
Software Update Notification



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application software version 2.00

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Mastersizer 2000 version 2.00 Application Software for use
with (English) Microsoft Windows95, Windows98 and
WindowsNT

Mastersizer 2000

(Part Number PSW0037/2.00)

I. Contents

I. Contents.....	2
1. Introduction.....	3
2. Instrument compatibility.....	3
3. Functional Features.....	3
3.1. Planned Additions not covered by an SCR.....	3
3.2. Planned Additions.....	3
3.3. Deletions.....	5
3.4. Changes.....	5
3.5. Known Bugs.....	6
3.6. Known Issues.....	6
3.7. Distribution Media.....	6
4. Installing Software.....	7
5. Directory Structure.....	7
6. What new features are present and how do I use them?.....	8
6.1. Overview.....	8
6.2. Record Numbers.....	8
6.3. Record Fields and the field chooser.....	8
6.4. Trend Graphs.....	10
6.5. Secure layered access.....	12
6.6. Ten-fold increase in file access speed.....	13
6.7. Result Emulation (formerly known as "Shape Factors").....	14
6.8. Cutting and pasting tables and graphs to other applications.....	23
6.9. Averaging.....	24
6.10. Improved Ultrasonic Control.....	26
6.11. Tank Fill Options.....	26
6.12. Zoom on the graph.....	26
6.13. "Vari-flow".....	27
6.14. Recording the actual number of snaps during a time-out event.....	28
7. Appendix A.....	29

1. Introduction

This update notification describes the release of version 2.00 application software for the Mastersizer 2000 system.

2. Instrument compatibility

This release is compatible with all Mastersizer 2000 products manufactured and is supported with Microsoft Windows 95™ (revision B or higher), Windows 98™ and Windows NT 4.0™ (service pack 5 or higher).

The firmware revision of the optical bench and sample handling units must be updated to firmware version 1.00, if not already done. Newly manufactured products automatically contain this version. Any older units will need updating by an engineer, as this is not a user task.

Version 2.00 application software is intended to update any system running version 1.00 application software. All installed systems should be updated to this latest version. This update is available free of charge as all systems installed are still in their warranty period.

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 not covered by an SCR.

Result Emulation.

Result emulation is a technique for modification of a Mastersizer result to emulate a result from an alternative particle sizing technique. A user may have previously used sieve measurements to control a process and may want the Mastersizer results to agree with the sieve results. The Mastersizer results may actually differ from the sieve results owing to the particles being non-spherical but the user may want the opportunity to produce a "sieve-like" measurement for comparison purposes.

The utility can be used to allow emulation of a wide variety of sizing techniques, provided that the technique being emulated provides sufficient data points and is consistent.

Secured Layered Access.

Operators with varying skill levels will use the Mastersizer 2000.

It is now possible to limit full access to the software to precisely defined groups of users.

This means that certain functions such as editing SOPs, deleting records and editing results can be reserved for authorised users only.

3.2. Planned Additions

¹ Software Change Request - Part of the Malvern ISO 9000 System.

SCR ¹	Description	Comments
360	Added ability to customise fields displayed on records page.	Implemented
314		
323		

368 363 764	Added copy to clipboard (also 'drag and drop') of widgets on views in main application. Also ability to import/export different data formats (text plus pictures) to Report Designer, either using the clipboard or 'drag and drop'.	Implemented
369	Speeded up loading and deleting of records	Implemented
539	Change to prevent editing of read only export template files.	Implemented
641	New result graph option, result normalised by concentration	Implemented
676	Addition of 'Above/Between/Below user sizes' export items.	Implemented
702	Added ability to use different values for particle refractive index for blue light.	Implemented
732	New data graph option, data normalised by obscuration	Implemented
767	Result Averaging	Implemented
891	Added record numbers. To make finding a particular record easier, records now have record numbers. These are assigned to records in ascending order as they are created. The record number refers uniquely to that record within that file. If a batch of records is deleted, the record numbers will remain unchanged. This means that, if the record numbering jumps from 10 to 16, there is clear evidence that records 11 to 15 have been deleted. If a record is cut from one file and pasted to another, the record number is not carried across to the new file otherwise duplication of record numbers would result.	Implemented
911	Add Vari-flow feature to SOPs. Some flaked materials have been found to align themselves into a structure in the flow cell under normal flow conditions. This structure gives rise to the appearance of a rogue peak, typically at 1000 nm. Stopping the flow allows the structure to "relax", at which point a good measurement can be obtained.	Implemented
919	Correction of a bug where if the cancel button was pressed while the instrument port was being set, the current setting was cleared to "" rather than being left alone. The communications would then fail and the next time that the dialogue was entered, the combo box would be empty.	Implemented
939	Allow data graphs to cope with all zero data	Implemented

3.3. Deletions

None.

3.4. Changes

SCR ¹	Description	Comments
310	Allow application of ultrasound during background measurement in Hydro 2000G and Hydro2000S SOPs	Implemented
317	Prevent SOP running while clean sequence is active	Implemented
332 334	Changes to tables to display correct result and labels when the result is transformed to surface, number etc.	Implemented
344	Change to use correct help ID on search criteria dialog	Implemented
392	Allow more control over ultrasound sequencing for Hydro 2000G and Hydro 2000S SOPs	Implemented
393	Add zoom feature to graphing package	Implemented
486	Add manual fill and clean facilities to Hydro 2000G and Hydro 2000S SOPs for non-aqueous dispersants	Implemented
504	Bug fix to correctly report results after 'Find Measurements'	Implemented
506	Bug fix to progress display during long searches.	Implemented
630	Improve/correct scale labelling on difference plots	Implemented
648	Correct Hydro 2000M bitmap (shows Hydro 2000MU not 2000M)	Implemented
652	Extend data graph scale range to allow small Y values (e.g. <= 1.1)	Implemented
679	Allow for running out of sample while obscuration triggering during a dry SOP	Implemented
680	Change to default "file open" dialog to folder previously accessed. (When the File - Open dialogue box was displayed, it would always open with the 'Measurement Data' directory. This was true even if a different directory had been used during the current session. The correction allows the dialogue to display the measurement directory last used)	Implemented
748	It is now possible to view results during a clean cycle.	Implemented
753	Allowable limits for particle density have been increased.	Implemented
761	Add new Trend graph component to graphing package	Implemented
825	Correct Phi scaling on result graph	Implemented
837	Date parameters are renamed to reflect date content. E.g. 'Sample Time' is now 'Measurement Date and Time'.	Implemented
842, 844	Autostart period is limited to 60 seconds as described in the manual.	Implemented

849	Correction of a bug where it was found that a freshly created SOP would not run.	Implemented
868	The display of the span formula has been replaced by the text 'Span' to avoid possible confusion.	Implemented
920	The validation of manual scaling of charts operates correctly.	Implemented
929	Possible to check use emulation file without specifying an emulation.	Implemented
930	It is no longer possible to select 'Always print results' and 'export data' without specifying the required parameters.	Implemented
931	The option to exit an SOP while the clean cycle is running has been greyed out.	Implemented
932	Improved helpfulness of 'poor measurement result' error message.	Implemented
933	It is no longer possible to select deleted parameters in the column chooser.	Implemented
937	Uninitialised dates are now displayed as a blank string rather than 00:00 30/2/1899.	Implemented
938	The result editor now shows the correct transform type.	Implemented
949	Export file selection no longer displays directories.	Implemented
950	Secured Layered Access no longer locks out use of toolbar.	Implemented
954	Windows95 toolbar header sizing now works correctly.	Implemented
958	The result emulation has improved extrapolation to zero.	Implemented
962	The help button for the manual measurement documentation property pages now works.	Implemented
1000	Refractive index of silicon changed from 1.4 to 3.5. The absorption remains at 0.1 as previously.	Implemented

3.5. 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 using the SCR system.

3.6. Known Issues

On some WindowsNT systems with 32MB of RAM, beta testers have reported 'out of virtual memory' errors. Upgrading the computer to 64MB of RAM (preferably greater) and re-configuring the virtual memory has resolved this problem. Malvern recommends a minimum of 64MB of RAM for WindowsNT.

3.7. Distribution Media

The full complement of files is listed in Appendix A.

4. Installing 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 change to the CD drive and in the MS2000 directory run the **setup.exe** program and follow the instructions.

If this is an update to a previous version of application software (e.g. v1.00), then it is strongly recommended that the user has backed up the Malvern directory to an independent media (e.g. tape, CD-Writer). (Remember it is the users responsibility to maintain backups and archives of all user data.) The previous version must now be uninstalled using **Windows, Settings, Control Panel, Add/Remove Programs**, selecting 'Yes' to any shared program files questions from the Uninstall Shield program. Note that the Uninstall Shield will probably report '**Uninstall completed. Some elements could not be removed. You should manually remove items related to the application.**' You should ignore this message, as it is reporting the fact that the user has created files, which were not present at the original installation. Then to install the software v2.00 either put the disc in the CD drawer and await the auto load sequence or change to the CD drive and in the MS2000 directory run the **setup.exe** program and follow the instructions.

Note: When using Windows NT 4.0ä installation is not allowed if the user does not have Administrator access. This is in line with Microsoft's Logo policy and is standard practice.

5. Directory Structure

The default directory structure is installed under program files as follows,

Shared	
Mastersizer 2000	-Export templates -Firmware Hex files -Measurement data -Models -Pages -Programs -SOP

The software is designed to run on Windows 95™ (revision B or higher), Windows 98™ and Windows NT 4.0™ (with service pack 5 or higher) and comes on one auto-loading compact disc (CD).

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

6.1. Overview

A quick scan of the content list indicates that there are a number of new features in Version 2.00 of the Mastersizer 2000 software. These are described in detail below, but the major features include a customisable records view, layered access, result emulation, averages, separate blue RI and a graph zoom as well as record numbering. Taken as a whole, these changes represent a significant improvement over Version 1.00 application software.

Any feedback should be reported to Malvern Instruments via the UK Help Desk via email helpdesk@malvern.co.uk or telephone on +44 (0)1684-891800

6.2. Record Numbers

To make finding a particular record easier, records now have record numbers. These are assigned to records in ascending order as they are created.

The following is a typical example of this.

Sample name	Record number	Source	Bulk lot	Measured on	Operator	SOP
1 mode 102nm latex	1			11 Nov 1998 14:35:20		
1 mode 304nm latex	2			11 Nov 1998 14:40:26		
1 mode 600nm latex	3			16 Oct 1998 16:09:24		
1 mode 1.0um latex	4			11 Nov 1998 14:29:10		
1 mode 2.0um latex	5			16 Oct 1998 14:47:04		
1 mode 5.0um latex	6			16 Oct 1998 14:41:54		
1 mode 9.0um latex	7			11 Nov 1998 14:31:32		
1 mode 25um latex	8			09 Sep 1998 15:15:45		
1 mode 50um latex	9			09 Sep 1998 15:18:03		
2 mode 0.20 + 0.45u...	10			16 Oct 1998 16:47:00		
2 mode 0.40 + 0.99u...	11			16 Oct 1998 15:50:16		
3 mode 1.0 + 2.0 + 5.0...	12			19 Oct 1998 15:33:04		
5 mode 0.1+0.5+1.0...	13			09 Sep 1998 15:40:04		
7 mode 0.1+0.5+1.0...	14			09 Sep 1998 15:43:40		

Figure 1: Measurement list showing record number field.

The record number refers uniquely to that record within that file.

If a batch of records is deleted, the record numbers will remain unchanged. This means that, if the record numbering jumps from 10 to 16, there is clear evidence that records 11 to 15 have been deleted.

If a record is cut from one file and pasted to another, the record number is not carried across to the new file otherwise duplication of record numbers would result.

6.3. Record Fields and the field chooser

The screen shot above shows the default display of the records page showing Sample name, Record Number, Source, Bulk Lot, Measured on, Operator and SOP. Now, however, this view can be modified to provide a very powerful new feature.

There are two ways of doing this.

The first way is to use the **View, Select Fields** menu option.

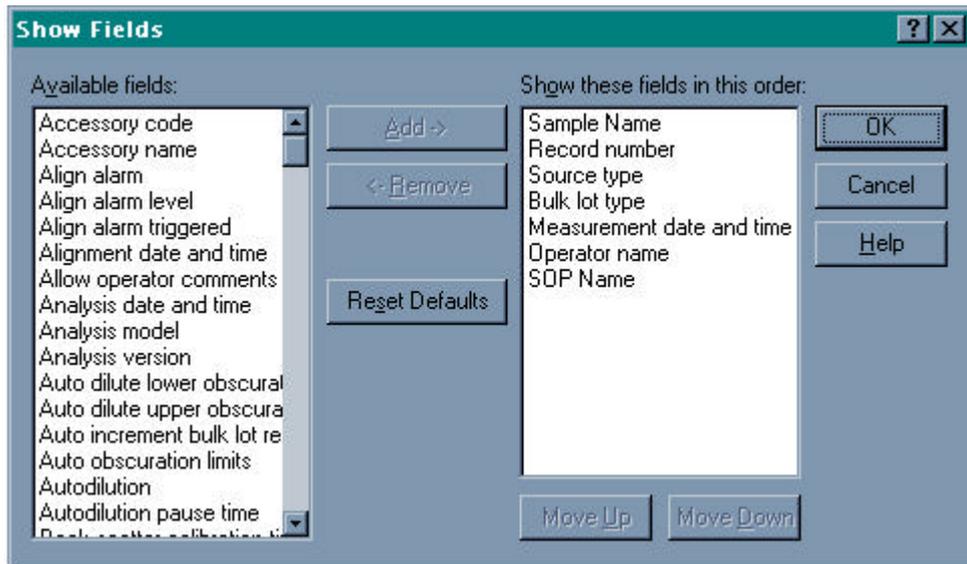


Figure 2: Show Fields dialogue

The dialogue shown above is displayed. Any of the available fields can be selected and added to or removed from the record view.

The second way is to use the **View, Field Chooser** menu option.

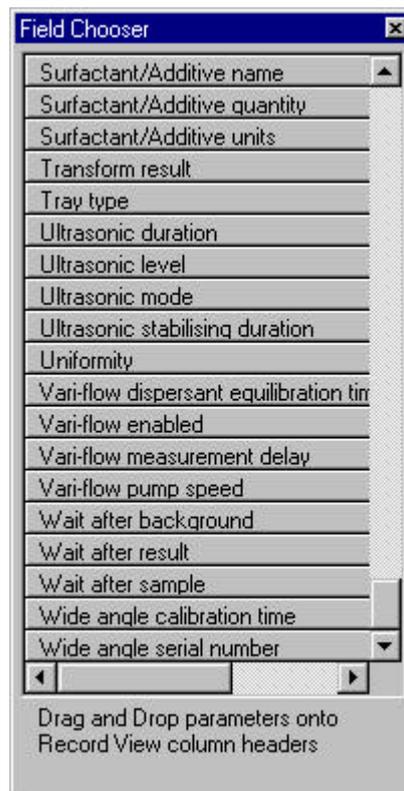


Figure 3: Field Chooser dialogue

The previous figure 3 shows a list of fields. To add a field to the Record view, simply click on the field and drag it onto the view. To remove a field, simply click on the field name (just under the record tab), hold down the Left Mouse Button and drag the field off the application. It is very easy to get views like the one shown below.

Sample name	Record number	d (0.1)	d (0.5)	d (0.9)	Measured on
1 mode 102nm latex	1	0.062	0.094	0.141	11 Nov 1998 14:35:29
1 mode 304nm latex	2	0.275	0.298	0.330	11 Nov 1998 14:40:26
1 mode 600nm latex	3	0.480	0.589	0.714	16 Oct 1998 16:09:24
1 mode 1.0um latex	4	0.926	1.013	1.123	11 Nov 1998 14:29:10
1 mode 2.0um latex	5	1.846	2.020	2.144	16 Oct 1998 14:47:04
1 mode 5.2um latex	6	4.725	5.339	6.102	16 Oct 1998 14:41:54
1 mode 9.0um latex	7	7.962	9.019	9.659	11 Nov 1998 14:31:32
1 mode 25um latex	8	23.308	26.449	28.821	03 Sep 1998 15:15:45
1 mode 50um latex	9	46.139	50.981	56.990	03 Sep 1998 15:18:03
2 mode 0.20 + 0.4...	10	0.176	0.296	0.540	16 Oct 1998 16:47:00
2 mode 0.49 + 0.9...	11	0.376	0.938	1.124	16 Oct 1998 15:50:16
3 mode 1.0 + 2.0 ...	12	0.934	1.863	5.441	19 Oct 1998 15:33:04
5 mode 0.1+0.5+1...	13	0.113	1.092	5.252	03 Sep 1998 15:40:04
7 mode 0.1+0.5+1...	14	0.128	2.109	44.256	03 Sep 1998 15:43:40

Figure 4: Customised Record View

To sort by any of these fields, just click on the field in the toolbar.

6.4. Trend Graphs

Monitoring the particle size provides key information on dynamic processes.

Measurements can be performed at different milling times, with different ultrasonication times, different air pressures, different pump / stir rates and can show such phenomena as aggregation / dissolution over a batch of repeat measurements. In the past, to compare such trends, data would have to be sent to Excel. Now it can be displayed directly in the Mastersizer software using the Trend graph feature. This can now be found among the graph options in Report Designer and can be added to a report in the usual way.

(For those new to the software, **Tools, Report Designer** will launch the application).

Right clicking on the graph will bring up the Trend graph Properties dialog box. To add a new property to plot, click on the add button. The default d(0.5) will now pop up in the list. Left click on it to replace it with any numerical parameter. Click on the "hide" checkbox to temporarily remove the item from the current plot. The x-axis can be changed by changing the "against" parameter at the bottom of the Trend Graph Properties box.

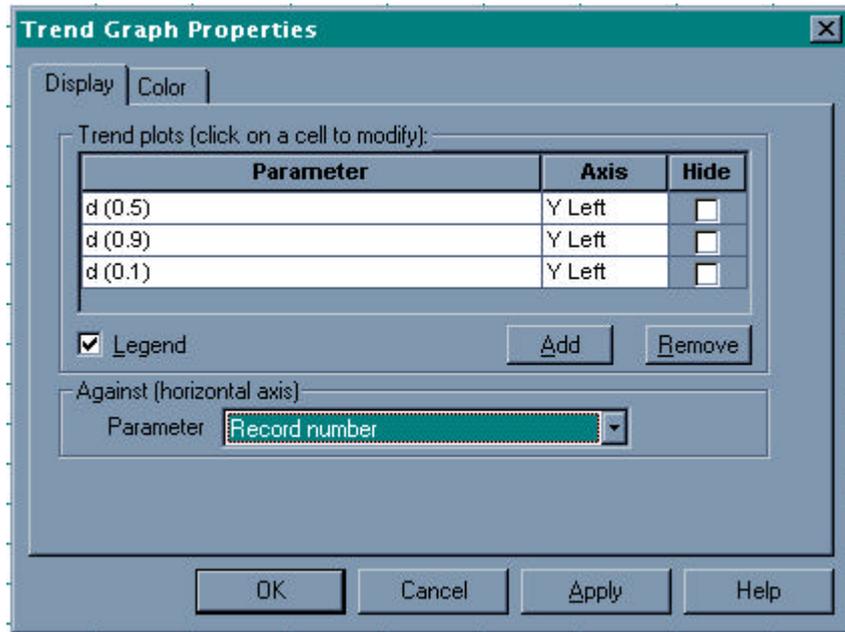


Figure 5: Trend Graph properties

The end result for a plot of $D(v,0.1)$, $D(v,0.5)$ and $D(v,0.9)$ against Record Number would look something like this.

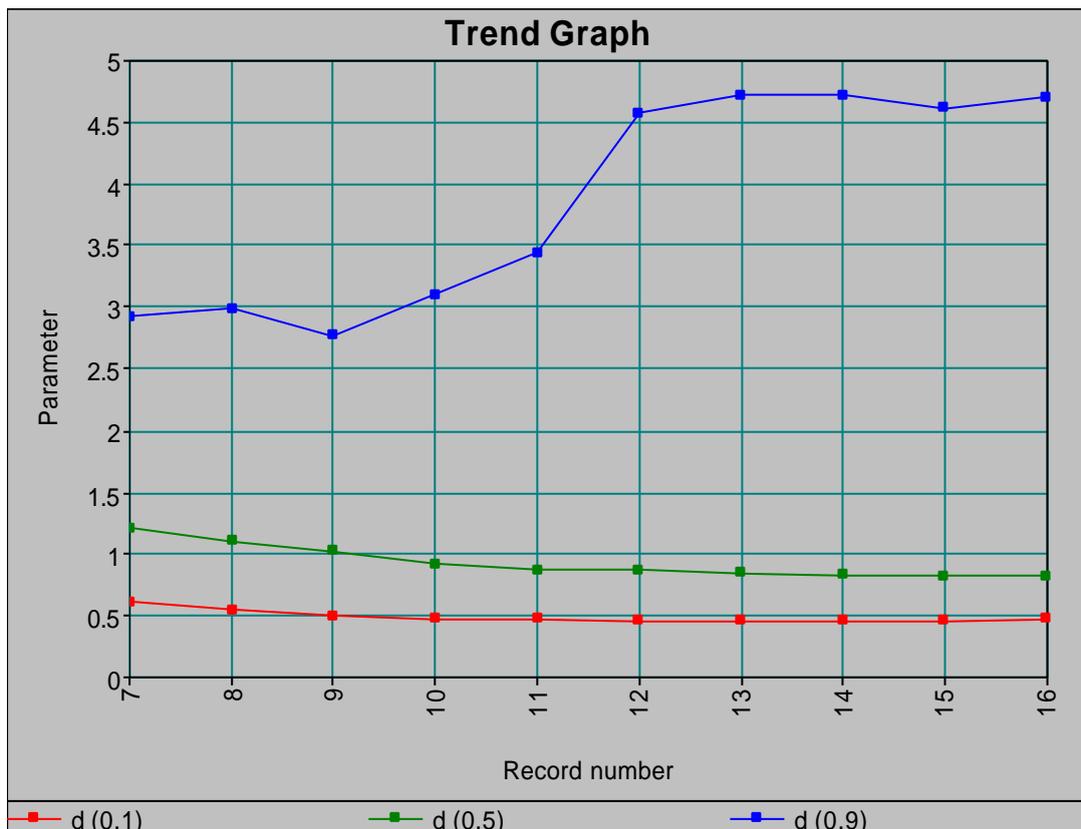


Figure 6: Trend Graph

6.5. Secure layered access

Operators with varying skill levels will use the Mastersizer 2000. It is now possible to limit full access to the software to precisely defined groups of users. This means that certain functions such as editing SOPs, deleting records and editing results can be reserved for authorised users only.

To set up the secure layered access feature, one user (preferably the one in charge of the instrument) should set himself up as the administrator.

To do this, use the **Tools, Secured Layered Access** menu option.

The following screen will be displayed. At the bottom of this, enter the name, password and a personal configuration file name (originally this will just be a copy of default).

The screenshot shows the 'Administrate Layered Access' dialog box. It features a title bar with a question mark and a close button. The main area is divided into three sections: 'Groups', 'This Group', and 'Users'. The 'Groups' section contains a table with columns 'Group Name' and 'Description', showing one entry: 'Administration' with description 'The administration group, (can access t...'. The 'This Group' section has input fields for 'Group Name' (containing 'Administration') and 'Description' (containing 'The administration group, (can access the administr...'), and buttons for 'Set Access Rights', 'Add/Edit', and 'Remove'. The 'Users' section contains a table with columns 'User', 'Password', and 'File Name', which is currently empty. Below it, the 'This User' section has input fields for 'User name' (containing 'Steve Ward-Smith'), 'Password' (containing 'test'), and 'Configuration File' (containing 'stevews'), with 'Add/Edit' and 'Remove' buttons. On the right side, there are 'OK', 'Cancel', and 'Help' buttons, a lock icon, a 'Show Password' checkbox, and a 'Security' section with radio buttons for 'On' and 'Off'.

Figure 7: Secured Layered Access Dialogue

The administrator name, password and configuration will be set once the Add/Edit button is clicked. Once the administrator has been established in this way, further groups of users can be added to the system. In a typical laboratory, the administrator may wish to set up a group of senior users who can do everything (apart from controlling the secured layered access as only the administrator can do this) and a group of users who can only perform measurements. To add a new group, a Group Name and Description are entered in the appropriate boxes and the Add/Edit button is clicked.

Setting Access Rights.

Clicking on **Set Access Rights** will open the following dialogue:

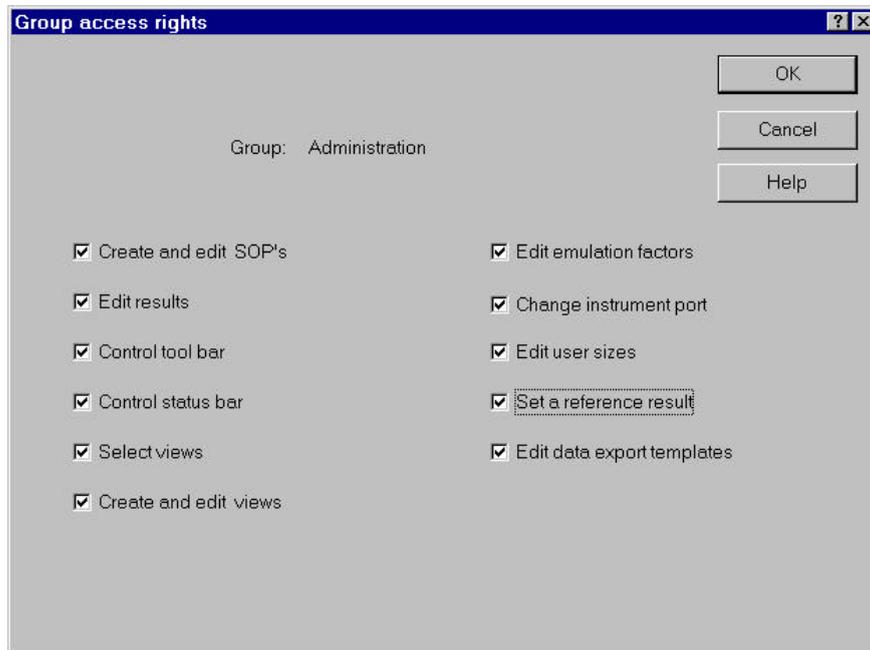


Figure 8: Group access rights dialogue

This example shows all the features enabled. If the administrator does not wish a group to be able to access a particular feature, the check box should be deselected. Clicking Ok will return the administrator to the main screen.

Once a group has been set up, users can be added to it. The group to which the user will be added should be highlighted, and the User Name, Password and Configuration file should be set up in the same way as previously described for the Administrator.

Viewing passwords.

An administrator can view the passwords of all the users by clicking in the "Show Password" check box.

Once the administrator is satisfied that the system has been set up correctly, security can be turned on by clicking in the "On" radio button and clicking "OK".

Once this has been done, users will have to enter user names and passwords when booting the software, and will only be able to perform the tasks to which they have been given rights of access.

Note: This utility has been designed primarily to afford user groups a measure of protection against careless or inexperienced personnel. Administrators looking to increase the security of their systems are strongly advised to install their software onto a Windows NTä platform and to use the security features embodied in the Windows NTä package.

6.6. Ten-fold increase in file access speed.

As the size of measurement files created with Version 1.00 software was increased, a noticeable slowing of certain operations such as over-plotting, deletion of files and editing of records would result.

In Version 2.00 software, file access has been speeded up by a factor of ten.

Note: despite the introduction of this feature, the creation of files containing thousands of records should be avoided as a principle of good practice.

It is always easier to find a particular record if the size of the file is restricted. It is also easier to back up smaller files; to back up files of many megabytes in size the user would need a PC with a CD writer fitted.

6.7. Result Emulation (formerly known as “Shape Factors”)

Result emulation is a technique for modification of a Mastersizer result to emulate a result from an alternative particle sizing technique. A user may have previously used sieve measurements to control a process and may want the Mastersizer results to agree with the sieve results. The Mastersizer results may actually differ from the sieve results owing to the particles being non-spherical but the user may want the opportunity to produce a “sieve-like” measurement for comparison purposes.

The utility can be used to allow emulation of a wide variety of sizing techniques, provided that the technique being emulated provides sufficient data points and is consistent.

6.7.1. Generating Result Emulation Factors

Result emulation factors describe how a Mastersizer result is translated into an external result (the particle size distribution measured by another instrument or technique). The result emulation generator wizard calculates these factors from a Mastersizer result and an external result. The factors may also be individually edited using the factor editor dialogue box, but this should rarely be necessary.

Important: It should be noted that the success of this technique depends on having as large a number of measurement points in the external result as possible. It should also be remembered that a set of factors produced for one particular variant of a material will not necessarily be suitable for all variants – changes in production processes will often have a significant effect on the morphology of a material.

6.7.2. Result Emulation Generator Wizard

The result emulation generator wizard is started by using the **Tools, Result Emulation, Generator Wizard** menu option. Operation of the wizard consists of three steps:

Select a Mastersizer result record.

Enter size and result values for a measurement made on the alternative particle size.

Generate and save the emulation factors.

The first page of the wizard shows details of the selected measurement record (shown below)

Result Emulation Generator Wizard - Step 1

Details of the selected measurement record are shown below.

The result emulation is calculated from this result and a measurement made of the same sample using an alternative technique.

Sample name:

Source:

Bulk Lot:

Measured on:

If this is not the correct measurement record; choose 'Cancel', select the correct record and start this wizard again.

Figure 9: Result Emulation generation wizard. Step 1

The second page of the wizard is divided into two parts. The lower half of the dialogue box is a graph that initially shows the selected Mastersizer result as a dark grey cumulative curve. The upper half of the dialogue box shows a grid where the results from the alternative particle sizing method are entered. The result must be entered as a cumulative undersize result with the largest size and 100% of the result as the top line in the grid. If the sizes or result values are entered out of order then users will be warned when they attempt to go to the next stage. As values are entered, the results will appear as blue points on the graph in the lower part of the dialogue box. Use the 'Insert Row' button to add new rows to the grid. When all the data points of the external result have been entered, it should be saved to a disk file using the 'Save...' button.

The 'Settings...' button displays a dialogue box to allow the generation of the emulation factors to be adjusted. See section 'Testing the emulation factors' for advice on using this dialogue box.

Note: The size of the wizard dialogue box is changed by clicking on the grip in the bottom right hand corner and dragging it with the mouse.

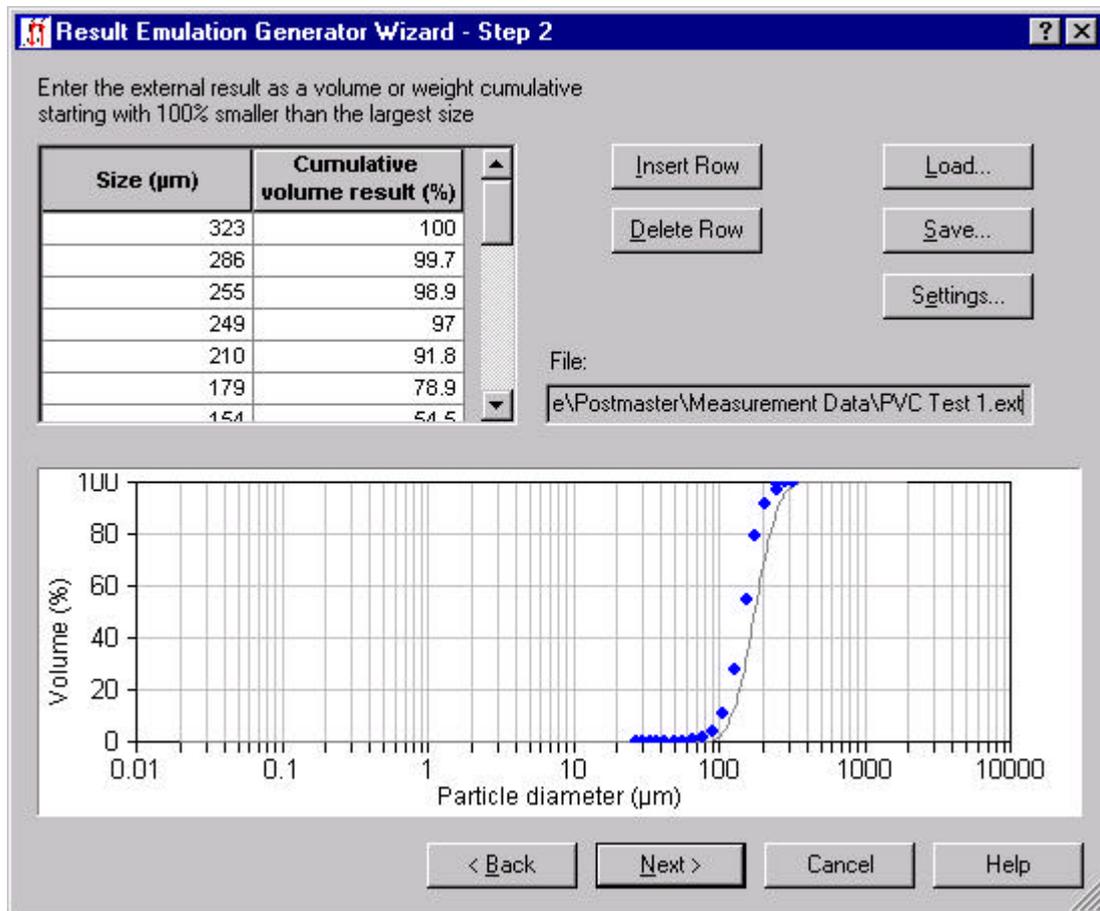


Figure 10: Result Emulation Generation Wizard. Step 2

After the external result has been saved, click the 'Next >' button to move on to step 3 of the wizard.

The third page of the wizard shows the result of the calculation of the emulation factors. If all is well, a smooth curve joining the points of the external result is added to the graph on the dialogue box. It is necessary to save the generated emulation factors to a file using the 'Save Factors...' button before finishing the wizard.

After the factors have been saved, the 'Preview...' button can be used to see a graphical representation of the factors.

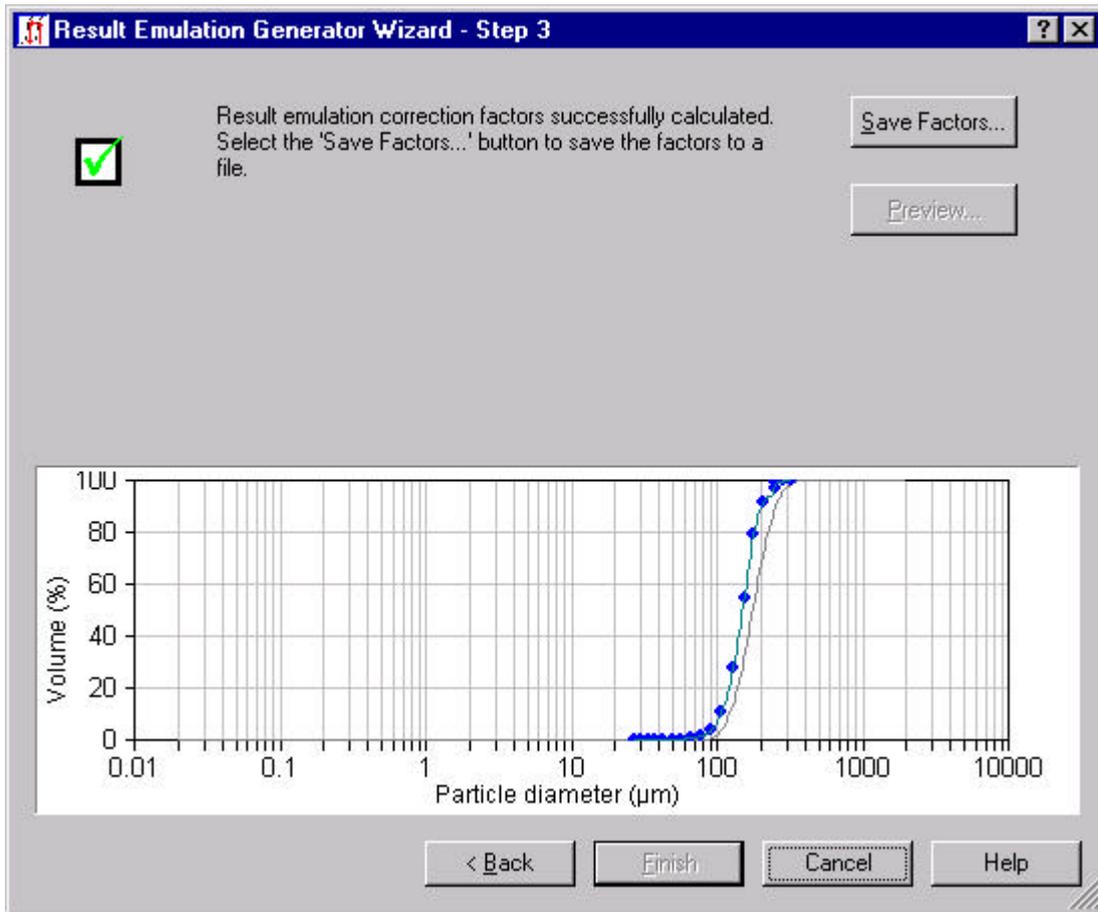


Figure 11: Result Emulation Generator Wizard. Step 3

6.7.3. Testing the emulation factors

The best way to test the generated emulation factors is to apply them to the Mastersizer result that was used to generate them. This should give the same result as was entered as the external result. Use the 'Result...' command on the Edit menu to create a new result with the result emulation factors applied. (See section 'Using Result Emulation with the Result Editor' for more details)

The new result can be compared with the external result either by using the percentile values (if available) or by direct graphical comparison in a spreadsheet (using the Export Data feature to send the results to the spreadsheet).

On some occasions, it may not be possible to successfully generate emulation factors. At step 3 of the wizard, a message will appear giving advice. The problems invariably arise from insufficient number of points describing the external result, particularly in regions where the cumulative curve has rapid changes in gradient. Even if the generation process has been successful, it is possible to get emulated results that have frequency curves that are not as smooth as the original result. In such cases, it is advisable to try and add extra points to the external result.

If it is not possible to add extra points to the external result, then it may be necessary to change the settings for the emulation generator. The settings dialogue box (shown below) is reached from step 2 of the generator wizard using the 'Settings...' button. The settings that may be changed are the extents of the result used in the calculation and the amount of smoothing applied to the factors. The default is that the result range used is from 1% to 99% of the cumulative result with no smoothing.

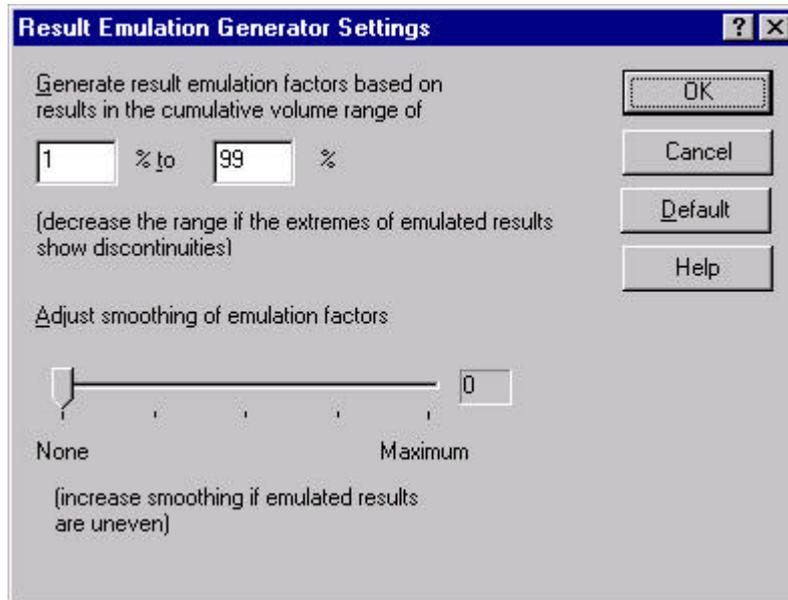


Figure 12: Emulation generator settings

6.7.4. Using Result Emulation with SOP Measurements

Result emulation is configured in the Advanced Result Calculation dialogue box. (This dialogue is reached using the 'Advanced...' button on the 'Material' page of the SOP)

The figure below shows the dialogue box. The bottom section deals with result emulation.

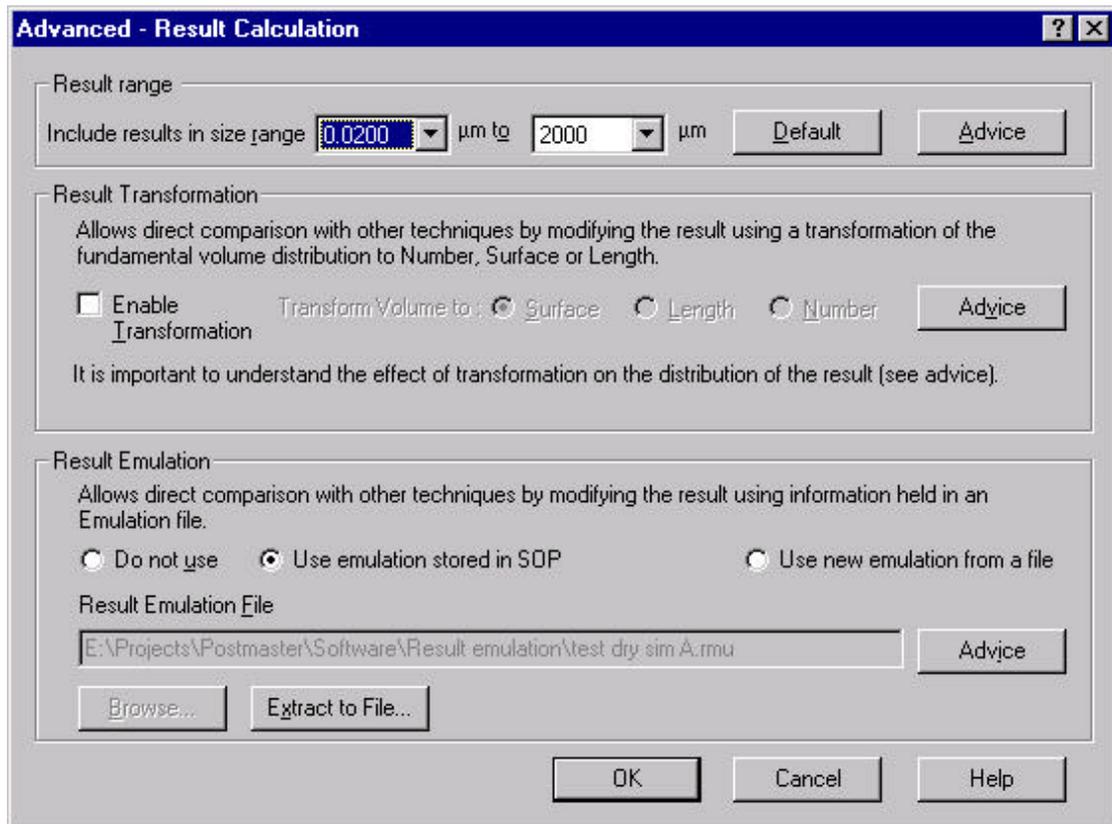


Figure 13: SOP Advanced Result Calculation

There are three options for setting result emulation:

Select 'Do not use' if you do not want to use result emulation.

Select 'Use emulation stored in SOP'. This option is only available if the SOP in question used result emulation. In such a case, the Result Emulation File box will show the file name of the factor file that was originally used.

Select 'Use new emulation from a file' to enable result emulation with a new factor file. The 'Browse' button will be enabled and will allow loading and previewing of a result emulation file.

The 'Extract to File' button is enabled if the 'Use emulation stored in SOP' option is selected. This extracts the emulation factors from a SOP and stores them in a result emulation factor file. This would be used to extract the factors embedded in a SOP for use in a manual measurement.

6.7.5. Browsing and Previewing Result Emulation Factor Files

To enable result emulation, it is necessary to select an emulation file. The Result Emulation Generator wizard creates this file. Click the 'Browse' button to display a dialogue box that allows the selection and previewing of emulation factor files. This dialogue box is shown below.

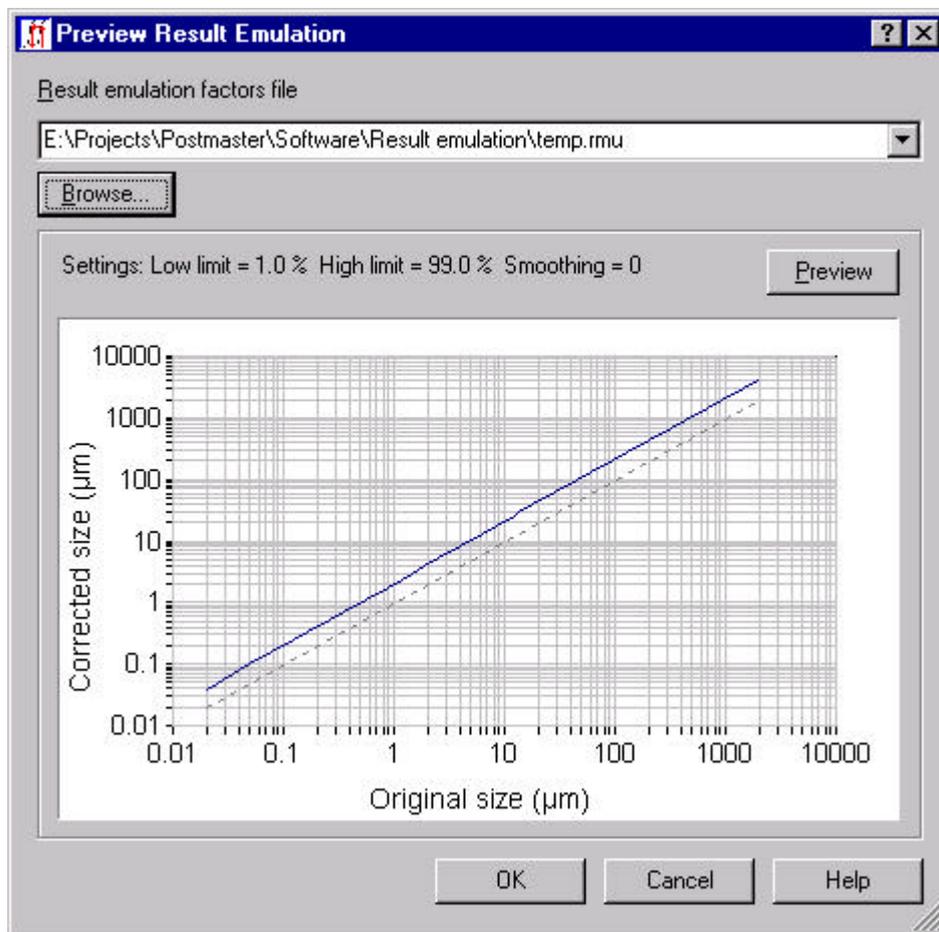


Figure 14: Preview Result Emulation

Use the 'Browse' button to open a result emulation factors file or type the path into the area above the button. A preview of the factors will appear on the graph. (If the path to the file is typed in, it will be necessary to click the 'Preview' button to load the factors and see the preview)

The preview area shows the settings of the limits and smoothing (see section 'Testing the emulation factors') and a graph. The graph shows how sizes as measured (bottom axis) are transformed to sizes in the emulated result (left hand axis). The grey dotted line is a reference for no emulation; that is, sizes in the emulated result are the same as the original result. The example in the figure is for an emulated result where sizes are double the values in the original measurement. The graph is only a rough guide to how results will be changed but is also useful for showing any major problems in the emulation generation process.

Note: Clicking on the grip in the bottom right hand corner with the mouse cursor and dragging it changes the size of the preview dialogue box.

6.7.6. Using Result Emulation with Manual Measurements

Result emulation is configured in the Advanced Result Calculation dialogue box. (This is reached using the 'Advanced...' button on the 'Material' page of the Measurement Options dialogue box)

The figure below shows the dialogue box. The bottom section deals with result emulation.

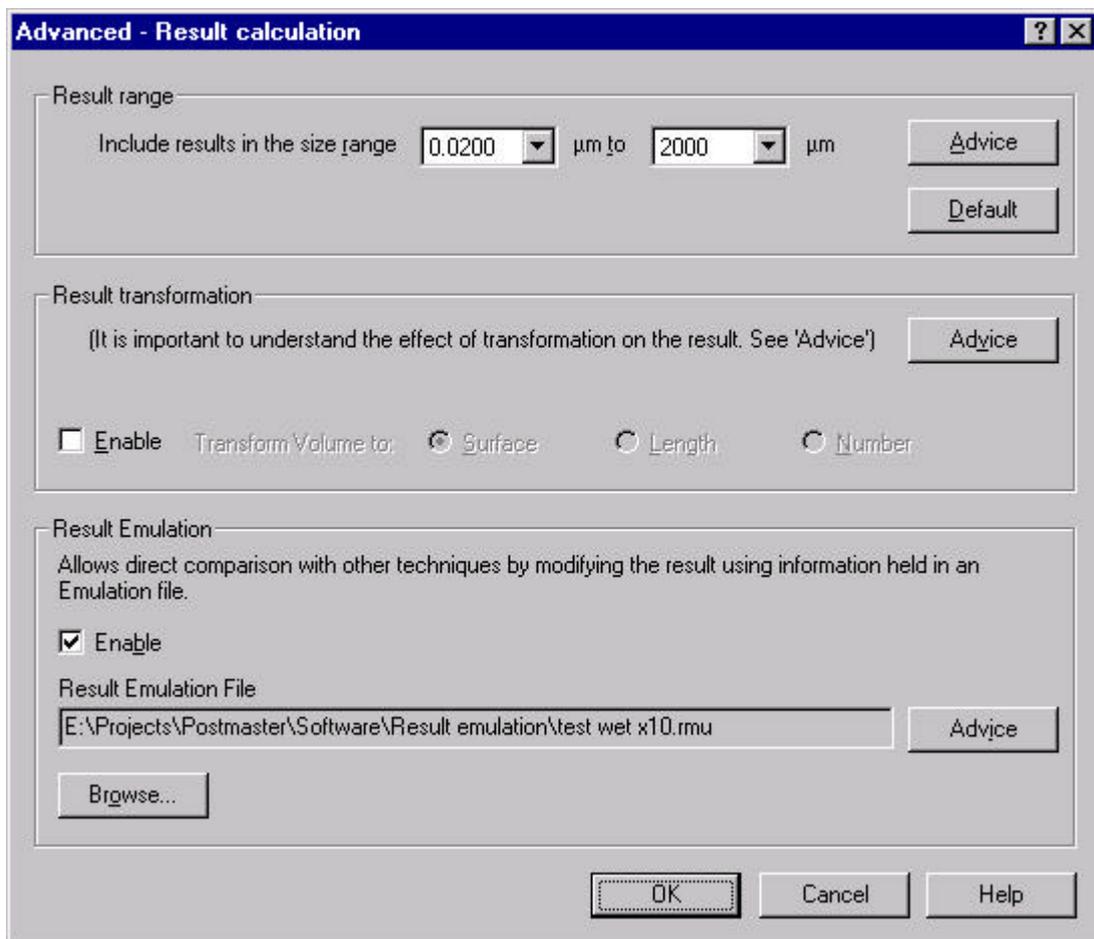


Figure 15: Result Calculation Settings

Setting the 'Enable' checkbox in the Result Emulation area enables result emulation. Use the 'Browse' button to load and preview a result emulation factors file.

6.7.7. Using Result Emulation with the Result Editor

Result emulation is configured in the Advanced Result Calculation dialogue box. (This is reached by using the 'Advanced...' button on the 'Material' page of the Result Editor)

The figure below shows the dialogue box. The bottom section deals with result emulation.

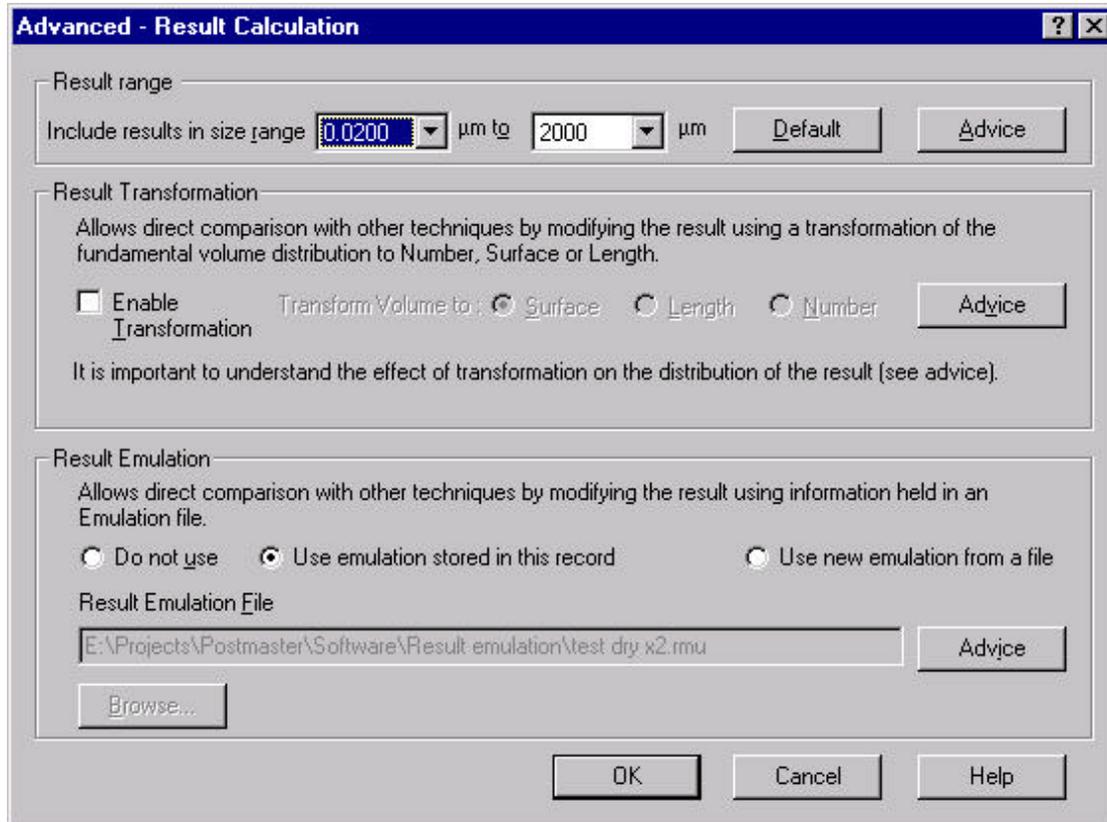


Figure 16: Result Calculation Settings

There are three options for setting result emulation:

Select 'Do not use' if result emulation is not required.

Select 'Use emulation stored in this record'. This option is only available if the first record selected has result emulation factors embedded in it. The Result Emulation File box will show the file name of the factor file that was originally used.

Select 'Use new emulation from a file' to use result emulation with a new factor file. The 'Browse' button will be enabled and will allow loading and previewing a result emulation factors file.

Options (b) and (c) will apply the same emulation factors to all the selected records.

6.7.8. Reporting on the Emulated Result

The default result screens and reports show if result emulation is enabled but only the parameters screen and report show the name and last modification date of the emulation factor file that was used. If result emulation is not used, then the file name parameter and the modification date are both blank.

6.7.9. Editing Result Emulation Factors

If the result emulation factor generator is found not to give the desired results, it is still possible to edit the factors directly. The result emulation factors editor is started from a command on the Tools menu **Tools, Result Emulation, Edit**. The dialogue box that appears is shown below.

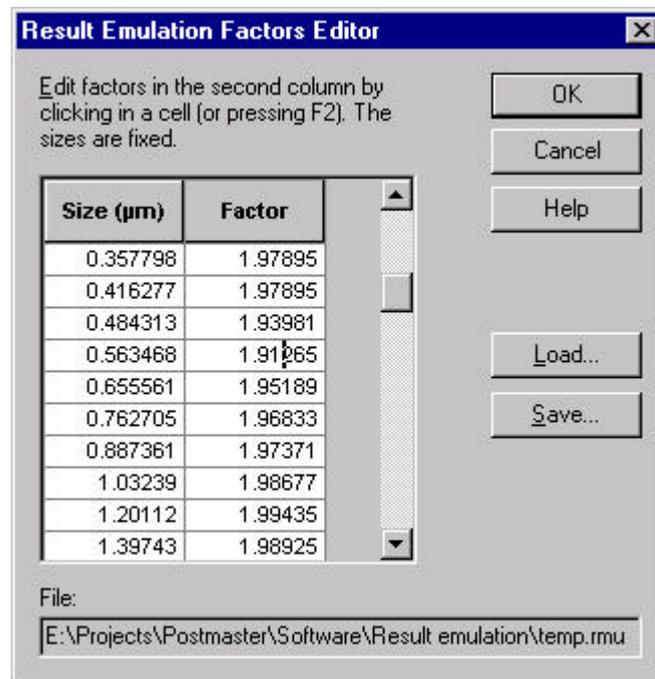


Figure 17: Result Emulation Factors Editor

The first step is to load a factor file to edit. The dialogue box contains a grid that allows the values to be edited in the same way as a spreadsheet. The first column of the grid contains the particle sizes associated with the factors; these cannot be edited. When editing is complete, use the 'Save...' button to save the edited factors to a file. At this point the factors are tested for consistency, that is, that the factors multiplied by the associated sizes gives a set of numbers that always increase with size.

6.8. Cutting and pasting tables and graphs to other applications

There are several ways to copy tables and graphs into other applications. The easiest method is to simply click on the graph or table required and 'drag and drop' it into the required application. Another method is to click on the graph and use **Edit, Copy Result Graph** or **Edit, Copy Result Table** menu options to copy it into the clipboard. It can then be pasted into the desired application. Alternatively the usual Windows CTRL-C to copy command can be used.

6.9. Averaging

It is now possible to create an average record from several records (normally repeats of the same sample). The records should be multiply selected by using the CTRL or SHIFT keys, and then **Edit, Create Average Result** should be selected.

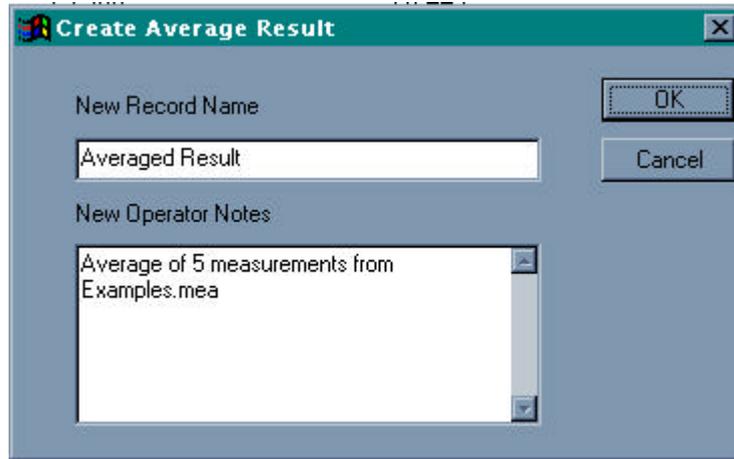


Figure 18: Create Average Result dialogue

The box above will be displayed and this will give the user the opportunity to enter a sample name and the record numbers that were used to create the average. The average will be created as a separate new measurement record capable of being saved and recalled.

6.9.1. Blue Refractive Index

For certain materials (most notably certain inks and pigments) the sample will have substantially different refractive indices in red and blue light. This is normally due to a material being highly adsorbing at one of the two wavelengths. In these cases, it is useful to enter both red and blue refractive indices separately (previously they were assumed to be the same).

For most materials you will NOT need to enter a blue RI. Blue RI information can be found from papers and textbooks in the same way as the red RI is. Determining the most appropriate choice of RI is achieved by a process of looking at the fit and residual and selecting the RI which gives a minimum fit error and residual.

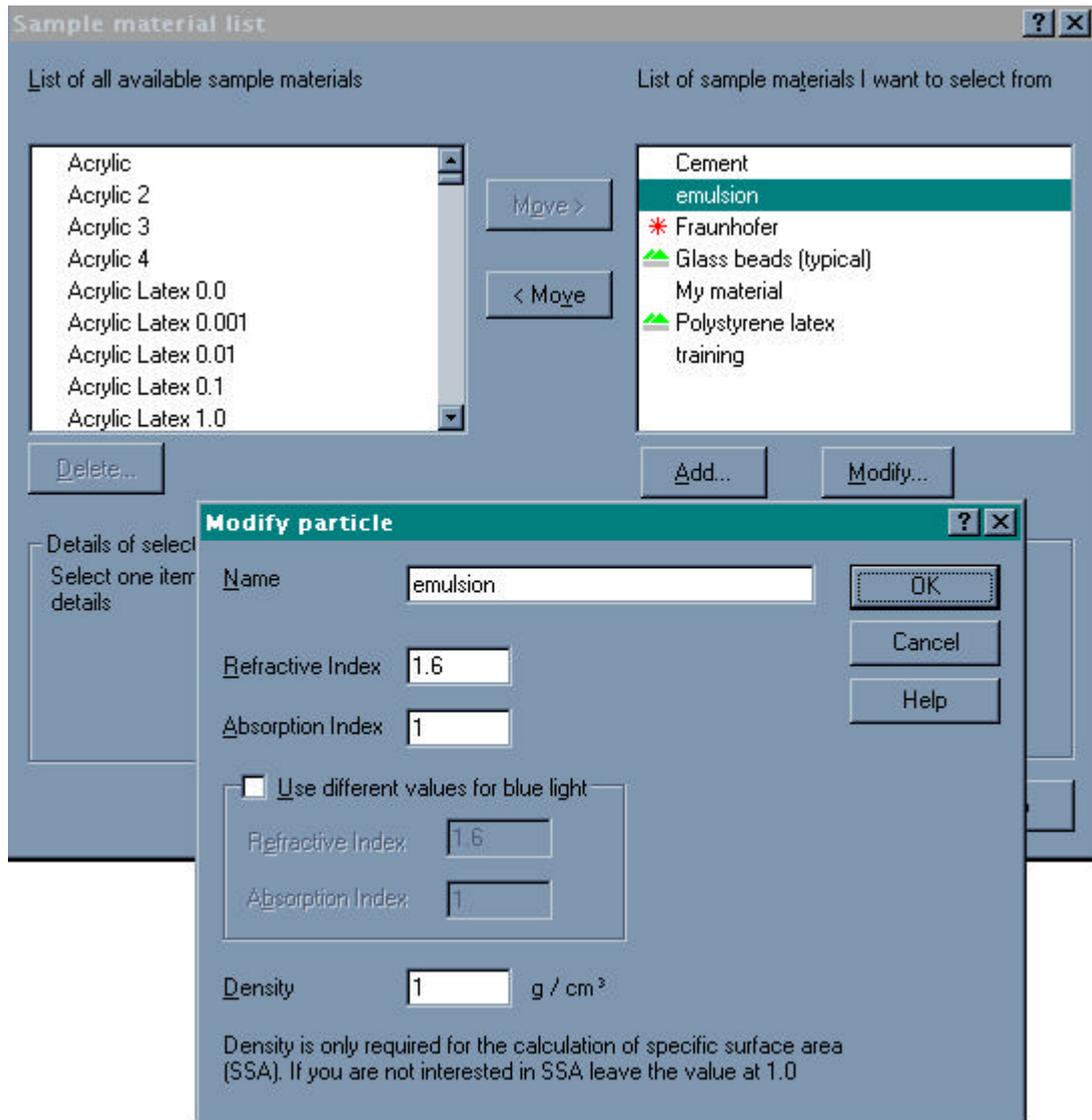
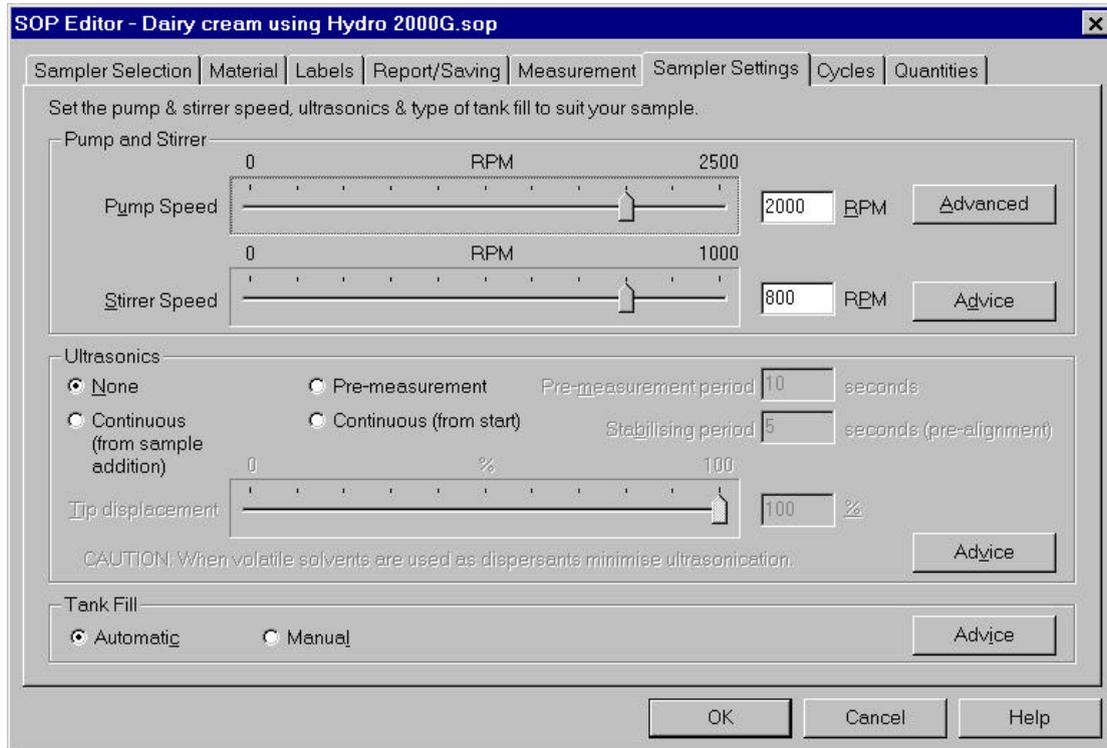


Figure 19: Modifying particle properties

To enter a blue refractive index, simply modify the refractive index used in the particle optical properties database. Click in the Use different values for blue light check box and enter the appropriate value.

6.10. Improved Ultrasonic Control

The ultrasonication options have been expanded to give more flexibility.



Sonication can be initiated continually from the start of the measurement procedure, continually from the moment of sample addition or as a timed process. Note the Advanced box (see point 13 for what it does).

6.11. Tank Fill Options

If the user is using an SOP calling for solvent, a “mains” supply of solvent is unlikely to be available. In such a situation, the dispersant valve would open and the system would wait for a predetermined period for the level sensor to report that the tank was full before shutting off the dispersant valve. Cleaning the tank was achieved by a series of discrete “Empty” and “Fill” steps.

Now the provision of a manual fill and a manual clean enables the user to clean the system easily using a beaker and a bottle of clean solvent. A series of prompts will guide the user through the cleaning cycle.

This also means that, since the manual fill and manual clean disable the dispersant valve, the user can make measurements using solvent without needing to disconnect the sample handling unit from the mains water supply.

6.12. Zoom on the graph

It is now possible to zoom in on the graph. Simply hold down the CTRL key and left mouse button, then slowly move the mouse and draw a “rubber band” box (from top left to bottom right) around the area to be enlarged. To zoom back out, simply draw a “rubber band” box in the opposite direction.

6.13. "Vari-flow"

If the advanced button in the SOP screen setting pump, stir and ultrasound is clicked, the following dialog box will appear:

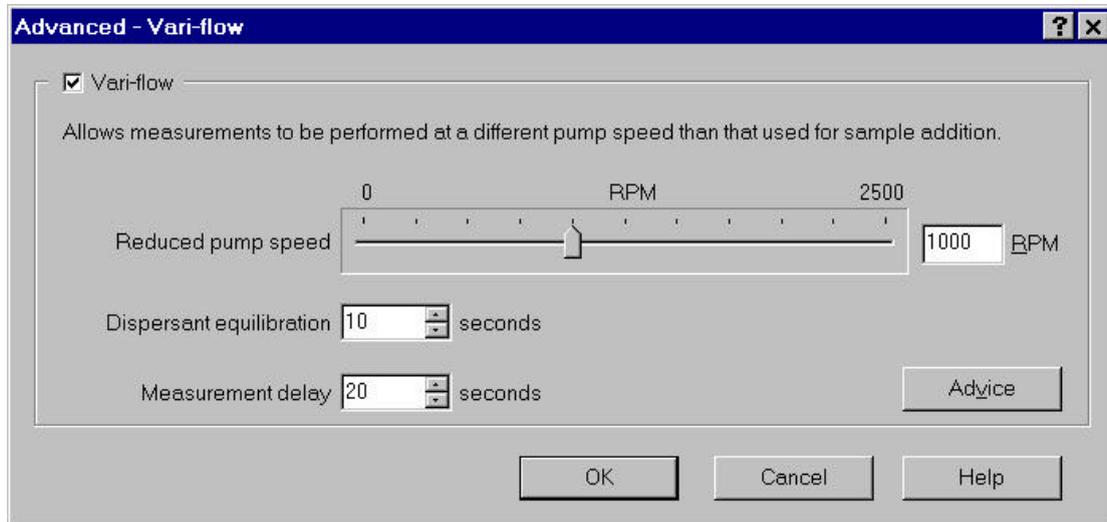


Figure 20: Vari-flow configuration screen

So what is Vari-flow and when should it be used?

Some materials such as metal flakes have been found to form structures when they are circulated through the flow cell at normal pump speeds. These structures give rise to a secondary diffraction pattern that is incorrectly interpreted as a small peak at 1000 microns. Vari-flow allows these materials to be dispersed in the tank in the normal way and then the pump is briefly turned off or reduced before measurement of the sample. When the pump is turned off, the structures in the sample are randomised and the measurement can be made without the occurrence of the secondary diffraction pattern.

When the flake material is suspended in a volatile solvent, such as white spirit, vari-flow is even more useful since it assists the rapid thermal stabilisation of the optics.

When the sample tank is filled with fresh solvent, very high backgrounds can often be observed. These arise from thermal gradients in the solvent causing steering of the laser beam onto the inner rings of the detector array. As the temperature equilibrates, the background will fall to normal levels (80 – 100) and the measurement can proceed. Pausing the pump after the solvent has had a chance to thoroughly disperse through the system will accelerate the fall of the background to normal levels.

What is the sequence of events?

The vari-flow cycle is as follows:

The pump is operated at full speed for an initial period to allow the dispersant to be thoroughly mixed and become thermally homogenous. This initial period can be set in the dialogue and is the Thermal stabilisation delay.

The pump speed then falls to a predetermined level (Reduced flow nnn rpm in the setup dialogue – this can be zero.) and an additional delay allows the background level to fall before the alignment is performed and the background is measured. (Optical stabilisation delay).

The pump speed is then returned to the higher rate for the sample to be added and dispersed in the normal way.

When the measure stage is entered, the pump speed will drop to the lower level and the system will wait for the duration of the optical stabilisation delay before measuring the sample. This delay is the delay to allow the relaxation of the sample in the flow cell so that a normal measurement can be obtained.

If repeat measurements are required, the pump will then return to the high level for a brief re-dispersion period and will then drop down again for the measurement process to be repeated. This will continue for as long as is prescribed in the SOP.

6.14. Recording the actual number of snaps during a time-out event

If a dry measurement runs out of sample, and times out as a result, the software now records the number of snaps measured before the sample was exhausted.

This figure can be used in tables as an indication of the completeness of the measurement e.g. "1750 of 2000 snaps measured."

The required measurement time is called measurement integration time demand.

The actual measurement time is called measurement integration time.

7. Appendix A

Complete listing of CD-ROM files for Mastersizer 2000 version 2.00 Application Software in compressed format. (Part Number PSW0037/2.00)

CD-ROM

After installation the uncompressed file structure will look like the following.

This does not include operating system DLL file updates and changes.

Directory Structure C:\Program Files\Malvern Instruments for Windows95 and Windows98

Volume in drive C has no label.

Volume Serial Number is A238-75F9

Directory of C:\Program Files\Malvern Instruments

```
11/09/99 09:09a <DIR> .
11/09/99 09:09a <DIR> ..
11/09/99 09:09a <DIR> Mastersizer 2000
11/09/99 09:09a <DIR> Shared
11/09/99 09:57a 0 dirlist
          5 File(s)          0 bytes
```

Directory of C:\Program Files\Malvern Instruments\Mastersizer 2000

```
11/09/99 09:09a <DIR> .
11/09/99 09:09a <DIR> ..
11/09/99 09:09a          80,616 Uninst.isu
11/09/99 09:09a <DIR> SOP
11/09/99 09:09a <DIR> Programs
11/09/99 09:09a <DIR> Firmware Hex Files
11/09/99 09:09a <DIR> Pages
11/09/99 09:09a <DIR> Models
11/09/99 09:09a <DIR> Measurement Data
11/09/99 09:09a <DIR> Export Templates
10/27/99 12:36p          2,247 mastersizer2k.CNT
10/27/99 12:37p        336,354 MASTERSIZER2K.HLP
11/18/99 05:00p        134,144 MieATL.dll
11/18/99 05:00p         69,632 Measurement Display.dll
11/18/99 05:00p    1,187,840 SOP Editor Package.dll
11/18/99 05:00p        159,744 Scattering Model Generator.DLL
11/18/99 05:00p        139,264 Result Calculator.DLL
11/18/99 05:00p         94,208 PMServer.dll
11/18/99 05:00p        176,128 PM Instrument Package.dll
11/18/99 05:00p         57,344 Measurement Simulator.dll
11/18/99 05:00p        425,984 Measurement Manager.dll
11/18/99 05:00p         86,016 Wet Accessory.dll
11/18/99 05:00p         57,344 Dry Accessory.dll
11/18/99 05:00p        304,128 LiveGraphXControl.ocx
11/18/99 01:02p         4,753 tips.txt
11/18/99 01:02p        30,700 Instrument Parameters.cfg
11/09/99 09:30a         5,987 Measurement.dat
11/09/99 10:18a         1,734 Mastersizer 2000.ini
11/09/99 10:18a          414 default user.ini
11/18/99 02:23p        12,300 particles.dat
11/18/99 02:23p         2,126 dispersants.dat
11/09/99 09:23a          83 $%&(!$^&.&^%
          32 File(s)        3,369,090 bytes
```

*Mastersizer 2000 version 2.00 Application Software for use with (English) Microsoft Windows95,
Windows98 and WindowsNT*

Directory of C:\Program Files\Malvern Instruments\Mastersizer
2000\SOP

11/09/99	09:09a	<DIR>	.
11/09/99	09:09a	<DIR>	..
11/18/99	01:02p		6,879 default.sop
11/18/99	01:02p		6,849 Result Editor.mod
11/18/99	01:02p		6,626 Dairy cream using Hydro 2000S.sop
11/18/99	01:02p		6,626 Dairy cream using Hydro 2000G.sop
11/09/99	09:23a		3,360 current.sop
		7 File(s)	30,340 bytes

Directory of C:\Program Files\Malvern Instruments\Mastersizer
2000\Programs

11/09/99	09:09a	<DIR>	.
11/09/99	09:09a	<DIR>	..
11/18/99	01:02p		4,842 Auto Dilution.BAS
11/18/99	01:02p		7,972 AutoMeasure Alarms.BAS
11/18/99	01:02p		29,323 AutoMeasure Dry Auto.BAS
11/18/99	01:02p		57,969 AutoMeasure Wet Auto.BAS
11/18/99	01:02p		25,508 AutoMeasure Wet Manual.BAS
11/18/99	01:02p		7,810 average.BAS
11/18/99	01:02p		15,934 Measure Manual.BAS
11/18/99	01:02p		10,660 Result Editor.BAS
		10 File(s)	160,018 bytes

Directory of C:\Program Files\Malvern Instruments\Mastersizer
2000\Firmware Hex Files

11/09/99	09:09a	<DIR>	.
11/09/99	09:09a	<DIR>	..
11/18/99	01:02p		141,740 Fidacs 1.00.ih
11/18/99	01:02p		134,520 HYDROG 1.00.ih
11/18/99	01:02p		130,879 HYDROS 1.00.ih
11/18/99	01:02p		128,985 SCIROCCO 1.00.ih
		6 File(s)	536,124 bytes

Directory of C:\Program Files\Malvern Instruments\Mastersizer
2000\Pages

11/09/99	09:09a	<DIR>	.
11/09/99	09:09a	<DIR>	..
11/18/99	01:02p		168,002 Sieve BS 410 1986 - ISO565 1990 (M).pag
11/18/99	01:02p		147,898 Fit (M).pag
11/18/99	01:02p		187,361 Parameter report (M).pag
11/18/99	01:02p		165,860 Result Analysis (M).pag
11/18/99	01:02p		166,143 Result Difference (M).pag
11/18/99	01:02p		167,953 Sieve ASTM E11 61 (M).pag
11/18/99	01:02p		133,932 Data (M).pag
11/18/99	01:02p		116,566 Result Statistics (M).pag
11/18/99	01:02p		4,810 Linearity (M).pag
11/18/99	01:02p		139,477 Trend (M).pag
		12 File(s)	1,398,002 bytes

*Mastersizer 2000 version 2.00 Application Software for use with (English) Microsoft Windows95,
Windows98 and WindowsNT*

Directory of C:\Program Files\Malvern Instruments\Mastersizer
2000\Models

11/09/99	09:09a	<DIR>	.
11/09/99	09:09a	<DIR>	..
11/18/99	01:02p		29,142 0-0-10000.sm
11/18/99	01:02p		29,142 15200-100000-13300.sm
11/18/99	01:02p		29,142 15200-100000-10000.sm
11/18/99	01:02p		29,142 0-0-13300.sm
11/18/99	01:02p		29,142 15900-0-13300.sm
		7 File(s)	145,710 bytes

Directory of C:\Program Files\Malvern Instruments\Mastersizer
2000\Measurement Data

11/09/99	09:09a	<DIR>	.
11/09/99	09:09a	<DIR>	..
11/09/99	10:18a		166,243 Examples.mea
11/18/99	01:02p		1,295 Default (dry).rmu
11/18/99	01:02p		1,122 Default (dry fine).rmu
11/18/99	01:02p		1,504 Default (wet).rmu
		6 File(s)	170,164 bytes

Directory of C:\Program Files\Malvern Instruments\Mastersizer
2000\Export Templates

11/09/99	09:09a	<DIR>	.
11/09/99	09:09a	<DIR>	..
11/18/99	01:02p		134 Result Analysis (M).edf
		3 File(s)	134 bytes

Directory of C:\Program Files\Malvern Instruments\Shared

11/09/99	09:09a	<DIR>	.
11/09/99	09:09a	<DIR>	..
11/18/99	01:43p		15,056 Malvern Application.tlb
11/18/99	05:00p		241,664 ViewEdit.exe
11/18/99	05:00p		643,072 Malvern.exe
11/18/99	05:00p		94,208 VistaLib.dll
11/18/99	05:00p		155,648 Launcher.exe
11/18/99	01:44p		8,260 Instrument Interfaces.tlb
11/18/99	05:00p		57,344 ISAC Communications Package.dll
11/18/99	05:00p		45,056 Parameter Set Interface.dll
11/18/99	05:00p		237,568 Result Statistics.dll
11/18/99	05:00p		135,168 Engineering.dll
11/18/99	05:00p		163,840 Malvern Tables.ocx
11/18/99	05:00p		122,880 widgets.ocx
11/18/99	05:00p		286,720 Malvern Graphs 2.ocx
11/18/99	05:00p		36,864 Vista Tools.dll
11/18/99	05:00p		73,728 Security.dll
		17 File(s)	2,317,076 bytes

Total Files Listed:

105 File(s)	8,126,658 bytes
	1,882,324,992 bytes free