

**“The Flowsheet
Processor”**

DATA WIZARD MANUAL

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1. INTRODUCTION

The best way to get to know the LIMN simulation tool is to complete a worked example. The following pages detail the worked example. It is strongly recommended that one complete the worked example, as it will benefit a first time user.

2. DRAWING THE FLOWSHEET

It is recommended that one draws the flowsheet by hand on paper before using the LIMN draw function. This will save the user having to redraw the flowsheet to get the spacing correct.

2.1 Drawing the flowsheet on paper

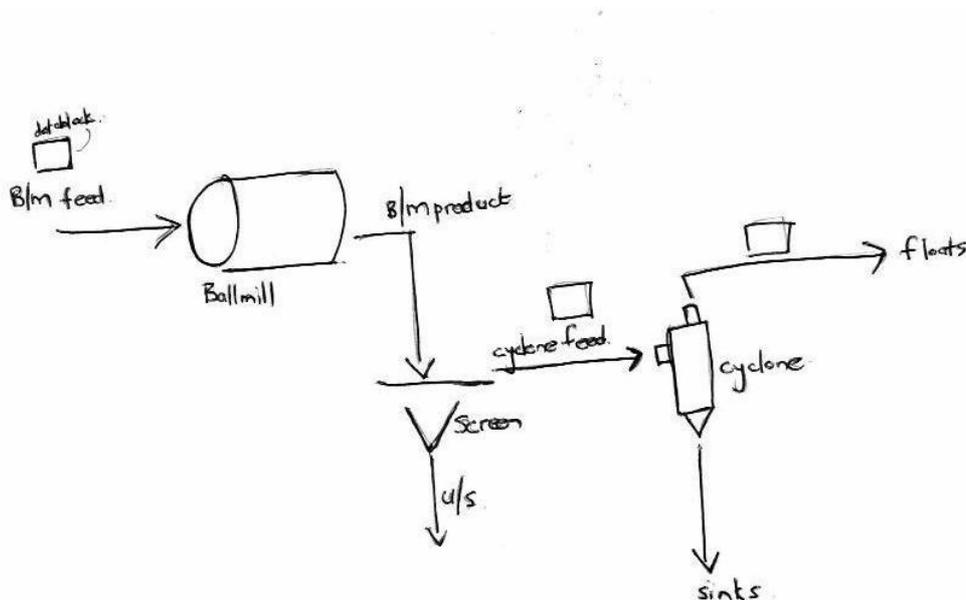


Figure 1: Drawn flowsheet

Make sure that the flowsheet, unit operations and spacing is correct before drawing the flowsheet using LIMN. Much time can be saved by making corrections before drawing the flowsheet using LIMN.

2.2 Using the LIMN Draw function

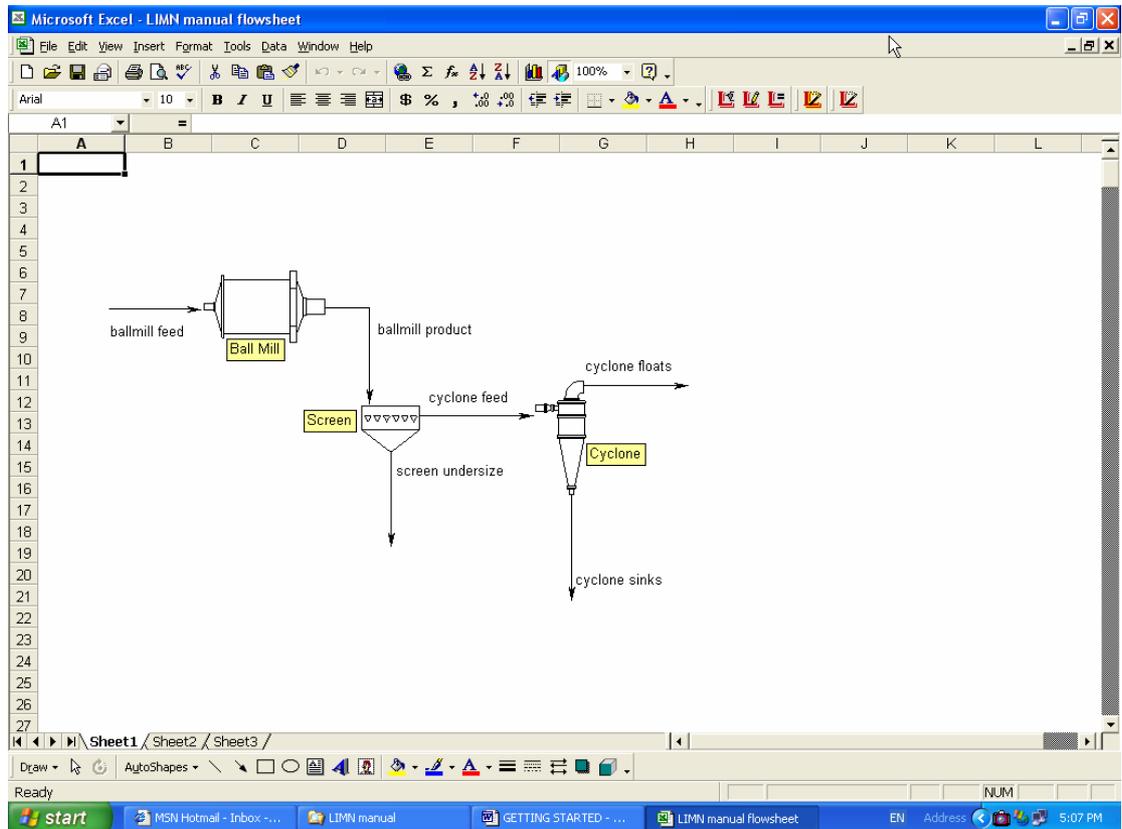


Figure 2: LIMN draw flowsheet

2.2.1 Click on the LIMN draw button.



2.2.2 Add each of the three icons by clicking on the New Icon button.



2.2.3 The icons can be found by searching through the Icons lists, see figure 3 below.

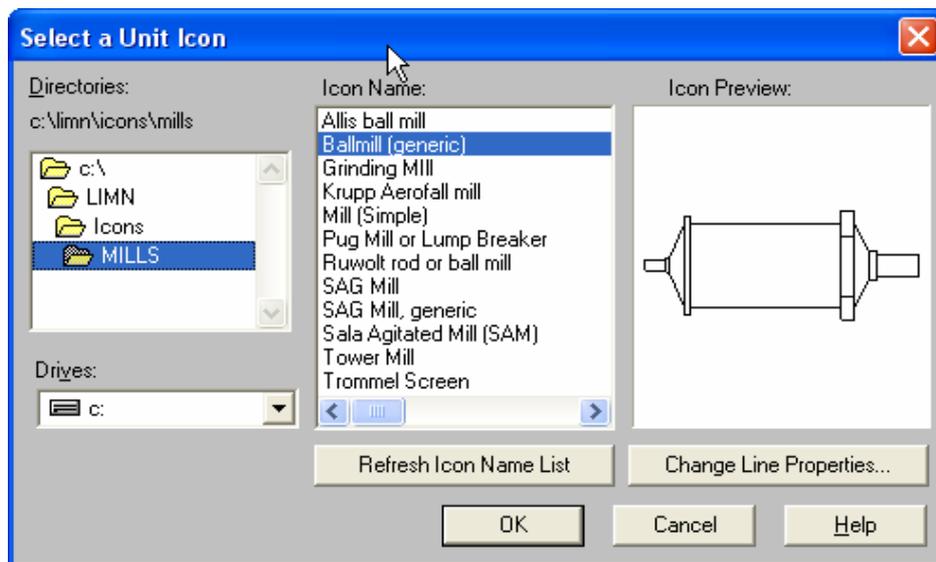


Figure 3: Icon List

2.2.4 Be careful when connecting the streams to the unit operations. Make sure that the arrow of the stream changes to the connection arrow before connecting, check the LIMN demo.

2.2.5 Label the unit operations by clicking on the unit and then entering the unit operation name in the Select Limn Object textbox. The unit operation names are: Ball Mill; Screen; Cyclone.

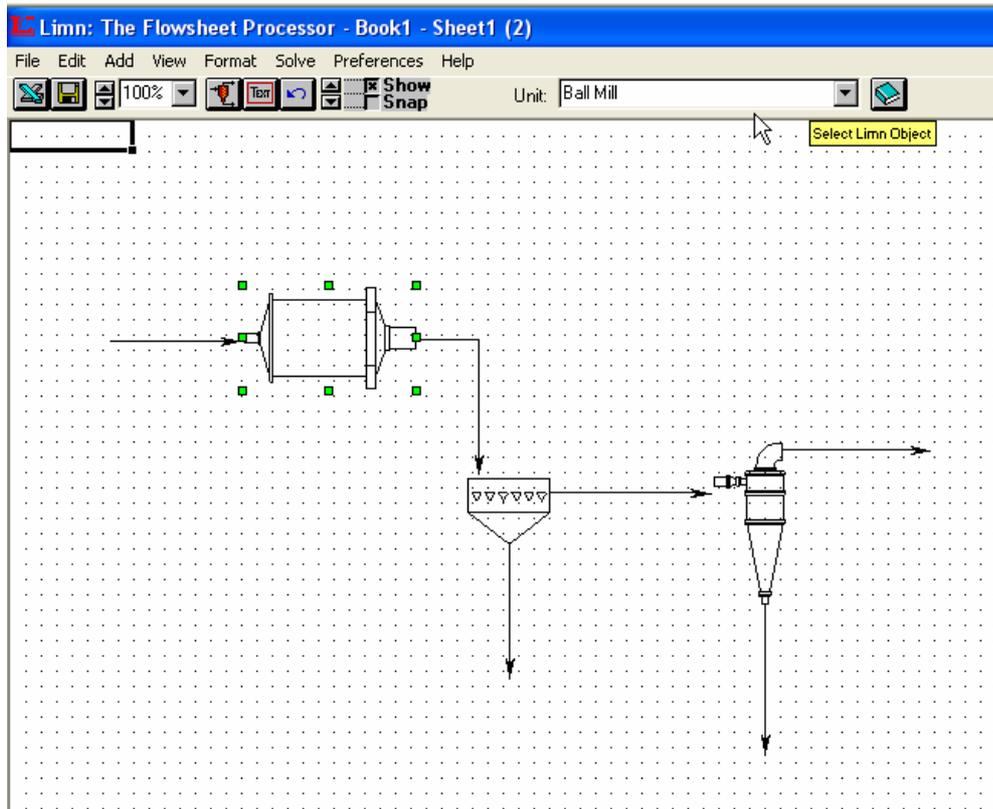


Figure 4: Naming Units

Note: When naming the unit operations and the streams one can switch from item to item by using the TAB key.

2.2.6 Label the streams by clicking on the stream and then entering the stream name in the Select Limn Object textbox. The stream names are: ballmill feed; ballmill product; screen undersize; cyclone feed; cyclone floats; cyclone sinks.

2.2.7 To display the labels of the unit operations and streams on the flowsheet click on the Add menu and then select Label All. Make sure that attach labels dialogue boxes are ticked. Position the labels as required.

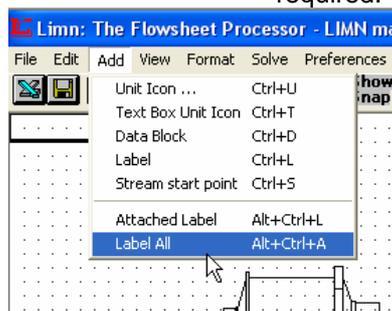


Figure 5: Adding Labels

3. RUNNING THE WIZARD

3.1 Click on the LIMN Data Wizard Button. 

3.2 The wizard will start with Sheet 1 of 4. Select the Vertical Layout and then click Next.

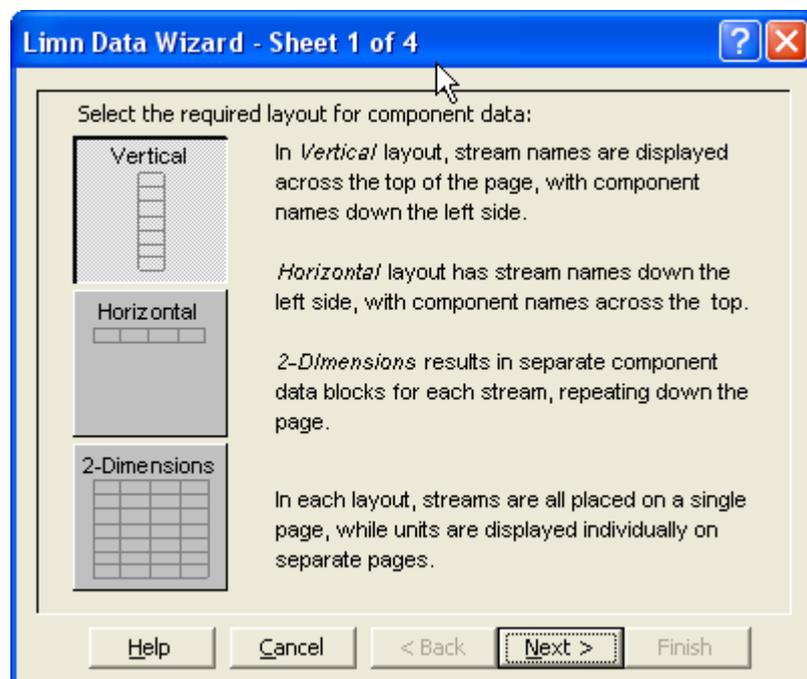


Figure 6: Data Wizard 1

3.3 Enter the size fractions for the simulation in the Mass related components window. Click on the Insert button then enter the size fraction with the mm unit in the pop up text box. Click on the OK button to enter each fraction. When finished click Next.

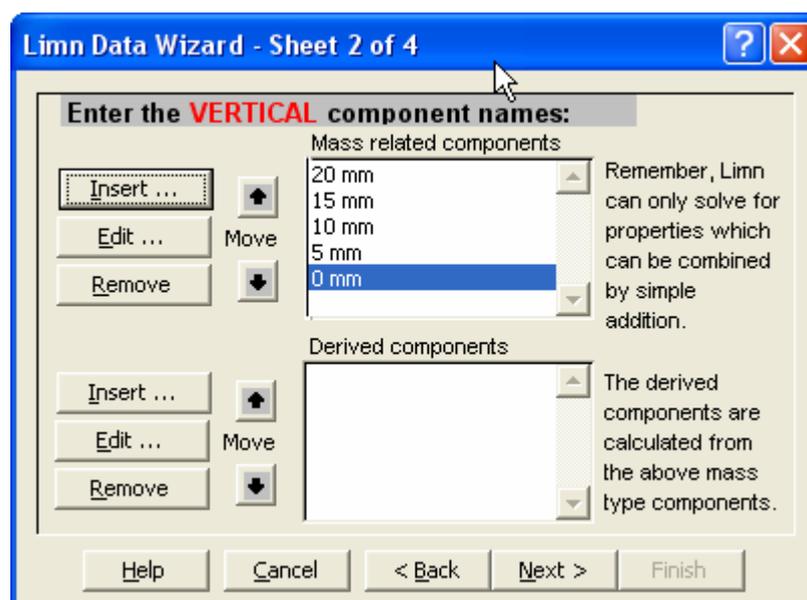


Figure 7: Data Wizard 2

3.4 Check that the stream names are correct. Click Next.

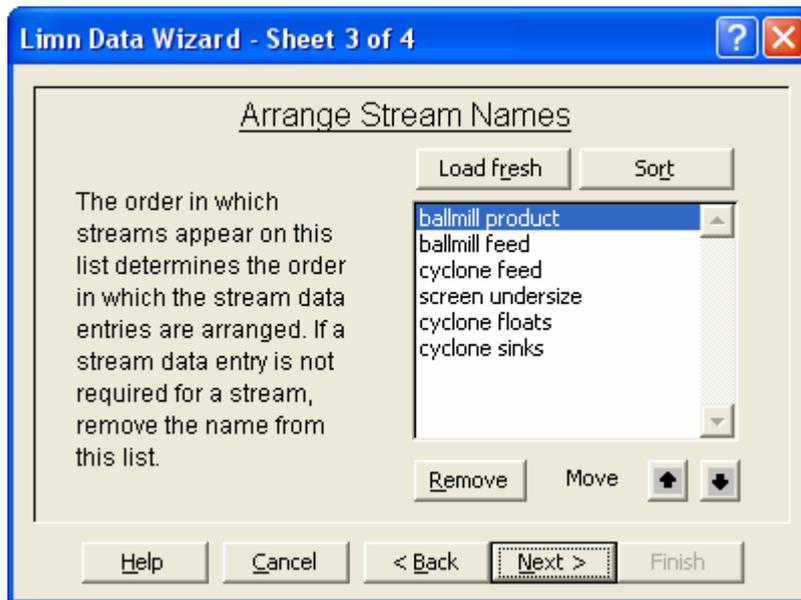


Figure 8: Data Wizard 3

3.5 Check that the unit operation names are correct.

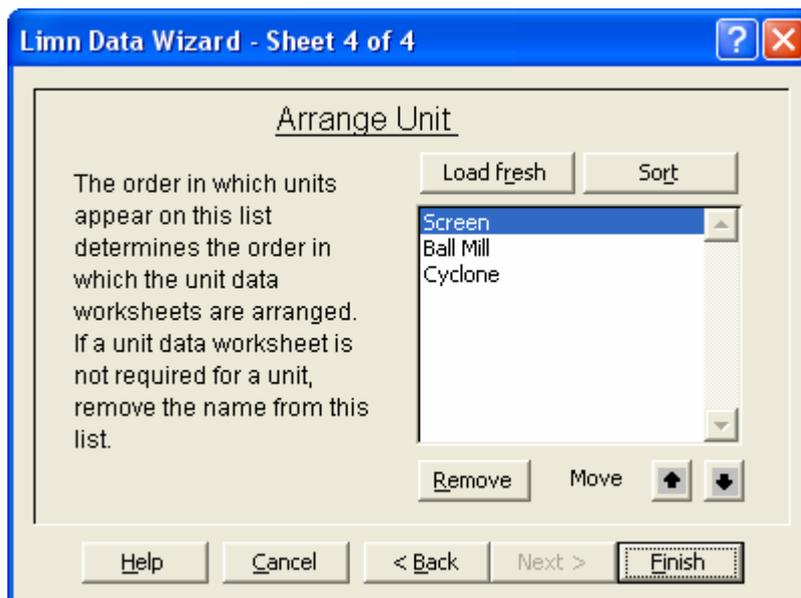


Figure 9: Data Wizard 4

3.6 Click Finish.

3.7 Once the Data Wizard has completed setting up the worksheets, save the workbook.

4. POPULATING THE WORKSHEETS

Now that the worksheets have been set up for the different units, one needs to specify the simulation inputs (i.e. feed stream and unit operation models).

4.1 The Stream Data sheet

LIMN requires the composition of the feed stream which is coming into the simulated flowsheet. The Data Wizard has been developed to track the mass of material through the simulation thus one needs to specify the t/h of material per size class.

Use the following data for the ballmill feed stream:

Total tonnage of ballmill feed = 500 t/h.

Size Interval [mm]	PSD [% (m/m)]
20 mm	40
15 mm	25
10 mm	20
5 mm	10
0 mm	5
Total	100

Stream Data							
Component	ballmill product	ballmill feed	cyclone feed	screen undersize	cyclone floats	cyclone sinks	
20 mm	0	200	0	0	0	0	
15 mm	0	125	0	0	0	0	
10 mm	0	100	0	0	0	0	
5 mm	0	50	0	0	0	0	
0 mm	0	25	0	0	0	0	
		500					
% by mass							
20 mm		40					
15 mm		25					
10 mm		20					
5 mm		10					
0 mm		5					
		100					
		500					

Figure 10: Stream Data sheet 1

- 4.1.1 Create the % mass PSD table on the Stream Data sheet. The easiest method is to create the distribution below the ballmill feed stream, see figure 10 above.
- 4.1.2 Input the total t/h of the ballmill feed stream onto the sheet, the easiest is below the % mass distribution table.
- 4.1.3 Multiply the % mass in each size interval by the total t/h of ballmill feed (500 t/h) to give the t/h of ballmill feed in each size interval. Note: LIMN will overwrite any formula written in a stream cell, except for the feed stream.
- 4.1.4 Make sure that the stream data sheet looks like figure 11 below.

	A	B	C	D	E	F	G	H	I
1									
2		Stream Data							
3									
4		<i>Stream</i>							
5		Component	ballmill product	ballmill feed	cyclone feed	screen undersize	cyclone floats	cyclone sinks	
6		20 mm	0	200	0	0	0	0	
7		15 mm	0	125	0	0	0	0	
8		10 mm	0	100	0	0	0	0	
9		5 mm	0	50	0	0	0	0	
10		0 mm	0	25	0	0	0	0	
11				500					
12		% by mass							
13		20 mm		40					
14		15 mm		25					
15		10 mm		20					
16		5 mm		10					
17		0 mm		5					
18				100					
19									
20				500					
21									

Figure 11: Stream Data sheet 2

- 4.1.5 Save the workbook.

4.2 The Unit_Ball Mill sheet

Model for Unit: Ball Mill				
	Feed		% PSD	Product1 (ballmill product)
20 mm	200		5	25
15 mm	125		10	50
10 mm	100		15	75
5 mm	50		20	100
0 mm	25		50	250
	500		100	500

Figure 12: Unit_Ball Mill sheet

LIMN will transfer the data for the feed stream when LIMN solve is run. One needs to specify the model to use for the reduction in the ballmill and one also needs to link the product stream to the model.

The easiest model to use is the product PSD model where one specifies the PSD of the ballmill product.

- 4.2.1 Create a PSD for the ballmill product in the User Modelling Area, see figure 12 above.
- 4.2.2 Total the t/h of the feed stream using the Sum function.
- 4.2.3 In the Product 1 column (ballmill product stream), multiply the % PSD for each size interval by the total mass of the feed stream.

4.3 The Unit_Screen sheet

Model for Unit: Screen					
	Feed	% to undersize	Product1 ('cyclone feed')	Product2 ('screen undersize')	
20 mm	25	0	25	0	
15 mm	50	0	50	0	
10 mm	75	0	75	0	
5 mm	100	0	100	0	
0 mm	250	80	50	200	
0 mm	500	80	300	200	

Figure 13: Unit_Screen sheet

LIMN will transfer the data for the feed stream when LIMN solve is run. One needs to specify the model to use for the separation on the screen and one also needs to link the product streams to the model.

The easiest model to use is the % of feed material passing to the undersize per size interval.

- 4.3.1 Enter the % of each size interval passing to the undersize stream in the User Modelling Area, see figure 13.
- 4.3.2 In the Product 2 column (screen undersize stream), multiply the Feed stream by the % material passing to the undersize.
- 4.3.3 In the Product 1 column (cyclone feed stream), subtract the Product 2 column from the Feed column.

4.4 The Unit_Cyclone sheet

Model for Unit: Cyclone					
	Feed	% to sinks	Product1 (cyclone floats)	Product2 (cyclone sinks)	
20 mm	25	5	23.75	1.25	
15 mm	50	5	47.5	2.5	
10 mm	75	5	71.25	3.75	
5 mm	100	5	95	5	
0 mm	50	5	47.5	2.5	
	300		285	15	

Figure 14: Unit_Cyclone sheet

LIMN will transfer the data for the feed stream when LIMN solve is run. One needs to specify the model to use for the separation in the cyclone and one also needs to link the product streams to the model.

The easiest model to use is the % of material in the feed stream reporting to the cyclone sinks.

- 4.4.1 Enter the % of material in the Feed stream passing to sinks in the User Modelling Area, see figure 14.
- 4.4.2 In the Product 2 column (cyclone sinks stream), multiply the Feed column by the amount of feed material passing to sinks.
- 4.4.3 In the Product 1 column (cyclone floats stream), subtract the Product 2 column from the Feed column.

5. RUNNING THE LIMN SOLVER

Stream Data						
Stream						
Component	ballmill product	ballmill feed	cyclone feed	screen undersize	cyclone floats	cyclone sinks
20 mm	25	200	25	0	23.75	1.25
15 mm	50	125	50	0	47.5	2.5
10 mm	75	100	75	0	71.25	3.75
5 mm	100	50	100	0	95	5
0 mm	250	25	50	200	47.5	2.5
	500	500	300	200	285	15
% by mass						
20 mm		40				
15 mm		25				
10 mm		20				
5 mm		10				
0 mm		5				
		100				
		500				

Figure 15: Stream Data sheet

5.1 Click on the Stream Data sheet.

5.2 Click on the LIMN Solve button. 

5.3 Check that the stream data sheet values are the same as the values in figure 15 above.

5.4 Save the workbook.

6. ADDING DATABLOCKS TO THE FLOWSHEET

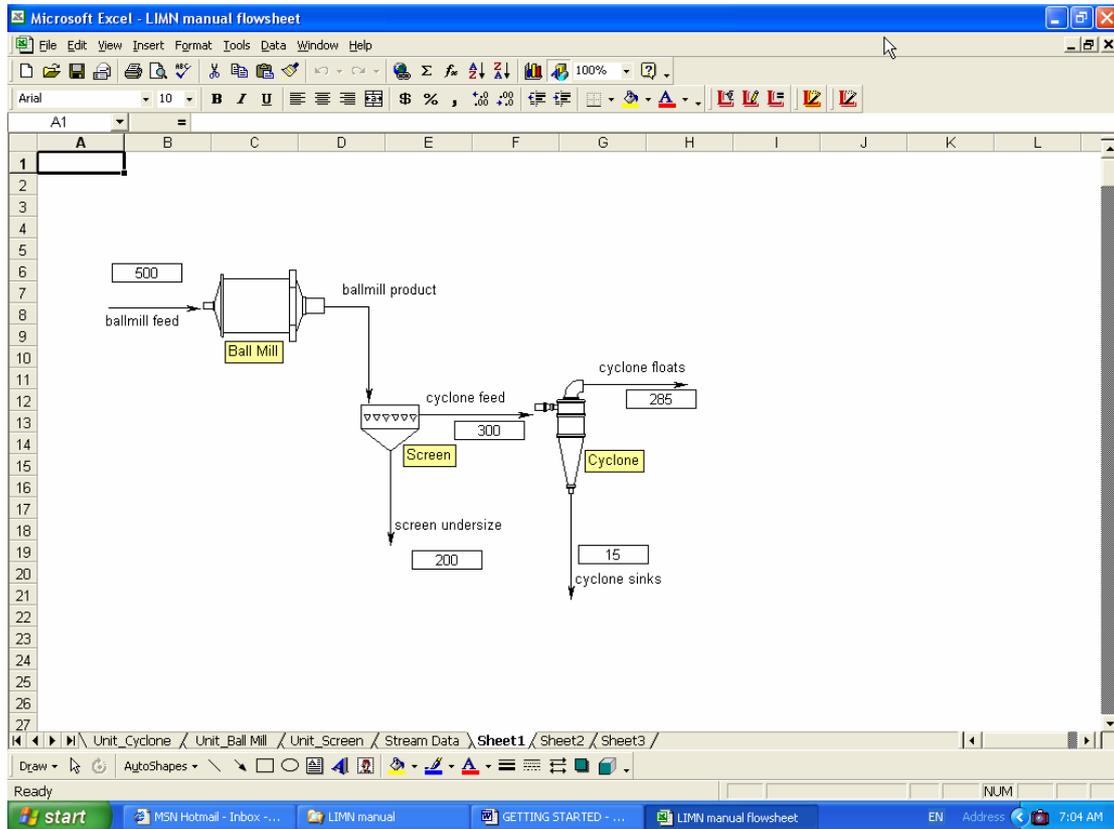


Figure 16: Data block flowsheet

6.1 Select Sheet 1.

6.2 Click on the LIMN draw button. 

6.3 Click on the Add menu, then select Data Block.

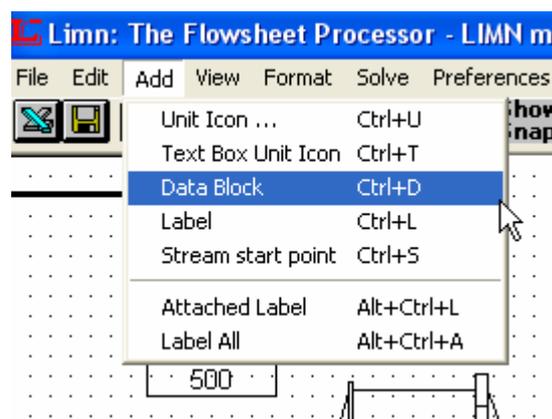


Figure 17: Data Block menu

6.4 Enter a name in the Data Block Name dialogue box.

6.5 Type the “=” sign in the Data Range dialogue box, then select the Stream Data sheet and click on the cell required, see figure 18 below.

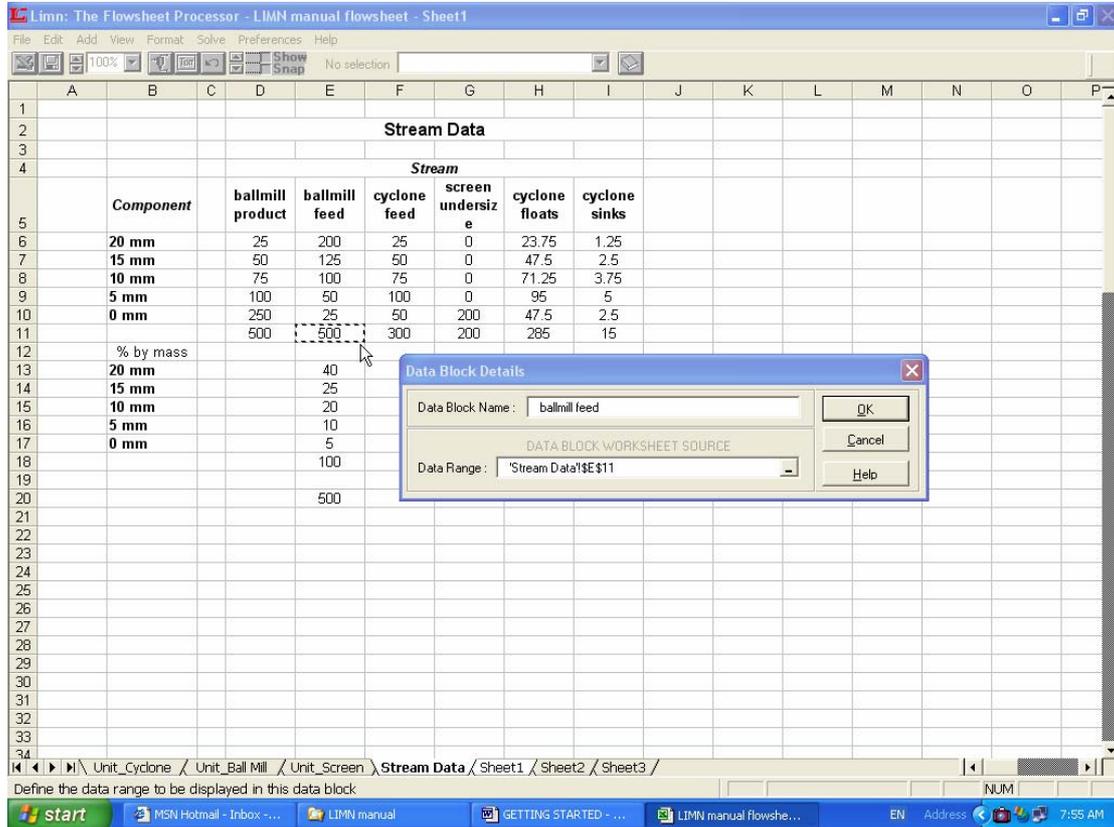


Figure 18: Datablock dialogue box

6.6 Create the datablocks for the other streams.

6.7 Save the workbook.

APPENDIX A: WORKED EXAMPLE

