Software Update Notification

Mastersizer 2000 version 3.01 Application Software for use with (English) Microsoft Windows 95, Windows 98 and Windows NT

Mastersizer 2000

(Part Number PSS0002/3)

0   Contents

1   Introduction

This is version 3.01 of the Mastersizer 2000 instrument application software. The software is tested and supported on the following Microsoft Operating Systems. Windows 95   (revision B or higher), Windows 98 (first and second editions) and Windows NT 4.0   (service pack 5 and higher) and comes on one auto loading compact disc (CD).

This update notification captures changes that have been introduced since Mastersizer 2000 v2.00.

2 Instrument compatibility

The Mastersizer 2000 v3.01 software is back compatible with Mastersizer 2000 version 2.00 and below.

Note: In common with a large number of applications which undergo significant updating, Data files produced by earlier versions will be compatible with this release but data files produced by this release will not be legible by earlier versions. Where there is regular correspondence between systems, users are advised to ensure that all instruments are updated to the same level.

3 Functional Features

3.1 Planned Additions and Headline Utilities.

- The Hydro 2000μP Micro Volume sample dispersion unit (AWA2003/AWA2004) has been added to the supported accessory list.
- Custom Calculations for Quality Control purposes introduced into Report Designer
- Grade Efficiency plot (Tromp Curve) added
- Rosin Rammler Plot added
- Phi Table added
- Variable Sensitivity analysis added
- Red-only analysis added
- Grade efficiency curve added

3.2 Requested Additions and changes.

Malvern Software Change Request Number (SCR)	Description	Comments
632	Add statistics functions to the report designer	Implemented
634	Create a calculation widget for the report designer	Implemented
684	Add Phi table	Implemented
733	Add Blaine number as a parameter.	Implemented
834, 1121	Recover corrupt files	Implemented
858	Remove level sensor threshold check on manual wet accessory's.	Fixed
869	Measurement file name added to the report footer	Implemented
893	Create custom variables such as Blaine numbers	Implemented
905	Passwords should not be displayed in 'plain text'	Implemented
918	Editing operator comments needs to show which record is being edited	Implemented
942	Limits bands added to trend graph	Implemented
946	Create an average result of multiple manual measurements	Implemented
955	Records page needs to display custom calculations	Implemented

Malvern Software Change Request Number (SCR)	Description	Comments
977	Table with distribution statistics needs creating	Implemented
980	Aspect ratio should be calculated by the new Custom Calculations	Implemented
986	Export tables as text.	Implemented
995	VCParameterFloat has a bug in some unused code.	Fixed
1011	Sensing of alignment target	Implemented
1014	Variable Sensitivity Analysis	Implemented
1016	Analysis of wet red-only measurements	Implemented
1022	Data graph can fail if obscuration is 0.0	Fixed
1030	Add pass fail colour property to expression widget	Implemented
1034	Precision of values – reduction of decimal places	Fixed
1038	Statistics graph crashes on 0.0 obscuration files	Fixed
1041	Grade efficiency curve (Tromp curve) introduced.	Implemented
1081	Result statistics graph crashes when measurement is aborted	Fixed
1084	Measurement directory path should be configurable in the INI file.	Implemented
1087	Red-only option added to SOP	Implemented
1090	No editing of averaged results	Fixed
1094	View options not remembered between executions	Fixed
1095	View editor does not display the correct version number	Fixed
1105	True colour bitmaps do not work on NT report designer	Fixed
1106	Floating point error in manual measurements Fixed	
1119	The value rt Default is incorrectly interpreted as length when used in Sax	Fixed
1126	Result statistics interface needs to be made more user friendly for custom calculations	Implemented

Malvern Software Change Request Number (SCR)	Description	Comments
1128	Edit calculation user comments dialogue needs to be multi-line	Fixed
1130	Upload/Download file name is incorrect in engineering browse dialogue	Fixed
1131	Hydro MU SOP's can not turn off ultrasound	Implemented
1132	Splining error	Fixed
1136	Editing version 1 SOPs does not initialise new parameters	Fixed
1146	Old measurement records can not be edited	Fixed
1148	No data saved after measure sample	Fixed
1149	Custom Calculation Help not working	Fixed
1150	Add Font property to graphs	Implemented
1151	Sub-micron modes may be removed in red-only measurements	Fixed
1160	Mastersizer 2000.ini uses wrong format	Fixed
1165	Ultrasonics stabilising period not saved on Hydro S	Fixed
1202	Auto-increment is not extracted from SOPS	Fixed
1204	Vari-flow in µP not correct	Fixed
1205	Alarms log has no need of a help button	Implemented
1214	Grade efficiency parameters	Fixed
1215	Grade Efficiency Graph crashes	Fixed
1248	Custom calculations using the statistics interface always return the same result as the first measurement opened	V3.00 b2 fixed
1252	Lower limit for ultrasonics demand for Hydro 2000µP set to 10%	
1256	Pump driver over- temperature status added to system	
1265	Detection of corrupt export configuration files.	V3.00 b2 fixed
1279	Hydro 2000µP control routine modified to reduce comms loading.	
1280	Clearer alignment test failure error message	V3.00 b2 fixed
1281	Allow manual operation of Hydro 2000µP during the sample addition stage of an SOP measurement	V3.00 b2 fixed
1285:	Correction of problems with printing from within an SOP.	
1287	Correction of failure of printing sampler reports at end of SOP.	

Malvern Software Change Request Number (SCR)	Description	Comments
1335	Allow print out of averaged result where averaging called for in an SOP	
1336	Allow print-out of averaged result as default in SOP	
1356.	Improve visibility of Obscuration value on live display.	
1357	Remove Degas option from Hydro 2000µP	
1452	Added parameters to file for future release	

3.3 Deletions

None.

3.4 Known Bugs

There are no known bugs at the time of this release. If you suspect that you have discovered a bug, you should report this to Malvern Instruments detailing all aspects of the symptoms.

3.5 Known Issues

On some NT systems with 32MB of RAM, testers have reported 'out of virtual memory' errors. 32MB of RAM is below the recommended PC RAM configuration level. The minimum specification is 64MB RAM when running WindowsNT v4.0 (service pack 5 or higher). Upgrading the computer to 64 MB of RAM and re-configuring the virtual memory will resolve the problem.

In order to increase program performance measurement records are kept in memory. For customers with a large number of measurements in a single file, this will affect the system performance by consuming large amounts of available memory. The best practice is to keep the number of measurement records in a single file to a reasonable number, less than 1000. A common mode of operation is a new file per week or month depending on the frequency of measurements.

4 Distribution Media

Mastersizer 2000 Software Suite (Part Number PSS0002/3) is contained on a single self-installing CD-ROM. The installation process has been fully automated by the industry standard software installer InstallShield™. Any fault during the installation process will be detected and the user is notified.

The installation process has been tested on all the supported configurations of operating system.

5   Installing the Software

All data is the user's responsibility and it is good practice to backup it up on a daily basis.
It is also good practice to backup all data before installing new application software

If this is the first ever installation of the software, then to install the software either put the disc
in the CD drawer and await the auto load sequence or select the CD drive within Explorer and, in the root
directory, run the setup.exe program and follow the instructions.
NOTE that when using Windows NT, it will not allow an installation if the user does not have Administrator
access. This is in line with Microsoft's Logo policy and is standard practice.

***If this version of software supersedes the software already installed on your computer, it will be
essential to uninstall the previous version of software first.***

To do this, select "**Start" – "Malvern Instruments**" – "**Mastersizer 2000**" – "**Uninstall Mastersizer 2000**"
Note: The Uninstall Shield has a list of programs and files which it originally installed and it can therefore
correctly delete them. This means that it cannot delete your record files or pages since they will not be on the
"hit list".
The only possible exception to this will be if you have stored measurements on the **Default.mea** file.
If this file does contain measurements that you wish to keep, the easiest way to protect it is to go into
Explorer and rename the file by clicking on it once and then a second time (not a double click – the two clicks
should be one second apart in time.) This will allow you to change the name of the file. Simply renaming the
file **Default1.mea** will be enough to protect it.

Alternatively, go into the sizer software and create a new file for the records to be saved. Open the
Default.mea file and select "**Window – "Tile Vertically**". The new empty file will appear alongside the
Default.mea file. Highlight the **Default.mea** records to be saved and drag them onto the new empty file.
Close the sizer software and proceed with the uninstall procedure.

6   Directory Structure

The default directory structure is installed under %WINDISK%\Program Files as follows;
Malvern Instruments
          Mastersizer 2000
                    Custom Calculations
                    Export Templates
                    Firmware Hex Files
                    Measurement Data
                    Models
                    Pages
                    Programs
                    Sop
          Shared

7   What new features are present and how do I use them?

7.1   Overview

A quick scan of section 3.1 above will show that a number of new features have been introduced in this version of the software for your Mastersizer 2000.
These are described in detail below with instructions on their implementation.
Any feedback should be reported to Malvern Instruments via email to helpdesk@malvern.co.uk or by telephoning the Helpdesk directly on +44 (0)1684-891800 Please have all necessary details to hand before telephoning.

7.2   Changing measurement sensitivity

The software now provides for two levels of calculation sensitivity.
On earlier versions of software, the default was **enhanced mode**, which fully exploited the capabilities of the new detector array of the Mastersizer 2000.
However, while the enhanced sensitivity was ideal for research applications, it was not always ideal in production environments – particularly for dry powder measurements. Consequently, the enhanced mode is now presented as an option while the **normal mode** is the default. This mode gives a degree of sensitivity providing the best balance between sensitivity and reproducibility of results without impairing the system's ability to reveal the presence of small quantities of out-of-specification material.

It should be noted that the choice of sensitivity options will not affect the quality of the raw data. Measurements that have been produced using one option can be recalculated using the other.

IMPORTANT: Users who have created SOPs using earlier versions of software will find that these will apply enhanced sensitivity to their measurements.

7.3   Repeat Measurements in manual mode / all SOPs and automatic averaging

In previous versions of software, repeat measurements could be made in SOPs for automatic accessories. However, this feature was not available in SOPs for manual accessories or when measurements were performed in manual mode.
This feature can now be found in the **Cycles** tab of an SOP and the **Measurement Cycles** tab (found in **Options)** in Manual mode. There is also an option in the same dialogue to automatically create an average (with a set Sample Name) at the end of a run of repeat measurements.

7.4   Custom Calculations and their uses

The most fundamental change between version 2 and version 3 is the introduction of custom calculations. Essentially these are Basic programs which set up some sort of calculation from the size distribution currently obtained. These can be set up in reports (recommended for one-offs or occasional calculations) or as Custom Calculations that create a new parameter that is stored with every future measurement record created.
Up to 20 of these custom calculations are permitted in the software. The number of these is only limited to twenty to prevent the creation of exceptionally large measurement files that would result from excessive use

of custom calculations. For this reason, it is good practice for users to be sparing in their use of this feature, powerful though it is.

The procedure for both methods of setting up custom calculations is identical.

There is extensive help on the syntax of the functions (and examples) and use of the parameter set available in the software.

The following example will guide you in the use of this feature and how it can be used for one parameter e.g. the percentage below 15 microns.

First go to **Tools – Custom Calculation Editor** and start a new calculation. A white editor box will appear. Delete the Calc = "No calculation" line.

Hit the Browse button (as shown above). Now select **Result Below** from the **Methods / Properties** box and click on the **Paste** button. Alter the line to get the following
Calc = Round(Stats.ResultBelow(15),2) . The round command truncates the answer to two decimal places. Check your syntax using the automatic syntax checker (next to the Browse button).

Now save as %<15. This will fill the first calculation slot. Now use **View - Select Fields** or **View - Field Chooser** to select %<15 as a parameter in the records view. **Now close down all open files**. This is an **ESSENTIAL** part of activating a calculation. Upon reopening the files, any recalculated or measured record will display a %<15 value.

Of course, this is a very simple example and there may well be much more complex calculations that the user wants to perform. These are possible and just need more time and thought to put together.

Once a custom parameter has been created, it can be searched for using **Tools - Find Measurements**; viewed in the records tab using **View - Select Fields** or **View - Field Chooser** or used in Trend Graph plots (see later).

Exactly the same procedure is followed to put a calculation into report designer. Go to **Tools – Report Designer** and hit the calculator button on the tool bar, place the calculation box on the report and edit the properties in the usual way. Now click the **edit** button and enter the same code as described in the previous example. The editor is identical to the one seen earlier. When finished, close the editor and click **OK**.

More complicated calculations involving exporting of data, aspect ratios and Rosin – Rammler fits are discussed below.

7.5   Aspect Ratios

The routine for determining the aspect ratio of plate-like particles, previously employed on the Mastersizer S, is available as an example calculation. Simply cut and paste it from the Mastersizer 2000 help. The help file also explains the theoretical and experimental basis behind these measurements.

7.6   Rosin Rammler Fits

The ability to apply the Rosin Rammler equation to undersize data and determine the centre and spread of the resulting fit is often required by the cement and minerals industries. Such a fit routine is available as an example calculation in the Mastersizer 2000 help as well as a default table.
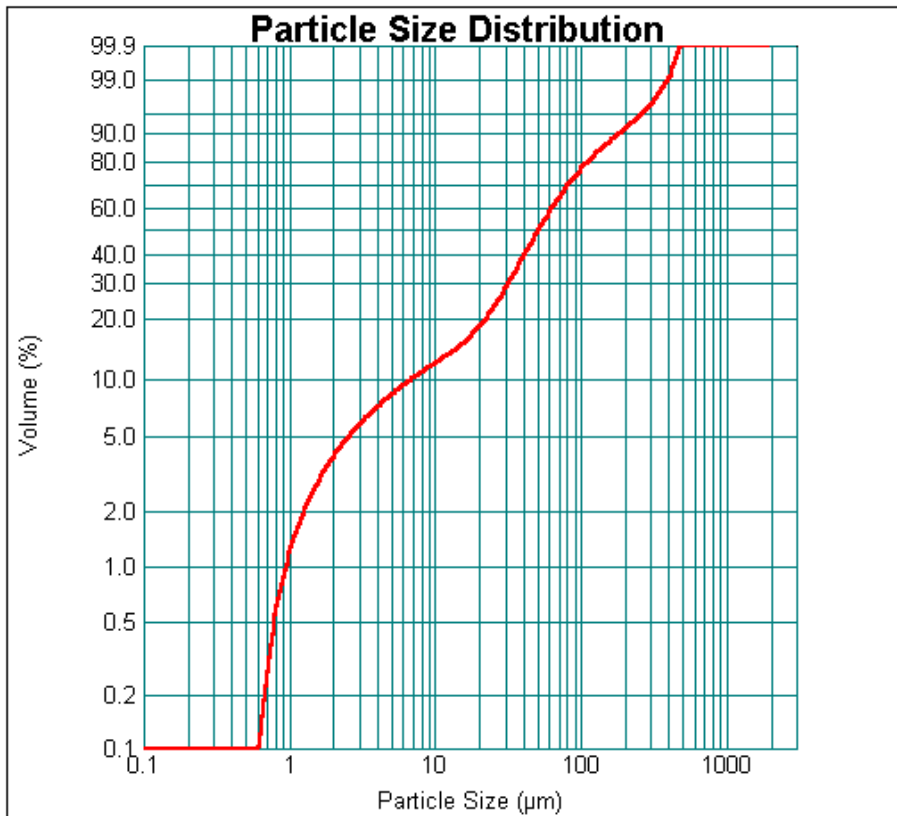
Sample Name : Averaged Underflow 1200

Measurement date and time : 06 Aug 1999 11:37:46

Analysis date and time : 06 Aug 1999 11:37:48

N 1.01 X 76.53µm. Fit 1.78

Particle Size Distribution

*The above figure shows an example of a Rosin – Rammler fit used in conjunction with a Rosin – Rammler graph.*

7.7 Exporting data to Excel using DDE or Active X.

The existing export functions in the Mastersizer 2000 are very powerful and cover 99% of all applications. However there is an occasional need to specify the exact destination cell that a particular piece of information travels to. This is normally required if a predefined template has been set up. There is an example calculation provided in the custom calculation help which demonstrates the use of Dynamic Data Exchange and Active X, and these examples can easily be tailored to your needs. These can be embedded in a report which initiates transfer every time it is refreshed (new sample, tab clicked on etc).
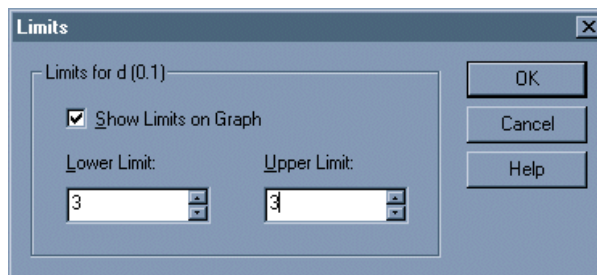
7.8   Trend Graph Limits

The version 2.00 trend graph has been improved by the addition of process control limits around variables on trend graphs.
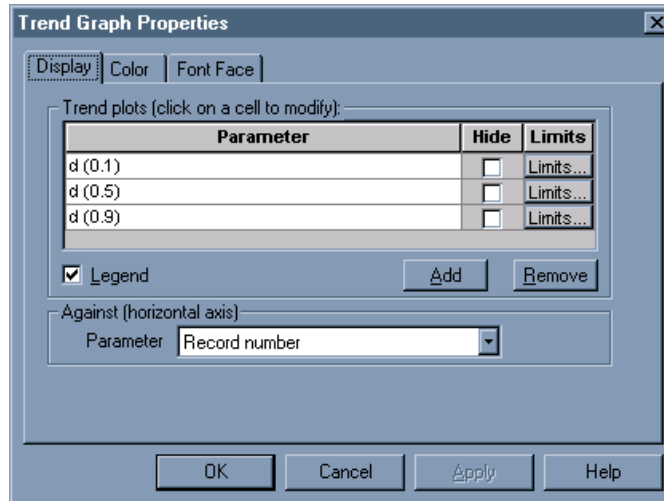
The screen looks similar to that seen in version 2.00 software, with the addition of the limits button. Pressing that button for any parameter brings up the following screen.

By clicking the Show Limits on Graph check box, upper and lower limits can be set up for a parameter. This also includes any custom calculated parameter (see section 7.4). In this way, a SPC graph can be set up for any required variable.
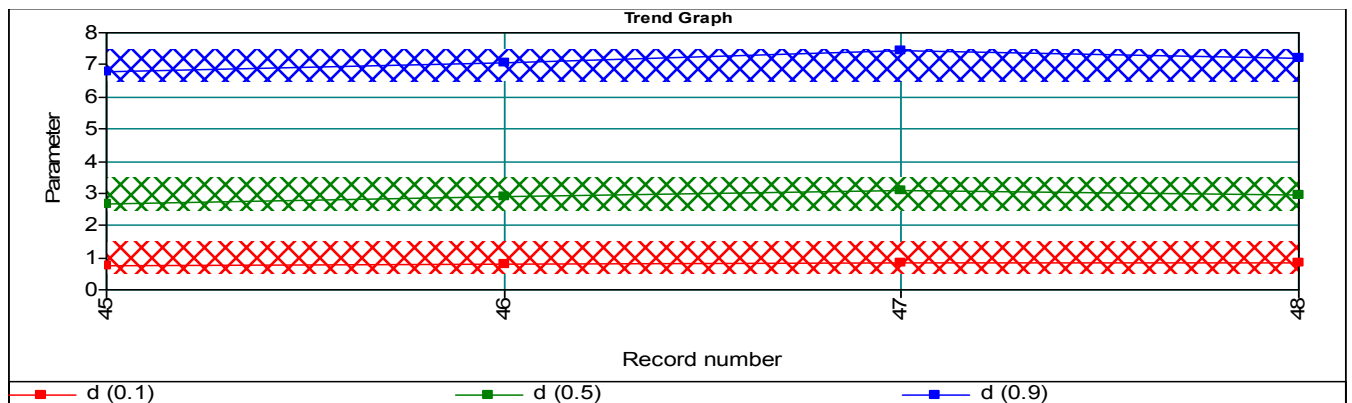
7.9   Grade efficiency (Tromp) curves

The creation of grade efficiency curves from particle sizing results is used to establish the efficiency of separators such as hydrocyclones, sedimenting centrifuges or gravitational classifiers. A feed material is passed into the separator which splits the material into an underflow fraction (coarse material) and a overflow fraction (fine material). The figure below illustrates this process. If this separation is performed as part of a grinding process, the underflow fraction may be passed back to be remilled, and the overflow fraction can be the final product.
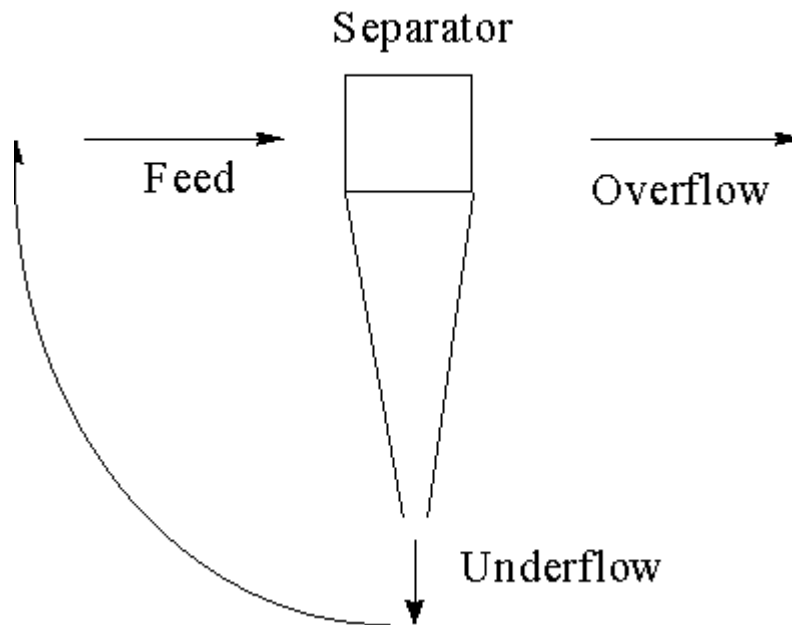
Diagram of a basic separator

The calculation of a grade efficiency curve requires the particle size distributions of two of the three components (overflow, underflow and feed), as well as knowledge of the components' input or output rate. Input or output rate is not required if all three size distributions are available.

How it works

Mass balance must be assumed in all calculations, i.e. the amount of material fed into the separator should equal the amount that comes out. The input / output rates are used to compare the volume in each size class of the product with the feed. If the ratio of the two rates is multiplied by the volume in each class, the probability that a given particle size will be separated can be calculated. This is the separation efficiency of that size, and the data for all material can then be combined as a grade efficiency curve.

Excellent Separation   Typical Separation   Poor Separation
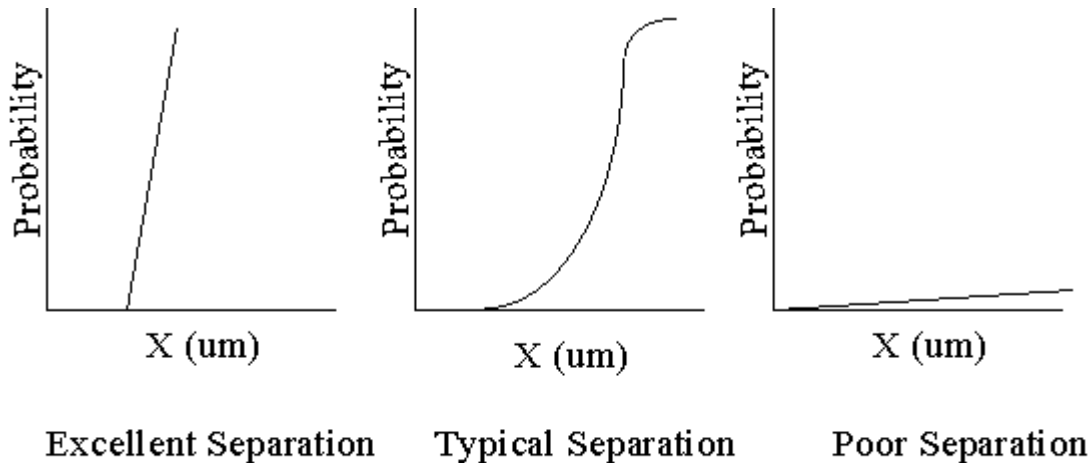
The above curves of probability Vs Size (x) show what the curve would look like for an excellent separation, a typical separation and no separation whatsoever.

An ideal separation would appear as a vertical line, but such separations never occur in reality.

The 25%, 50% and 75% points on this curve are calculated by linear interpolation. The ratio of the 25% point to the 75% point is termed the sharpness, and is equal to unity for a perfect separation.
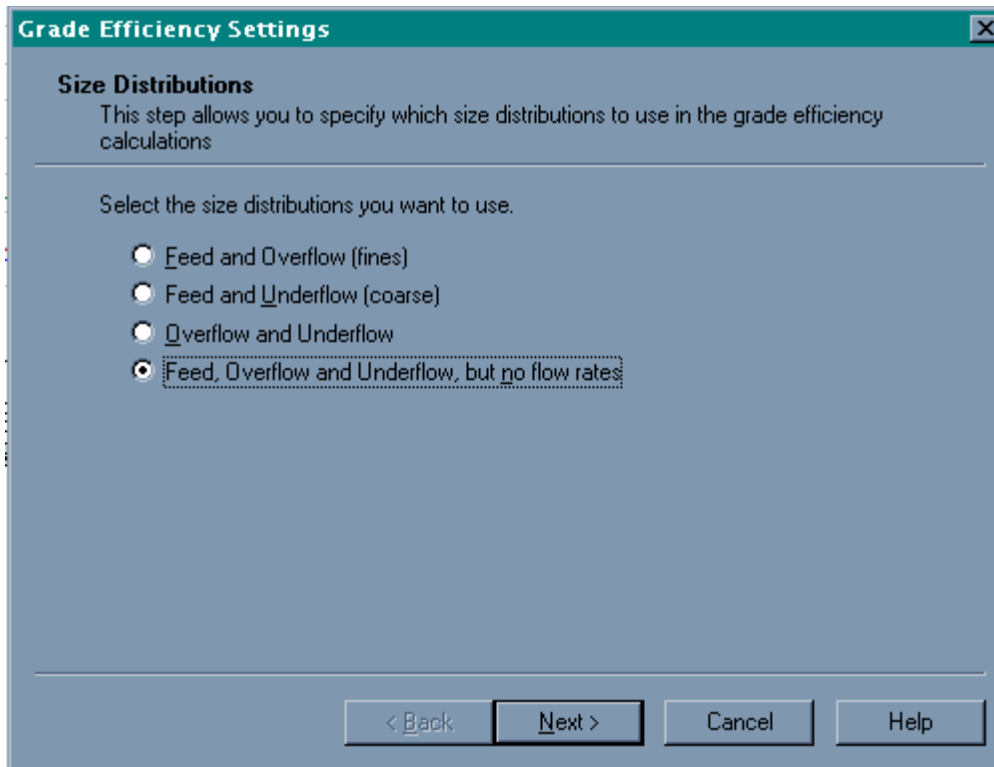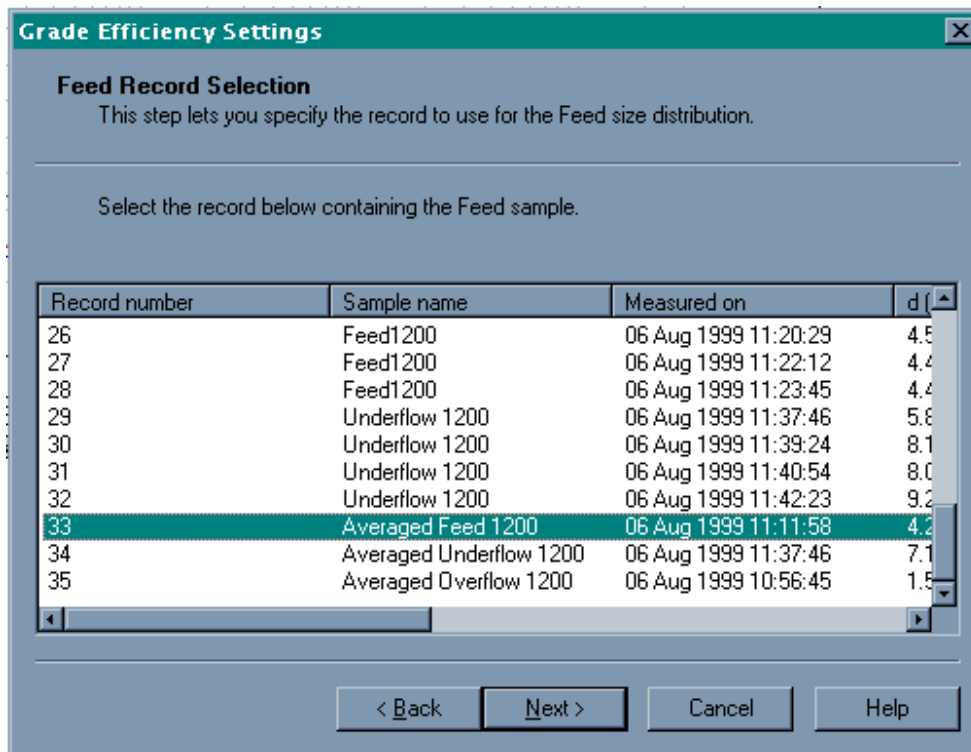
To calculate a grade efficiency curve, first **Edit - Grade Efficiency Settings**

This brings up the box above where the user can select the information available.

Clicking Next brings up the record selection screen for the first record:

The user selects the appropriate record, and clicks **Next** again and will enter a flow rate (if appropriate). This procedure is repeated until all required information has been given to the software.
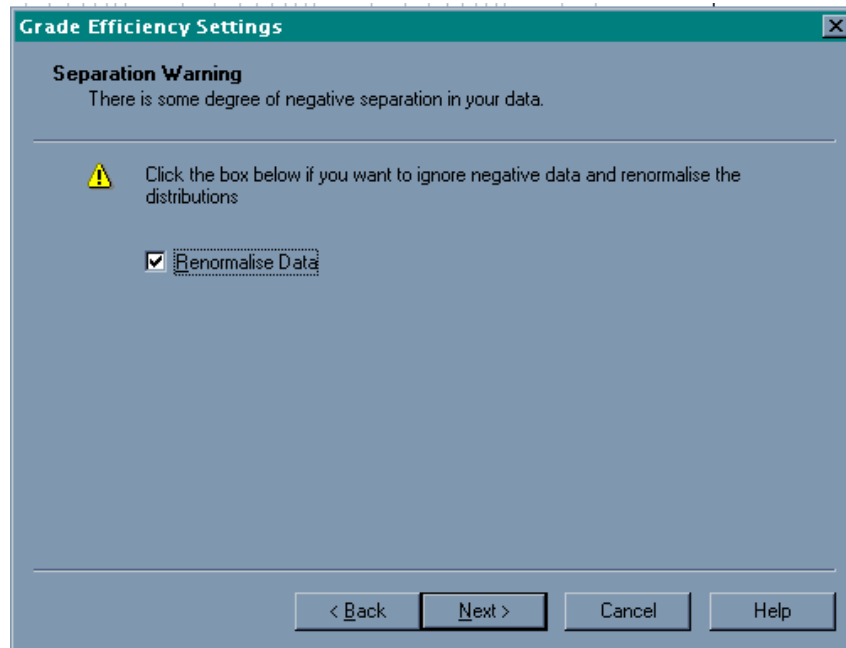
Software Update Notification

Sometimes, due to sampling errors or "piggybacking" (fines stuck to large particles and separated with them, which are then dispersed when the large material is sized), there may be material present in the overflow or underflow that is not present in the feed. In these cases, a negative separation warning (see below) will appear, giving the user the option to re-normalise the data.

Clicking **Next** will lead to a completion screen, then viewing a grade efficiency report page will give a table, curve and other information. This will include the record numbers / mass flow rates originally provided and the D25, D50, D75 and Sharpness:

Feed Mass Flow : N/A   Overflow Mass Flow : N/A   Underflow Mass Flow : N/A
Feed Record Number : 13   Overflow Record Number : 15   Underflow Record Number : 14

D25 :   um   D50 : 27.84 um   D75 : 45.71   um   Sharpness : 0.38
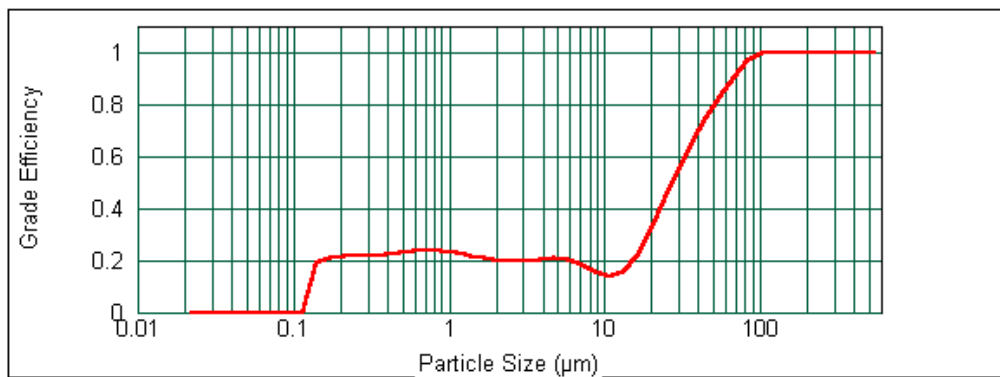
Size (µm)	Efficiency	Size (µm)	Efficiency	Size (µm)	Efficiency	Size (µm)	Efficiency	Size (µm)	Efficiency	Size (µm)	Efficiency
0.020	0.00	0.128	0.19	0.818	0.24	5.232	0.20	33.462	0.66	214.012	1.00
0.025	0.00	0.157	0.19	1.005	0.23	6.430	0.19	41.124	0.75	263.016	1.00
0.030	0.00	0.193	0.21	1.236	0.22	7.902	0.16	50.541	0.83	323.239	1.00
0.037	0.00	0.237	0.21	1.519	0.21	9.712	0.14	62.113	0.90	397.252	1.00
0.046	0.00	0.292	0.22	1.866	0.20	11.936	0.16	76.336	0.97	488.212	1.00
0.056	0.00	0.359	0.22	2.294	0.19	14.669	0.22	93.814	1.00	600.000	
0.069	0.00	0.441	0.22	2.819	0.20	18.027	0.32	115.295	1.00		
0.085	0.00	0.542	0.23	3.464	0.20	22.155	0.44	141.695	1.00		
0.104	0.00	0.666	0.23	4.257	0.21	27.228	0.55	174.139	1.00		
0.128	0.00	0.818	0.24	5.232		33.462		214.012			

7.10 Red light-only measurements

Certain coloured materials may give noticeably different amounts of obscuration in red and blue light. In these cases, an obscuration of 5-10% for a given concentration of material in red light will be matched by an obscuration of >50% in blue light. This causes multiple scattering in the blue light region, which will give erroneous results.
Such cases are however rare. The best course of action in such cases is to perform a red-only measurement. This feature, which was previously only available in engineering mode can be found in the advanced measurement options box in both the SOP and manual measurements.

7.11 Corrupt File Data Recovery

Occasionally (computers being what they are) the computer may hang and corrupt a data file, or maybe a cheap floppy disc might have been used. Whatever the reason, unreadable files are occasionally encountered (Very rarely, fortunately) In the past, all would be lost, but not now.
If version 3.00 can't open a file it will restore as much of it as it can. This way, only a few measurement records are likely to be lost rather than the whole file.

However, Malvern still recommends that all vital data files are backed up regularly as this is the only way to ensure complete data validity.

7.12   Editing operator comments is no longer a "blind" operation.

Previously, if the operator comments were edited on multiple records, there was no indication of the name of the sample whose record was being edited.. Now the following box clearly stating the sample ID is displayed when the operator comments are edited.
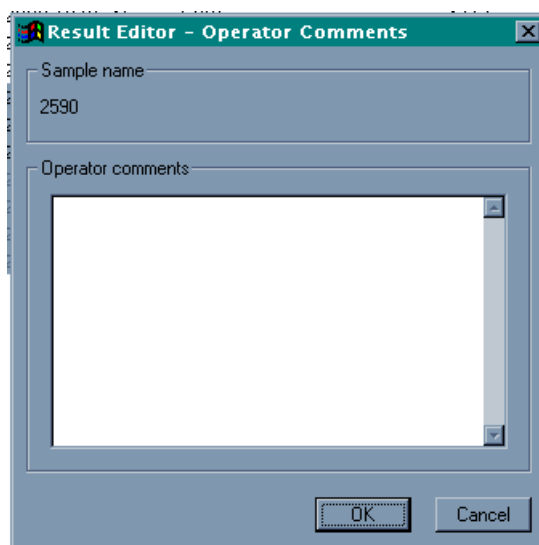
7.13   Measurement Filename in footer of printed page

When a result is printed, the name of the measurement from which it came is displayed on the footer of the printed page. This is useful if the actual measurement record has to be found later.

7.14   Phi Table

A phi graph has been present in the Mastersizer 2000 software since its inception. Unfortunately, this has not been matched by a table until now. Soil scientists often use a different size classification to present data. This is known as "phi notation" and is based on a power of two series where the class boundaries are labelled by the index. This does not necessarily correspond to "sensible" Mastersizer 2000 sizes. In this notation the 2000 measures from 15.5 phi (21 nm) to –1 phi (2000 um).

To convert from phi to microns,
Micron Size = 1000 * 2-phi

Phi	Volume In %
-1.0	
-0.5	10.95
0.0	36.20
0.5	36.00
1.0	12.17
1.5	0.55
2.0	0.00
2.5	0.00
3.0	0.00
3.5	0.00

Phi	Volume In %
3.5	
4.0	0.00
4.5	0.01
5.0	0.55
5.5	1.37
6.0	1.42
6.5	0.70
7.0	0.07
7.5	0.00
8.0	0.00

Phi	
8.0	
8.5	0.00
9.0	0.00
9.5	0.00
10.0	0.00
10.5	0.00
11.0	0.00
11.5	0.00
12.0	0.00
12.5	0.00

Phi	Volume In %
12.5	
13.0	0.00
13.5	0.00
14.0	0.00
14.5	0.00
15.0	0.00
15.5	0.00

The table is available in report designer for the creation of phi based reports where it would normally be combined with a phi graph.