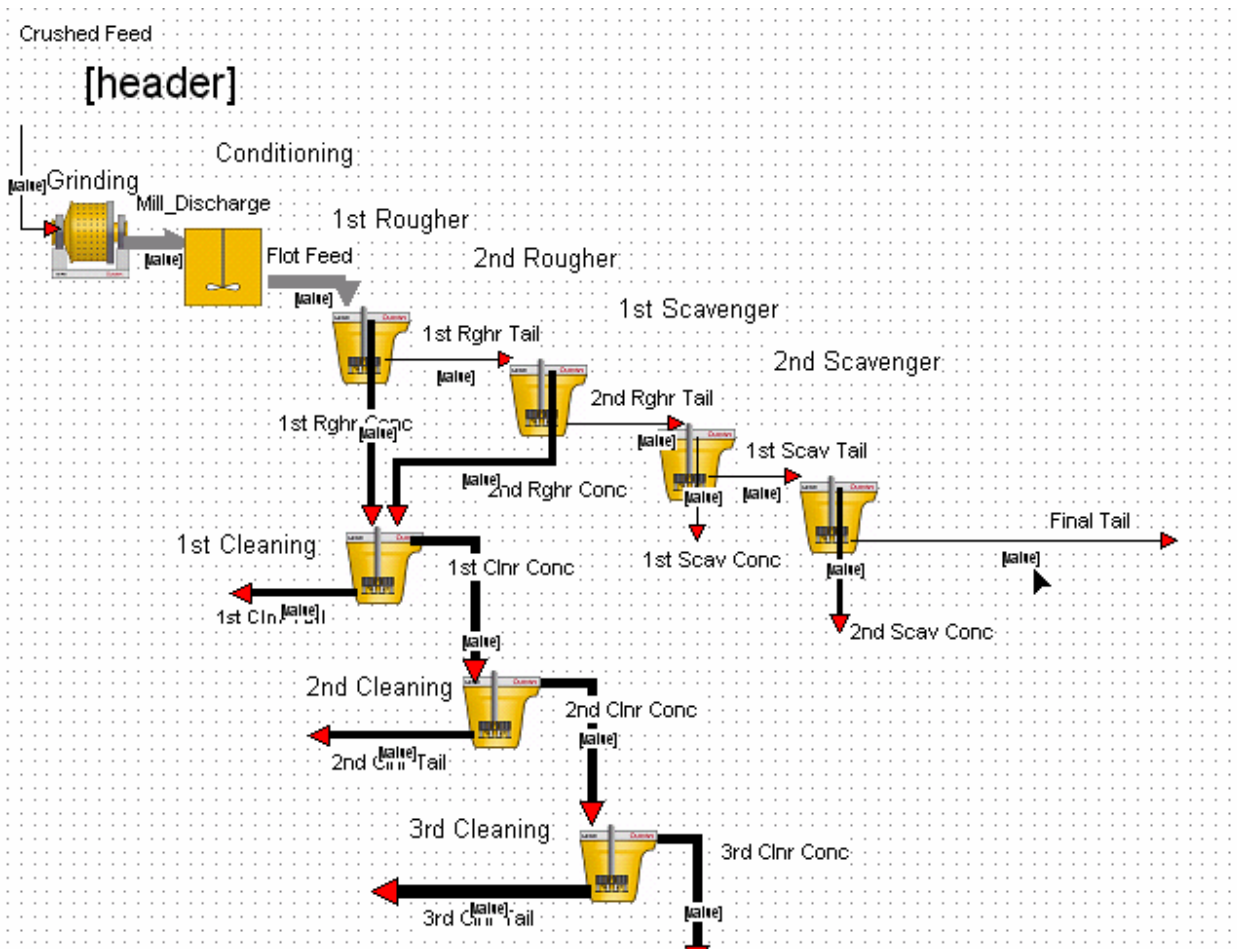


Figure 24. HSC Sim has created the "Stream Value Labels" (shows as [value]) and "Stream Header Label" (shown as [header]).

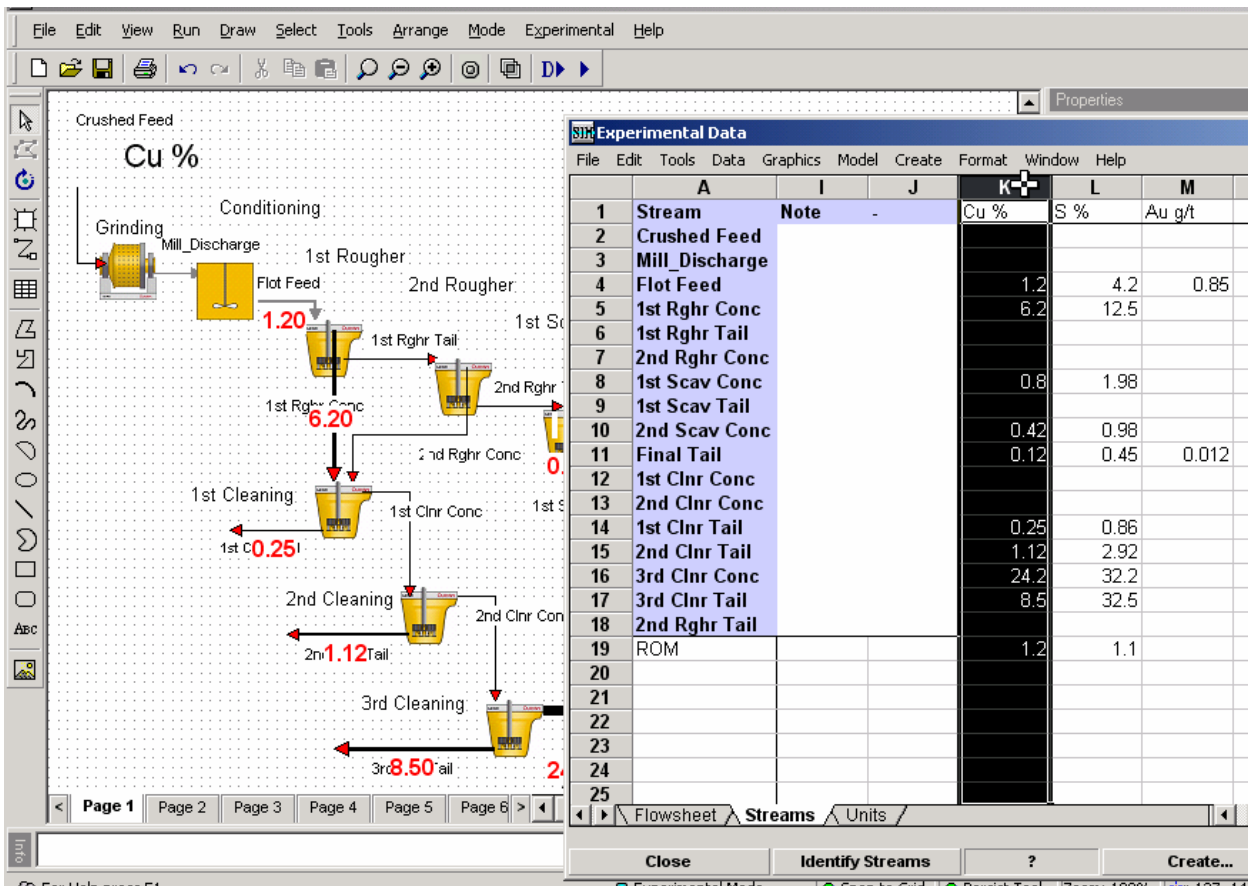


Figure 25. To visualize, select the whole column by clicking the column header.

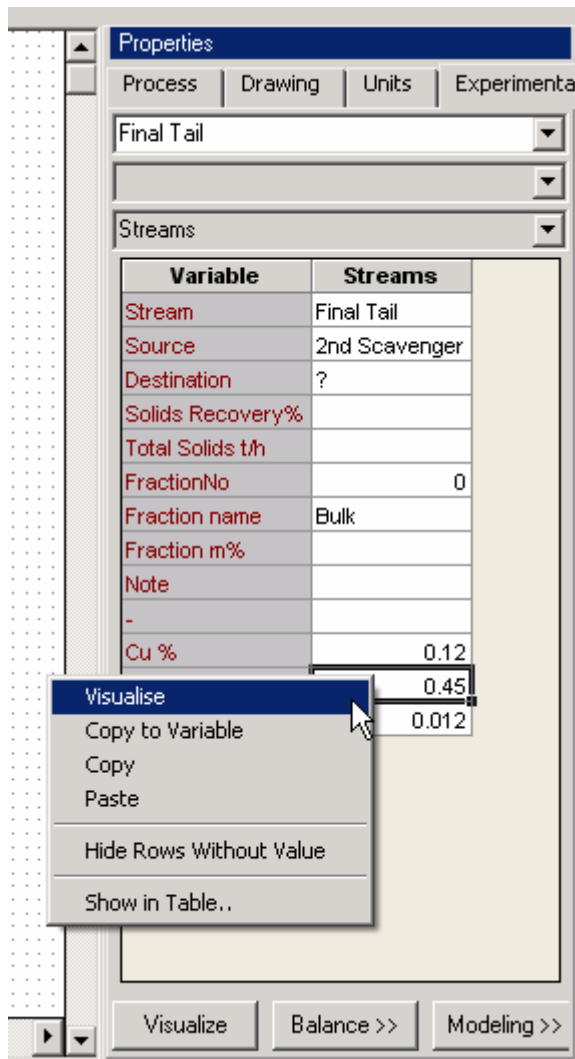


Figure 26. Visualizing a variable with a Sankey diagram from the “Experimental” tab.

47.4.2. Stream Tables

You can also visualize using Stream Tables.

- In the “Experimental” tab, press the “Visualize” button and select “Create Stream Tables” (Figure 27)
- In the “Experimental” tab, activate the variable you want to show in the table.
- Press the right button and select “Show in Table” (Figure 28)
- Select the coordinate (Row:Column) (Figure 29)
- Continue to assign other variables (Figure 30)
- Formulate the tables by double-clicking any of the table, changing the settings (font type, size, color; cell pattern; row height) and then use Format to apply style, size and dimensions to all tables.
- Add other elements like tables, texts, and drawings onto the flowsheet (Figure 31).
- Use Print, or Copy Paste to report out.

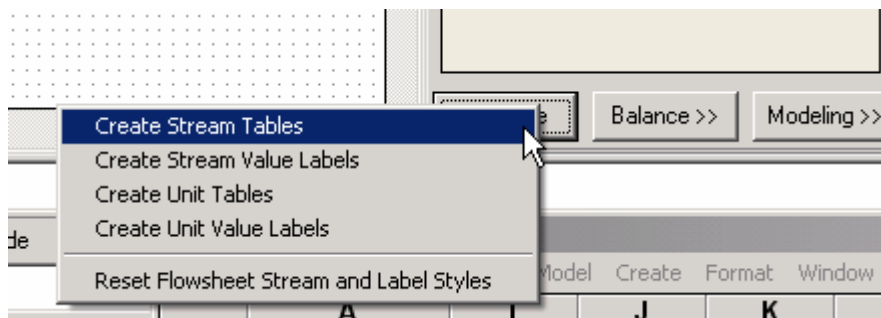


Figure 27. Creating Stream Tables.

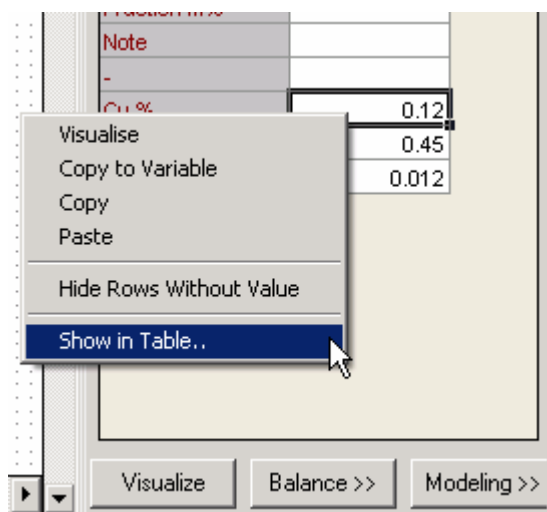


Figure 28. Select the variable and with the right mouse select “Show in Table..”

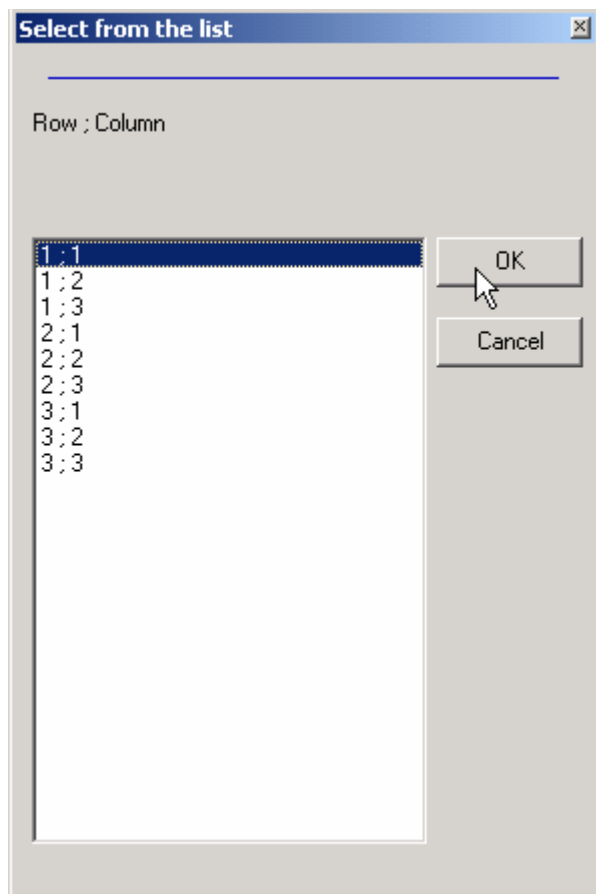


Figure 29. Select the location (Row, Column).

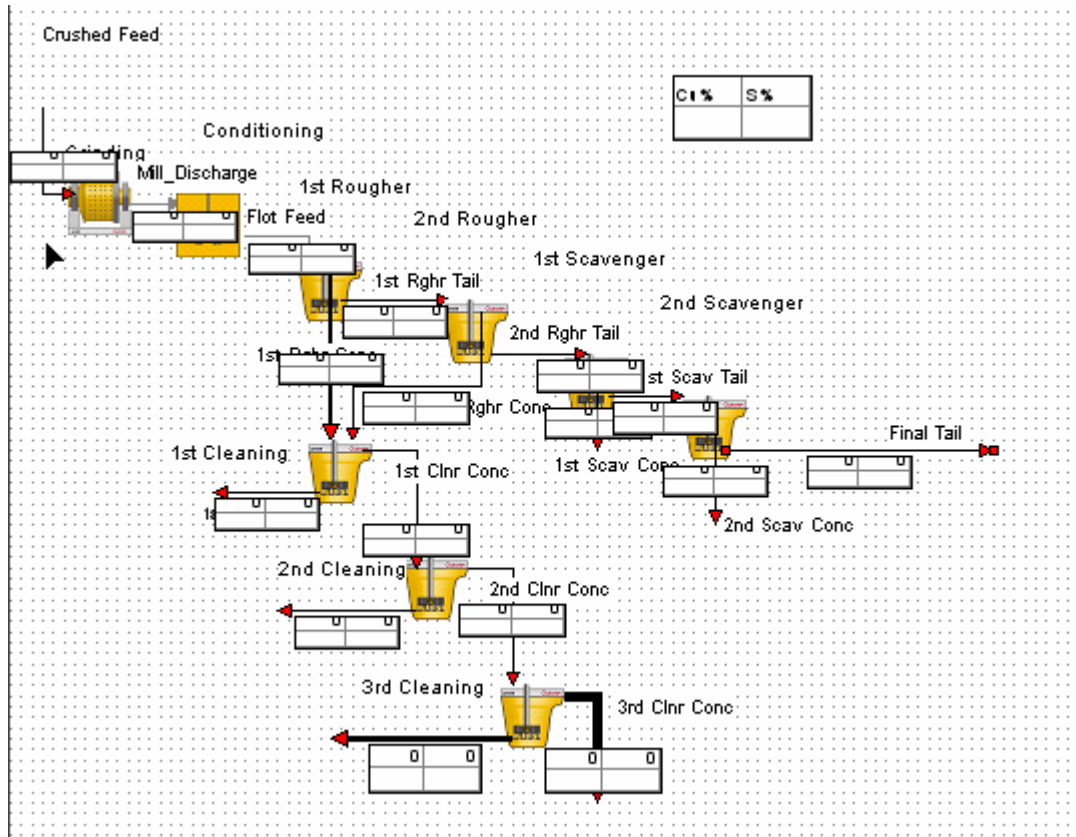


Figure 30. Tables created and Cu % and S % assigned.

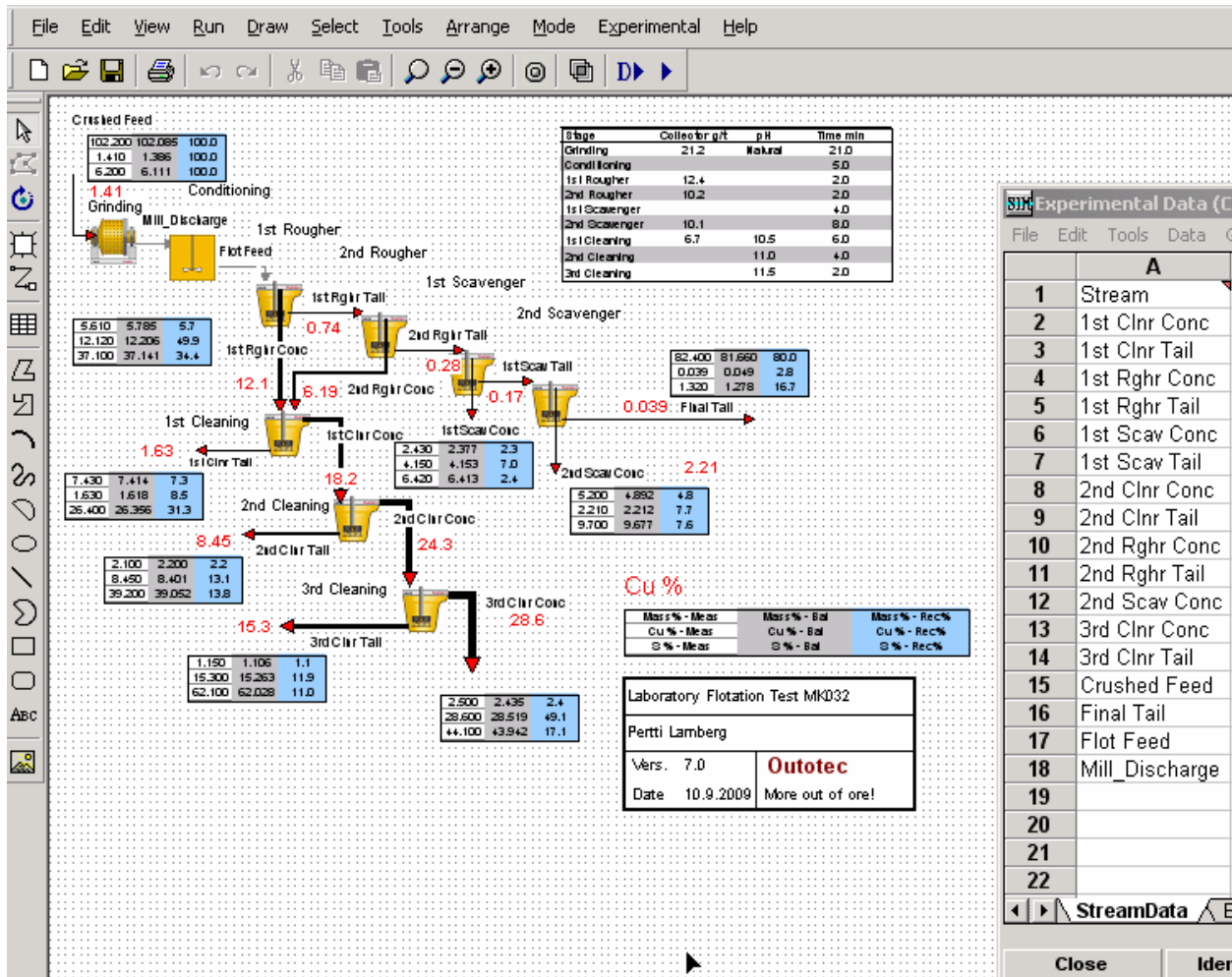


Figure 31. Graphical objects added to the flowsheet.

47.5. Example

See the example in folder HSC7\Flowsheet_Experimental\Example - Laboratory Flotation Test. The LabTestData.xls file gives the assays. If you want to rehearse how to bring the experimental data into HSC Sim, copy the flowsheet file "Laboratory Flotation Test.flw" into another (empty) folder and work as described in chapter 47.3.

Please check the HSC Forum (www.hsc-chemistry.com, Forum; or directly http://www.hsc-chemistry.com/forum_v3/) for updates and new examples.