



**Linechart Viewer**



## Linechart Viewer

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### Introduction

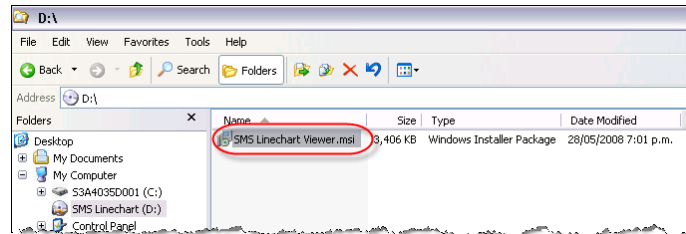
This document details how to install and operate Linechart Viewer.

This document assumes that Linechart Server and all the Data Collectors have already been installed. Other documentation exists for these products.

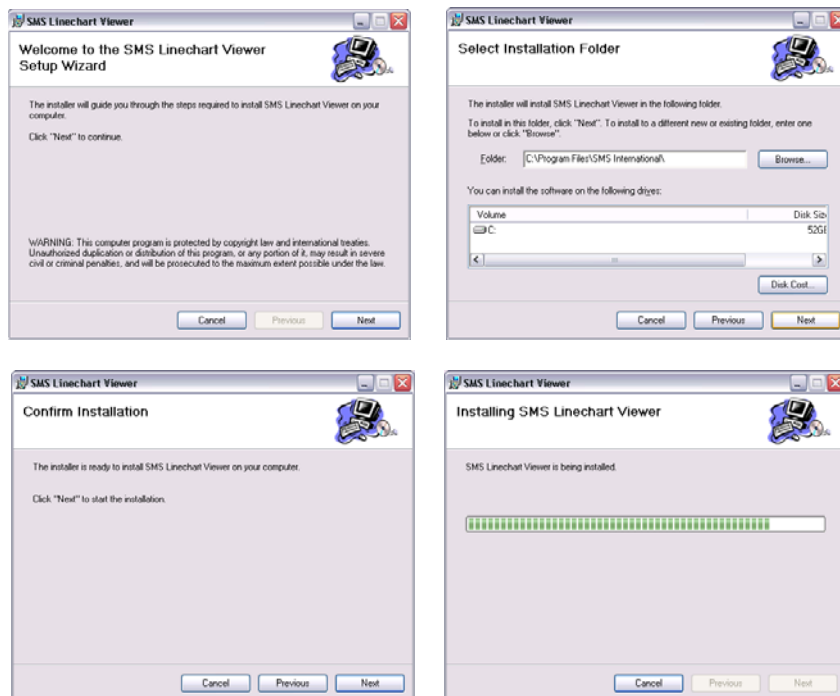
If Linechart Viewer is being used in demo mode then the other software, as mentioned above, is not needed.

## Installation

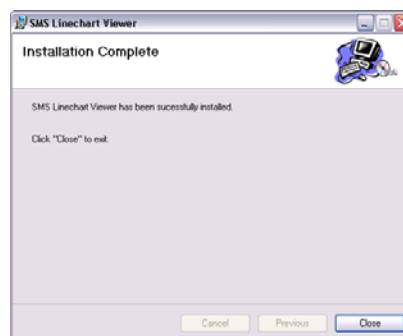
Launch the installation process by double clicking on the 'SMS Linechart Viewer.msi' file on the 'SMS Linechart' CD



Click the 'Next' Button on all the screens in the Setup Wizard



Click the Close button when the installation is complete



## Using Linechart Viewer

### Launching Application

Linechart Viewer can be launched in one of two ways.

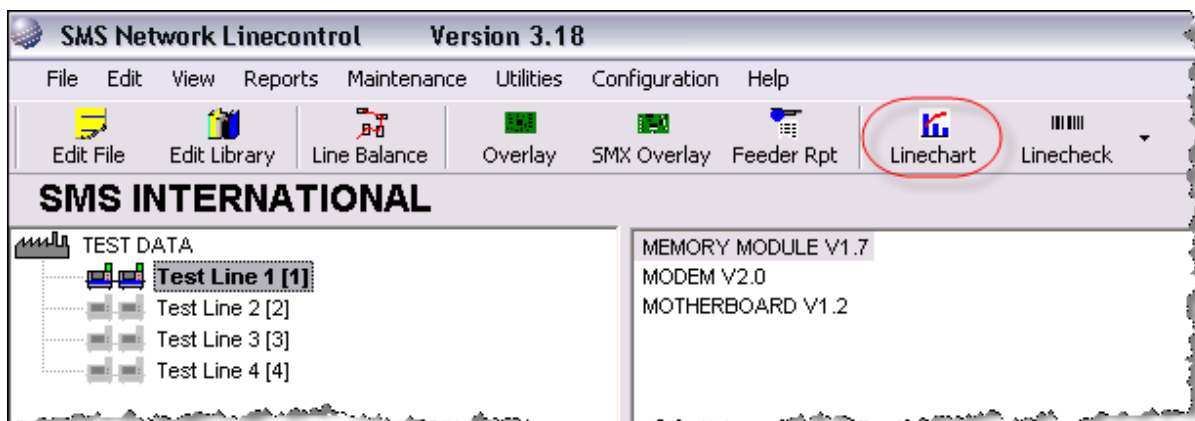
#### From the Start Menu

Select Programs , SMS then SMS Linechart Viewer.



#### From Linecontrol

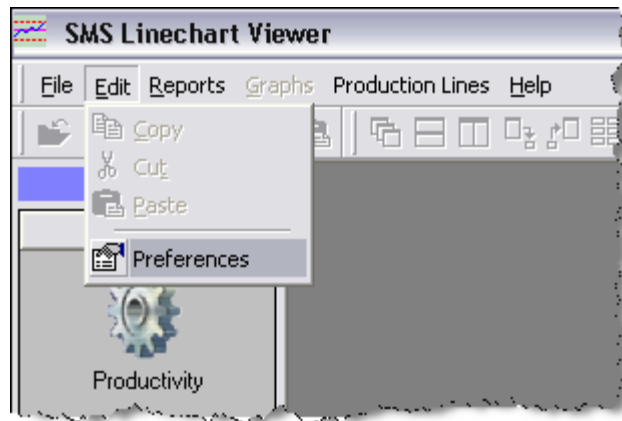
Click on the Linechart icon in the Linecontrol toolbar. See Linecontrol documentation for further details



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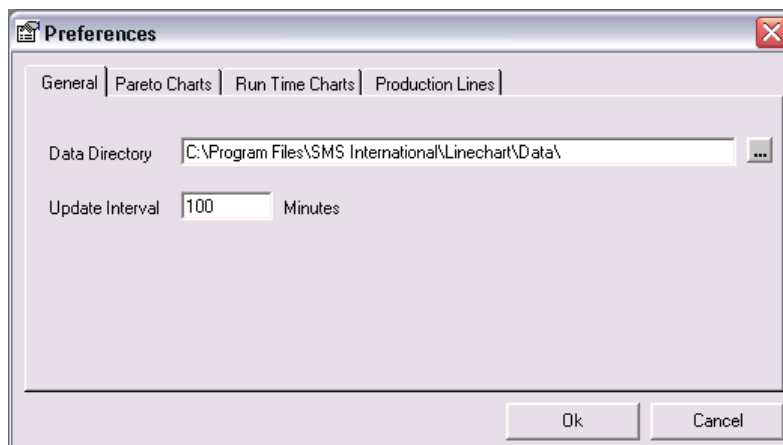
## Preferences

Select Preferences from the Edit drop down menu.



## General

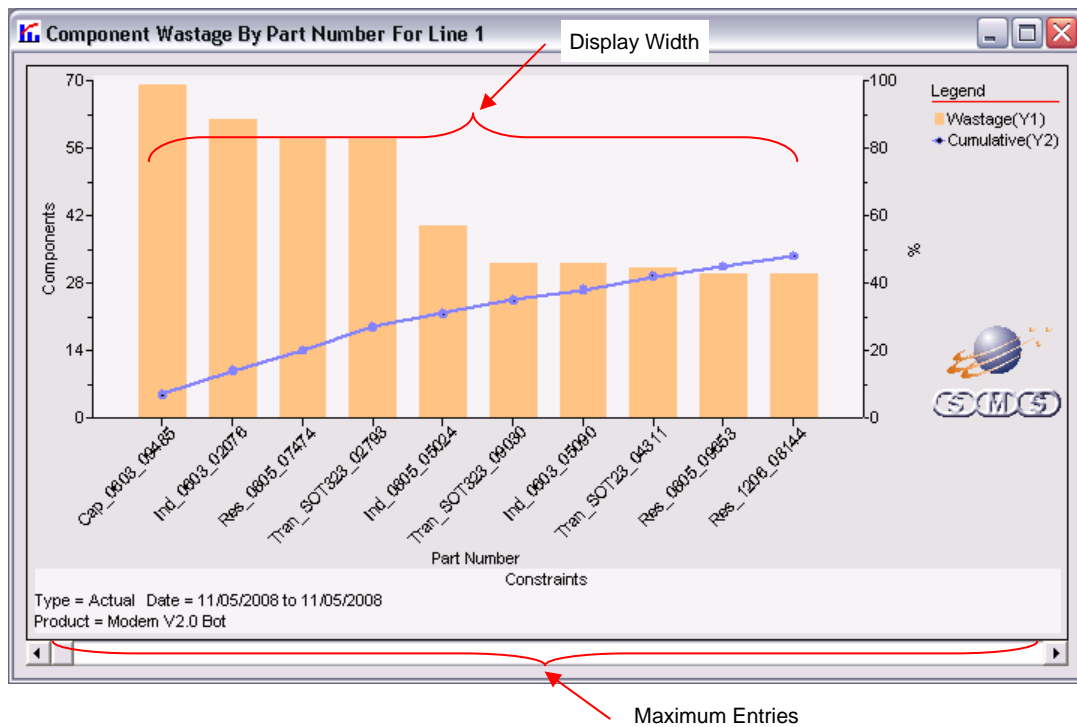
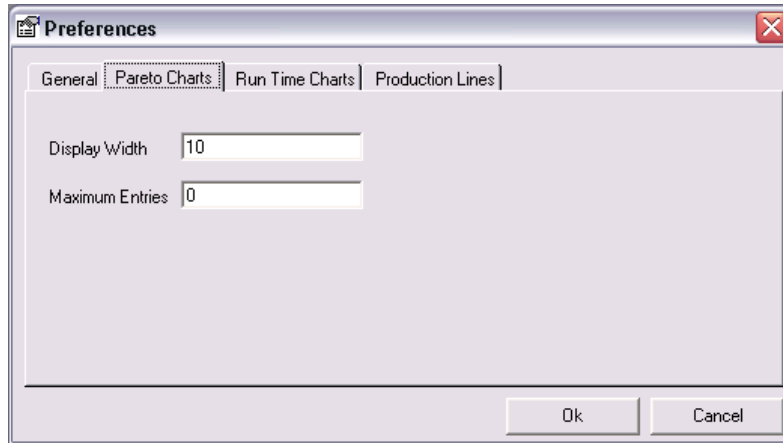
- Data Directory – This is the location that Linechart SMX Database. This setting **must** be set to the same value as in Linechart Server. If Linechart Viewer is being used in Demo mode then this location **must not** be altered, as it points to the demo data by default.
- Update interval – The number of minutes that Linechart Viewer will wait before automatically reloading any open charts. If Linechart Viewer is being used in Demo mode then this value should be set to a relatively high value. E.g. 100



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## Pareto Charts

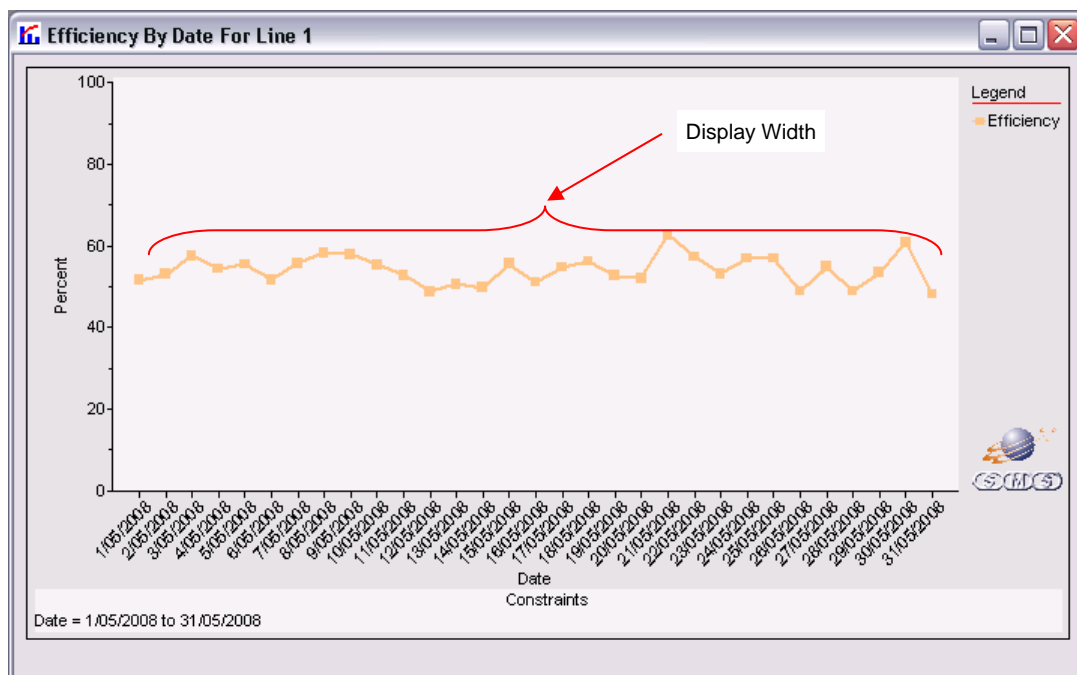
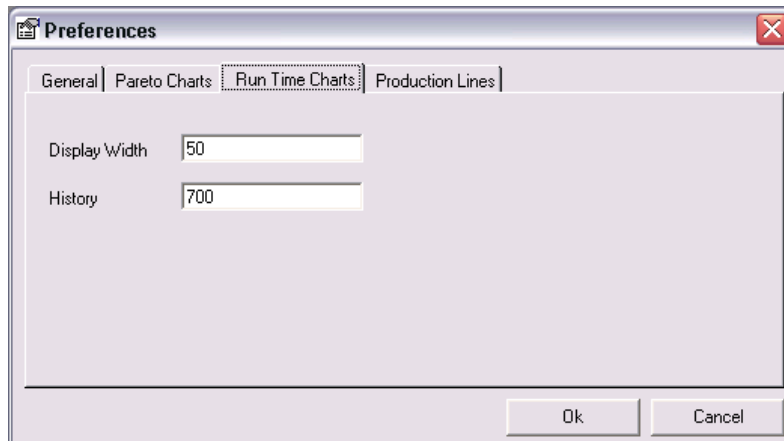
- Display Width – This is the maximum number of data points that can actually displayed on the screen at any given time for a bar chart.
- Maximum Entries – This is the maximum number of data points that can be viewed by scrolling left or right on a bar chart.



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## Run Time Charts

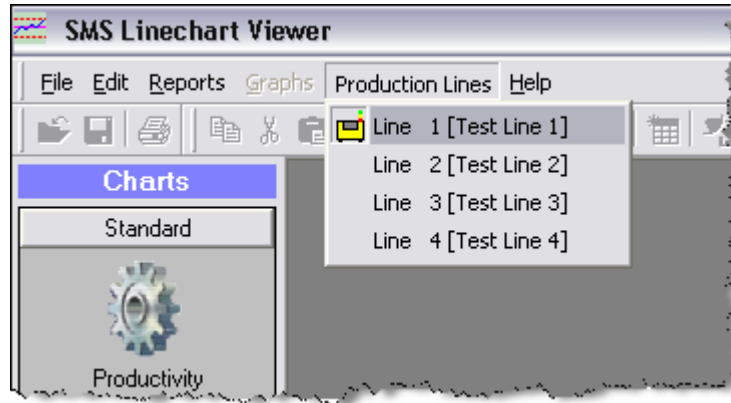
- Display Width – The maximum number of data points viewable on a time based chart
- History – The maximum number of days in the past a date range can be selected from.



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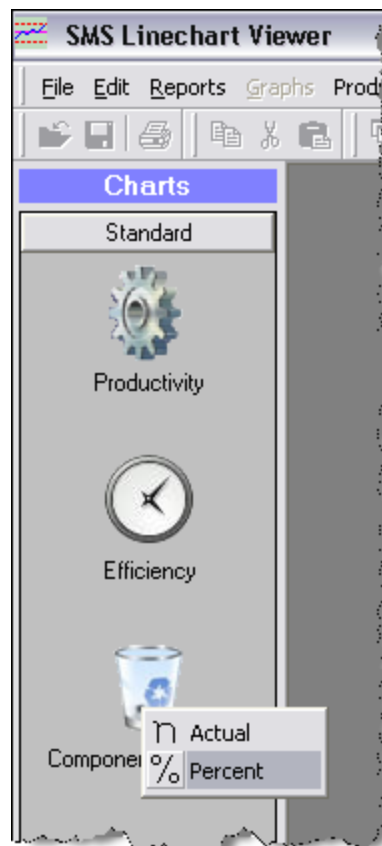
## Selecting A Production Line

Select from the Production Line menu. If Linechart Viewer is being used in Demo mode then only one production line will be available.



## Opening A Chart

The base chart types can be selected by clicking on the icons in the short cut bar on the left of the screen. Some charts require further options to be selected by way of a pop up menu. E.g. The component wastage chart allows the user to select between the actual number of components wasted or the percentage of components wasted.

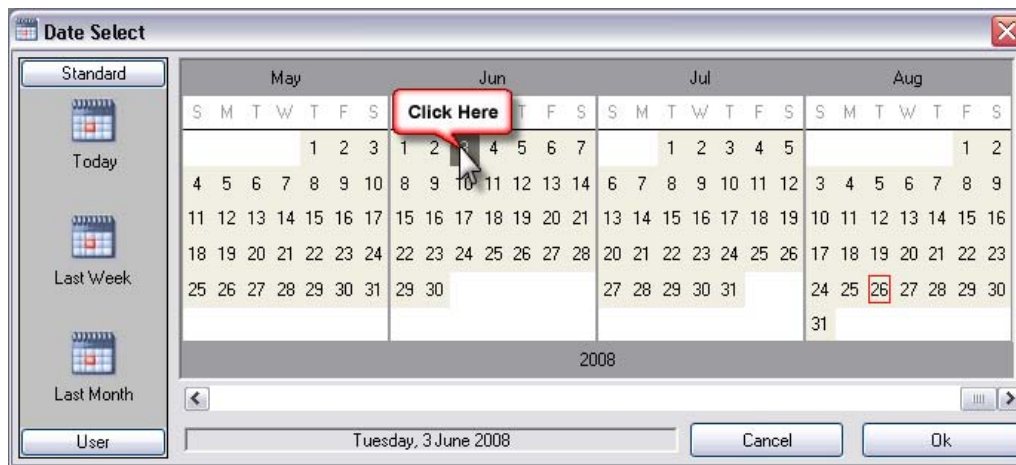




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## Selecting A Date Range

A single day can be selected by clicking on the particular day



A date range can be selected by clicking on the first day and dragging to the last day



An entire month can be selected by clicking on the month name.



If Linechart Viewer is being used in Demo mode then there is no option to select a date range as this is automatically set to fit the demo data supplied.

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## Date Range Macros

Linechart Viewer has three standard Data Range Macros and the ability for user defined macros to select commonly required date ranges.

### Standard Macros

Clicking on the 'Last Week' macro in the Standard macro section will automatically select the last seven days



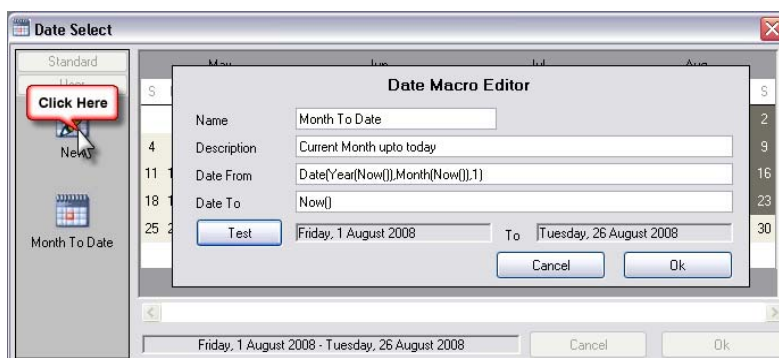
### User Defined Macros

Clicking on the User button (Click on the Standard button to view standard macros) will display all the user defined macros. Clicking on the appropriate icon will then automatically select the desired date range.



### Defining a New Macro

Clicking on the 'New' Icon will display the Date Macro Editor (See separate document for further details)

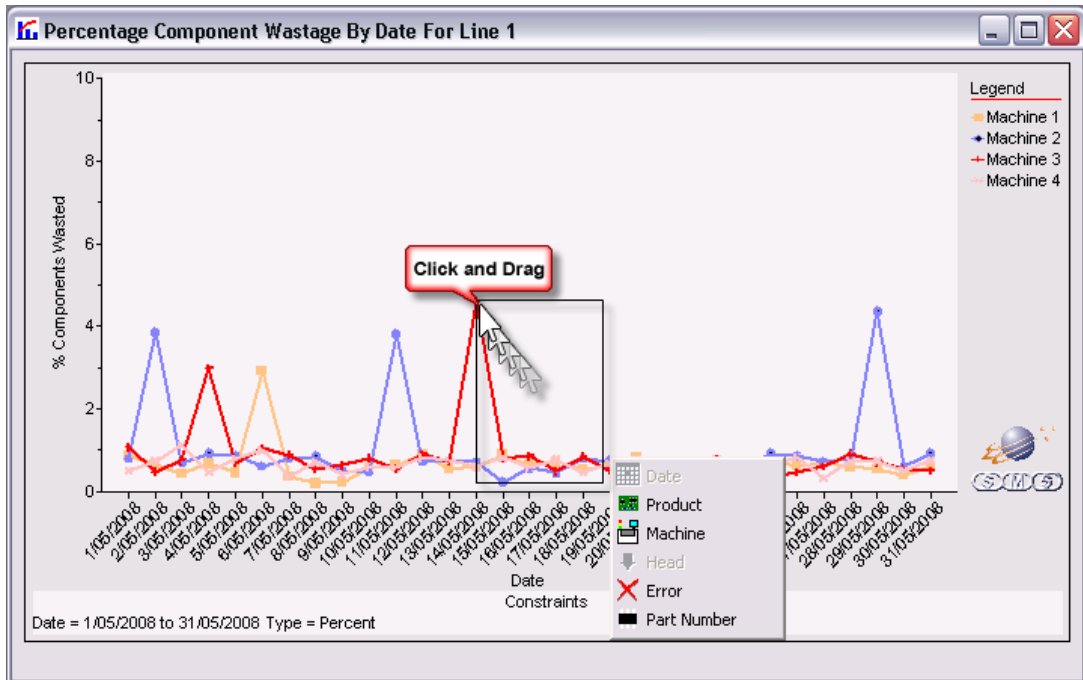


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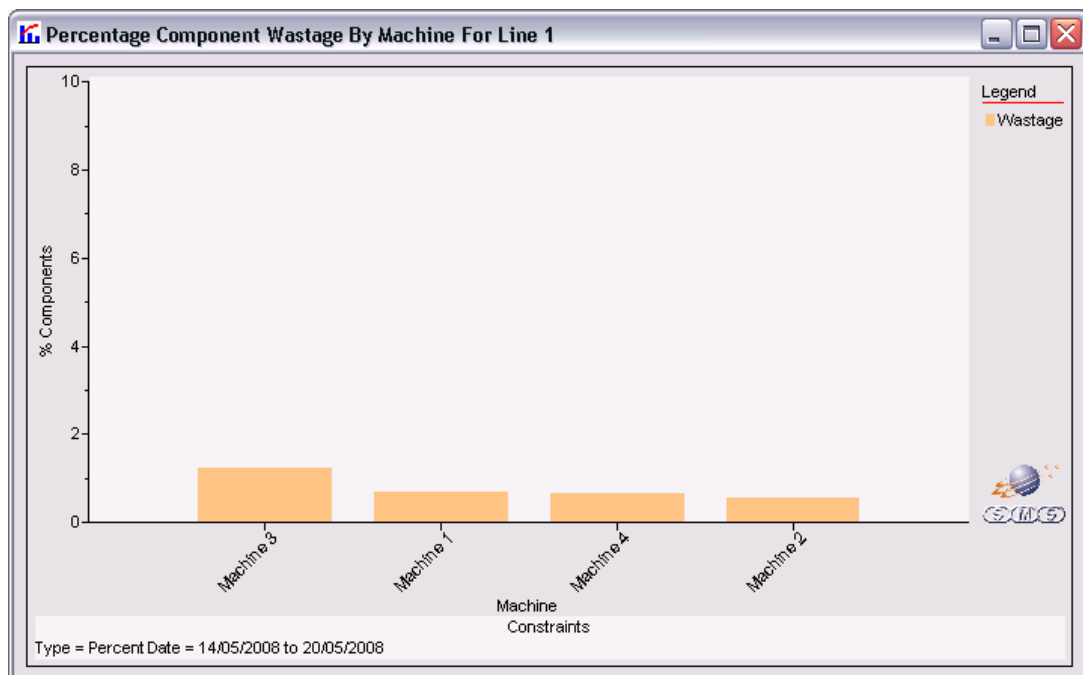
## Drilling Down

Once a chart is displayed it can be further refined by clicking on a single data point or dragging across a range of data points. A pop up menu will appear to allow the user to select from list of options on how the chart can be constrained.

The example below shows a component wastage chart that has drilled down to show the data by machine over a selected date range.



## Resulting chart

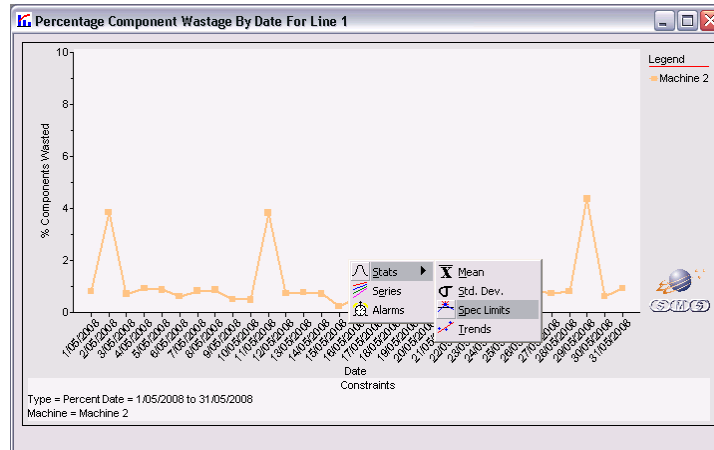


This process can be repeated on the new chart.

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## Statistics

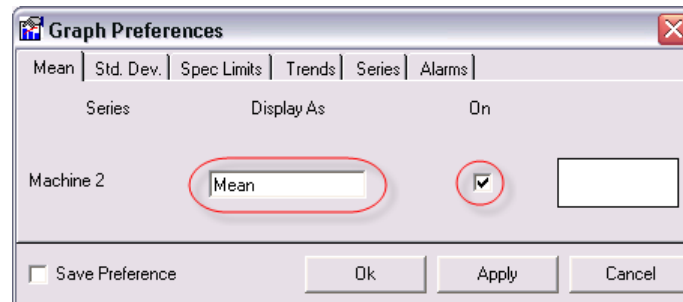
By right clicking on a chart, various statistical information can be displayed.



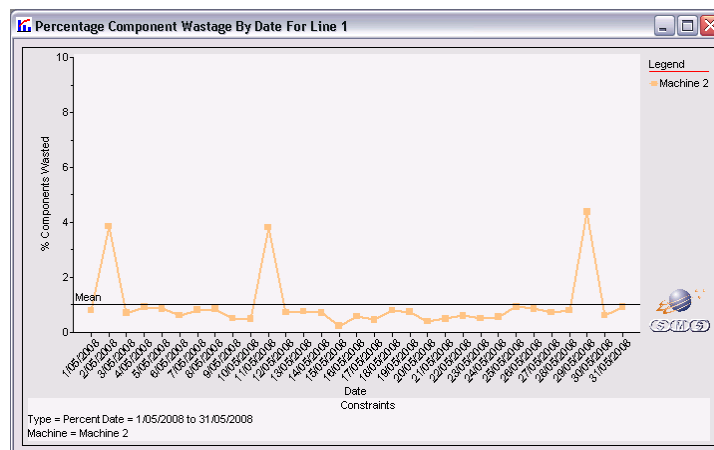
### Mean

Draws mean lines on the chart.

- Display as – The text that is displayed on the mean line.
- On – Turns the mean line on and off



The screenshot shows the "Graph Preferences" dialog box with the "Mean" tab selected. The dialog has tabs for Mean, Std. Dev., Spec Limits, Trends, Series, and Alarms. Under the "Mean" tab, there are three columns: "Series", "Display As", and "On". The "Series" column contains "Machine 2". The "Display As" column has a text box containing "Mean". The "On" column has a checked checkbox. At the bottom, there are buttons for "Save Preference", "Ok", "Apply", and "Cancel".

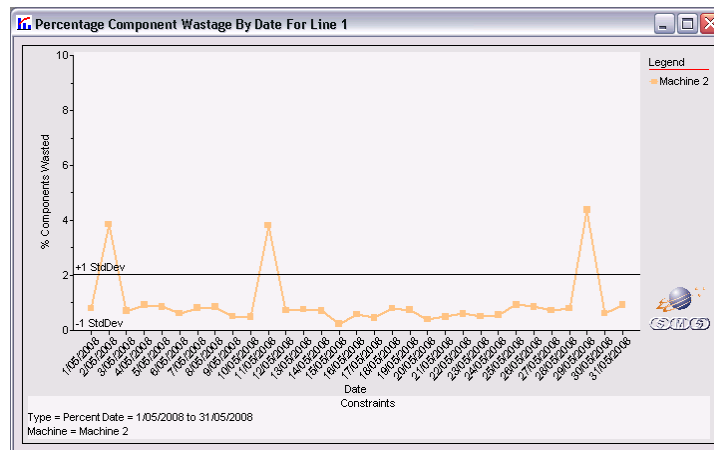
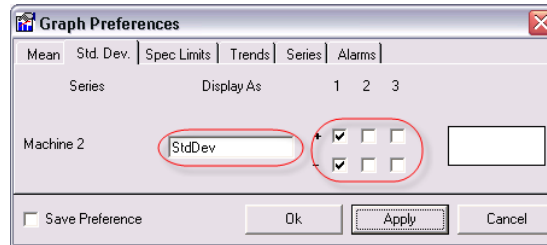


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## Std Dev

Draws standard deviation lines on the chart.

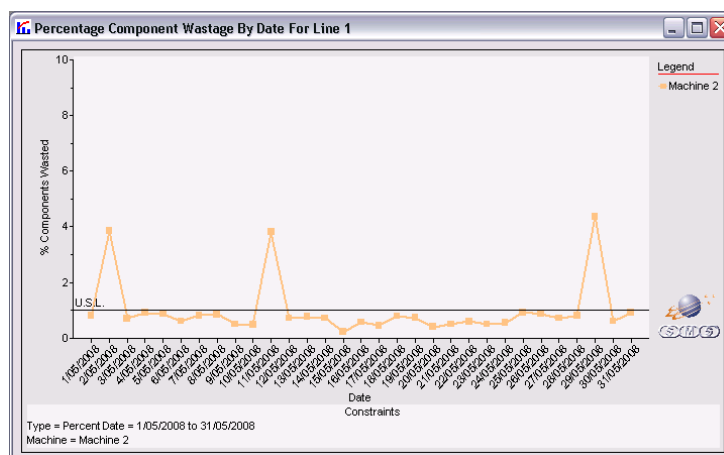
- Display As – The text that is displayed on the standard deviation line.
- 1 2 3 – Individually turns on and off the standard deviation line at  $\pm 1, 2$  or  $3$



## Spec Limit

Draws an upper and / or lower specification limit line on the chart

- Display As – The text that is displayed on the specification limit line
- Value – The value that the specification limit is set to.
- On – Turns the specification limit line on and off

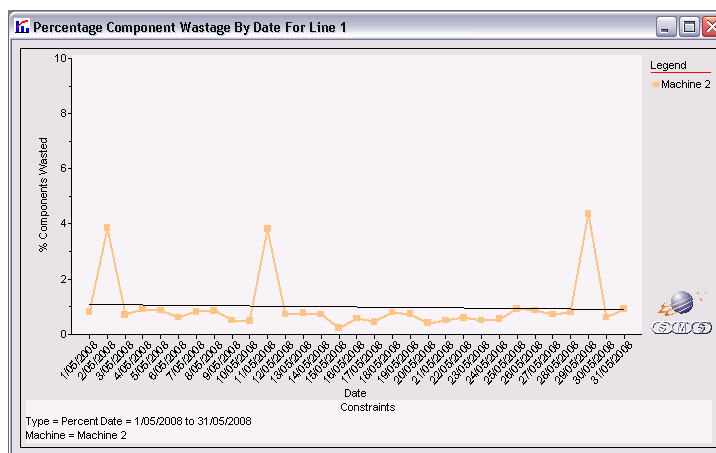
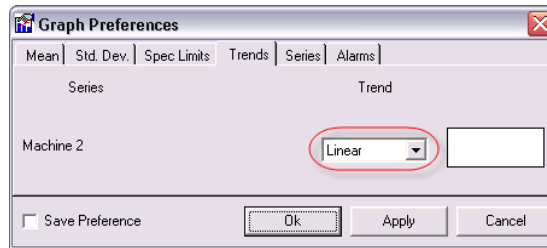


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## Trends

Draws a trend line on the chart

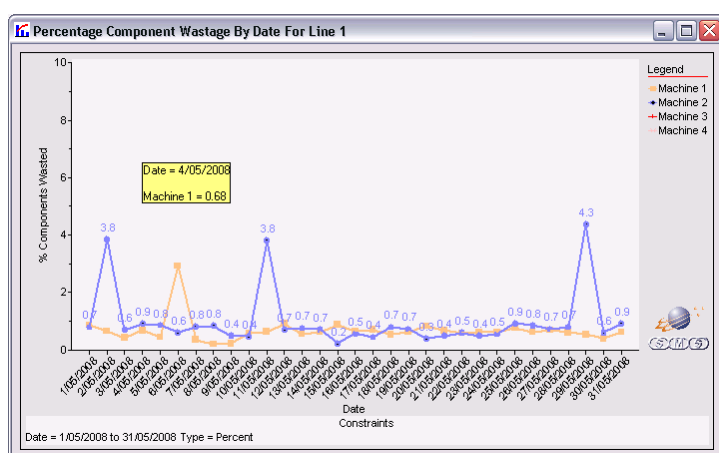
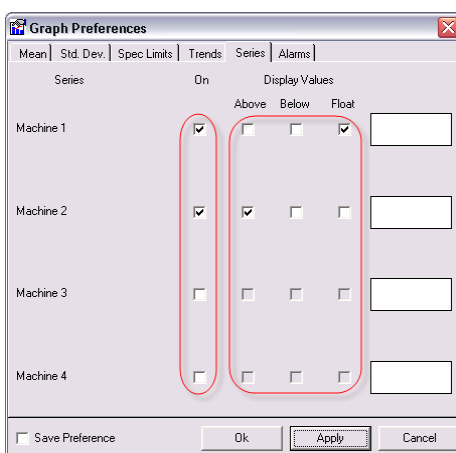
- Trend – Select a trend type to display on the chart



## Series

Controls the visibility and display of numeric data for individual series

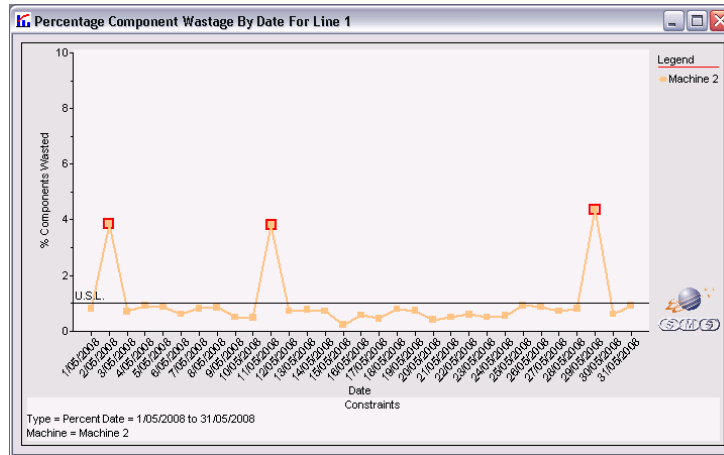
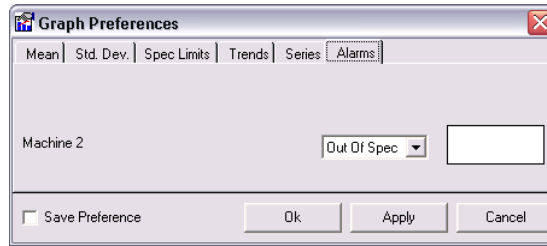
- On – Turns each series on and off
- Above – Displays the numeric value above each data point on the chart
- Below – Displays the numeric value below each data point on the chart
- Float – Displays a floating text box that shows the numeric values for each data point as the mouse is moved across the chart



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## Alarms

Highlights data points on the chart that are out of specification

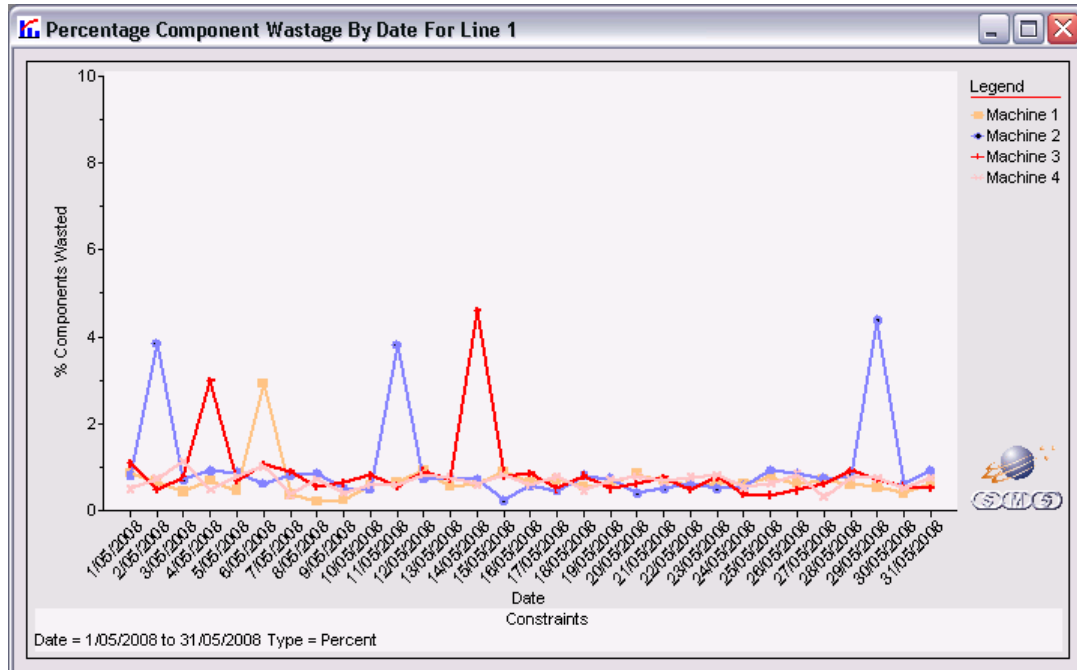


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## Tables

A numeric table of any chart can be produced by:

- Selecting the relevant chart (Click the title bar)
- Clicking on the Table icon in the toolbar



Percentage Component Wasteage By Date For Line 1 - Table				
LineChart				
Percentage Component Wasteage By Date For Line 1				
Date	Machine 1	Machine 2	Machine 3	Machine 4
1/05/2008	0.86	0.79	1.07	0.49
2/05/2008	0.65	3.85	0.47	0.73
3/05/2008	0.43	0.70	0.75	1.13
4/05/2008	0.68	0.91	2.99	0.47
5/05/2008	0.45	0.86	0.69	0.79
6/05/2008	2.92	0.60	1.05	1.00
7/05/2008	0.35	0.81	0.88	0.35
8/05/2008	0.20	0.84	0.54	0.71
9/05/2008	0.23	0.49	0.63	0.42
10/05/2008	0.57	0.47	0.80	0.58
11/05/2008	0.63	3.81	0.55	0.57
12/05/2008	0.91	0.71	0.89	0.81
13/05/2008	0.54	0.76	0.72	0.76
14/05/2008	0.61	0.71	4.61	0.59
15/05/2008	0.87	0.22	0.79	0.82
16/05/2008	0.65	0.57	0.85	0.57
17/05/2008	0.70	0.45	0.49	0.77
18/05/2008	0.54	0.79	0.79	0.46
19/05/2008	0.62	0.73	0.50	0.69



## Manual Update

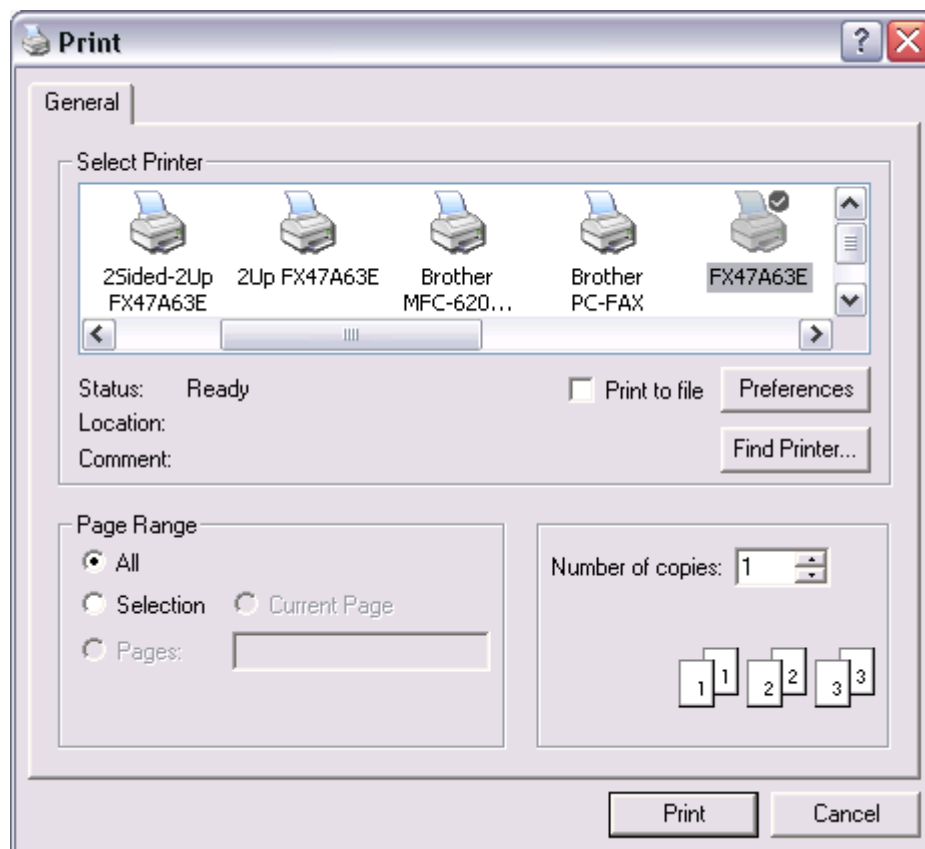
All charts will automatically update themselves after the time interval that is specified in the Preferences form. The user can manually force the charts to update by clicking on the Manual Update icon in the toolbar



## Printing

Any chart or table can be printed by:

- Selecting the relevant chart or table (Click the title bar)
- Clicking on the Print icon in the toolbar



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## Exporting Data

### Copying Data

Any chart or table can be copied to the clipboard by:

- Selecting the relevant chart or table (Click the title bar)
- Clicking on the Copy icon in the toolbar



Which can now be pasted into another application.

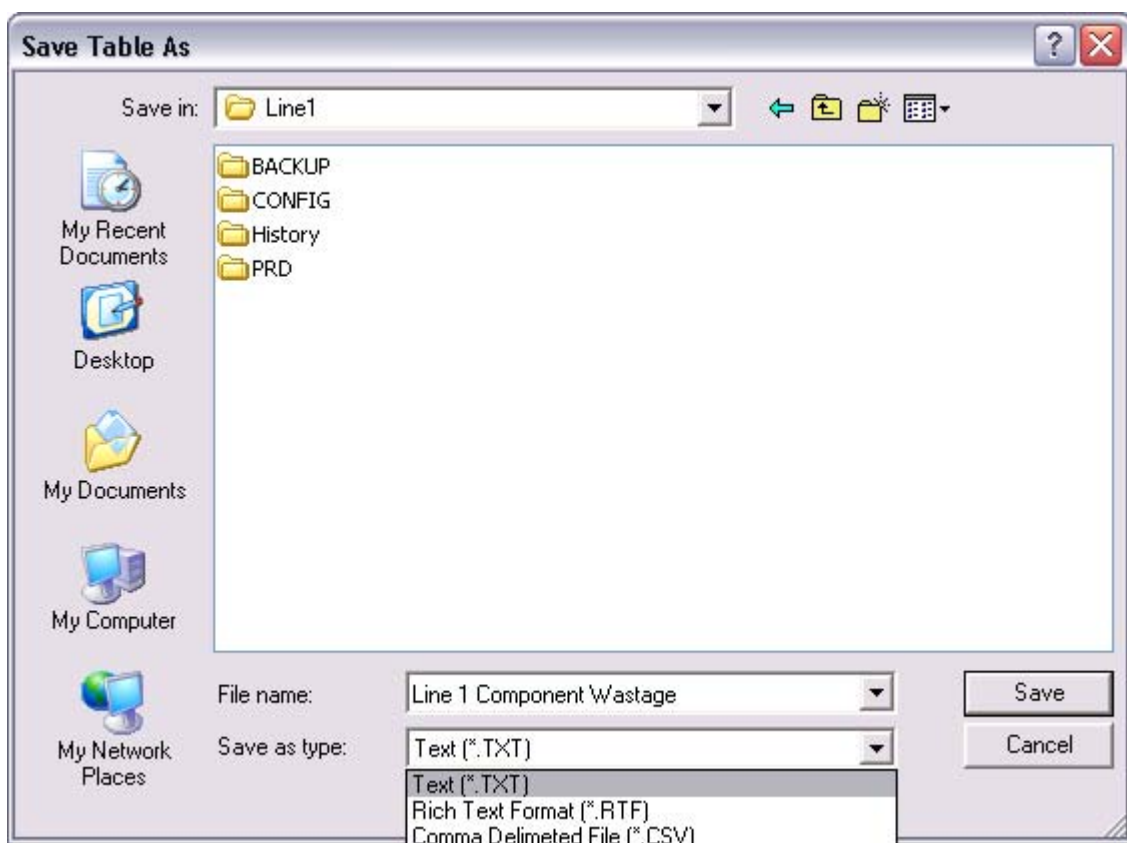
### Saving Data

Any chart or table can be saved to file by:

- Selecting the relevant chart or table (Click the title bar)
- Clicking on the Save icon in the toolbar









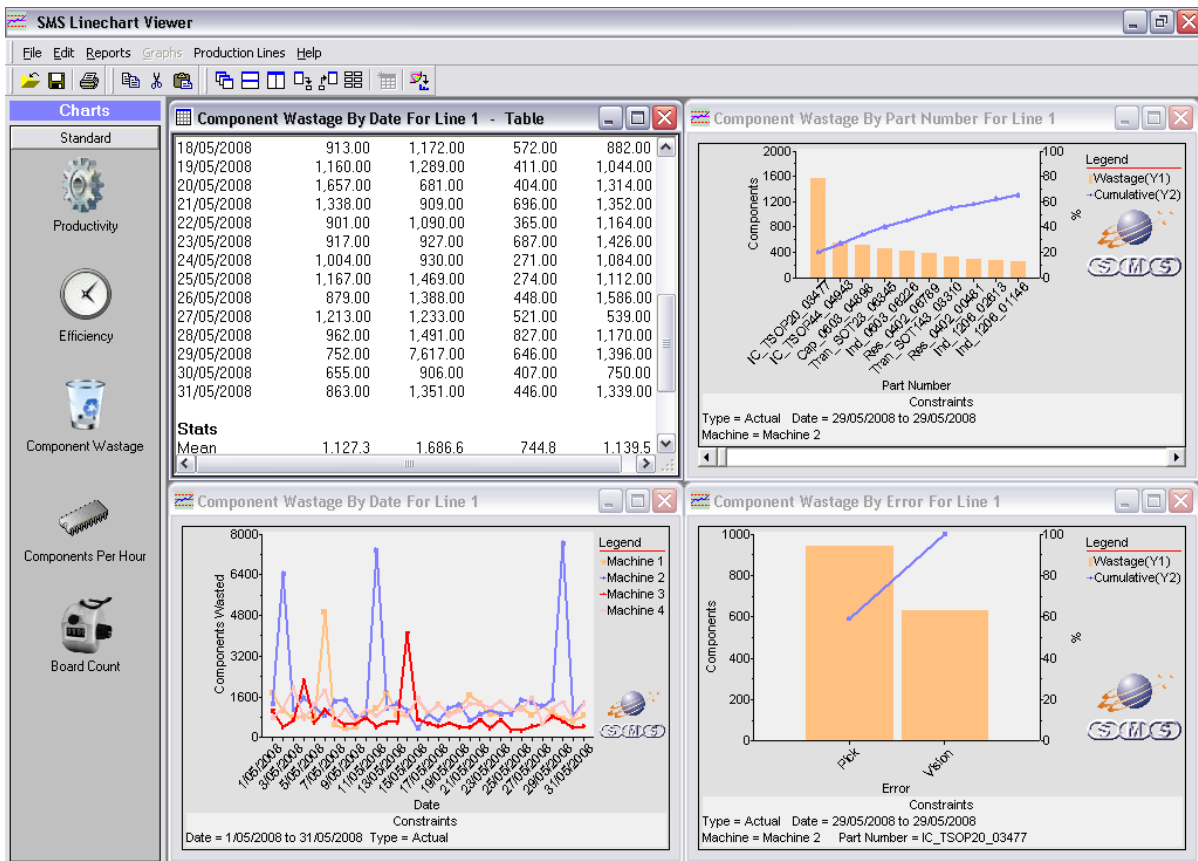
Charts are saved as bitmaps and tables can be save as plain text, rich text or comma separated files.



## Multiple Windows

Linechart Viewer is a Multiple Document Interface in that more than one Table and or Chart can be open at any given time. The following operations can be performed on open windows by clicking the corresponding icon in the toolbar

- Cascade 
- Tile Horizontal 
- Tile Vertical 
- Minimise All 
- Maximise All 
- Arrange All Minimised 



The screenshot displays the SMS Linechart Viewer application with the following windows and data:

### Component Wasteage By Date For Line 1 - Table

18/05/2008	913.00	1,172.00	572.00	882.00
19/05/2008	1,160.00	1,289.00	411.00	1,044.00
20/05/2008	1,657.00	681.00	404.00	1,314.00
21/05/2008	1,338.00	909.00	696.00	1,352.00
22/05/2008	901.00	1,090.00	365.00	1,164.00
23/05/2008	917.00	927.00	687.00	1,426.00
24/05/2008	1,004.00	930.00	271.00	1,084.00
25/05/2008	1,167.00	1,469.00	274.00	1,112.00
26/05/2008	879.00	1,388.00	448.00	1,586.00
27/05/2008	1,213.00	1,233.00	521.00	539.00
28/05/2008	962.00	1,491.00	827.00	1,170.00
29/05/2008	752.00	7,617.00	646.00	1,396.00
30/05/2008	655.00	906.00	407.00	750.00
31/05/2008	863.00	1,351.00	446.00	1,339.00

**Stats**

Mean	1,127.3	1,686.6	744.8	1,139.5
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### Component Wasteage By Part Number For Line 1

Bar chart showing wasteage by part number. Legend: Wastage(Y1) (orange bars), Cumulative(Y2) (blue line). Part numbers include IC\_TSOP20\_03477, Cap\_06183\_048345, Tran\_507125\_083045, Ind\_09013\_082208, Res\_04070\_087819, Res\_507125\_083110, Ind\_12016\_082113, and Ind\_12016\_071146.

### Component Wasteage By Date For Line 1

Line chart showing wasteage by date for four machines. Legend: Machine 1 (orange), Machine 2 (blue), Machine 3 (red), Machine 4 (green). Date range: 1/05/2008 to 31/05/2008.

### Component Wasteage By Error For Line 1

Bar chart showing wasteage by error type. Legend: Wastage(Y1) (orange bars), Cumulative(Y2) (blue line). Error types: Pbk and Vision.

## Standard Charts

All Linechart Viewer standard charts initially produce a runtime chart based on the selected data range (See selecting a date range above). Further more all the charts can be further constrained and regrouped by clicking and dragging on the chart (See drilling down above)

## Productivity



Productivity is a measure of the Running Time versus On Time expressed as a percentage.

$$\text{Productivity} = \frac{\text{Running Time}}{\text{On Time}} \times 100$$

- On Time = Running Time + Waiting Time + Stopped Time
- Running Time = The time the machine is either picking, placing or conveying PCBs
- Waiting Time = The time spent waiting for either an upline or downline machine.
- Stopped Time = Any time that the machine has been manually stopped or is in an error state

Productivity charts can be refined to group the data by Date, Product or Machine

## Efficiency



Efficiency compares the components per second placed with the theoretical placement speed of the machine.

$$\text{Efficiency} = \frac{\text{CPS}_{\text{Actual}}}{\text{CPS}_{\text{Theoretical}}} \times 100$$

CPS = Components Per Second

See Linechart Server documentation about setting individual machine placement speeds

Efficiency charts can be refined to group the data by Date, Product or Machine

## Component Wastage



Component wastage reports the parts the machines have rejected or mispicked. So these are parts that have been consumed but have not been placed. When selecting Component Wastage there is a choice of either Actual Wastage or Percentage Wastage.

### Actual Wastage

As the name suggests, Actual Wastage charts the actual number of components.

### Percentage Wastage

Percentage Wastage compares the total number of rejected parts versus the total number of components picked.

$$\text{Wastage}_{\%} = \frac{\text{Parts}_{\text{Rejected}}}{\text{Parts}_{\text{Picked}}} \times 100$$

Component Wastage charts can be refined to group the data by Date, Product, Machine, Placement Head, Error or Part Number

## Components Per Hour



Components Per Hour takes the total number of component placed and divides this by the On Time (In hours)

$$\text{Component Per Hour} = \frac{\text{Components}_{\text{Placed}}}{\text{On Time}_{\text{Hours}}}$$

Components Per Hour charts can be refined to group the data by Date, Product or Machine

## Board Count



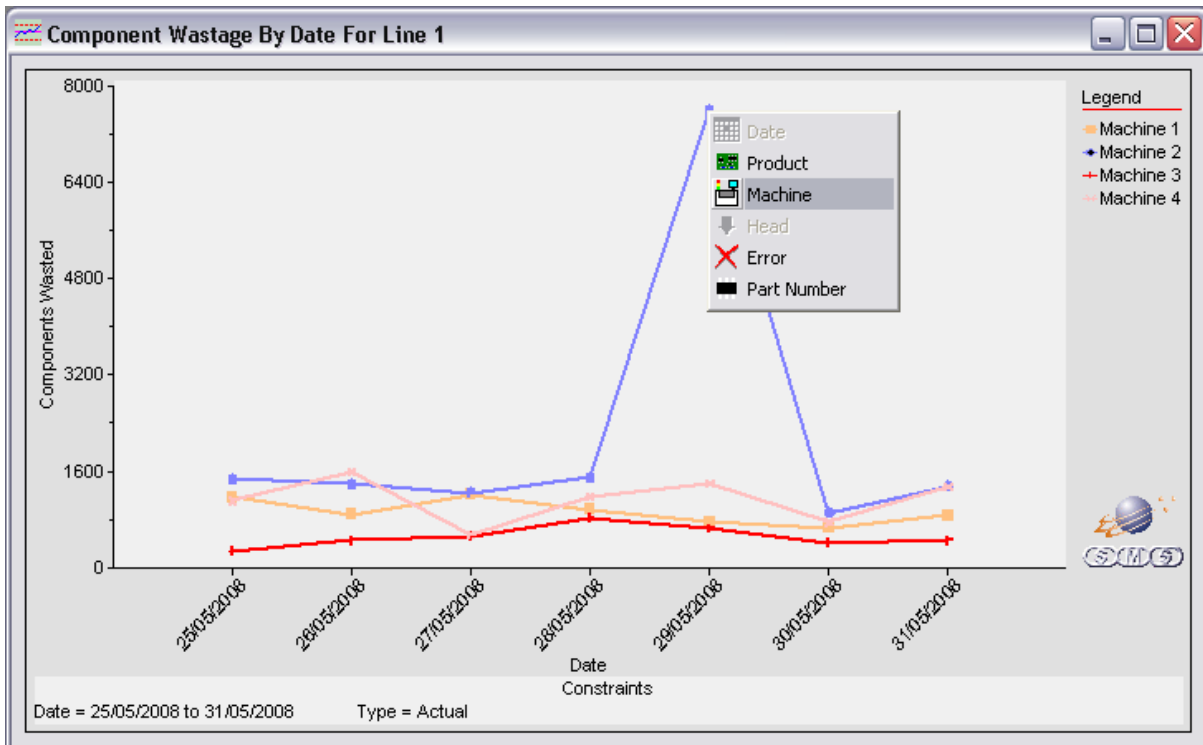
Board Count shows the total number of boards produced on any given day as well as the number of boards produced per hour.

$$\text{Board Count}_{\text{Per Hour}} = \frac{\text{Boards}_{\text{Total}}}{\text{On Time}_{\text{Hours}}}$$

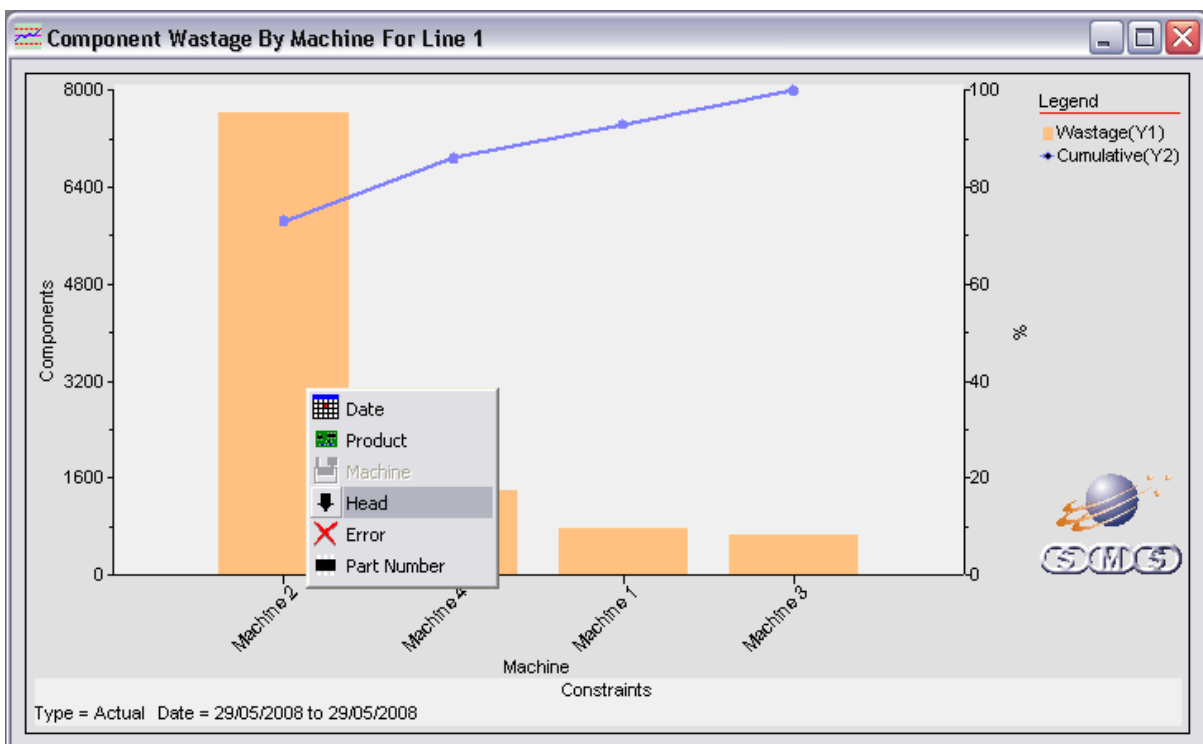
Board Count charts can be refined to group the data by Date, Product

## Example

During a routine weekly component wastage check, a process engineer notices that there is an unusually large value for a particular day. To investigate further he clicks on the offending day then selects machine. This will show all the component wastage for this day as a bar graph grouped by machine.



The vast majority of the component wastage has occurred on Machine 2, so he clicks on the bar for Machine 2 then selects Head



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In a few short mouse clicks the process engineer is able to establish that nearly 40% of all the faults that occurred on Machine 2 on the 29<sup>th</sup> May 2008 on Line 1 were on components that were placed by nozzle 12 of head 1

