



# Ten green bottles

**Stephen Wells picks up tips for using Excel to improve industrial processes, and tries to decipher the growing jargon of spreadsheet publishers.**

**M**elvyn Perry, from North Yorkshire, is a process improvement specialist who takes advantage of the flexible graphing features of Excel.

He tells me that process improvement work frequently uses statistical data analysis. It might be for measuring things like the volume of liquid in bottles. A specification for a bottled liquid product will obviously demand that the volume remains consistent.

When the bottles are filled by machines with multiple filling heads, you have to see that each filling pump provides the same output as all the others.

The average pump output is calculated, as is the standard deviation of the error in the sampling method. This error is deployed to calculate what is known as the least significant interval (LSI) and is used to compare the average pump outputs.

The LSI is the uncertainty in the value of the average output. If two averages are further apart than the maximum and minimum least significant values for the respective averages, then those averages are considered to be statistically different.

Melvyn says that the quickest way of identifying any filling pumps that differ from the rest, is to graph the pump averages with the LSI

bars shown. Then, any pumps with overlapping LSI bars are operating at the same average. The LSI bars are essentially the same as error bars.

He has collected data for each of ten pumps for his example. The averages, and the lower and upper least significant values, are shown in *Table 1*.

He selects this data and makes a line graph, then reformats the chart with high/low lines. By selecting Patterns and deleting the joining lines (where appropri-

ate), and changing the data markers to a dash at the end of the "error bars", he arrives at an attractive chart that shows which pumps need adjusting. *Fig 1* shows that pumps seven and eight on the multiple-head bottle-filling machine are under-filling.

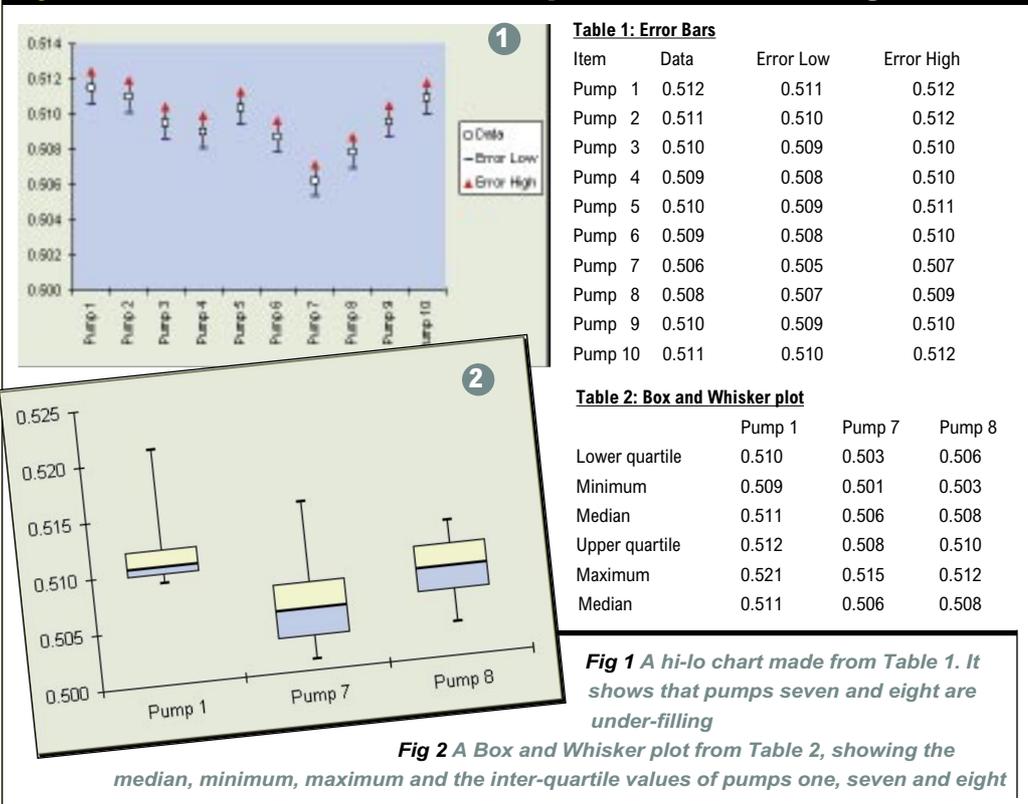
Melvyn sent me a disk of the tables, with example charts which I first duplicated with Excel 4, then tried it in Excel 7. The results are the same but the charting procedure and formatting is so much easier, partly because of the multi-tabbed dialogue boxes which first appeared in version 5, and partly because of the context-sensitive mini-menus offered with right clicks on the mouse in the Windows 95 version.

To create a graphical summary of data sets, Melvyn uses the Box and Whisker plot. This reflects the median, minimum, maximum and inter-quartile values. The inter-quartile range is a measure of the dispersion of the data — its spread. The lower and upper quartiles are the values at the 25 percent and 75 percent rankings of the data. The median is the 50 percent point.

To demonstrate the value of the Box and Whisker plot, he used the data from the filling head example and worked with pumps 1, 7 and 8.

The data is shown in *Table 2*. Using Excel 4, he made the chart (shown adja-

**Figs 1 & 2 Performance of the multiple-head bottle-filling machine**



**Fig 1** A hi-lo chart made from *Table 1*. It shows that pumps seven and eight are under-filling

**Fig 2** A Box and Whisker plot from *Table 2*, showing the median, minimum, maximum and the inter-quartile values of pumps one, seven and eight



cent to *Table 2*) like this:

Select the complete data block (e.g. I4:L10), choose the Chart Wizard and extend the square to chart size. At Step 1, choose Next. At Step 2, choose Line, Next. With Step 3, take Line chart Type 7. At Step 4, change Data series to Rows; and accept 1st Row for Labels and 1st Column for Legend. At Step 5, choose your option for having a data legend or not.

Now double-click the chart so that the menu bar changes and choose Chart, Add Overlay. Choose Format, Main Chart, Hi-Lo lines and Up/Down bars. Set Gap Width at 100%: this formats the main chart. Format the overlay in the same way. Excel 7 doesn't use the term "overlay"; instead you Format Groups 1 and 2.

Double-click on a horizontal line in the graph. In the resulting Patterns dialogue box choose: Line, None; Marker, Custom; Style a dash; Foreground black; Background, white. Then check the Apply to All box. Double-click on a marker and choose those same options again, and that's it.

The box and whisker plot illuminates three points. Firstly, the data may not be symmetrical — particularly for pump one. Secondly, pumps seven and eight are similar in that the median of pump eight falls inside the median to upper quartile value of pump seven. Thirdly, pump one has a higher output than pumps seven and eight, as seen with the LSI comparison.

The box and whisker plot is very powerful and is often used in statistics. Melvyn says: "It is a shame that this plot cannot be made more quickly in Excel." Ironically, Excel 4 did have a spare square in the choice of chart types box, but Excel 5 filled it with a doughnut-type chart.

**Fig 3** *If you sign up for the Microsoft Network, you can click on a Help option in Excel 7 to instantly connect to all these resources*

Why do I pass on such an obscure use for a spreadsheet? It's my experience that applications, or chart variations which are new to me, frequently strike a chord with readers. I've had quite a bit of response to my recent column dealing with golf handicapping, as well as my article about calculating nurses' shift hours.

### Going through the changes

I remember when a shop was a shop. Then it became a retailer, expanded to a retail outlet and finally, a traditional retail distribution channel.

The hyperbole used by spreadsheet publishers has grown in the same way. Particularly Microsoft with Excel. We used to have macros, templates and add-ins. Then it was Wizards. Then Auto this and Auto that. And now it's enhanced IntelliSense technology.

Interchangeably called "Excel 7" and "Microsoft Excel for Windows 95", the latest incarnation is like one of those massive cinema organs with every conceivable feature and accessory known to man.

Microsoft's admirable intent was to move to a task-orientated approach. So instead of thinking about functions and formats on worksheets, you'd think about budget reviews, contact lists, and financial analysis. Pete Higgins, Group VP Applications and Content, says: "You've told us that your primary focus is on getting your work done, not learning our products."

The inference is that all these ease-of-

use accessories will cut the time taken to learn the software. A laudable objective. But computer software is only a tool and the user always has to familiarise himself with it. The more complex the tool, the longer it takes, initially.

To take a simple example, the information you would obtain by running the macro, CHECKUP.XLM in the Excel 4\Library\Checkup directory, you can now find in the Excel 7 menu bar. But would you find it under (a) File, Properties, Statistics? Or (b) Tools, Options, General? Or (c) Help, About, System Info?\*

One way or another, the new Excel in combination with Windows 95 offers more kinds of help than has ever been seen on a spreadsheet.

Cleverly, to save memory the Help file only adds subjects as they're needed. The VBA (Visual Basic for Applications) library, for instance, doesn't load until you run or edit a VBA macro.

The menu bar Help offers you a choice between a Contents, an Index, Find, or the Answer Wizard.

The Contents offers drop-down chapter heads and the Index offers a complete alphabetical listing. Both of these are like an on-screen manual. Find is like a database search: type in a word, choose from numerous options for searching, then pick a topic.

The Answer Wizard lets you type a question like "How do I change colours in a block?" then offers a choice of subjects.

You can also reach this main Help file by clicking on the desktop and pressing F1. Often, the resulting Help screens will contain buttons to take you to a branch, show you an example, or even start a macro. These are called Shortcut buttons.

Another form of Help is the question mark in the title bar of every dialogue box. Click the What's This? button, then an item, and a clarification statement appears.

The constantly running Tip Wizard makes helpful suggestions as you go along. If it's suggesting that you use an icon for something like creating a note, it displays a working icon whether regularly visible on a toolbar or not.

There is the context-sensitive mouse right-click menu, too: you might be looking at a list of files to open and you can choose a Quick View of the file, or examine its properties.

You can find out what any button does just by pointing at it. You can view any helpful note which you've attached to any cell (or play any warning sound) just by pausing the mouse cursor on the cell. These are now called Cell Tips.

## Top Tips for Lotus 1-2-3 Release 4 for Windows

- You can put text in a cell outside your printed page area and have it appear in the header or footer. If you were to enter it in cell Z1, for example, you just put \Z1 in the left, centre or right box of the header or footer section in Page Set-up.
- Here's an easy way to multiply or divide by a constant. Let's say you have a series of currency amounts in the range A1 to A12. You want column B to carry the same amount plus VAT at 17.5 percent. Just enter 1.175 in, say, cell F1. Then choose Range, Analyse, Multiply Matrix. In the dialogue box put A1:A12 in the First matrix slot, F1 for the Second matrix and B1 for the Resulting matrix.
- A simple formula for calculating the first day of each month is:  

```
+D1+32-@DAY(D1+31)
```

 This assumes column D is in a date format. You enter any date in cell D1. Enter the formula in D2. Mark the block D2 down as far as you like. Choose Edit, Copy Down.
- To access a comprehensive list of all @Functions with descriptions, choose Help, the Search option, and then the Search button. Type @Functions. Pick @Function Categories and click the Display button and the Go To button (marked >>). To go to each succeeding group of @Functions, repeat clicks of the Go To Button.
- To add notes to formulas, just separate them with a semi-colon. To add one to a label, enter it like this:  

```
+ "Jan 8 '96";Marsha's birthday
```

 The date will appear in the cell. Both the date and the note will appear on the Edit line.
- If you're getting an ERROR message in, say, cell A12 caused by a division by zero in cell B5, then you can suppress it like this. If the current formula is  

```
@SUM(A3..A11)/B5
```

 change it to:  

```
@IF(B5,@SUM(A3..A11)/B5,"")
```

 If you'd rather be advised about the problem with a more specific message, enter instead:  

```
@IF(B5,@SUM(A3..A11)/B5,"B5 has a zero")
```

I also think it's helpful to be able to view an instant total for any block of cells you mark. The answer appears in the status bar. This feature is called AutoCalculate. And more than just a SUM, you can right-click on the figure and instantly change it to an average, a cell count, or the maximum of a range and so on.

Finally, there is always the latest Help from the horse's mouth. Assuming you've joined the MSN Network, you can go straight to the screen shown in *Fig 3 (page 309)*, from Excel. Just choose Help, The Microsoft Network, Microsoft Excel 95 Forum, Connect.

If you choose an item to download, it goes into the C:\Program Files\The Microsoft Network\Transferred Files folder. Then you can view it or print it at your leisure.

### Loose ends

I'm grateful to Shane Devenshire, of Walnut Creek, California, for the panel of tips for Lotus 1-2-3 (page 308).

Speaking of post from overseas, among the hundreds of requests I've received for the financial analysis templates (described in this column over the past year) have been a number from regular readers of *PCW* in places as far away as Colorado and South Australia. Most

know the drill for foreign correspondence; others enquire how to pay for the return postage.

Wherever you are in the world you can buy Coupon-Response International coupons at your local post office. You just send these with a formatted 3.5in disk and a return address envelope to the usual address. And I'm going to spell that out because I receive so many creative interpretations of that phrase: Stephen Wells, Personal Computer World, Editorial Dept, VNU House, 32-34 Broadwick Street, London W1A 2HG.

\* The answer to the question about how to run the info macro is (c).

## PCW Contacts

Stephen Wells welcomes comments on spreadsheets and solutions to be shared. Send them to PCW Editorial at the usual address or at **Stephen\_Wells@msn.com**.

For the financial analysis Excel templates for service companies and those which carry stock, send a formatted 3.5in disk and a stamped, self-addressed envelope.