CPAS
Electrostatic Evaluation
Project no 644.
April 2002
Funded by CRDC

THE UNIVERSITY OF QUEENSLAND

The Centre for Pesticide Application and Safety

Final Report

Field Evaluation and Droplet Spectrum Analysis
For the Spectrum Electrostatic System for use in Cotton

The Centre for Pesticide Application and Safety is a national scientific research and training group that provides a wide range of research and consultancy services to industry and government in pesticide application technology

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CRDC 186C

Executive Summary

CRDC Funded Evaluation of the Spectrum Electrostatic Application System Fitted to An Agricultural Aircraft – Deposition Study on Mature Cotton.

Objective: To compare the deposition and drift profiles of the Spectrum electrostatic system at 10 L/ ha with Micronair AU 5000 units at 30 L/ha fitted to a fixed wing aircraft using fluorometric techniques.

Conclusions

Deposition onto leaves within the cotton canopy

Results obtained in this experiment, under the environmental conditions experienced, indicate that treatment 1 (electrostatics on at 10 L/ha) delivered equivalent levels of deposition (significant at 0.05 level) onto leaves within various zones sampled as treatment 3 (micronair at 30 L/ha) .

The CV of deposition in each zone of the canopy tends to indicate that treatment 1 (electrostatics on) produced less variation of deposit within the canopy (ie. a more even deposit across the two swaths sampled).

Deposition onto artificial collectors

Results obtained in this experiment indicate that there was no significant difference in the amount of fluorescent dye was arriving at the top of the canopy between any of the treatments. Treatment one (electrostatics on at 10 L/ha) was able to deliver the same quantity of dye to the crop as treatment3, the micronair at 30 L/ha.

However significantly less dye was recovered from flat plates at the bottom of the canopy in treatment one (electrostatics on) than for other treatments. This may indicate that when the electrostatically charged droplets were applied much of the material was captured by foliage.

Drift.

The results in this experiment, while not conclusive, do show some very interesting trends. The results obtained indicate that Treatment 1 (electrostatics on) produced a rapid reduction in the amount of material leaving the field with distance from the treated area.

Treatment 1 (electrostatics on) produced lower deposits at 311m downwind than Treatment 3 (micronair).

General Conclusion

Results obtained in this experiment indicate that the electrostatics system does warrant further investigation, particularly considering that in this experiment the electrostatic system was able to deliver equivalent levels of deposition, with lower CV's and similar or less drift at application rates of 10 L/ha when compared with the micronair au5000 at 30 L/ha.

The ability of the electrostatic system to demonstrate equivalent deposition at 10 L/ha in this trial indicates that in using such a system there may be potential cost savings to growers through reduced costs of application, increased productivity and improved timeliness of application. The ability of the system to deliver equivalent deposition with similar or lower CV's and levels of drift should be investigated further.

CPAS Project Number: 644

Part 1: Field Evaluation of Electrostatic Nozzles Fitted to an Agricultural Aircraft.

OBJECTIVE:

To conduct a preliminary evaluation of the deposition characteristics onto mature cotton plants and the associated drift profile of an electrostatic application system fitted to an aircraft, and compare it with an application system currently used in commercial practice.

METHODOLOGY: (Overview):

This single trial was conducted to compare the same aircraft fitted with the 'spectrum' electrostatic system operating at 10 L/ha with a micronair AU5000 rotary atomisers operating at 30 L/ha (as an example of commercial practice). The evaluation was conducted on a mature cotton field (just prior to defoliation).
Deposition of a fluorescent dye was measured on leaves from various zones within the crop canopy and on artificial collectors within the field and on drift arrays located downwind from the field. Amounts of dye were quantitatively measured using fluorometric techniques and analysed using a standard one-way analysis of variance and calculations of the coefficient of variation CV.

Design: A single, unreplicated, three whole plots (intensive sampling within each).

Treatment Details:

Treatment 1: (Electrostatics ON at 10L/ha)

Helios® 500 SC fluorescent dye was applied at approximately 10 gai/ha in water using a CESSNA T188C AIRCRAFT supplied and setup by Gwydir Air Moree.

The aircraft was fitted with 80 electrostatic nozzles setup to deliver a total volume of 10 L/ha at an airspeed of approx 54 m/sec producing a VMD of 150-160 microns.

The electrostatic charge will be TURNED ON for this treatment.
Swath width: 15 m. Number of swaths: 10

Treatment 2: (Electrostatics OFF at 10L/ha)

Helios® 500 SC fluorescent dye was applied at approximately 10 gai/ha in water using a CESSNA T188C AIRCRAFT supplied and setup by Gwydir Air Moree.

The aircraft will be fitted with 80 electrostatic nozzles setup to deliver a total volume of 10 L/ha at an airspeed of approx 54 m/sec producing a VMD of 150-60 microns.

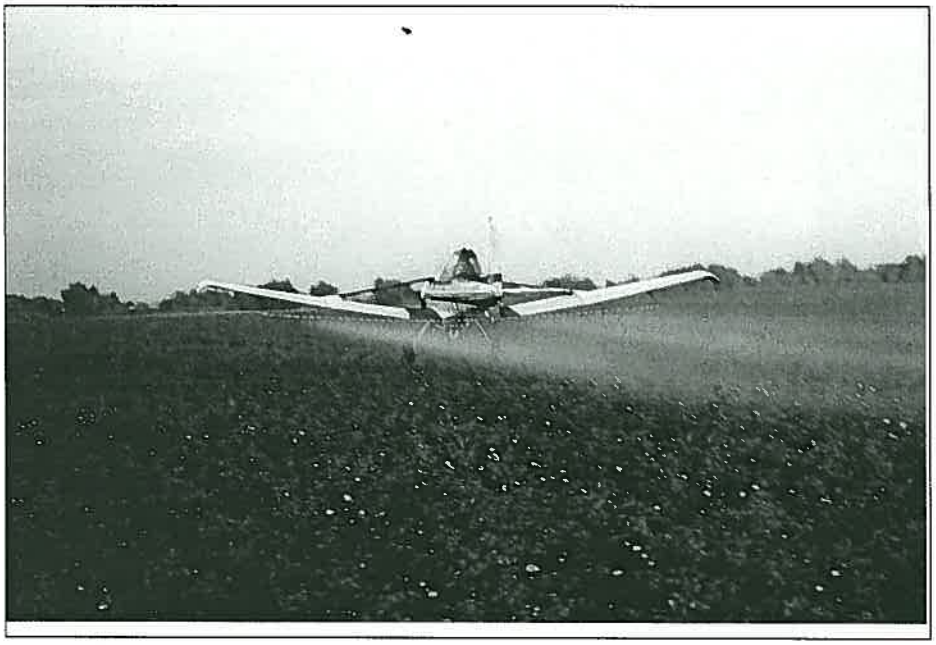
The electrostatic charge will be TURNED OFF for this treatment.
Swath width 15 m. Number of swaths: 10

Treatment 3: (Micronair at 30 L/ha)

Helios® 500 SC fluorescent dye was applied at 25 gai/ha in water using a CESSNA T188C AIRCRAFT supplied and setup by Gwydir Air Moree.

The aircraft will be fitted with 8 micronair AU5000 rotary atomisers setup to deliver a total volume of 20 L/ha at an airspeed of approx 54 m/sec producing a VMD of 150-160 microns.

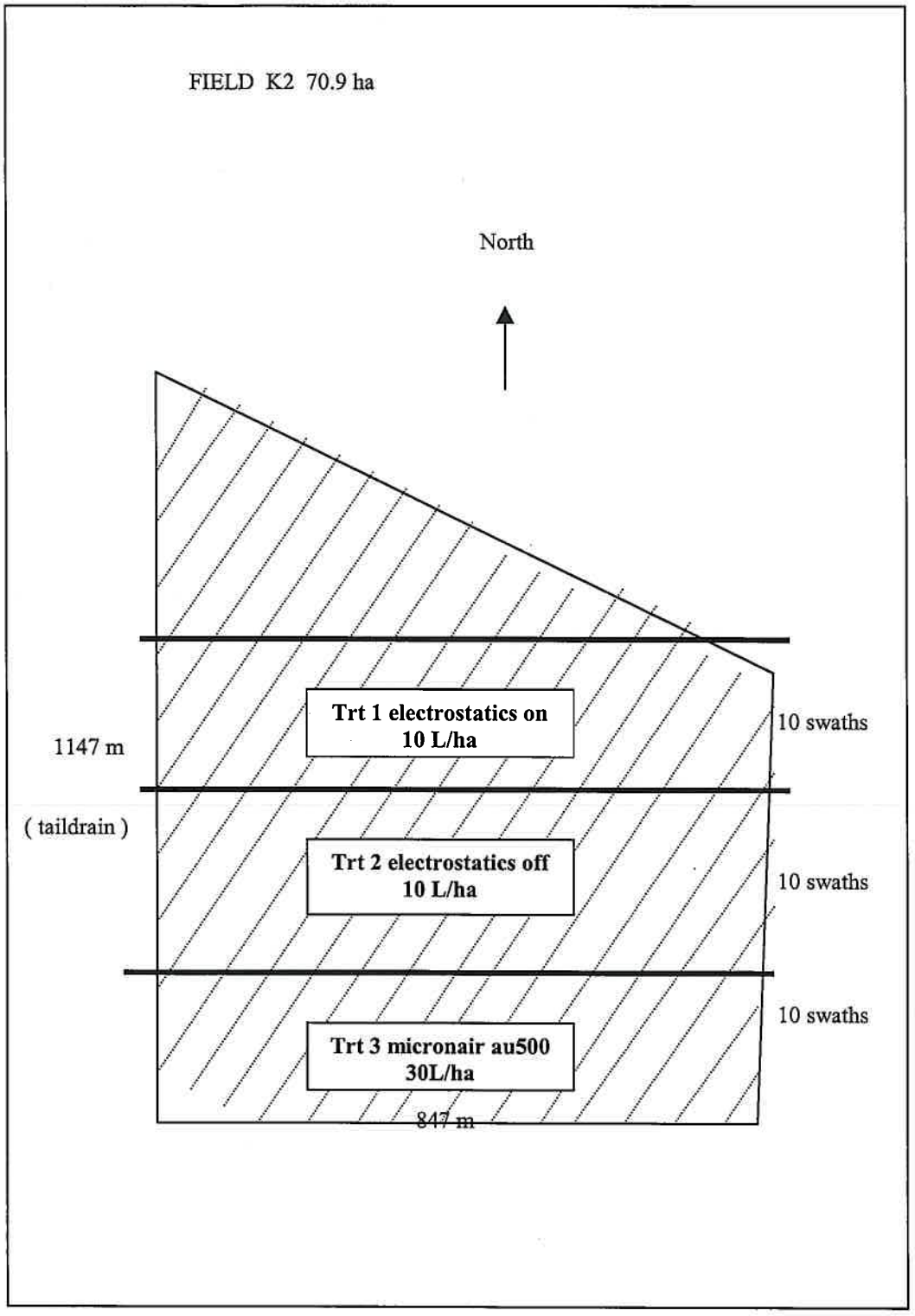
Location / Cooperator: Moree, Property CAROALE/KERN



The Electrostatic On Treatment in use during the trial.

The aircraft fitted with the 80 spectrum electrostatic nozzles prior to the trial.

Overall Trial Layout



SAMPLING METHOD

Deposition onto leaves.

For each of the three treatments leaves were collected from ten locations within centre two swaths of each treatment (two rows of five sampling positions).

```
     5m          5m          5m          5m
X         X         X         X         X

     X         X         X         X         X
         5m          5m          5m          5m
```

At each location of the ten locations, leaves were collected from each of the 3 positions on the cotton plants, those being:

The Upper (leaves from the top 4 nodes),
The Mid (leaves from the outer part of canopy adjacent to first fruit retention) and
The Inner (Inner part of plant adjacent to the mid).

At each of the ten locations, artificial collectors were also used to sample deposition and assess the CV both above and within the canopy.

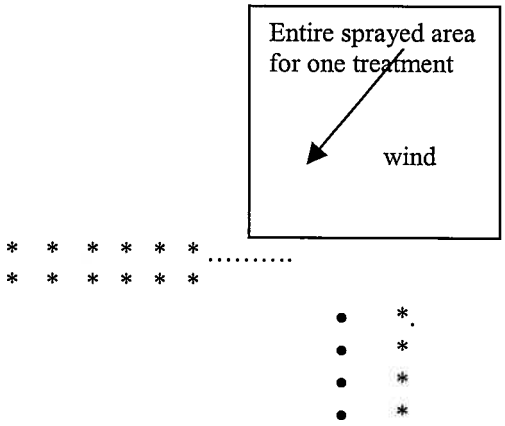
Artificial Targets

Flat plate collectors at each of the ten sampling locations per treatment. Plates were place just above the top of the canopy and within the canopy at the height of first fruit retention. Chromatography paper was placed on each flat plate to collect the fluorescent dye.

Drift Arrays

Two parallel rows of artificial targets were used for collecting drift samples, (flat plates on 1.2 m fibreglass posts fitted with chromatography paper held by rubber bands). The artificial collectors were placed downwind (to the north and west) of the treated area.

The two parallel rows of targets were placed 10m apart at following distances from the edge of the field for each treatment at 0m, 50m, 100m, 150m, and 200m.



ANALYSIS OF SAMPLES:

Deposition onto Leaves:

Quantitative:

Fluorometric analysis of deposition on leaves was determined by extracting the helios dye from 100 leaves per treatment from each sampling zone using an appropriate solvent (ethyl digol). The amount of dye in each sample was determined using a Sequoila-Turner 450 fluorometer, concentrations obtained were then related to the surface area of each sample.

Deposits on Artificial targets, conducted at CPAS laboratories - Gatton.

Fluorometric analysis of deposition on artificial targets (papers) was determined by extracting the helios dye from leaves using an appropriate solvent (isopropanol). Measurements of the amount of dye in each sample were be determined using a Sequoila-Turner 450 fluorometer, and were related to the surface area of each sample.

METEOROLOGICAL MEASUREMENTS

Stability was measured using a sonic anemometer. The full C-PAS data logged Environdata Meteorological Station was used to continuously record wind speed (at 2m, wind direction, temperature (at 2m, relative humidity, solar radiation and rainfall).

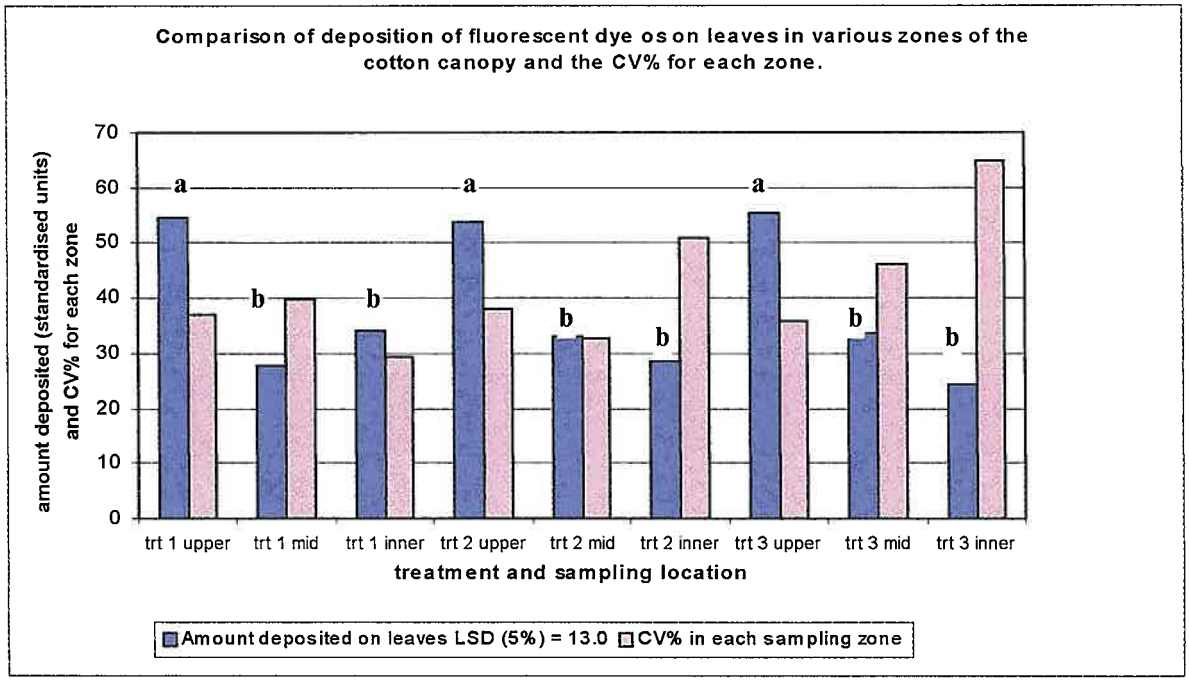
RESULTS and DISCUSSION:

Deposition onto Leaves:

The figure below shows the deposition onto cotton leaves sampled from 10 locations across the middle two swaths of each treatment in standardised units for each of the zones sampled (dark bars) and the coefficient of variation of that deposition within each zone (light bars).

Treatment 1 = electrostatics on, treatment 2 = electrostatics off and treatment 3 = micronair.

Note the LSD (5.0%) for comparing deposition in each zone is 13.00. The dark bars with the same letter or combination of letters above them are not significantly different from one another.



Deposition on leaves

Statisitical analysis (one anova) yielded the following results:

No significant difference between treatments in the deposition of fluorescent dye onto leaves in the upper part of the canopy.

Deposition onto leaves in the upper part of the canopy was significantly higher than deposition onto leaves in the mid and inner parts of the canopy for all treatments.

There were no significant differences between treatments in the deposition onto on the leaves in the mid and inner parts of the canopy.

Coefficient of Variation (CV) of deposition onto leaves

Treatment one (electrostatics on) had the lowest CV for deposition onto leaves in mid and inner zones, and a similar CV in the upper part of the canopy to treatment 3 (the micronair).

Treatment one (electrostatics on) produced the lowest range of CV's for all zones (29.4-39.8), treatment 2 (electrostatics off) and treatment 3 (micronair) were (32.6-51.0) and (35.9-65.1) respectively.

The results from this experiment tend to indicate that the electrostatics on treatment at 10 L/ha was capable of producing an equivalent deposition onto leaves as the micronair at 30 L/ha, but with a more even distribution of deposit onto leaves in the mid and inner parts of the cotton canopy.

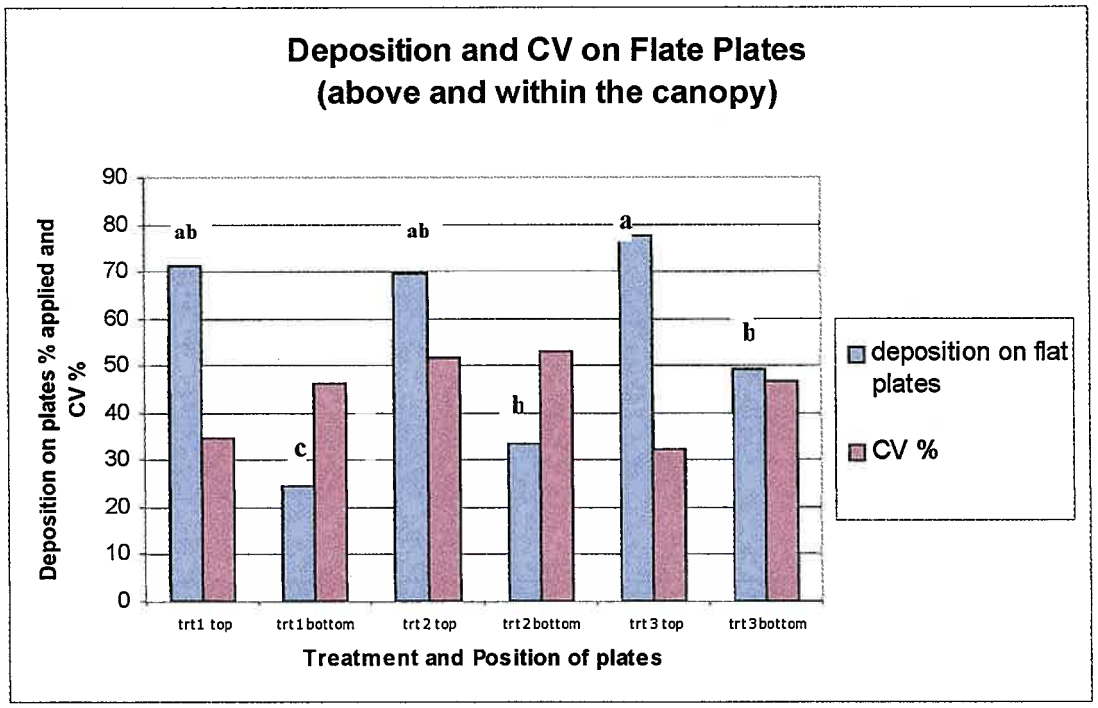
DEPOSITION ONTO ARTIFICIAL COLLECTORS

Flat Plates

The figure below shows the deposition onto flat plate collectors (expressed as a percentage of rate applied) for each of the 10 zones sampled across the middle two swaths of each treatment (lighter shaded bars) and the coefficient of variation of that deposition within each zone (darker bars).

Treatment 1 = electrostatics on, treatment 2 = electrostatics off and treatment 3 = micronair.

Note the LSD (5%) for comparing deposition in each zone is 16.55. The lighter shaded bars with the same letter or combination of letters above them are not significantly different from one another.



Deposition onto Flat Plates.

The above graph shows no significant different difference in percentage of the rate applied arriving at the top plates (artificial collectors placed just above the height of the cotton canopy).

These results reflect those obtained for deposition on leaves, where no significant difference was detected between the levels of deposition onto leaves sampled in the upper part of the cotton canopy.

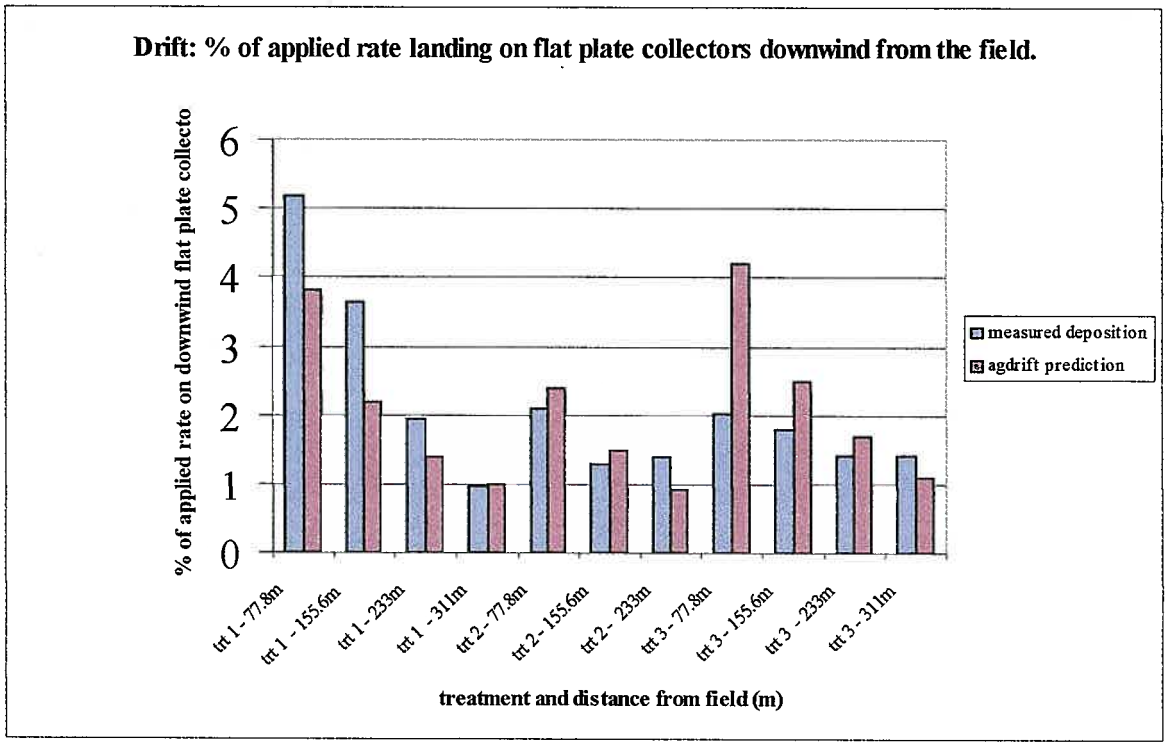
Deposition onto plates placed at the bottom of the canopy were significantly lower for treatment1 (electrostatics on) suggesting less spray was passing through the canopy, hence more was being captured by leaves.

CV of Deposition onto Flat Plates

The CV of deposition onto flat flates placed just above the canopy was reduced by having the electrostatic system turned on at 10 L/ha, and was similar to that of the micronair treatment at 30 L/ha.

DRIFT

The percentage of the applied rate leaving field was measured on flat plates at distances up to 311m from the edge of the treated areas. The results of measurements are illustrated in the figure below, along with agdrift® predictions for the droplet sizes used.



Note: The results obtained are from a single trial under a small range of environmental conditions, using a fluorescent dye technique (sensitive to parts per million) which has detection limits. Winds speeds during spraying for each treatment were light (average 0.7 m/sec) but reasonably consistent.

Within this single trial it be seen that treatment one (electrostatics on) shows higher levels of deposition close to the edge of the treated area with a rapid reduction in the amount of dye recovered from flat plate collectors as distance increased. The rate of decrease is similar to that predicted by Agdrift for this treatment.

Treatment 2 (electrostatics off) did not follow the agdrift predictions as closely, and did not show the same rate of decrease in deposition with distance from the field.

Treatment 3 (micronair) produced lower than predicted amounts of deposition close to the treated area, however the rate of decrease with distance from the edge of the field was less than predicted by Agdrift.

In this experiment both the predicted (agdrift) and actual depositions at 311m from the edge of the field were less for treatment 1 (electrostatics on) than those measured for treatment 3 (micornair).

Conclusions

Deposition onto leaves within the cotton canopy

Results obtained in this experiment, under the environmental conditions experienced, indicate that treatment 1 (electrostatics on at 10 L/ha) delivered equivalent levels of deposition (significant at 0.05 level) onto leaves within various zones sampled as treatment 3 (micronair at 30 L/ha) .

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Drift.

The results in this experiment, while not conclusive, do show some very interesting trends. The results obtained indicate that Treatment 1 (electrostatics on) produced a rapid reduction in the amount of material leaving the field with distance from the treated area.

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Results obtained in this experiment indicate that the electrostatics system does warrant further investigation, particularly considering that in this experiment the electrostatic system was able to deliver equivalent levels of deposition, with lower CV's and similar or less drift at application rates of 10 L/ha when compared with the micronair au5000 at 30 L/ha.

The ability of the electrostatic system to demonstrate equivalent deposition at 10 L/ha in this trial indicates that in using such a system there may be potential cost savings to growers through reduced costs of application, increased productivity and improved timeliness of application. The ability of the system to deliver equivalent deposition with similar or lower CV's and levels of drift should be investigated further.

Recommendations.

Further investigations into the potential of the electrostatics system should be undertaken in the following areas:

- The ability of the system to provide similar reductions in the amount of spray leaving treated fields at different growth stages of the crop.
- The ability of the system to provide similar reductions in the amount of spray leaving treated fields under different environmental conditions.
- The downwind movement of spray material travelling over fallow after leaving the treated area (in this experiment spray had to travel over canopy before reaching the flat plate collectors).

Part 2: Droplet Spectrum Analysis

Nomenclature

Definitions of technical terms used in this report are listed in Table 1.

Table 1 Nomenclature

Term	Description
VMD or D[v,0.5]	Volume Median Diameter (VMD) 50% of the volume of the spray consists of droplets smaller than this size
D[v,0.9]	90% of the volume of the spray consists of droplets smaller than this size
D[v,0.1]	10% of the volume of the spray consists of droplets smaller than this size
SPAN	(D[v,0.9]- D[v,0.1]) / D[v,0.5], a measure of the width of the distribution

Methodology

A wind tunnel facility located at the University of Queensland, Gatton was used for the experimental program. The facility comprises an open circuit wind tunnel, a transparent working section, a Malvern 2600 laser diffraction analyser and an exhaust air scrubber extraction system. A 400mm by 400mm contraction section was used to accelerate the air up to operational speeds of 72 m/s (140 knots). The rotary nozzles were mounted on a streamline boom. Two gantries were used to independently position the laser-diffraction particle-size analyser and the nozzle system. This allowed the emitted spray plume to be traversed through the laser beam. Droplet size was measured from a traverse of the bottom half of the spray plume emitted by the rotary nozzles. The test facility was fitted with transducers to monitor fan speed, air temperature, humidity, air velocity, spray liquid temperature, pressure and flow rate. A plan of the facility is shown in Figure 1.

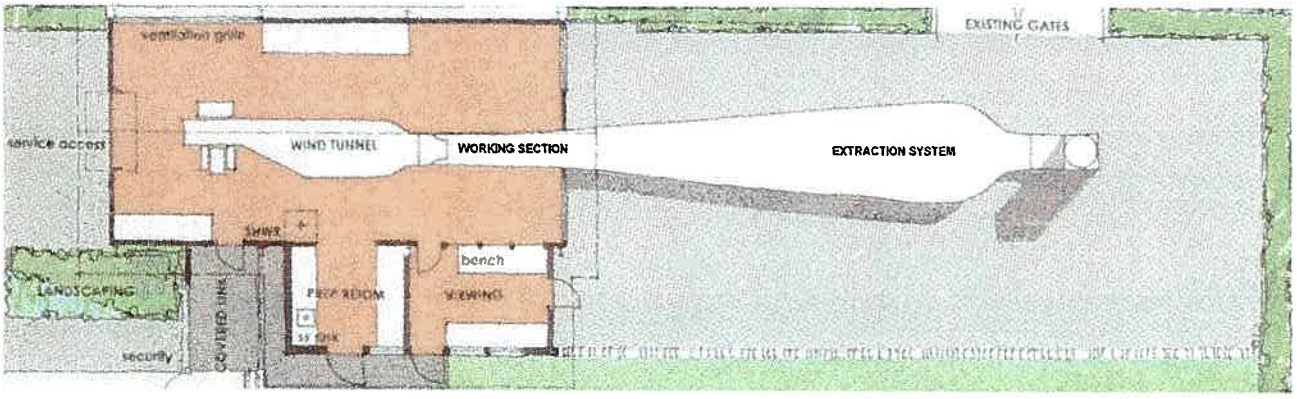
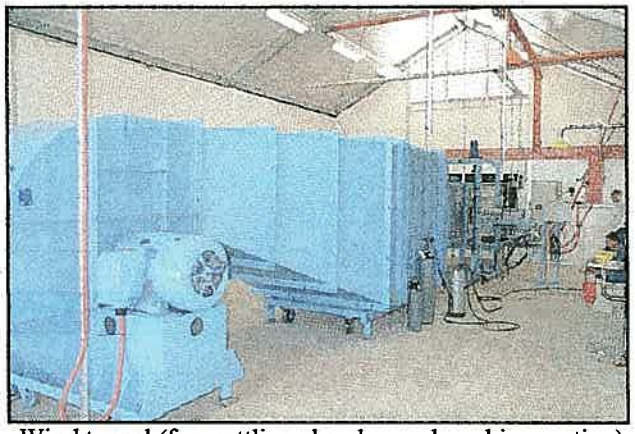


Figure 1 Plan view of the facility

The particle sizing system uses a laser-diffraction device (Malvern 2600, Malvern Instruments, UK) which is an internationally recognised industry standard for droplet and particle characterisation. It has a range of lenses and accessories for characterising sprays, powders and liquid emulsions. The 800 mm focal length lens was selected which is able to measure a particle size range from 4 μm to 1504 μm.

In use, the sample is illuminated by a visible-wavelength He/Ne laser. The particles or droplets scatter some of the light at angles which are characteristic of their size, forming a series of annular diffraction rings. The scattered light is collected by a Fourier optical system and focused on a radial diode array detector. The signal from each detector is amplified and digitised and the complete light energy pattern is analysed by a computer to derive the size distribution.



Wind tunnel (fan, settling chamber and working section)

Working section (with Malvern 2600)

Two spectrum nozzles (black and white) were tested with two formulations (water and 10% Biopest) at two airspeeds (54 and 62m/s) and two pressures (340 and 480 kPa) to give a total of 16 treatments. All treatments were replicated twice.

Results and Discussion

The Volume Median Diameter for each treatment (average of 2 replicates) is shown in Figure 2. Figure 3 shows the percentage of the total volume of the spray that is less than 141µm.

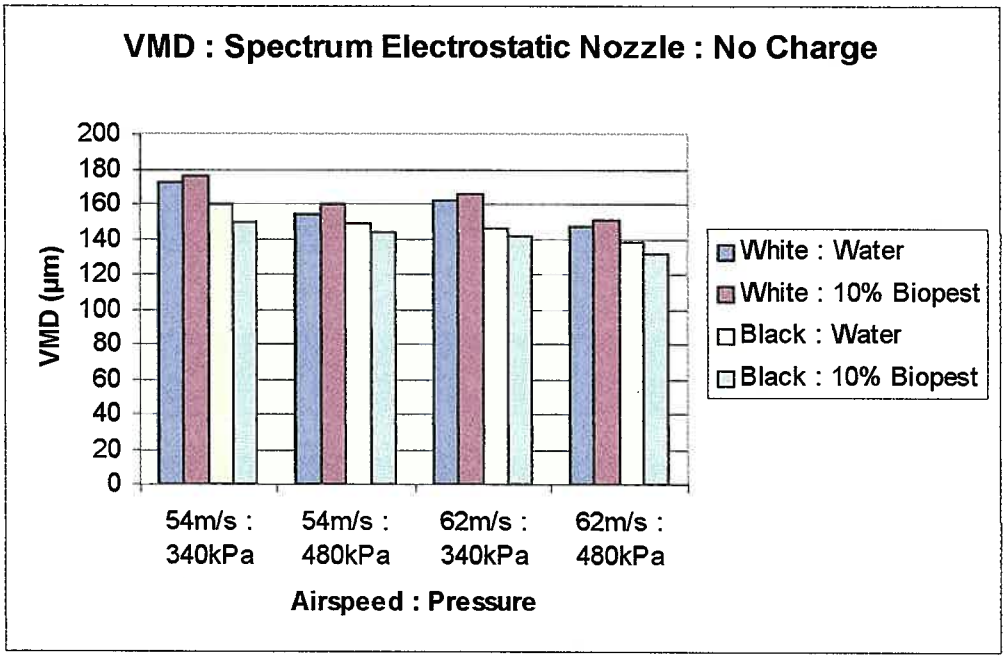


Figure 2 **The Volume Median Diameter produced by a spectrum electrostatic nozzle with no charge**

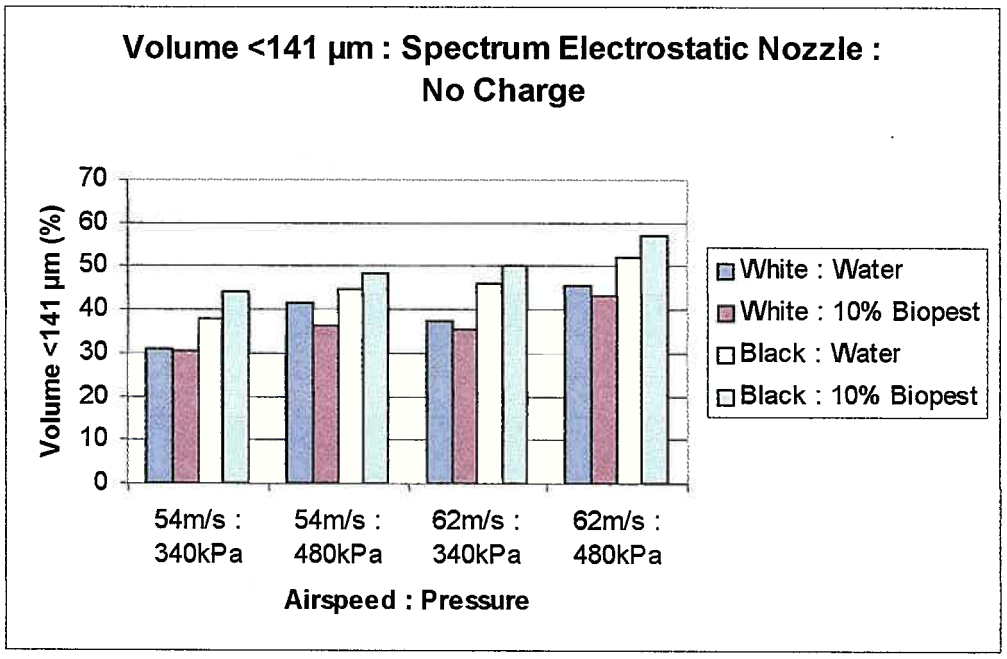


Figure 3 **The volume of spray less than 141µm produced by a spectrum electrostatic nozzle with no charge**

The black nozzle tended to produce a smaller droplet size (VMD) than the white nozzle. Increasing airspeed and increasing pressure reduced the droplet size for both the black and white nozzles. There was little difference in droplet size between water and a 10% Biopest mix.

MALVERN Instruments 32.0B 26 Mar 1992 4:04 pm

Spectrum Electrostatic Nozzles (2 stacked) Blank
Water
34 m/s , 340 kPa

0000S1608

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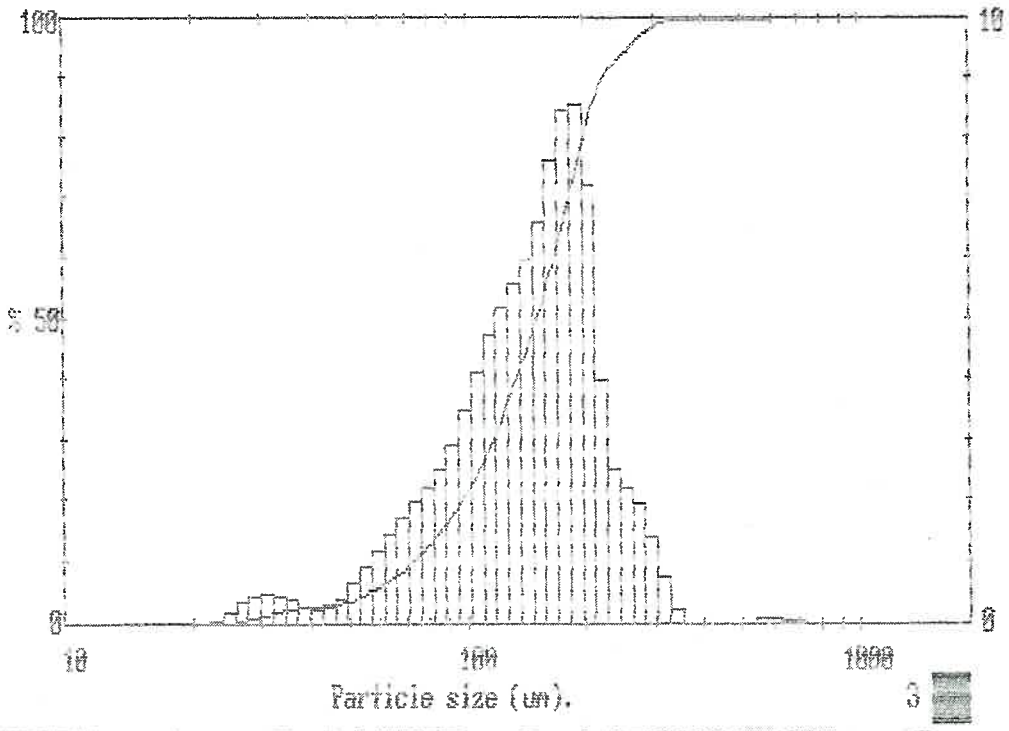

Upper	in	Lower	Under	Upper	in	Lower	Under	Upper	in	Lower	Under	Span 1.01
				401	0.0	399	99.7	78.5	3.9	67.7	8.3	
				355	0.0	344	99.7	67.7	5.9	59.4	8.4	D[4,3]
				314	1.4	335	99.7	59.4	7.7	50.6	8.7	157.46µm
				295	2.7	256	99.5	50.4	6.7	43.5	9.9	
				252	5.3	250	99.5	43.5	6.5	37.5	8.4	D[3,2]
1584	0.0	1257	100	250	13.4	197	95.2	37.5	6.0	32.4	7.5	110.88µm
1257	0.0	1120	100	197	17.4	159	88.1	32.4	5.0	27.9	6.5	
1120	0.0	995	100	159	17.5	141	76.8	27.9	4.6	24.1	6.1	D[v,0.9]
995	0.0	877	100	141	17.7	125	66.8	24.1	4.0	20.8	5.3	224.61µm
877	0.0	775	100	125	17.7	112	57.5	20.8	3.6	17.9	4.9	
775	0.0	685	99.9	112	15.8	105	49.9	17.9	3.0	15.5	4.4	
685	0.0	595	99.9	105	7.0	90.5	47.5	15.5	2.6	13.4	3.9	D[v,0.5]
595	0.0	447	99.7	90.5	5.3	79.5	42.2	13.4	2.0	11.6	3.3	152.56µm
Source = Res.;spectrum				Base length = 300.0 mm				Model indp				D[v,0.1]
Record No. = 37				Log. Diff. = 3.205								100.17µm
Focal length = 300 mm				Obscuration = 0.0225				Volume Conc. = 0.0025%				
Presentation = 1HD				Volume distribution				Sp.B.D. 0.0500 g/cm³				Shape OFF

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Spectrum Electrostatic Nozzles (2 stacked) Black
Water/10% w/v oil
54 m/s : 340 kPa

000051605

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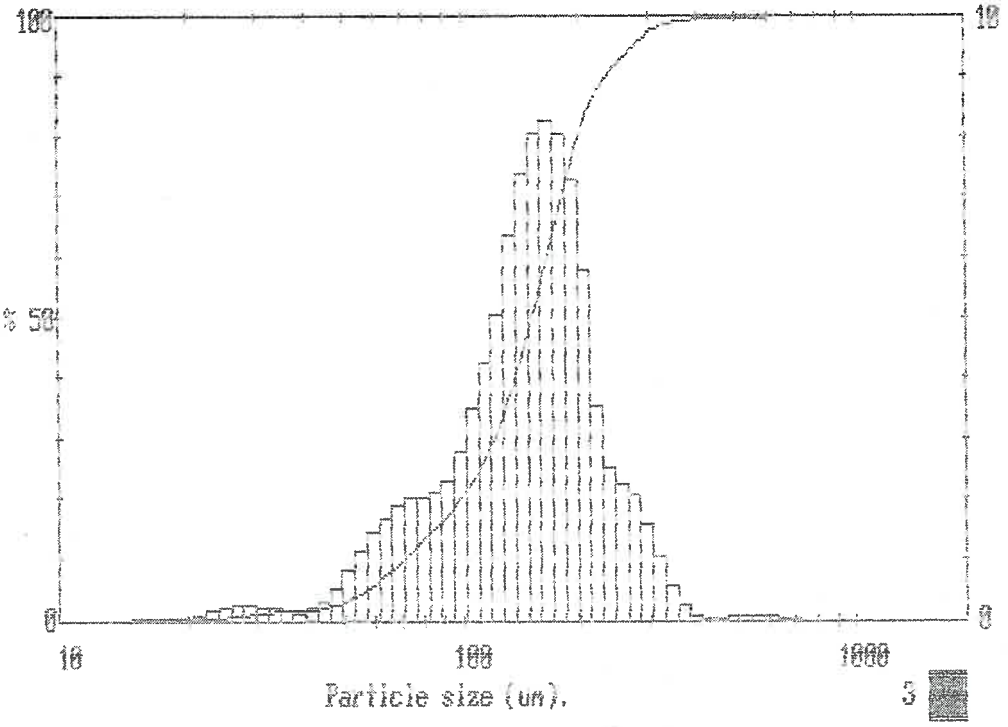

Upper	in	Lower	Under	Upper	in	Lower	Under	Upper	in	Lower	Under	Span 1.02
				461	0.1	399	99.5	78.5	4.1	67.7	8.8	
				399	0.5	344	99.0	67.7	3.4	58.4	5.4	DEA 3,2
				344	2.0	296	97.0	58.4	3.3	50.4	2.1	154.00µm
				296	4.3	255	93.0	50.4	1.0	43.5	2.2	
1584	0.0	1367	100	255	5.3	220	87.7	43.5	0.4	37.5	1.8	DE3,21
1367	0.0	1180	100	220	11.0	191	76.7	37.5	0.4	32.4	1.5	120.21µm
1180	0.0	985	100	191	16.5	164	60.2	32.4	0.5	27.9	1.2	
985	0.0	850	100	164	15.4	141	45.0	27.9	0.5	24.1	0.9	DEv,0.91
850	0.0	735	100	141	13.6	122	31.8	24.1	0.5	20.8	0.5	222.[illegible]µm
735	0.0	635	100	122	9.5	105	22.7	20.8	0.1	17.9	0.1	
710	0.1	550	99.9	105	8.5	90.7	14.1	17.9	0.1	15.5	0.0	DEv,0.12
550	0.2	475	99.7	90.7	7.5	80.0	6.6	15.5	0.0	13.3	0.0	70.35µm
475	0.2	411	99.5	80.0	4.3	70.0	2.3	13.3	0.0	4.00	0.0	

Source = Res.spectrum	Base length = 300.0 mm	Model indp	DEv,0.52
Record No. = 32	Half = 2.557		140.89µm
Focal length = 300 mm	Obscuration = 0.0227	Volume Conc. = 0.0005%	
Presentation = 1ds	Volume distribution	Sp:8.0 0.0199 m²/cc	Shape 257

MALVERN Instruments 3S.8D 26 Mar 1992 4:32 pm

Spectrum Electrostatic Nozzles (2 stacked) Black
Water
22 m/s 1.340 MPa

0000051602

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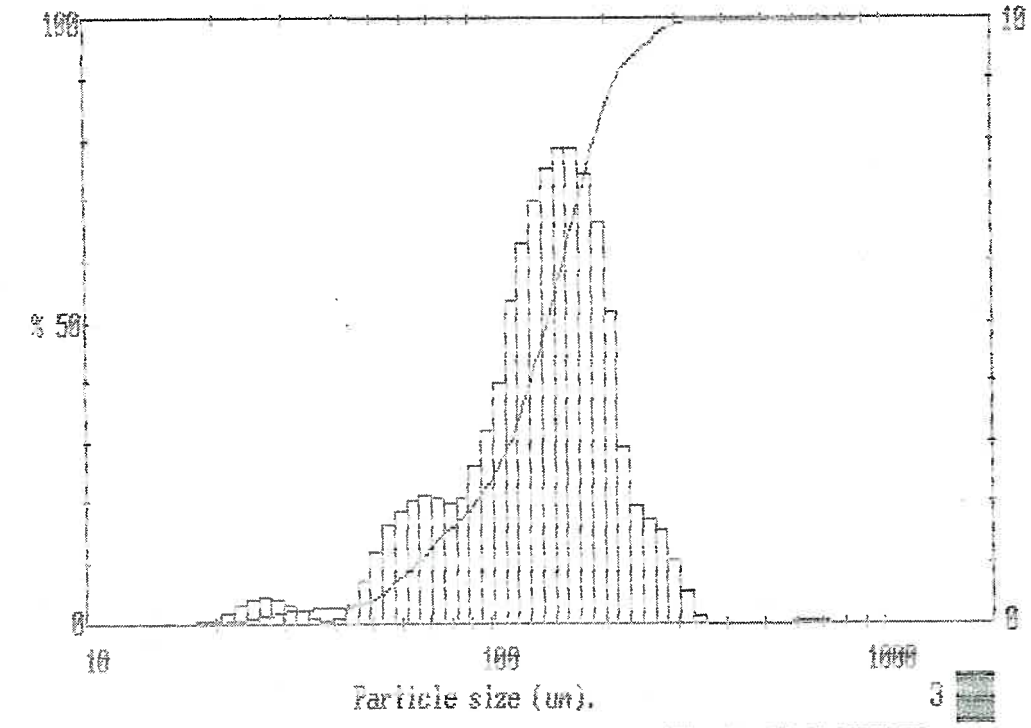
2750 lds 1M00414



Upper	in	Lower	Under	Upper	in	Lower	Under	Upper	in	Lower	Under	Span 1.04
				461	0.0	399	99.7	78.5	4.3	67.7	11.1	
				399	0.0	346	99.7	67.7	4.1	58.4	7.6	D[4,3]
				346	0.0	299	99.7	58.4	3.1	50.4	3.8	143.84µm
				299	0.0	259	99.6	50.4	1.9	43.5	2.7	
1504	0.0	1297	100	259	0.7	224	97.9	43.5	0.8	37.6	5.6	D[3,2]
1297	0.0	1120	99.9	224	0.8	194	97.1	37.6	0.2	32.4	5.2	111.97µm
1120	0.0	965	99.9	194	0.8	167	96.3	32.4	0.7	27.9	1.5	
965	0.0	835	99.8	167	15.4	144	95.5	27.9	0.0	24.1	0.7	Dv,0.5
835	0.0	720	99.8	144	16.1	124	80.1	24.1	0.0	20.8	0.7	87.11µm
720	0.0	620	99.8	124	15.0	107	64.0	20.8	0.0	17.9	0.0	
620	0.0	535	99.8	107	10.6	92	49.0	17.9	0.0	15.5	0.0	Dv,0.1
535	0.0	461	99.7	92	6.4	80	38.4	15.5	0.0	13.4	0.0	65.22µm
				80	4.1	69	32.0	13.4	0.0	4.00	0.0	

Source = Res.lspectrum	Beam length = 200.0 mm	Model indp
Record No. = 26	Conc. Mixt. = 3.5E4	
Focal length = 800 mm	Obscuration = 0.0206	Volume Conc. = 0.00040
Presentation = 1ds	Volume Distribution	Sp.G.0 0.0536 g/cc

Span 1.04
D[4,3] 143.84µm
D[3,2] 111.97µm
Dv,0.5 87.11µm
Dv,0.1 65.22µm
Dv,0.5/Dv,0.1 140.54µm
Shape OFF

MALVERN Instruments 3B.00 26 Mar 1992 4:01 pm

Spectrum Electrostatic Nozzles (2 stacked) Black
Water (10% oil)
52 g/s 1 340 kPa

000051509

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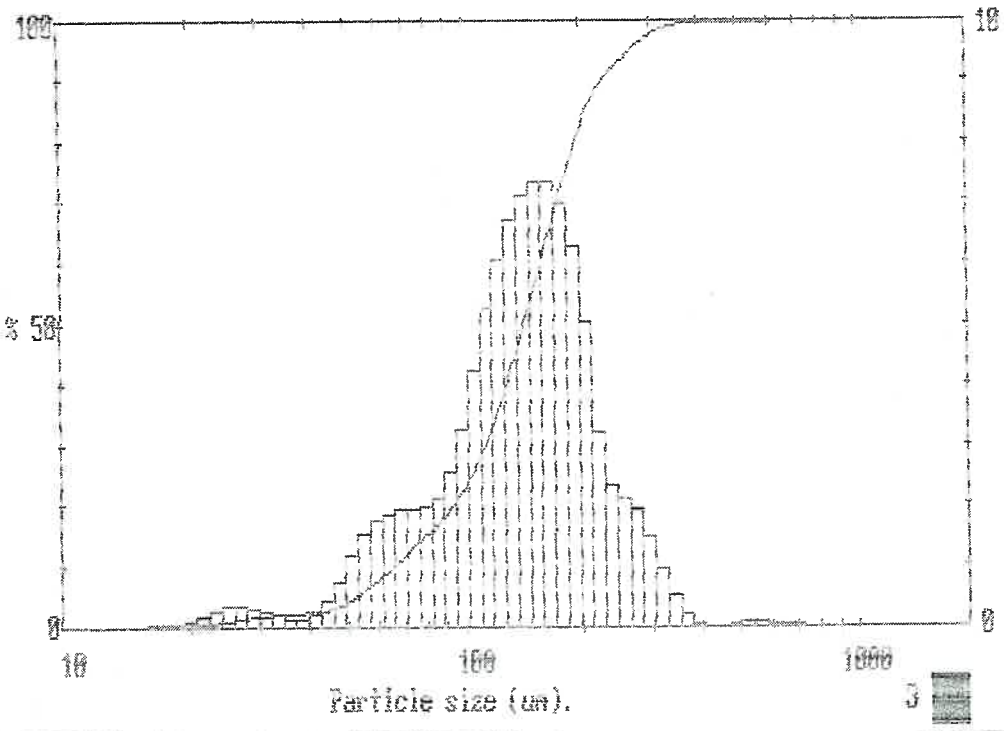
2750 1ds 1M00114



Upper	in	Lower	Under	Upper	in	Lower	Under	Upper	in	Lower	Under	Span 1.15
				461	0.0	299	99.6	78.5	4.0	67.7	10.9	
				399	0.4	346	99.2	67.7	3.8	58.4	7.1	D[4,3]
				344	1.9	299	97.4	58.4	3.0	50.4	4.1	167.75µm
				299	3.8	258	93.5	50.4	1.4	43.5	6.7	
				258	5.0	223	88.7	43.5	0.4	37.5	2.4	D[3,2]
1500	0.0	1297	100	223	5.6	191	78.1	37.5	0.3	32.4	2.0	111.77µm
1297	0.0	1120	100	192	6.5	164	72.4	32.4	0.6	27.9	1.4	
1120	0.0	965	100	191	14.4	164	64.7	32.4	0.6	27.9	1.4	D[v,0.9]
965	0.0	833	100	164	15.0	141	49.6	27.9	0.7	24.1	0.7	258.41µm
833	0.0	719	100	141	15.0	122	34.6	24.1	0.5	20.9	0.2	
719	0.1	620	99.9	122	15.5	105	22.5	20.9	0.5	17.9	0.1	
620	0.0	535	99.7	105	5.6	90.9	16.9	17.9	0.1	15.5	0.0	D[v,0.1]
535	0.1	461	99.1	90.9	4.5	78.5	14.5	15.5	0.0	4.0	0.0	25.16µm

Source = Pec.1spectrum	Beam length = 200.0 mm	Model indp	D[v,0.5]
Record No. = 74	Size = 3.707		141.85µm
Focal length = 300 mm	Obscuration = 0.0203	Volume Conc. = 0.0004%	
Presentation = 12s	Volume Distribution	Sp.S.A. 0.0521 m²/cc.	Shape OFF

MALVERN Instruments SD.00 26 Mar 1992 4:00 pm

Spectrum Electrostatic Nozzles (2 stacked) Black
Water
62 m/s : 480 kPa

0000051596

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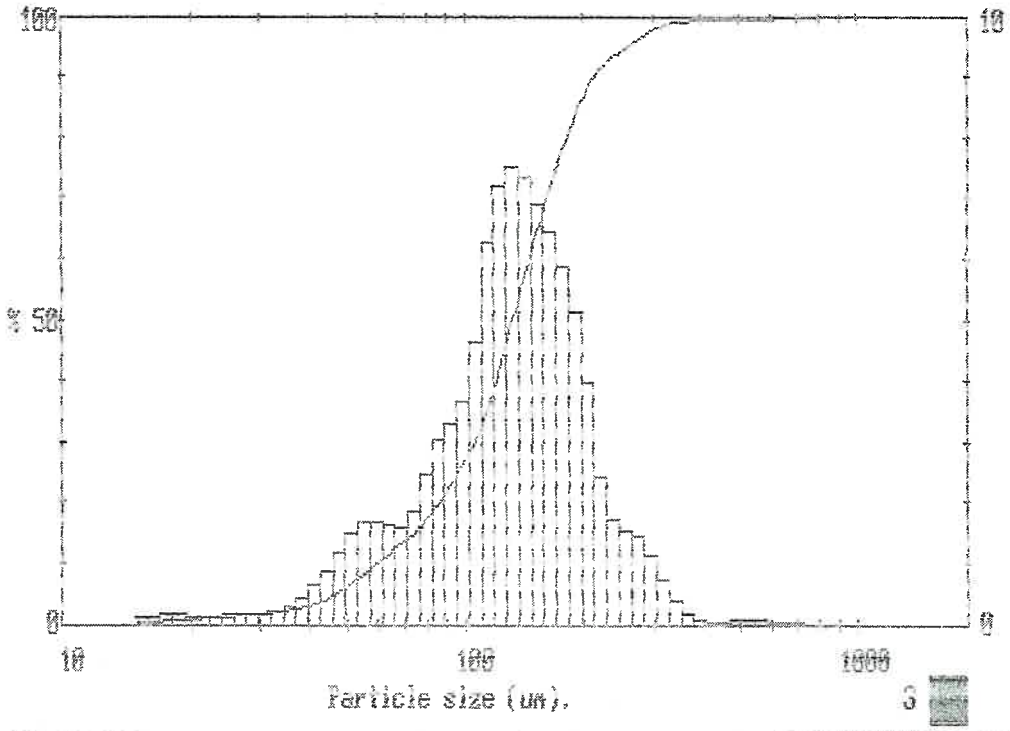
2750 lds 1N002416



Upper	in	Lower	Under	Upper	in	Lower	Under	Upper	in	Lower	Under	Span 1.16
				461	0.1	399	99.5	78.5	3.2	67.7	12.9	
				399	0.6	374	99.2	67.7	3.1	58.4	9.3	D[4,3]
				374	1.4	296	97.7	58.4	5.7	50.4	6.2	138.42µm
				296	2.8	256	94.9	50.4	2.2	43.5	3.9	
				256	3.8	220	97.3	43.5	1.5	37.5	3.7	D[3,2]
1504	0.0	1297	100	220	7.5	191	93.7	37.5	0.5	32.4	2.1	100.60µm
1297	0.0	1120	100	191	12.1	164	71.6	32.4	0.4	27.9	1.7	
1120	0.0	966	100	164	14.5	141	57.8	27.9	0.3	24.1	1.4	D[v,0.9]
966	0.0	833	100	141	16.8	122	42.5	24.1	0.3	20.8	1.3	212.45µm
833	0.0	719	100	122	19.4	105	30.1	20.8	0.2	17.9	0.7	
719	0.1	620	99.9	105	19.4	90	22.6	17.9	0.2	15.5	0.4	D[v,0.5]
620	0.1	535	99.7	90	7.5	80.5	22.2	15.5	0.2	13.4	0.4	50.55µm
535	0.1	461	99.6	80.5	6.0	78.5	12.9	13.4	0.2	4.60	0.0	

Source = Res.separation	Beam length = 200.0 mm	Model indp	D[v,0.1]
Record No. - 22	Log Size = 7.457		12.10µm
Focal length = 800 mm	Obscuration = 0.2861	Volume Conc. = 0.00246	
Presentation = 1Rb	Volume distribution	Sp.G.0 0.0596 m²/cc.	Shape OFF

MALVERN Instruments 99.00 26 Mar 1992 3:59 pm

Spectrum Electrostatic Nozzles (2 stacked) Blank
Water, 10% w/w oil
62 m/s : 480 kPa

0000051593

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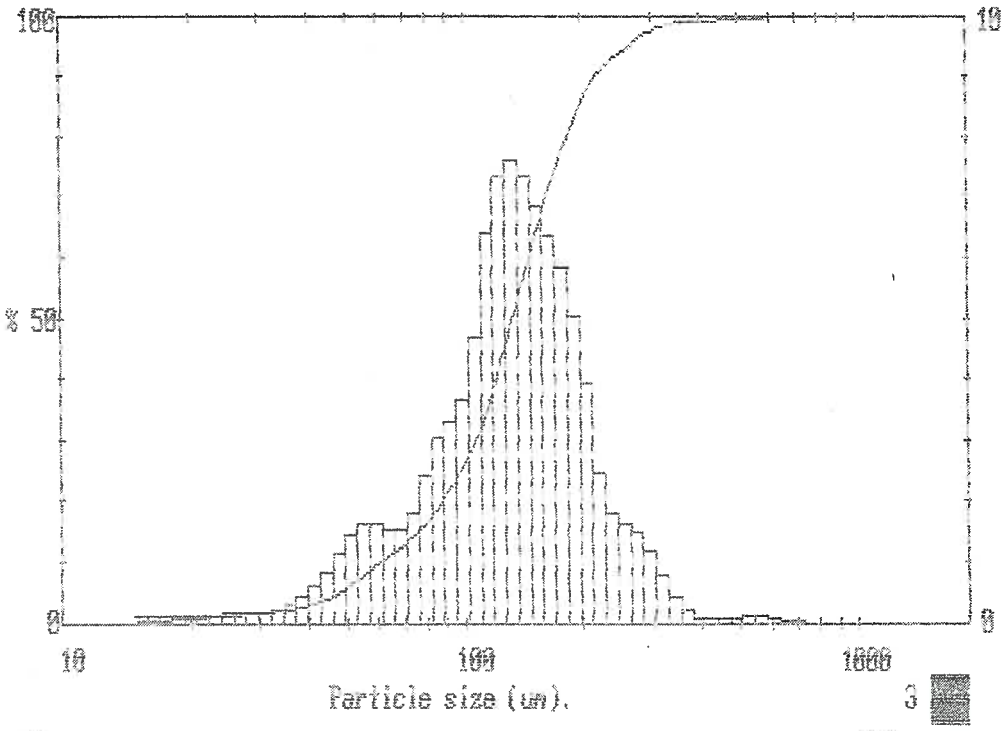
3750 Id: IN09414



Upper	in	Lower	Under	Upper	in	Lower	Under	Upper	in	Lower	Under	Span 1.17
				461	0.1	399	99.3	78.5	3.6	67.7	12.2	
				399	0.4	344	98.9	67.7	3.2	58.4	9.1	D[4,3]
				344	1.5	296	97.4	58.4	3.5	50.4	5.8	140.08µm
				296	2.9	255	94.5	50.4	2.2	43.5	3.6	
1504	0.0	1297	100	256	3.8	220	90.7	43.5	1.1	37.5	2.5	D[3,2]
1297	0.0	1120	100	220	7.5	191	83.1	37.5	0.5	32.4	2.0	102.50µm
1120	0.0	966	100	191	12.0	164	71.1	32.4	0.4	27.9	1.6	
966	0.0	833	100	164	14.1	141	57.1	27.9	0.3	24.1	1.3	D[v,0.9]
833	0.0	718	100	141	15.1	122	42.0	24.1	0.3	20.8	1.0	212.87µm
718	0.1	620	99.9	122	12.6	105	25.3	20.8	0.3	17.9	0.7	
620	0.3	535	99.7	105	7.5	90.9	21.2	17.9	0.3	15.5	0.4	D[v,0.1]
535	0.2	461	99.5	90.9	5.9	78.5	15.3	15.5	0.4	4.00	0.0	50.92µm

Source = Rec.spectrum	Peak length = 200.0 mm	Model indp
Record No. = 58	Log. Diff. = 3.8%	
Focal length = 300 mm	Obscuration = 0.0274	Volume Conc. = 0.0035%
Presentation = 1ds	Volume distribution	Sp.G.1.0 0.0035 ml/cm.

D[v,0.5] 132.07µm

Shape OFF

MALVERN Instruments 3B.0D 26 Mar 1992 3:56 pm

Spectrum Electrostatic Nozzler (2 stacked) Black
Water+10% v/v oil 000051589
Ex a/s : 480 kPa

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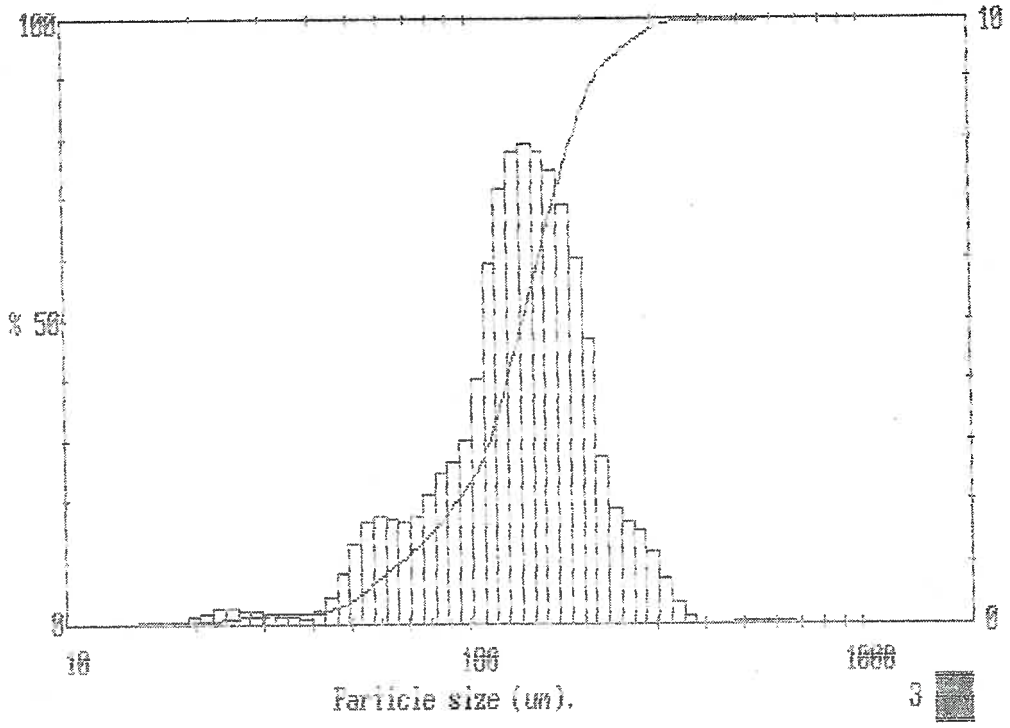
8750 lds 1M00414



Upper	in	Lower	Under	Upper	in	Lower	Under	Upper	in	Lower	Under	Span 1.07
				461	0.0	399	99.8	79.5	3.6	67.7	10.5	
				399	0.2	344	99.6	67.7	3.5	58.4	7.0	D[4,3] 143.32µm
				344	1.4	296	96.2	58.4	3.2	50.4	3.7	
				296	2.0	255	95.2	50.4	1.8	42.9	2.3	
				255	1.6	220	91.2	42.9	0.5	37.0	1.9	D[3,2] 112.66µm
1504	0.0	1297	100	220	3.9	190	89.5	37.0	0.2	32.4	1.7	
1297	0.0	1120	100	190	8.9	164	82.2	32.4	0.1	27.9	1.3	
1120	0.0	965	100	191	14.2	164	68.1	27.9	0.5	24.1	0.8	D[v,0.9] 212.08µm
965	0.0	833	100	164	15.8	141	53.9	24.1	0.5	20.8	0.5	
833	0.0	719	100	141	15.1	122	38.8	20.8	0.3	17.9	0.1	
719	0.0	620	100	122	11.7	105	25.1	17.9	0.1	15.5	0.0	D[v,0.5] 66.27µm
620	0.1	535	99.9	105	8.1	90.7	16.9	15.5	0.0	13.4	0.0	
535	0.1	461	99.8	90.7	4.0	78.3	14.1	13.4	0.0	11.6	0.0	

Source = Rec.spectrum	Beam length = 200.0 mm	Model indp	D[v,0.5] 128.54µm
Record No. = 1	Lens fitted = 2.4mm		
Focal length = 800 mm	Obscuration = 0.0257	Vol.Ms Conc. = 0.0003%	
Presentation = lds	Volume distribution	Sp.S.A. 0.0532 m²/mc.	Shape OK

MALVERN Instruments 3B.00 26 Mar 1992 3:55 pm

Spectrum Electrostatic Nozzles (2 stacked) Black
Water
5 m/s : 480 kPa

000051583

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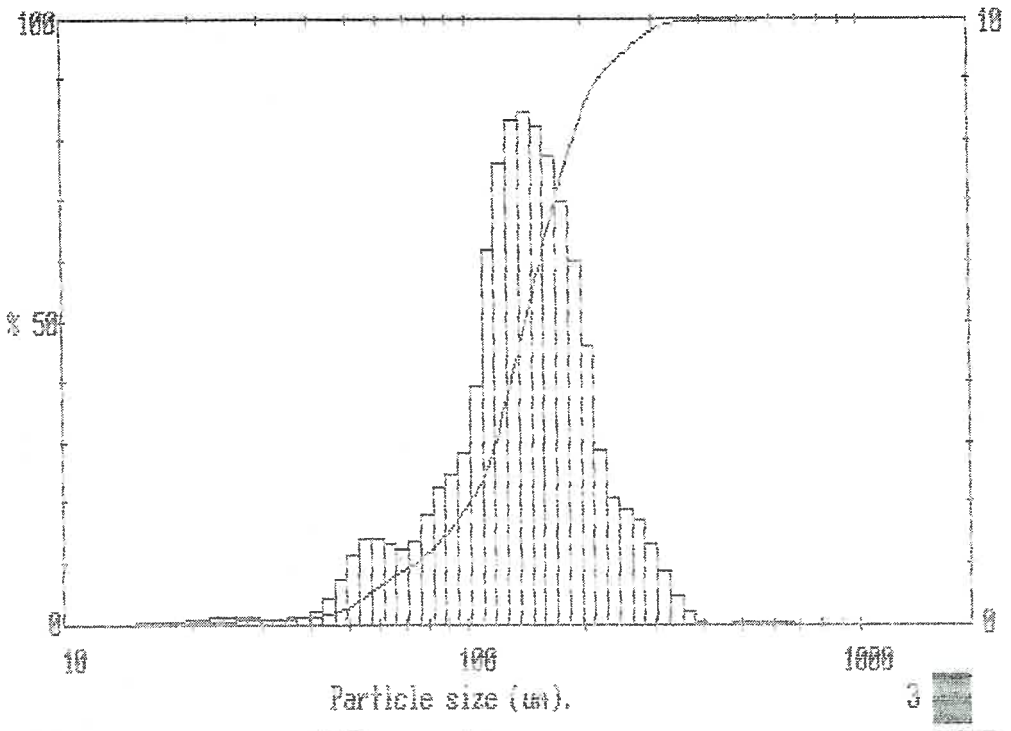
2750 lds 1W00414



Upper	in	Lower	Under	Upper	in	Lower	Under	Upper	in	Lower	Under	Span 1.03
				461	0.0	299	99.7	78.5	2.8	57.7	2.5	
				299	0.4	344	99.4	67.7	2.7	50.4	5.6	D[4,3]
				344	1.7	296	97.7	58.4	2.7	50.4	3.0	147.85µm
				296	3.3	256	94.4	50.4	1.4	43.5	1.5	
1504	0.0	1297	100	256	4.4	220	90.9	43.5	0.4	37.5	1.2	D[3,2]
1297	0.0	1120	100	220	8.9	191	81.5	37.5	0.2	32.4	1.0	118.94µm
1120	0.0	955	100	191	14.4	164	65.8	32.4	0.2	27.9	0.8	
955	0.0	823	100	164	16.9	141	50.9	27.9	0.3	24.1	0.5	D[v,0.9]
823	0.0	710	100	141	18.4	122	33.5	24.1	0.3	20.8	0.3	238.21µm
710	0.0	620	100	122	15.1	105	21.4	20.8	0.1	17.9	0.1	
620	0.1	535	99.8	105	5.8	90.9	15.6	17.9	0.1	15.5	0.1	D[v,0.1]
535	0.1	461	99.8	90.9	4.4	78.5	11.3	15.5	0.1	4.00	0.0	73.92µm

Source = Res.rspectrum	Beam length = 200.0 mm	Model indp	D[v,0.5]
Record No. = 99	Log. Diff. = 3.922		141.35µm
Focal length = 800 mm	Obscuration = 0.0211	Volume Conc. = 0.0094%	
Presentation = 1[1]	Volume distribution	Sp.S.A. 0.0504 m²/cm³	Shape OPT

MALVERN Instruments 3B.00 26 Mar 1992 3:59 pm

Spectrum Electrostatic Nozzles (2 stacked) Black
Water+10% v/v oil 000051580
5 m/s : 480 kPa

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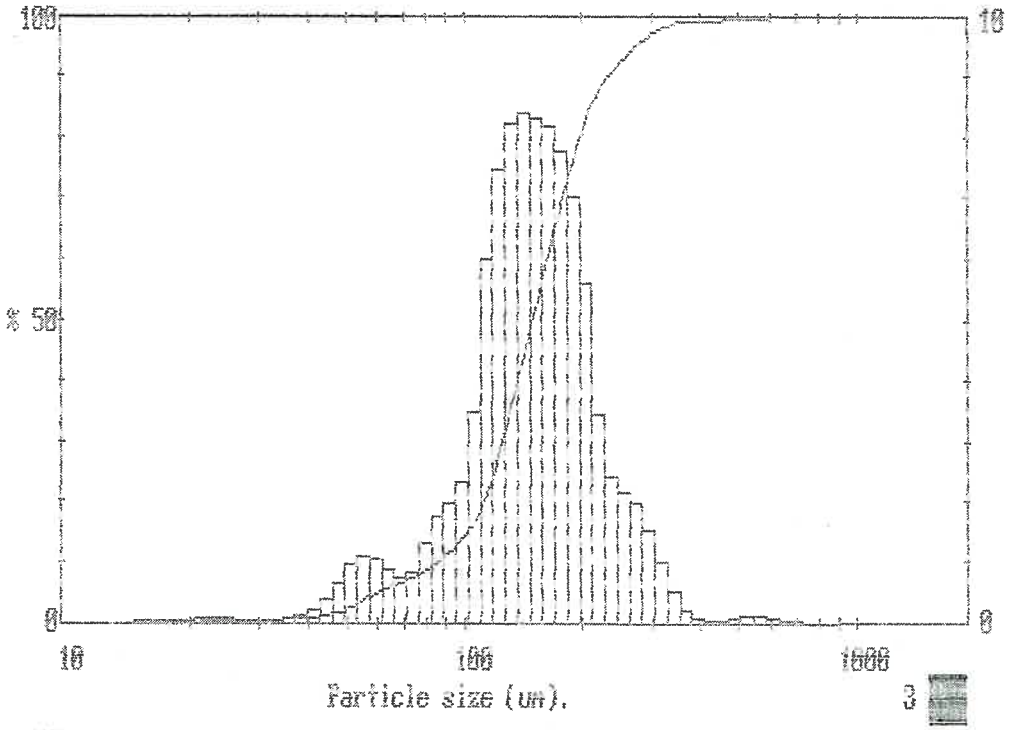
2750 Ids 1N000414



Upper	in	Lower	Under	Upper	in	Lower	Under	Upper	in	Lower	Under	Span 0.99
				461	0.1	399	99.4	78.5	1.8	67.7	6.4	
				399	0.4	344	98.9	67.7	1.9	58.4	8.5	D[4,3]
				344	1.9	296	97.0	58.4	2.2	50.4	2.4	135.88µm
				296	3.9	256	93.1	50.4	1.2	43.5	1.1	
1504	0.0	1297	100	256	5.1	220	88.0	43.5	0.7	37.5	0.7	D[3,2]
1297	0.0	1120	100	220	10.7	191	77.2	37.5	0.1	32.4	0.6	128.46µm
1120	0.0	966	100	191	16.0	164	61.3	32.4	0.1	27.9	0.5	
966	0.0	833	100	164	17.0	141	44.3	27.9	0.1	24.1	0.4	D[v,0.5]
833	0.0	719	100	141	16.5	122	28.0	24.1	0.1	20.8	0.3	231.87µm
719	0.1	620	99.9	122	11.6	105	15.4	20.8	0.1	17.9	0.1	
620	0.2	535	99.7	105	4.8	90.9	11.6	17.9	0.1	15.5	0.0	D[v,0.1]
535	0.2	461	99.4	90.9	3.4	78.5	8.2	15.5	0.0	4.00	0.0	85.46µm

Source = Res.ispectrum Record No. = 28 Focal length = 800 mm Presentation = 1de	Beam length = 200.0 mm Log. Diff. = 4.110 Obscuration = 0.9821 Volume distribution	Model indp Volume Conc. = 0.0005% Sp.S.A 0.0467 m²/cm³

D[v,0.5] 148.52µm

Shape OFF

MALVERN Instruments 3B.0D 26 Mar 1992 3:53 pm

Spectrum Electrostatic Nozzles (2 stacked) Black
Water+10% v/v oil
m/s : 480 kPa

000051577

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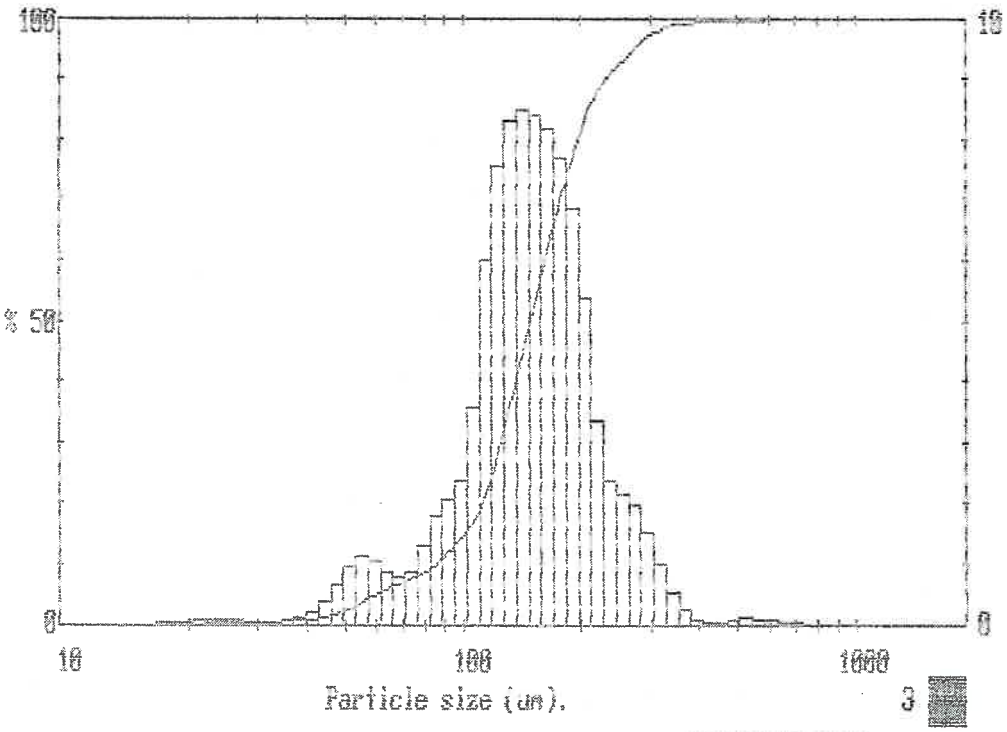
2750 lds IMC0414



Upper	in	Lower	Under	Upper	in	Lower	Under	Upper	in	Lower	Under	Span 0.99
				461	0.1	399	99.5	78.5	1.8	67.7	6.6	
				399	0.4	344	99.0	67.7	1.9	58.4	4.6	D(4,3)
				344	1.9	296	97.1	58.4	2.2	50.4	2.4	155.75µm
				296	3.8	256	93.3	50.4	1.3	43.5	1.1	
1504	0.0	1297	100	256	5.1	220	89.2	43.5	0.4	37.5	0.8	D(3,2)
1297	0.0	1120	100	220	10.3	191	77.9	37.5	0.1	32.4	0.6	127.97µm
1120	0.0	965	100	191	15.8	164	62.1	32.4	0.1	27.9	0.5	
965	0.0	833	100	164	17.3	141	44.9	27.9	0.5	24.1	0.3	D(v,0.3)
833	0.0	719	100	141	16.4	122	28.6	24.1	0.2	20.8	0.2	220.62µm
719	0.1	620	99.9	122	11.7	105	16.8	20.8	0.1	17.9	0.1	
620	0.2	535	99.7	105	4.9	90.9	11.1	17.9	0.0	15.5	0.0	D(v,0.1)
535	0.2	461	99.5	90.9	3.5	78.5	8.4	15.5	0.0	4.00	0.0	84.70µm

Source = Res.:spectrum	Beam length = 200.0 mm	Model indp	D(v,0.5)
Record No. = 27	Log. Diff. = 4.095		147.60µm
Focal length = 800 mm	Obscuration = 0.0213	Volume Conc. = 0.0005%	
Presentation = lds	Volume distribution	Sp.G.R 0.0469 m²/cc.	Shape OFF

MALVERN Instruments S2.00 25 Mar 1992 3:51 pm

Spectrum Electrostatic Nozzles (2 stacked) Black
Water+10% v/v oil
52 m/s : 480 kPa

000051574

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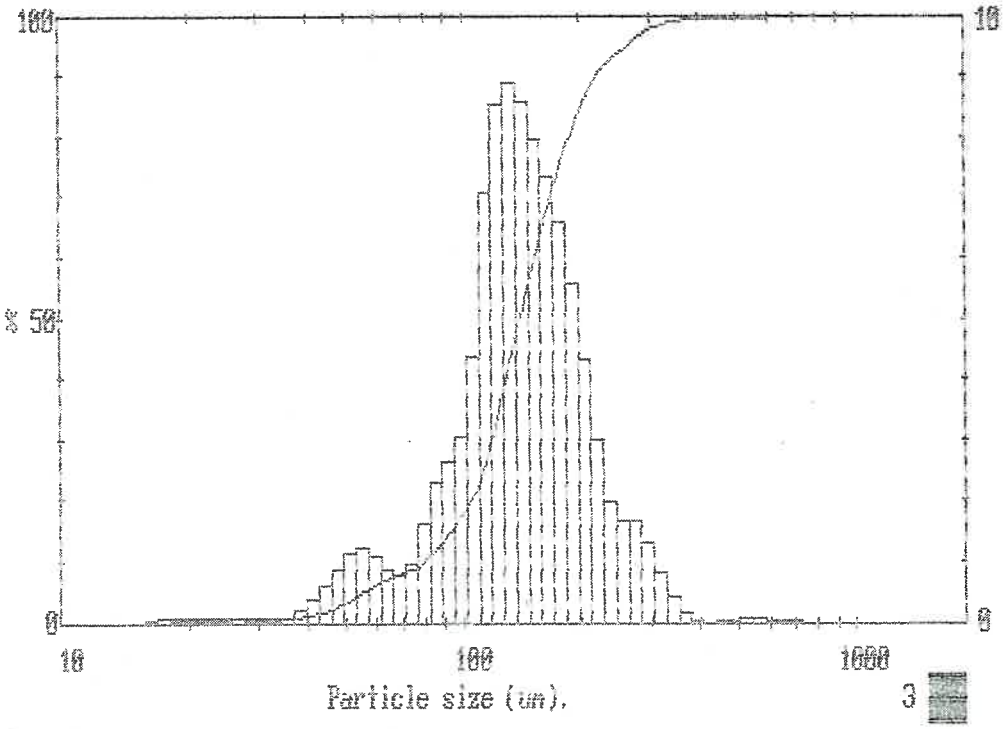
2759 1ds 1M00414



Upper	in %	Lower	Under	Upper	in	Lower	Under	Upper	in	Lower	Under	Span 1.01
				461	0.0	399	99.6	78.5	2.0	67.7	7.8	
				399	0.4	344	99.2	67.7	1.9	58.4	5.9	D[4,3]
				344	1.6	296	97.3	58.4	2.5	50.4	3.4	147.81µm
				296	3.2	255	94.4	50.4	1.7	43.5	1.7	
1504	0.0	1297	100	255	4.3	220	90.2	43.5	0.7	37.5	1.0	D[3,2]
1297	0.0	1120	100	220	3.4	191	81.8	37.5	0.8	32.4	0.8	118.65µm
1120	0.0	965	100	191	13.6	164	68.2	32.4	0.1	27.9	0.7	
965	0.0	833	100	164	16.3	141	51.9	27.9	0.1	24.1	0.6	D[v,0.9]
833	0.0	719	100	141	17.6	122	34.3	24.1	0.3	20.8	0.4	219.16µm
719	0.1	620	99.9	122	13.8	105	20.4	20.8	0.2	17.9	0.2	
620	0.1	535	99.8	105	5.3	90.9	14.5	17.9	0.1	15.5	0.1	D[v,0.1]
535	0.1	461	99.6	90.9	4.4	78.5	9.8	15.5	0.1	4.00	0.0	79.25µm

Source = Res.spectrum	Peak length = 200.0 mm	Model indp	D[v,0.5]
Record No. = 26	Log. Diff. = 2.924		138.17µm
Focal length = 900 mm	Obscuration = 0.0211	Volume Conc. = 0.00046%	
Presentation = 1ds	Volume distribution	Sp.G.= 0.0506 m²/cm³	Shape OFF

MALVERN Instruments 2.00 26 Mar 1992 3:50 pm

Spectrum Electrostatic Nozzles (2 stacked) Black
Water+10% v/v oil
52 m/s : 480 kPa

000051571

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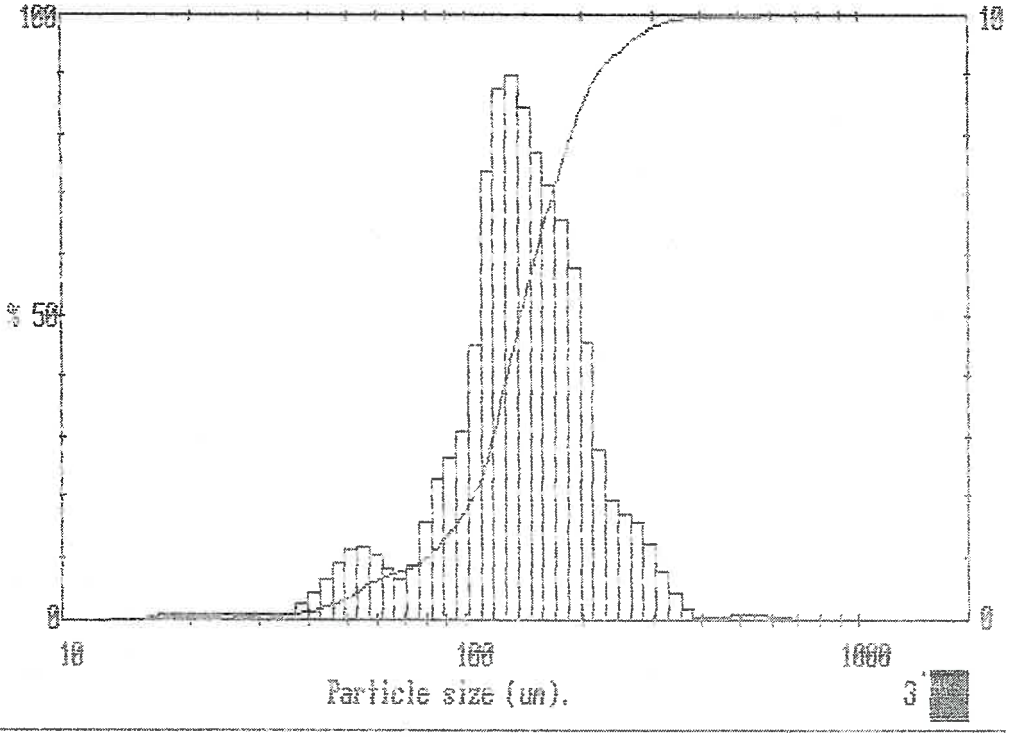
2750 lds 1N00414



Upper	in	Lower	Under	Upper	in	Lower	Under	Upper	in	Lower	Under	Span 0.99
				461	0.1	399	99.6	78.5	1.8	67.7	7.7	
				399	0.3	344	99.2	67.7	1.8	58.4	6.0	D(4,3)
				344	1.5	296	97.7	58.4	2.4	50.4	3.6	147.18µm
				296	3.1	256	94.5	50.4	1.7	43.5	1.9	
1504	0.0	1297	100	256	4.1	220	90.5	43.5	0.8	37.5	1.0	D(3,2)
1297	0.0	1120	100	220	8.5	191	81.9	37.5	0.2	32.4	0.5	117.93µm
1120	0.0	966	100	191	13.6	164	68.3	32.4	0.1	27.9	0.8	
966	0.0	833	100	164	15.9	141	52.4	27.9	0.1	24.1	0.7	D(v,0.9)
833	0.0	719	100	141	17.8	122	36.6	24.1	0.2	20.8	0.5	217.05µm
719	0.1	620	99.9	122	16.2	105	20.3	20.8	0.2	17.9	0.3	
620	0.2	535	99.8	105	6.3	90.9	14.0	17.9	0.1	15.5	0.1	D(v,0.1)
535	0.1	461	99.6	90.9	4.4	78.5	9.6	15.5	0.1	4.00	0.0	79.58µm

Source = Res.;spectrum	Beam length = 200.0 mm	Model indp	D(v,0.5)
Record No. = 25	Log. Diff. = 4.201		138.46µm
Focal length = 800 mm	Obscuration = 0.0224	Volume Conc. = 0.0004%	
Presentation = lds	Volume distribution	Sp.S.A. 0.0509 m²/cc.	Shape OFF

MALVERN Instruments SB.00 26 Mar 1992 3:49 pm

Spectrum Electrostatic Nozzles (2 stacked) Black
Water+10% v/v oil 000051558
62 m/s : 340 kPa

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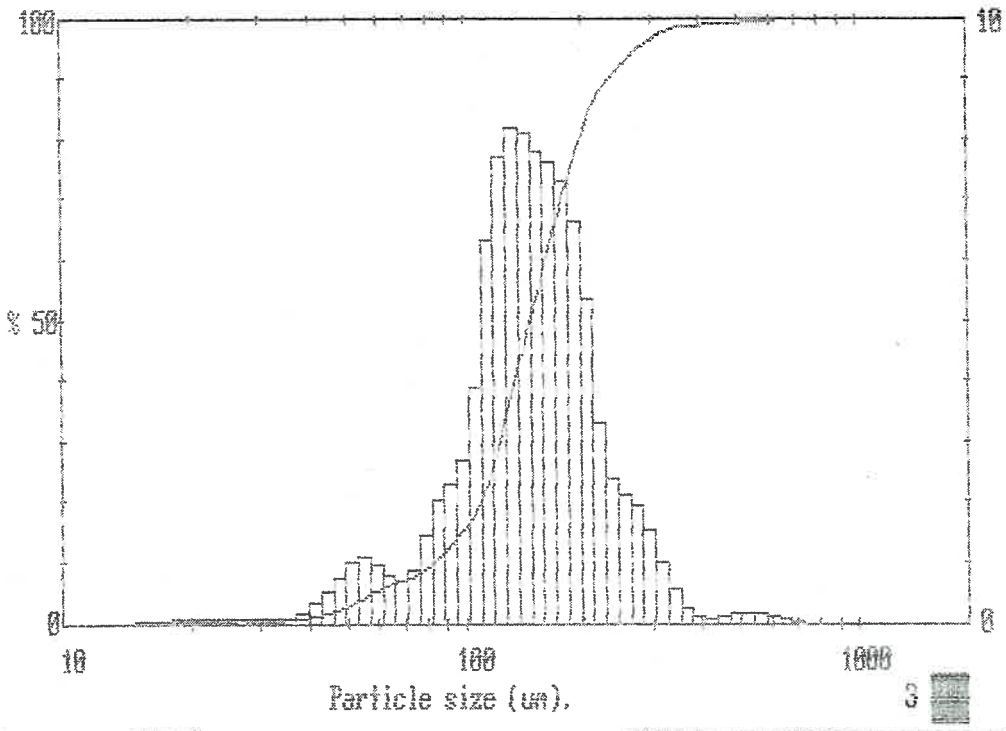
2750 lds 1N00414



Upper	in	Lower	Under	Upper	in	Lower	Under	Upper	in	Lower	Under	Span 1.04
				461	0.2	399	99.9	78.5	1.8	67.7	5.9	
				399	0.5	344	99.4	67.7	1.7	58.4	5.1	D[4,3] 156.27µm
				344	2.0	296	96.5	58.4	2.2	50.4	3.0	
				296	3.8	256	92.7	50.4	1.4	43.5	1.5	
1504	0.0	1297	100	256	5.0	220	87.7	43.5	0.6	37.5	0.9	D[3,2] 124.39µm
1297	0.0	1120	100	220	10.1	191	77.6	37.5	0.2	32.4	0.8	
1120	0.0	966	100	191	15.0	164	65.5	32.4	0.1	27.9	0.7	
966	0.0	833	100	164	16.0	141	46.5	27.9	0.1	24.1	0.6	D[v,0.9] 234.45µm
833	0.0	719	100	141	16.2	122	30.4	24.1	0.2	20.8	0.4	
719	0.1	620	99.9	122	12.3	105	18.0	20.8	0.2	17.9	0.2	
620	0.3	535	99.5	105	8.5	90.9	12.6	17.9	0.1	15.5	0.1	D[v,0.1] 83.28µm
535	0.4	461	99.2	90.9	3.9	78.5	8.7	15.5	0.1	4.00	0.0	

Source = Res.:spectrum	Beam length = 200.0 mm	Model indp	D[v,0.5] 145.32µm
Record No. = 24	Log. Diff. = 4.040		
Focal length = 300 mm	Obscuration = 0.0236	Volume Conc. = 0.0005%	
Presentation = lds	Volume distribution	Sp.S.A. 0.0482 m²/cc.	Shape OFF

MALVERN Instruments SB.00 26 Mar 1992 3:48 pm

Spectrum Electrostatic Nozzles (2 stacked) Black
Water+10% v/v oil
62 m/s : 340 kPa

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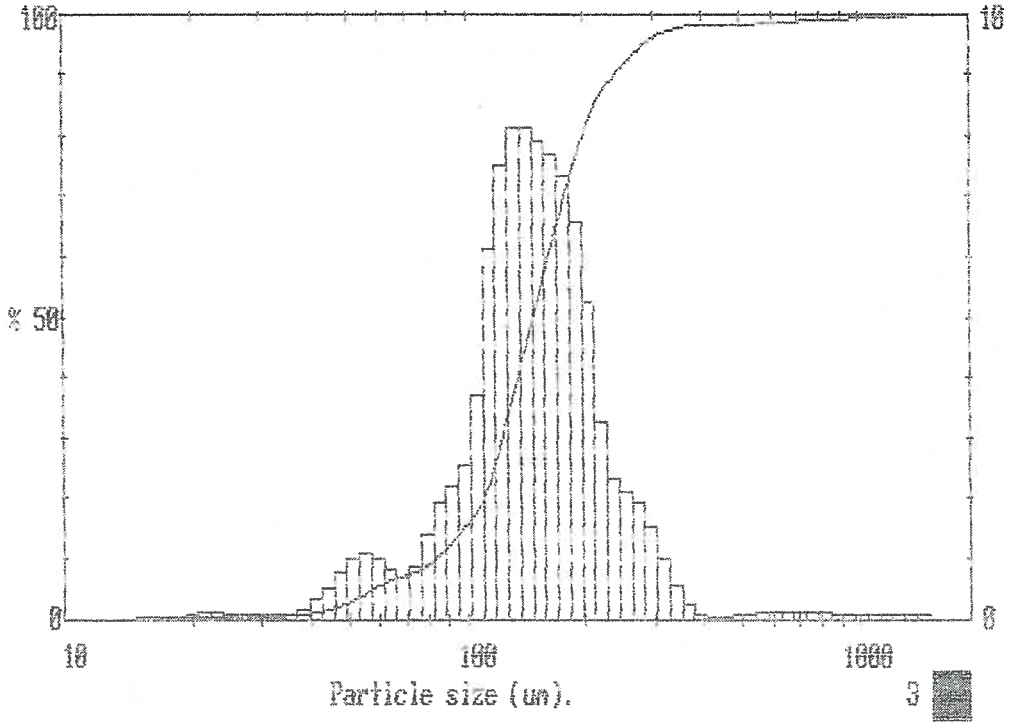
2750 Ids: 1W00414



Upper	in	Lower	Under	Upper	in	Lower	Under	Upper	in	Lower	Under	Span 1.06
				401	0.1	399	98.3	78.5	1.8	67.7	7.0	
				399	0.5	344	97.8	67.7	1.8	58.4	5.2	D[4,3] 154.37µm
				344	1.9	296	95.9	58.4	2.2	50.4	3.0	
				296	3.8	255	92.1	50.4	1.5	43.5	1.5	
1504	0.2	1297	99.8	255	5.0	220	87.1	43.5	0.6	37.5	0.9	D[3,2] 125.83µm
1297	0.2	1120	99.6	220	10.0	191	77.1	37.5	0.2	32.4	0.8	
1120	0.2	965	99.5	191	15.1	164	62.0	32.4	0.1	27.9	0.7	
965	0.2	833	99.2	164	16.2	141	45.8	27.9	0.2	24.1	0.5	D[v,0.9] 238.87µm
833	0.2	719	99.0	141	16.1	122	29.7	24.1	0.2	20.8	0.3	
719	0.3	620	98.7	122	11.9	105	17.8	20.8	0.1	17.9	0.1	
620	0.2	535	98.5	105	5.2	90.9	12.5	17.9	0.1	15.5	0.1	D[v,0.1] 83.02µm
535	0.2	461	98.3	90.9	3.8	78.5	8.8	15.5	0.1	4.00	0.0	

Source = Ref.(spectrum)	Beam length = 200.0 mm	Model indp	D[v,0.5] 146.82µm
Record No. = 23	Log. Diff. = 3.885		
Focal length = 800 mm	Obscuration = 0.0232	Volume Conc. = 0.0005%	
Presentation = 1ds	Volume distribution	Sp.S.A 0.0477 m²/cm³	Shape OFF

MALVERN Instruments SB.00 26 Mar 1992 3:48 pm

Spectrum Electrostatic Nozzles (2 stacked) Black
Water+10% v/v oil
54 m/s : 340 kPa

000051592

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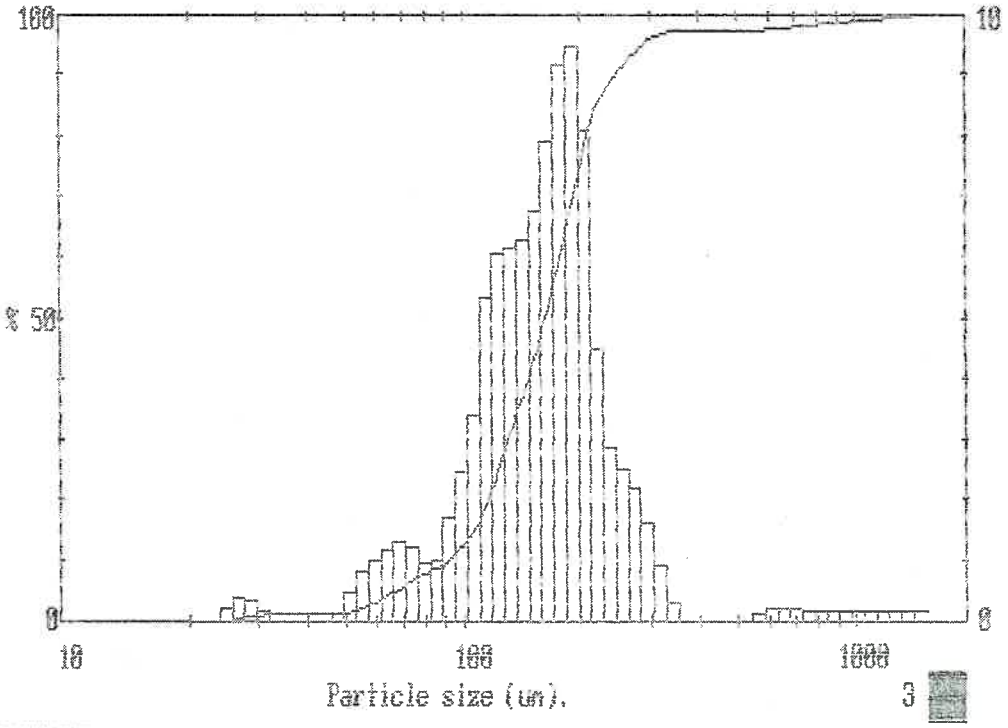
2750 lds 1M00414



Upper	in%	Lower	Under	Upper	in	Lower	Under	Upper	in	Lower	Under	Span 0.95
				461	0.0	399	97.5	78.5	2.5	67.7	5.2	
				399	0.0	344	97.5	67.7	2.4	58.4	2.9	D[4,3] 179.73µm
				344	1.7	296	95.7	58.4	1.5	50.4	1.4	
				296	4.2	256	91.5	50.4	0.2	43.5	1.2	
1504	0.3	1297	99.7	256	6.1	220	85.4	43.5	0.0	37.5	1.2	D[3,2] 137.27µm
1297	0.3	1120	99.3	220	15.1	191	70.2	37.5	0.0	32.4	1.2	
1120	0.4	966	99.0	191	18.8	164	51.5	32.4	0.5	27.9	0.7	
966	0.4	833	98.6	164	14.0	141	37.4	27.9	0.5	24.1	0.0	D[v,0.9] 245.40µm
833	0.4	719	98.2	141	12.3	122	25.2	24.1	0.0	20.8	0.0	
719	0.4	620	97.8	122	10.5	105	14.8	20.8	0.0	17.9	0.0	
620	0.3	535	97.5	105	4.9	90.9	9.9	17.9	0.0	15.5	0.0	D[v,0.1] 91.21µm
535	0.0	461	97.5	90.9	2.2	78.5	7.8	15.5	0.0	4.00	0.0	

Source = Res.spectrum	Peak length = 200.0 mm	Model indp	D[v,0.5] 161.74µm
Record No. = 39	Log. Diff. = 3.638		
Focal length = 800 mm	Obscuration = 0.0211	Volume Conc. = 0.0005%	
Presentation = lds	Volume distribution	Sp.S.D 0.0437 m²/cc.	Shape OFF

MALVERN Instruments SV.0D 26 Mar 1992 3:47 pm

Spectrum Electrostatic Nozzles (2 stacked) Black
Water+10% v/v oil
54 m/s : 340 kPa

000051559

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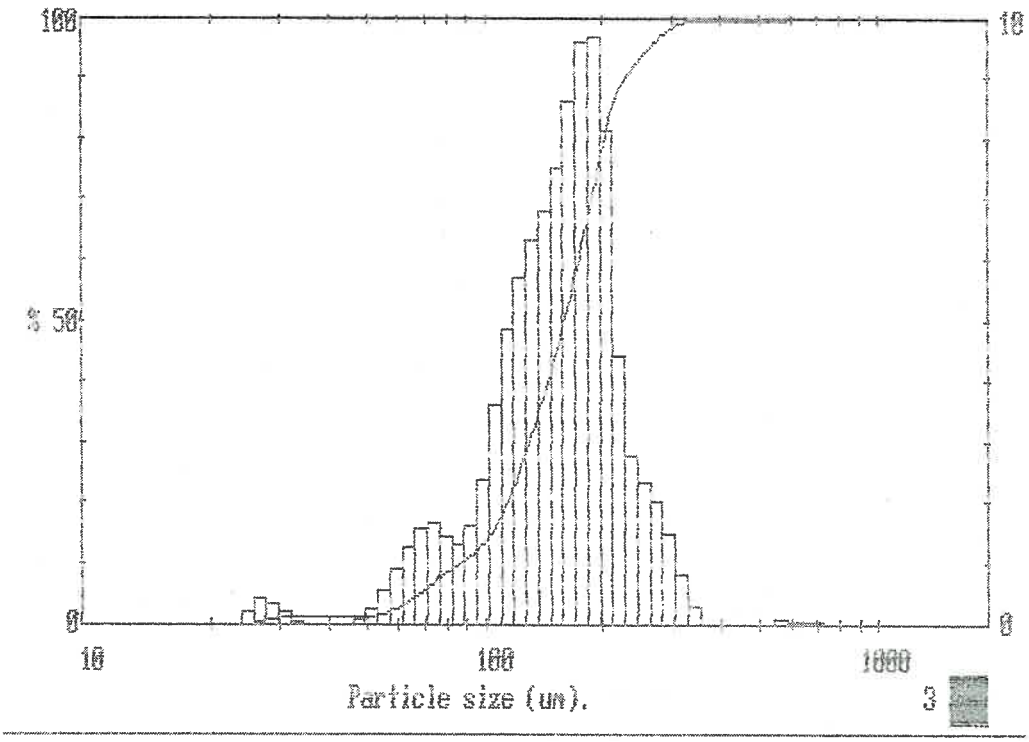
2750 lds 1M00414



Upper	in	Lower	Under	Upper	in	Lower	Under	Upper	in	Lower	Under	Span 0.89
				461	0.0	399	99.8	78.5	3.4	67.7	4.3	
				399	0.0	344	99.8	67.7	2.5	58.4	2.4	D[4,3]
				344	1.6	296	98.2	58.4	1.0	50.4	1.4	160.05µm
				296	3.9	256	94.3	50.4	0.1	43.5	1.3	
1504	0.0	1297	100	256	5.8	220	88.4	43.5	0.0	37.5	1.3	D[3,2]
1297	0.0	1120	100	220	15.2	191	72.2	37.5	0.0	32.4	1.3	133.83µm
1120	0.0	966	100	191	19.7	164	53.5	32.4	0.5	27.9	0.7	
966	0.0	833	100	164	15.4	141	38.1	27.9	0.7	24.1	0.0	D[v,0.9]
833	0.0	719	100	141	12.5	122	22.7	24.1	0.0	20.8	0.0	227.72µm
719	0.1	620	99.9	122	9.7	105	10.2	20.8	0.0	17.9	0.0	
620	0.1	535	99.8	105	4.8	90.9	5.5	17.9	0.0	15.5	0.0	D[v,0.1]
535	0.0	461	99.8	90.9	2.8	78.5	2.7	15.5	0.0	4.00	0.0	85.10µm

Source = Res.:spectrum	Beam length = 200.0 mm	Model indp	D[v,0.5]
Record No. = 21	Log. Diff. = 4.621		159.03µm
Focal length = 800 mm	Obscuration = 0.0132	Volume Conc. = 0.0004%	
Presentation = lds	Volume distribution	Sp.G.0 0.0448 ml/cc.	Shape OFF

MALVERN Instruments SB.00 26 Mar 1992 3:39 pm

Spectrum Electrostatic Nozzles (2 stacked) WHITE
Water+10% v/v oil 000051556
54 m/s : 240 MPa

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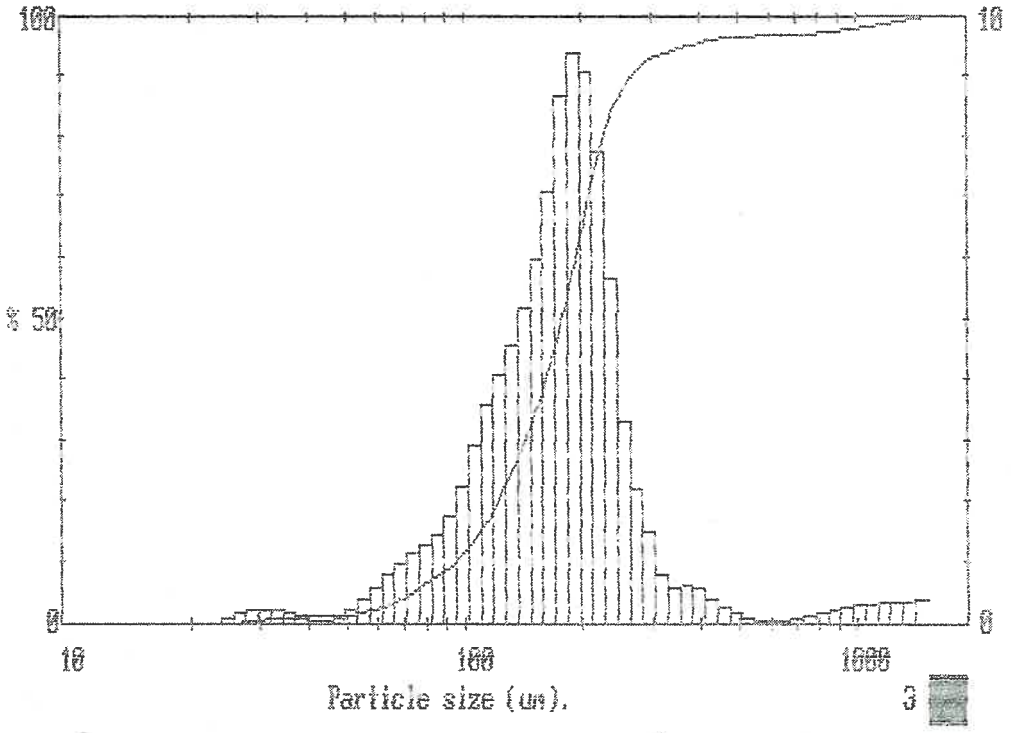
2750 lds 1M00414



Upper	in	Lower	Under	Upper	in	Lower	Under	Upper	in	Lower	Under	Span 0.97
				461	0.0	399	95.7	78.5	2.3	67.7	3.7	
				399	1.2	344	94.4	67.7	1.5	58.4	2.1	D[4,3] 204.55µm
				344	1.7	296	92.8	58.4	0.7	50.4	1.4	
				296	4.2	255	88.6	50.4	0.2	43.5	1.2	
1504	0.8	1297	99.2	255	11.2	220	77.3	43.5	0.1	37.5	1.1	D[3,2] 149.15µm
1297	0.7	1120	98.5	220	17.6	191	59.7	37.5	0.4	32.4	0.8	
1120	0.6	965	97.9	191	17.8	164	41.9	32.4	0.5	27.9	0.3	
965	0.5	833	97.4	164	12.3	141	23.7	27.9	0.3	24.1	0.0	D[v,0.9] 266.73µm
833	0.3	719	97.0	141	8.1	122	20.6	24.1	0.0	20.8	0.0	
719	0.2	620	96.9	122	7.2	105	13.5	20.8	0.0	17.9	0.0	
620	0.1	535	96.8	105	4.6	90.9	9.9	17.9	0.0	15.5	0.0	D[v,0.1] 94.93µm
535	0.3	461	96.4	90.9	2.9	78.5	6.0	15.5	0.0	4.00	0.0	

Source = Res.:spectrum	Beam length = 200.0 mm	Model indp	D[v,0.5] 176.59µm
Record No. = 20	Log. Diff. = 1.275		
Focal length = 300 mm	Obscuration = 0.0247	Volume Conc. = 0.0006%	
Presentation = lds	Volume distribution	Sp.S.A. 0.0402 m²/cc.	Shape OFF

MALVERN Instruments SB.0D 26 Mar 1992 3:38 pm

Spectrum Electrostatic Nozzles (2 stacked) WHITE
Water10% v/v oil 000051553
54 m/s : 340 kPa

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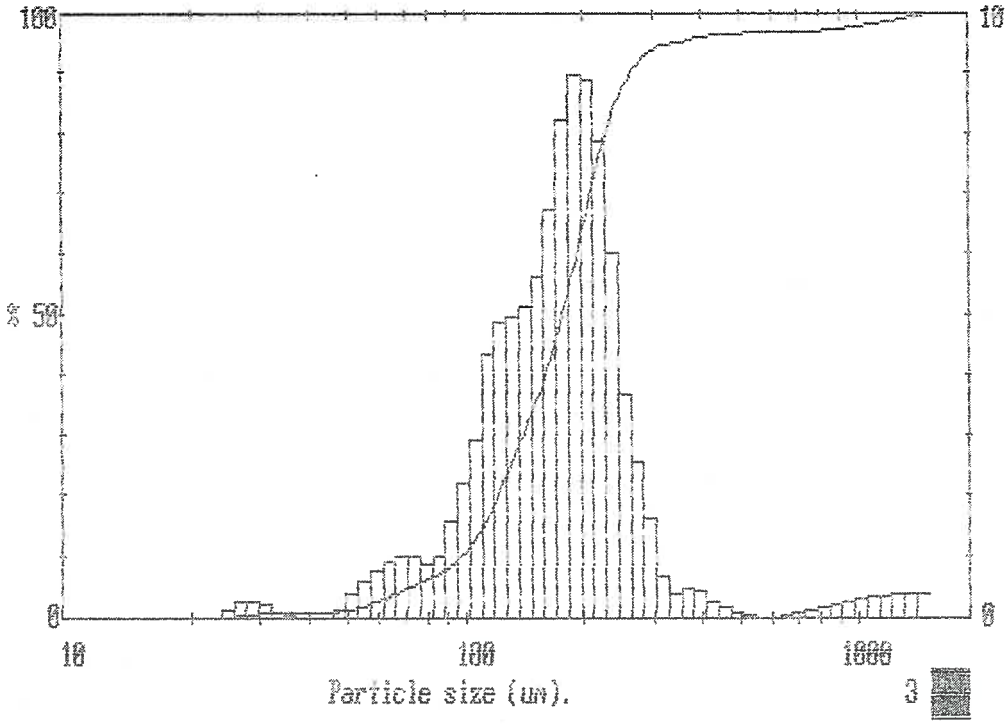
2750 lds 1M00414



Upper	in	Lower	Under	Upper	in	Lower	Under	Upper	in	Lower	Under	Span 0.94
				461	0.5	399	96.1	78.5	2.0	67.7	4.3	
				399	1.0	344	95.2	67.7	1.8	58.4	2.4	D[4,3] 203.50µm
				344	1.4	296	93.7	58.4	1.2	50.4	1.3	
				296	4.9	256	88.9	50.4	0.2	43.5	1.0	
1504	0.8	1297	99.2	256	12.0	220	76.8	43.5	0.0	37.5	1.0	D[3,2] 148.32µm
1297	0.6	1120	98.4	220	17.3	191	59.5	37.5	0.1	32.4	0.9	
1120	0.7	965	97.8	191	16.9	164	42.6	32.4	0.5	27.9	0.4	
965	0.5	833	97.3	164	11.6	141	31.0	27.9	0.4	24.1	0.0	D[v,0.9] 253.24µm
833	0.3	719	96.9	141	9.9	122	21.3	24.1	0.0	20.8	0.0	
719	0.1	620	96.8	122	8.4	105	12.7	20.8	0.0	17.9	0.0	
620	0.0	535	96.8	105	4.3	90.9	8.4	17.9	0.0	15.5	0.0	D[v,0.1] 87.00µm
535	0.2	461	96.6	90.9	2.1	78.5	6.3	15.5	0.0	4.00	0.0	

Source = Res.;spectrum	Beam length = 200.0 mm	Model indp	D[v,0.5] 175.07µm
Record No. = 19	Log. Diff. = 3.254		
Focal length = 800 mm	Obscuration = 0.0234	Volume Conc. = 0.0005%	
Presentation = lds	Volume distribution	Sp.S.A 0.0405 m²/cc.	Shape OFF

MALVERN Instruments SB.8D 26 Mar 1992 3:36 pm

Spectrum Electrostatic Nozzles (2 stacked) WHITE
Water+10% v/v oil
62 m/s : 340 kPa

000051350

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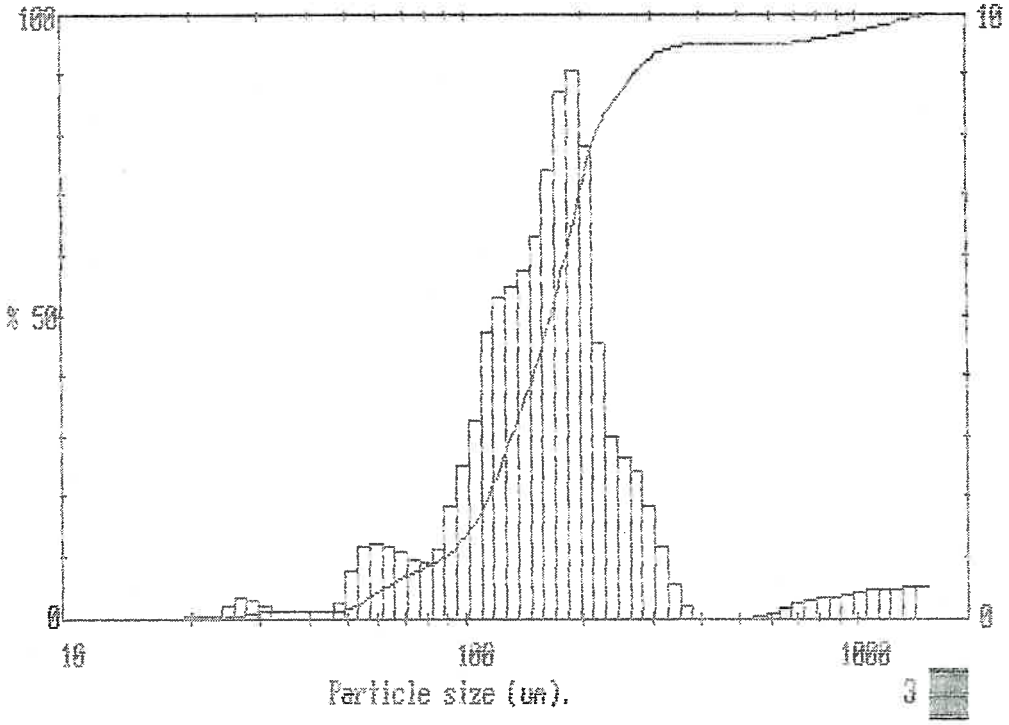
2750 lds 1N00414



Upper	in	Lower	Under	Upper	in	Lower	Under	Upper	in	Lower	Under	Span 1.11
				461	0.0	399	95.1	78.5	2.0	67.7	6.3	
				399	0.3	344	94.7	67.7	2.4	58.4	3.9	D[4,3] 205.04µm
				344	2.3	296	92.3	58.4	2.2	50.4	1.7	
				296	4.6	256	87.8	50.4	0.4	43.5	1.3	
1504	1.0	1297	99.0	256	6.4	220	81.5	43.5	0.0	37.5	1.3	D[3,2] 138.48µm
1297	1.0	1120	97.9	220	14.6	191	66.9	37.5	0.0	32.4	1.3	
1120	0.9	965	97.0	191	17.9	164	49.0	32.4	0.5	27.9	0.8	
965	0.8	833	96.2	164	13.7	141	35.9	27.9	0.6	24.1	0.2	D[v,0.9] 272.20µm
833	0.6	719	95.5	141	11.0	122	24.9	24.1	0.1	20.8	0.0	
719	0.4	620	95.2	122	9.2	105	15.7	20.8	0.0	17.9	0.0	
620	0.1	535	95.1	105	5.0	90.9	10.7	17.9	0.0	15.5	0.0	D[v,0.1] 87.22µm
535	0.0	461	95.1	90.9	2.3	78.5	8.4	15.5	0.0	4.00	0.0	

Source - Res.:spectrum	Beam length = 200.0 mm	Model indp	D[v,0.5] 153.39µm
Record No. = 18	Log. Diff. = 3.480		
Focal length = 800 mm	Obscuration = 0.0215	Volume Conc. = 0.00054	
Presentation = lds	Volume distribution	Sp.S.A 0.0423 m²/cc.	Shape O-P

MALVERN Instruments SB.00 25 Mar 1992 3:36 pm

Spectrum Electrostatic Nozzles (2 stacked) WHITE
Water+10% v/v oil
62 m/s : 340 kPa

000051547

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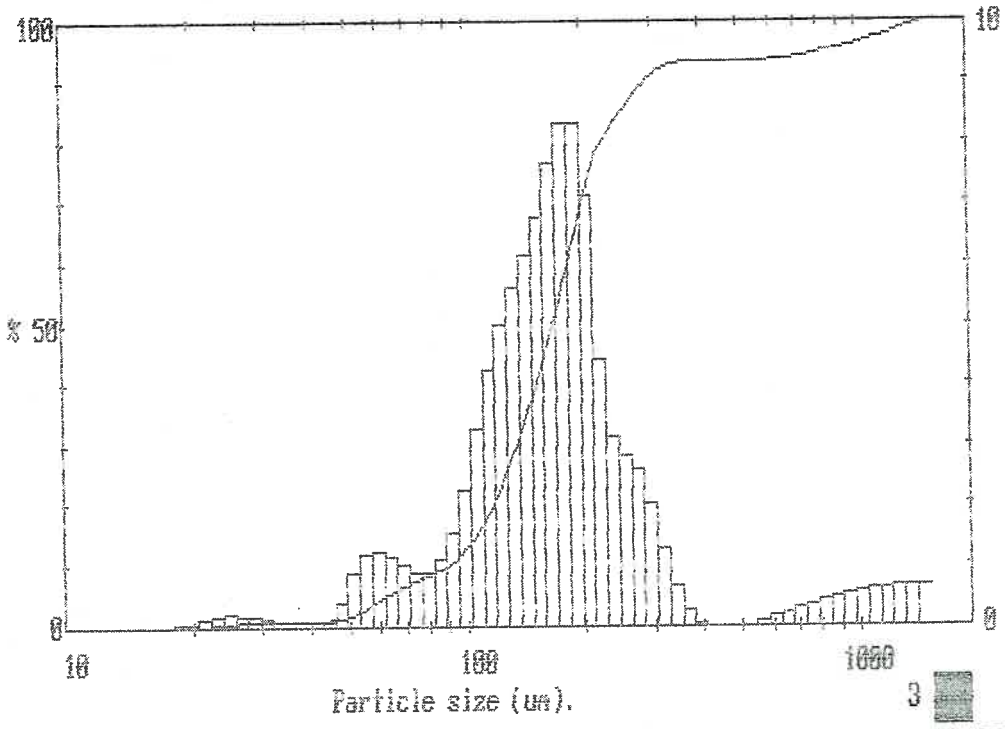
2750 lds 1M0041A



Upper	in	Lower	Under	Upper	in	Lower	Under	Upper	in	Lower	Under
				461	0.0	399	93.5	78.5	1.9	67.7	6.3
				399	0.4	344	93.1	67.7	2.4	58.4	4.0
				344	2.5	296	90.6	58.4	2.2	50.4	1.7
				296	5.0	255	85.6	50.4	0.7	43.5	1.1
1504	1.4	1297	98.5	255	6.6	220	79.0	43.5	0.0	37.5	1.1
1297	1.3	1120	97.3	220	13.4	191	65.6	37.5	0.0	32.4	1.1
1120	1.2	965	96.1	191	17.1	164	48.5	32.4	0.3	27.9	0.8
965	1.0	832	95.1	164	13.9	141	34.5	27.9	0.4	24.1	0.4
832	0.8	719	94.2	141	11.2	122	22.4	24.1	0.3	20.8	0.1
719	0.5	620	93.7	122	8.5	105	14.9	20.8	0.1	17.9	0.0
620	0.3	535	93.5	105	4.5	90.9	10.4	17.9	0.0	15.5	0.0
535	0.0	461	93.5	90.9	2.2	78.5	8.2	15.5	0.0	4.00	0.0

Span 1.21

D[4,3] 221.01µm

D[3,2] 141.12µm

D[v,0.9] 289.76µm

D[v,0.1] 89.04µm

D[v,0.5] 166.34µm

Shape OFF

Source = Res.:spectrum
Record No. = 17
Focal length = 800 mm
Presentation = lds

Beam length = 200.0 mm
Log. Diff. = 3.577
Obscuration = 0.0291
Volume distribution

Model indp
Volume Conc. = 0.0005%
Sp.S.A 0.0425 m²/cm³

MALVERN Instruments SB.00 26 Mar 1992 3:34 pm

Spectrum Electrostatic Nozzles (2 stacked) WHITE
Water+10% v/v oil
62 m/s : 480 kPa

000051544

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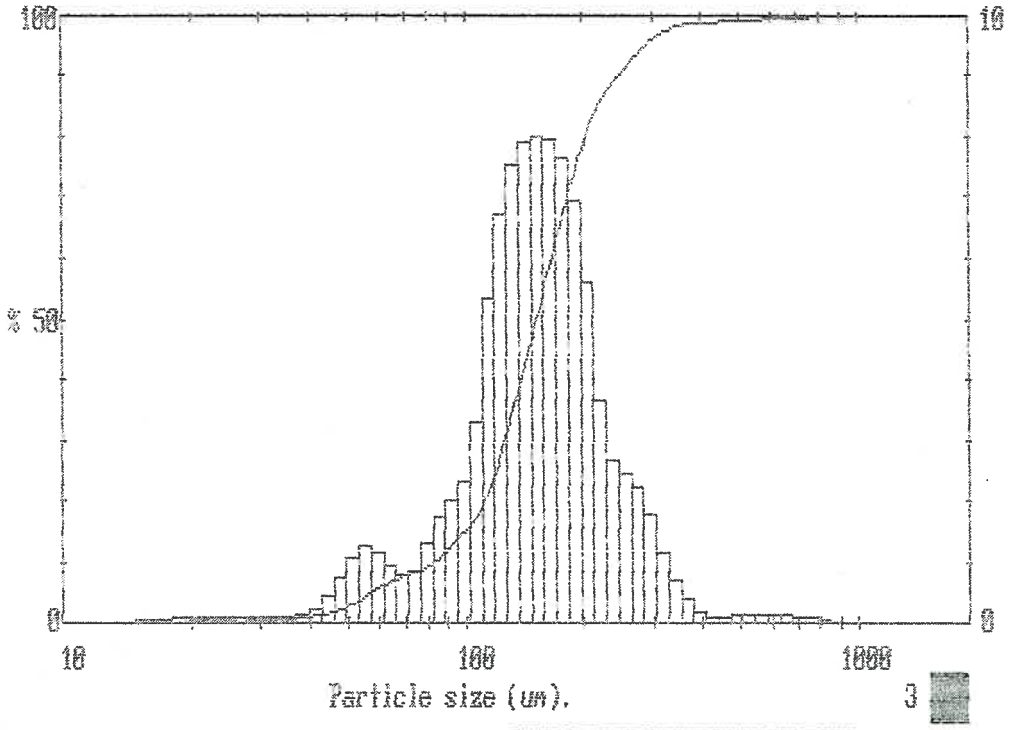
2750 lds IM00414



Upper	in	Lower	Under	Upper	in	Lower	Under	Upper	in	Lower	Under	Span 1.09
				461	0.2	399	98.8	78.5	1.8	67.7	7.4	
				399	0.7	344	98.1	67.7	2.1	58.4	5.3	D[4,3]
				344	2.3	295	95.9	58.4	2.5	50.4	2.8	161.43µm
				295	4.4	256	91.4	50.4	1.4	43.5	1.4	
1504	0.0	1297	100	256	5.7	220	85.7	43.5	0.4	37.5	0.9	D[3,2]
1297	0.0	1120	100	220	10.7	191	75.0	37.5	0.1	32.4	0.8	127.09µm
1120	0.0	965	100	191	15.8	164	59.2	32.4	0.1	27.9	0.7	
965	0.0	833	100	164	15.4	141	42.8	27.9	0.2	24.1	0.5	D[v,0.9]
833	0.1	719	99.8	141	14.2	122	27.9	24.1	0.2	20.8	0.3	245.65µm
719	0.2	620	99.6	122	10.5	105	17.4	20.8	0.2	17.9	0.1	
620	0.3	535	99.3	105	4.8	90.9	12.6	17.9	0.1	15.5	0.1	D[v,0.1]
535	0.3	461	99.0	90.9	3.4	78.5	9.2	15.5	0.1	4.00	0.0	81.85µm

Source = Rec.;spectrum	Beam length = 200.0 mm	Model indp	D[v,0.5]
Record No. = 16	Log. Diff. = 3.909		150.86µm
Focal length = 800 mm	Obscuration = 0.0305	Volume Conc. = 0.0007%	
Presentation = lds	Volume distribution	Sp.S.A 0.0472 m²/cc.	Shape OFF

MALVERN Instruments SD.00 26 Mar 1992 3:34 pm

Spectrum Electrostatic Nozzles (2 stacked) WHITE
Water+10% v/v oil
62 m/s : 480 kPa

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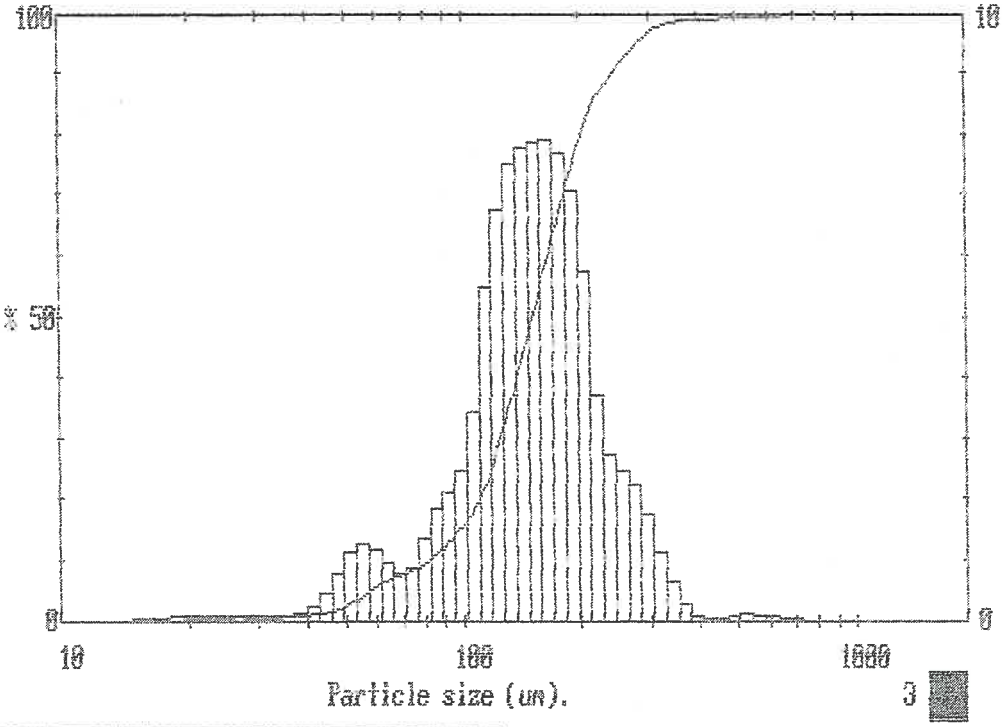
2750 lds 1X00414



Upper	in	Lower	Under	Upper	in	Lower	Under	Upper	in	Lower	Under	Span 1.06
				461	0.1	399	99.3	78.5	1.9	67.7	7.4	
				399	0.5	344	98.8	67.7	2.1	58.4	5.4	D[4,3] 158.56µm
				344	2.3	296	96.5	58.4	2.5	50.4	2.8	
				296	4.4	256	92.2	50.4	1.4	43.5	1.4	
1504	0.0	1297	100	256	5.7	220	85.4	43.5	0.4	37.5	1.0	D[3,2] 126.07µm
1297	0.0	1120	100	220	11.0	191	75.5	37.5	0.1	32.4	0.8	
1120	0.0	965	100	191	15.8	164	59.6	32.4	0.1	27.9	0.7	
965	0.0	833	99.9	164	16.1	141	43.5	27.9	0.2	24.1	0.5	D[v,0.9] 240.47µm
833	0.0	719	99.9	141	14.9	122	28.6	24.1	0.2	20.8	0.3	
719	0.1	620	99.8	122	10.7	105	17.9	20.8	0.2	17.9	0.1	
620	0.2	535	99.6	105	5.0	90.9	12.9	17.9	0.1	15.5	0.1	D[v,0.1] 81.31µm
535	0.2	461	99.4	90.9	3.6	78.5	9.3	15.5	0.1	4.00	0.0	

Source = Res.:spectrum	Beam length = 200.0 mm	Model indp	D[v,0.5] 150.10µm
Record No. = 15	Log. Diff. = 3.898		
Focal length = 800 mm	Obscuration = 0.0261	Volume Conc. = 0.0005%	
Presentation = lds	Volume distribution	Sp.S.A 0.0476 m²/cm³	Shape OFF

MALVERN Instruments SB.0D 26 Mar 1992 3:10 pm

Spectrux Electrostatic Nozzles (2 stacked) WHITE
Water+10% v/v oil
54 m/s : 480 kPa

000051514

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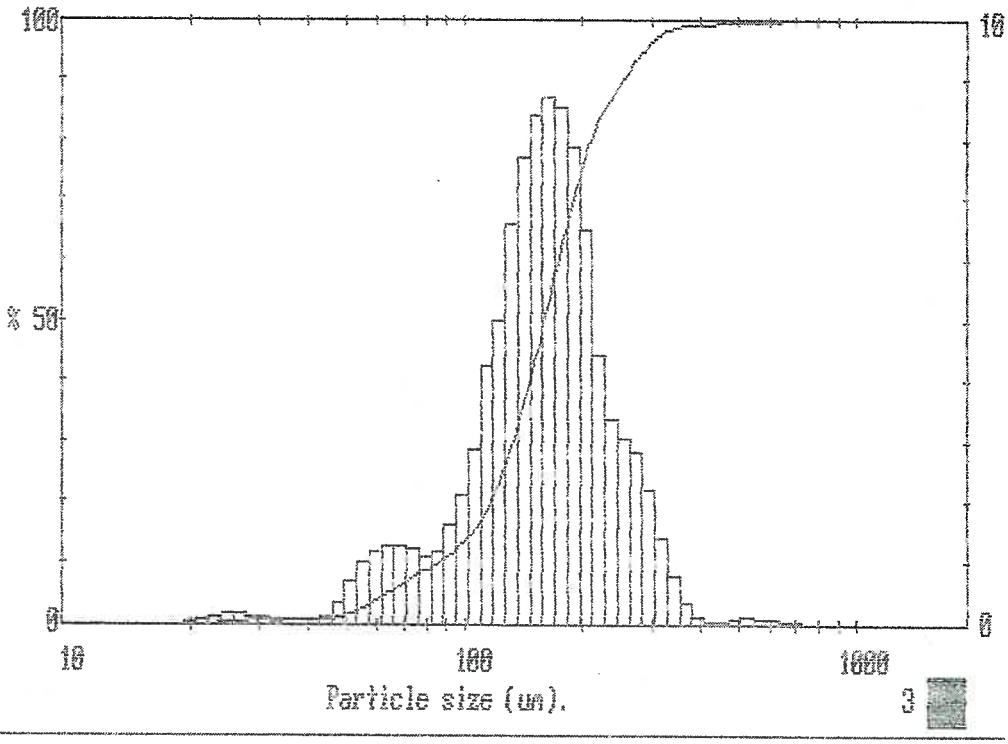
2750 lds 1M00414



Upper	in	Lower	Under	Upper	in	Lower	Under	Upper	in	Lower	Under	Span 1.05
				461	0.1	399	99.4	78.5	2.5	67.7	6.1	
				399	0.6	344	98.8	67.7	2.5	58.4	3.5	D[4,3] 166.58µm
				344	2.8	296	96.0	58.4	1.9	50.4	1.6	
				296	5.4	255	90.6	50.4	0.6	43.5	0.9	
1504	0.0	1297	100	255	7.1	220	83.5	43.5	0.0	37.5	0.9	D[3,2] 135.69µm
1297	0.0	1120	100	220	12.4	191	71.1	37.5	0.1	32.4	0.9	
1120	0.0	965	100	191	17.6	164	53.5	32.4	0.3	27.9	0.6	
965	0.0	833	100	164	17.1	141	36.4	27.9	0.3	24.1	0.3	D[v,0.9] 252.63µm
833	0.0	719	99.9	141	12.9	122	23.5	24.1	0.2	20.8	0.1	
719	0.1	620	99.9	122	8.2	105	15.3	20.8	0.1	17.9	0.0	
620	0.2	535	99.7	105	4.2	90.9	11.0	17.9	0.0	15.5	0.0	D[v,0.1] 86.06µm
535	0.2	461	99.5	90.9	2.4	78.5	8.6	15.5	0.0	4.00	0.0	

Source = Res.:spectrum	Beam length = 200.0 mm	Model indp	D[v,0.5] 159.28µm
Record No. = 12	Log. Diff. = 3.747		
Focal length = 900 mm	Obscuration = 0.0232	Volume Conc. = 0.0008%	
Presentation = lds	Volume distribution	Sp.S.A 0.0442 m²/cc.	Shape OFF

MALVERN Instruments SB.0D 26 Mar 1992 3:08 pm

Spectrum Electrostatic Nozzles (2 stacked) WHITE
Water+10% v/v oil
54 m/s : 480 kPa

000051508

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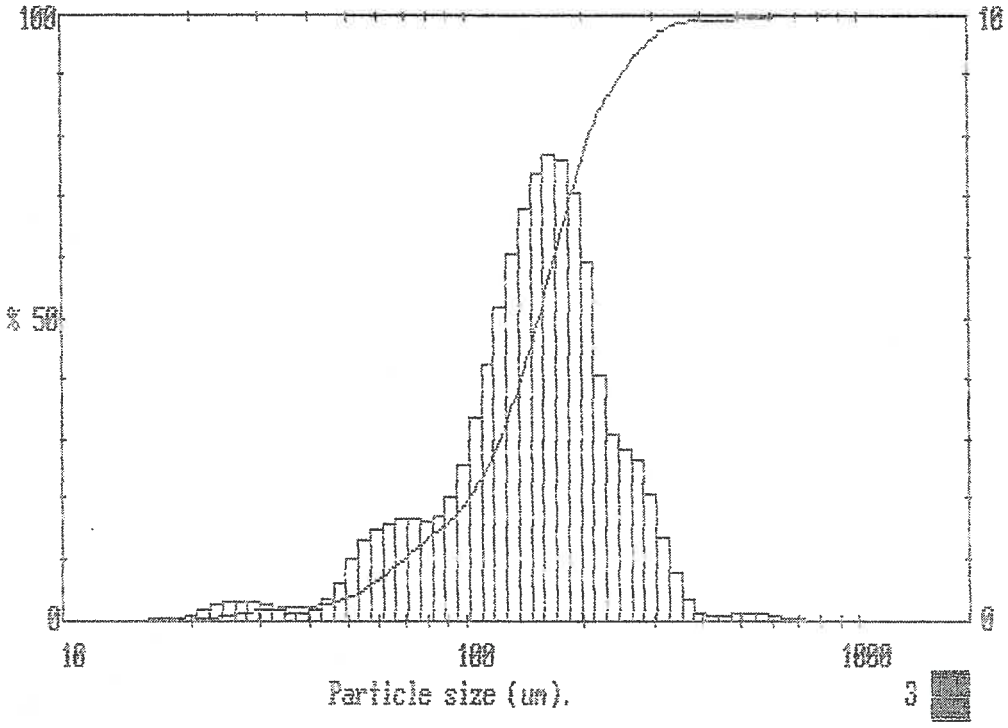
2750 lds IM00414



Upper	in	Lower	Under	Upper	in	Lower	Under	Upper	in	Lower	Under	Span 1.19
				461	0.2	399	99.2	78.5	3.4	67.7	9.5	
				399	0.7	344	98.5	67.7	3.2	58.4	6.2	D[4,3]
				344	2.6	296	95.9	58.4	2.5	50.4	3.7	159.39µm
				296	5.1	256	90.8	50.4	1.1	43.5	2.6	
1504	0.0	1297	100	256	6.5	220	84.2	43.5	0.3	37.5	2.2	D[3,2]
1297	0.0	1120	100	220	11.3	191	72.9	37.5	0.3	32.4	1.9	120.69µm
1120	0.0	965	100	191	15.7	164	57.2	32.4	0.6	27.9	1.4	
965	0.0	833	100	164	15.1	141	42.1	27.9	0.5	24.1	0.7	D[v,0.9]
832	0.0	719	100	141	12.0	122	30.2	24.1	0.5	20.8	0.2	250.99µm
719	0.1	620	99.9	122	8.6	105	21.6	20.8	0.2	17.9	0.1	
620	0.3	535	99.6	105	5.2	90.9	16.4	17.9	0.1	15.5	0.0	D[v,0.1]
535	0.3	461	99.4	90.9	3.5	78.5	12.9	15.5	0.0	4.00	0.0	69.31µm

Source = Res.:spectrum	Beam length = 200.0 mm	Model indp	D[v,0.5]
Record No. = 11	Log. Diff. = 3.580		153.07µm
Focal length = 800 mm	Obscuration = 0.0397	Volume Conc. = 0.0008%	
Presentation = lds	Volume distribution	Sp.S.A 0.0497 m²/cc.	Shape OFF

MALVERN Instruments SB.00 26 Mar 1992 3:07 pm

Spectrum Electrostatic Nozzles (2 stacked) WHITE
Water
54 m/s : 480 kPa

000051505

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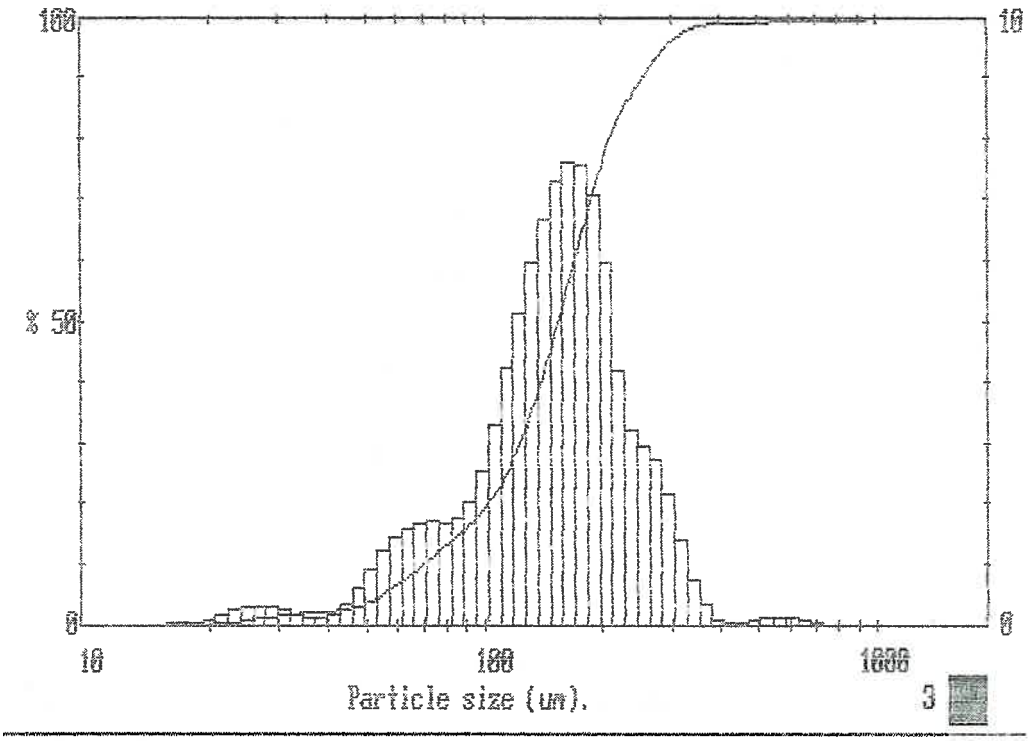
2750 lds IM00414



Upper	in	Lower	Under	Upper	in	Lower	Under	Upper	in	Lower	Under
				461	0.1	399	99.1	78.5	3.5	67.7	9.2
				399	0.6	344	98.5	67.7	3.2	58.4	6.0
				344	2.7	296	95.8	58.4	2.4	50.4	3.7
				296	5.3	256	90.5	50.4	1.1	43.5	2.5
1504	0.0	1297	100	256	6.8	220	83.7	43.5	0.4	37.5	2.2
1297	0.0	1120	99.9	220	11.4	191	72.2	37.5	0.3	32.4	1.9
1120	0.0	965	99.9	191	15.6	164	56.6	32.4	0.6	27.9	1.3
965	0.0	833	99.9	164	14.8	141	41.8	27.9	0.5	24.1	0.7
833	0.0	719	99.8	141	11.8	122	30.0	24.1	0.5	20.8	0.2
719	0.1	620	99.7	122	8.5	105	21.5	20.8	0.1	17.9	0.1
620	0.3	535	99.4	105	5.2	90.9	16.3	17.9	0.1	15.5	0.0
535	0.2	461	99.2	90.9	3.6	78.5	12.7	15.5	0.0	4.00	0.0

Span 1.19

D[4,3] 161.51µm

D[3,2] 121.53µm

D[v,0.9] 253.05µm

D[v,0.1] 69.97µm

D[v,0.5] 153.80µm

Shape OFF

Source = Res.:spectrum
Record No. = 10
Focal length = 800 mm
Presentation = lds

Beam length = 200.0 mm
Log. Diff. = 3.419
Obscuration = 0.0378
Volume distribution

Model indp
Volume Conc. = 0.0008%
Sp.S.A 0.0494 m²/cc.

MALVERN Instruments SB.00 26 Mar 1992 3:07 pm

Spectrum Electrostatic Nozzles (2 stacked) WHITE
Water
54 m/s : 480 kPa

000051502

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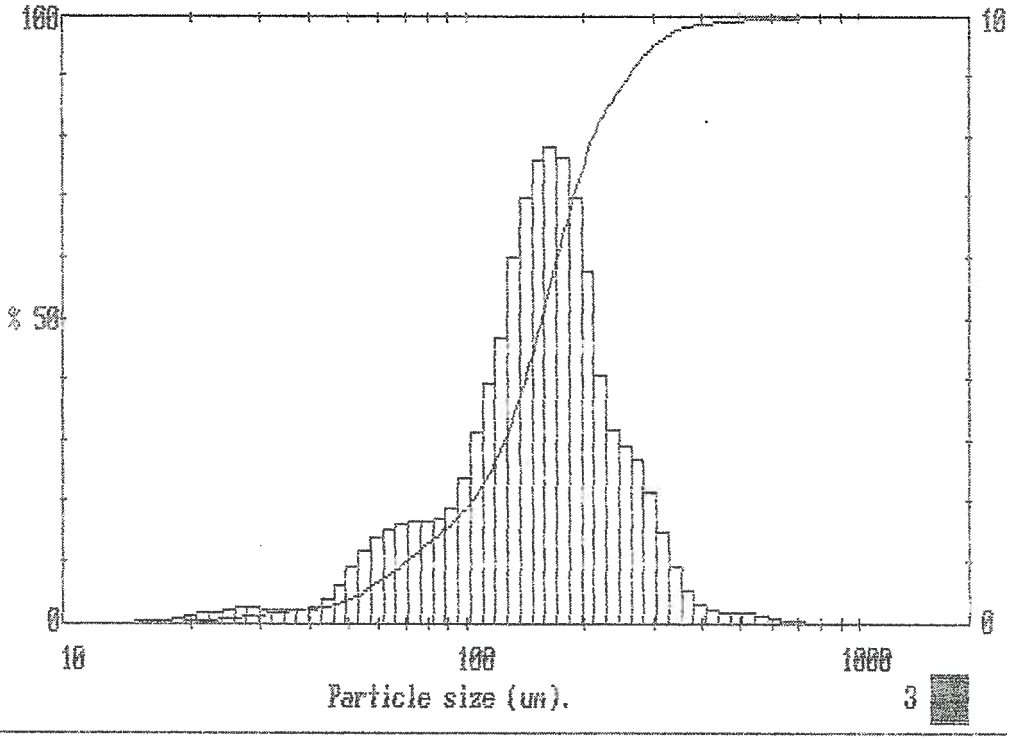
2750 lds 1N00414



Upper	in	Lower	Under
1504	0.0	1297	100
1297	0.0	1120	100
1120	0.0	965	99.9
965	0.0	833	99.9
833	0.0	719	99.9
719	0.1	620	99.8
620	0.3	535	99.5
535	0.3	461	99.2

Upper	in	Lower	Under
461	0.4	399	98.8
399	1.0	344	97.8
344	3.0	296	94.8
296	5.2	256	89.6
256	6.7	220	82.9
220	11.1	191	71.8
191	15.7	164	56.1
164	15.5	141	40.6
141	11.8	122	25.8
122	7.9	105	20.9
105	4.8	90.9	16.1
90.9	3.5	78.5	12.6

Upper	in	Lower	Under
78.5	3.4	67.7	9.2
67.7	3.1	58.4	6.1
58.4	2.3	50.4	3.8
50.4	1.2	43.5	2.6
43.5	0.5	37.5	2.1
37.5	0.4	32.4	1.7
32.4	0.5	27.9	1.2
27.9	0.5	24.1	0.7
24.1	0.4	20.8	0.4
20.8	0.2	17.9	0.1
17.9	0.1	15.5	0.1
15.5	0.1	4.00	0.0

Span 1.22

D[4,3] 163.39µm

D[3,2] 121.91µm

D[v,0.9] 258.79µm

D[v,0.1] 70.13µm

D[v,0.5] 154.99µm

Shape OFF

Source = Res.:spectrum
Record No. = 9
Focal length = 800 mm
Presentation = lds

Beam length = 200.0 mm
Log. Diff. = 3.629
Obscuration = 0.0274
Volume distribution

Model indp

Volume Conc. = 0.0006%
Sp.S.A 0.0432 m²/cc.

MALVERN Instruments SD.0D 26 Mar 1992 3:04 pm

Spectrum Electrostatic Nozzles (2 stacked) WHITE
Water
62 m/s : 480 kPa

000051499

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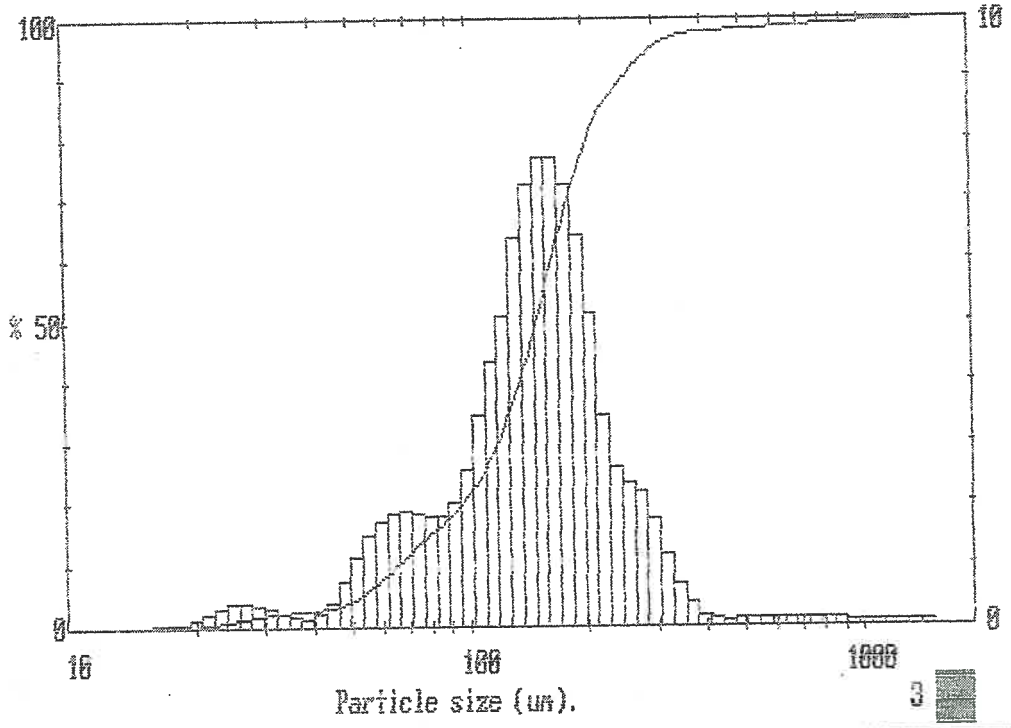
2750 lds 1M00414



Upper	in	Lower	Under	Upper	in	Lower	Under	Upper	in	Lower	Under
				461	0.2	399	97.9	78.5	3.8	67.7	11.0
				399	0.7	344	97.2	67.7	3.7	58.4	7.2
				344	2.3	296	94.8	58.4	2.9	50.4	4.3
				296	4.3	256	90.6	50.4	1.3	43.5	3.0
1504	0.2	1297	99.8	256	5.5	220	85.1	43.5	0.4	37.5	2.6
1297	0.2	1120	99.6	220	9.8	191	75.3	37.5	0.4	32.4	2.2
1120	0.2	965	99.4	191	14.9	164	60.4	32.4	0.6	27.9	1.6
965	0.2	833	99.1	164	15.6	141	44.7	27.9	0.8	24.1	0.8
833	0.2	719	98.9	141	12.5	122	32.2	24.1	0.6	20.8	0.3
719	0.3	620	98.6	122	8.6	105	23.6	20.8	0.2	17.9	0.1
620	0.3	535	98.4	105	5.2	90.9	18.5	17.9	0.1	15.5	0.0
535	0.3	461	98.1	90.9	3.7	78.5	14.8	15.5	0.0	4.00	0.0

Span 1.25

D[4,3] 164.70µm

D[3,2] 116.39µm

D[v,0.9] 251.53µm

D[v,0.1] 65.31µm

D[v,0.5] 148.80µm

Shape OFF

Source = Res.+spectrum
Record No. = 8
Focal length = 800 mm
Presentation = lds

Beam length = 200.0 mm
Log. Diff. = 3.671
Obscuration = 0.0406
Volume distribution

Model indp

Volume Conc. = 0.0008%
Sp.S.A 0.0516 m²/cc.

MALVERN Instruments SB.0D 26 Mar 1992 3:03 pm

Spectrum Electrostatic Nozzles (2 stacked) WHITE
Water
62 m/s : 480 kPa

000051496

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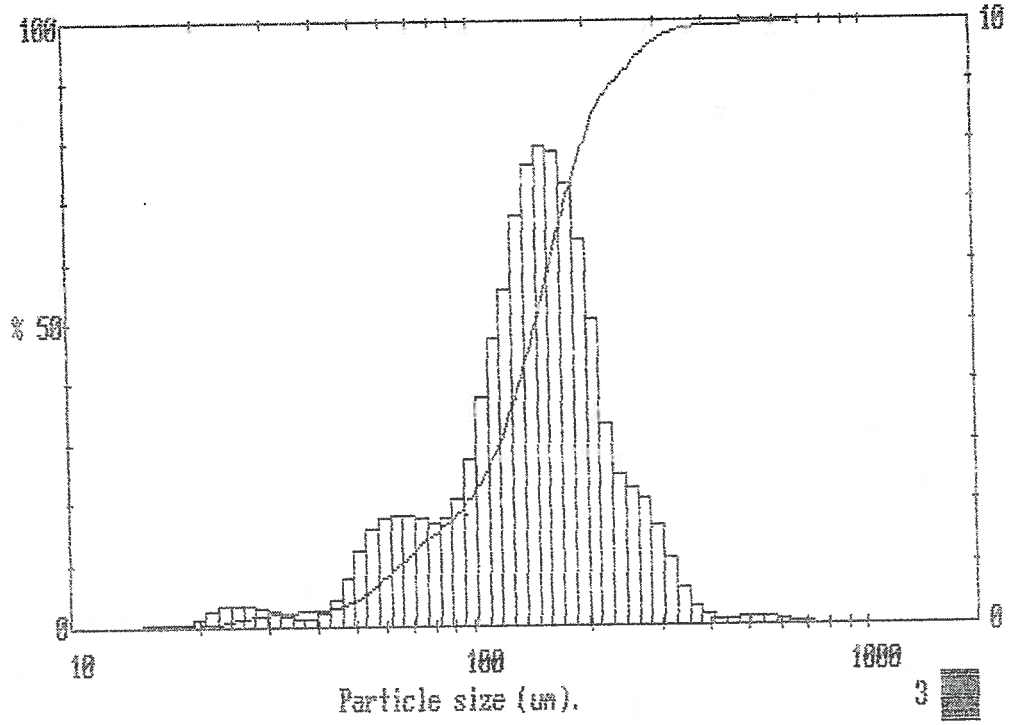
2750 lds 1M00414



Upper	in	Lower	Under
1504	0.0	1297	100
1297	0.0	1120	100
1120	0.0	965	100
965	0.0	833	99.9
833	0.0	719	99.9
719	0.1	620	99.8
620	0.3	535	99.6
535	0.3	461	99.3
461	0.2	399	99.1
399	0.6	344	98.5
344	2.1	296	96.4
296	4.0	256	92.4
256	5.2	220	87.2
220	9.6	191	77.5
191	15.0	164	62.6
164	16.1	141	46.4
141	13.2	122	33.1
122	9.5	105	23.7
105	5.5	90.9	18.2
90.9	3.6	78.5	14.6
78.5	3.6	67.7	11.0
67.7	3.7	58.4	7.4
58.4	3.0	50.4	4.3
50.4	1.4	43.5	2.9
43.5	0.4	37.5	2.5
37.5	0.3	32.4	2.2
32.4	0.6	27.9	1.7
27.9	0.7	24.1	0.9
24.1	0.6	20.8	0.3
20.8	0.2	17.9	0.1
17.9	0.1	15.5	0.0
15.5	0.0	4.00	0.0

Span 1.18

D[4,3] 153.02µm

D[3,2] 114.60µm

D[v,0.9] 237.50µm

D[v,0.1] 65.02µm

D[v,0.5] 146.16µm

Shape OFF

Source = Res.;spectrum
Record No. = 7
Focal length = 800 mm
Presentation = lds

Beam length = 200.0 mm
Log. Diff. = 3.654
Obscuration = 0.0342
Volume distribution

Model indp
Volume Conc. = 0.0007%
Sp.S.A 0.0524 m^2/cc.

MALVERN Instruments SB.00 26 Mar 1992 2:58 pm

Spectrum Electrostatic Nozzles (2 stacked) WHITE
Water
54 m/s : 340 kPa

000051484

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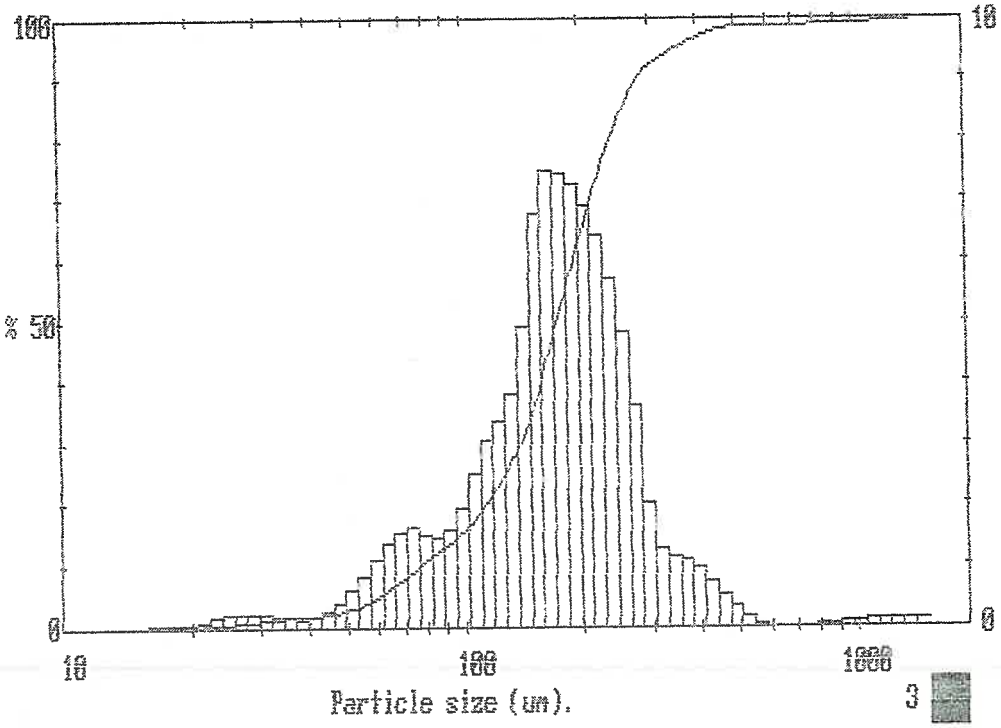
2750 lds 1M00414



Upper	in	Lower	Under	Upper	in	Lower	Under	Upper	in	Lower	Under
				461	1.4	399	96.9	78.5	3.3	67.7	7.1
				399	2.2	344	94.7	67.7	2.7	58.4	4.4
				344	2.7	296	92.0	58.4	1.6	50.4	2.8
				296	6.7	256	85.3	50.4	0.7	43.5	2.1
1504	0.3	1297	99.7	256	11.7	220	73.5	43.5	0.3	37.5	1.7
1297	0.3	1120	99.4	220	13.5	191	60.0	37.5	0.3	32.4	1.4
1120	0.2	965	99.2	191	15.4	164	44.6	32.4	0.5	27.9	0.9
965	0.2	833	99.0	164	13.5	141	31.1	27.9	0.4	24.1	0.5
833	0.0	719	99.0	141	7.6	122	23.5	24.1	0.3	20.8	0.2
719	0.0	620	99.0	122	6.1	105	17.4	20.8	0.1	17.9	0.1
620	0.1	535	98.9	105	4.0	90.9	13.4	17.9	0.1	15.5	0.0
535	0.6	461	98.3	90.9	3.0	78.5	10.4	15.5	0.0	4.00	0.0

Span 1.17

D[4,3] 189.17µm

D[3,2] 135.35µm

D[v,0.9] 279.17µm

D[v,0.1] 77.11µm

D[v,0.5] 172.78µm

Shape OFF

Source = Res.:spectrum
Record No. = 3
Focal length = 800 mm
Presentation = lds

Beam length = 200.0 mm
Log. Diff. = 3.633
Obscuration = 0.0300
Volume distribution

Model indp

Volume Conc. = 0.0007%
Sp.S.A 0.0440 m²/cc.

MALVERN Instruments SB.00 26 Mar 1992 2:57 pm

Spectrum Electrostatic Nozzles (2 stacked) WHITE
Water
54 m/s : 340 kPa

000051481

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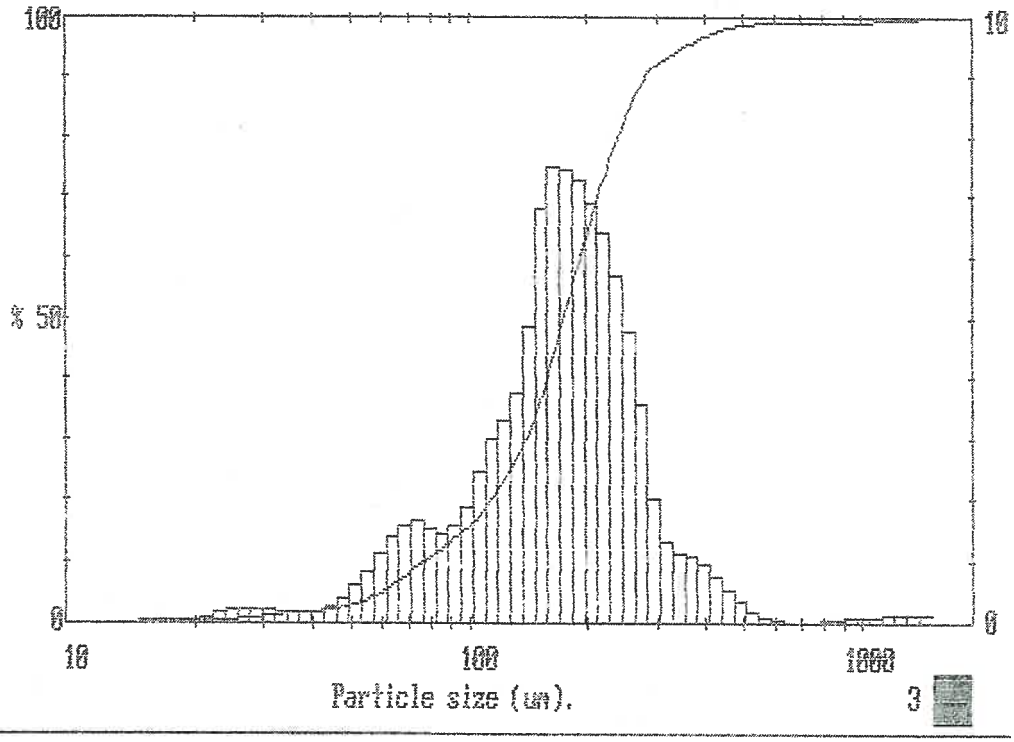
2750 lds 1M00414



Upper	in	Lower	Under	Upper	in	Lower	Under	Upper	in	Lower	Under
				461	1.4	399	96.9	78.5	3.3	67.7	7.3
				399	2.2	344	94.7	67.7	2.8	58.4	4.5
				344	2.7	296	92.0	58.4	1.6	50.4	2.9
				296	6.7	255	85.3	50.4	0.8	43.5	2.1
1504	0.3	1297	99.7	255	11.7	220	73.6	43.5	0.4	37.5	1.8
1297	0.2	1120	99.5	220	13.6	191	60.0	37.5	0.4	32.4	1.4
1120	0.2	965	99.3	191	15.5	164	44.5	32.4	0.5	27.9	0.9
965	0.1	833	99.2	164	13.5	141	31.0	27.9	0.4	24.1	0.5
833	0.1	719	99.1	141	7.5	122	23.5	24.1	0.3	20.8	0.2
719	0.0	620	99.1	122	6.0	105	17.5	20.8	0.1	17.9	0.1
620	0.1	535	99.0	105	3.9	90.9	13.6	17.9	0.1	15.5	0.0
535	0.6	461	98.3	90.9	3.0	78.5	10.6	15.5	0.0	4.00	0.0

Source = Res.:spectrum	Beam length = 200.0 mm	Model indp	Span 1.17
Record No. = 2	Log. Diff. = 3.627		D[4,3] 188.02µm
Focal length = 800 mm	Obscuration = 0.0295	Volume Conc. = 0.0007%	D[3,2] 135.72µm
Presentation = lds	Volume distribution	Sp.S.A 0.0442 m²/cc.	D[v,0.9] 279.05µm
			D[v,0.1] 76.29µm
			D[v,0.5] 172.86µm
			Shape OFF

MALVERN Instruments SB.00 26 Mar 1992 3:00 pm

Spectrum Electrostatic Nozzles (2 stacked) WHITE
Water
62 m/s : 340 kPa

000051490

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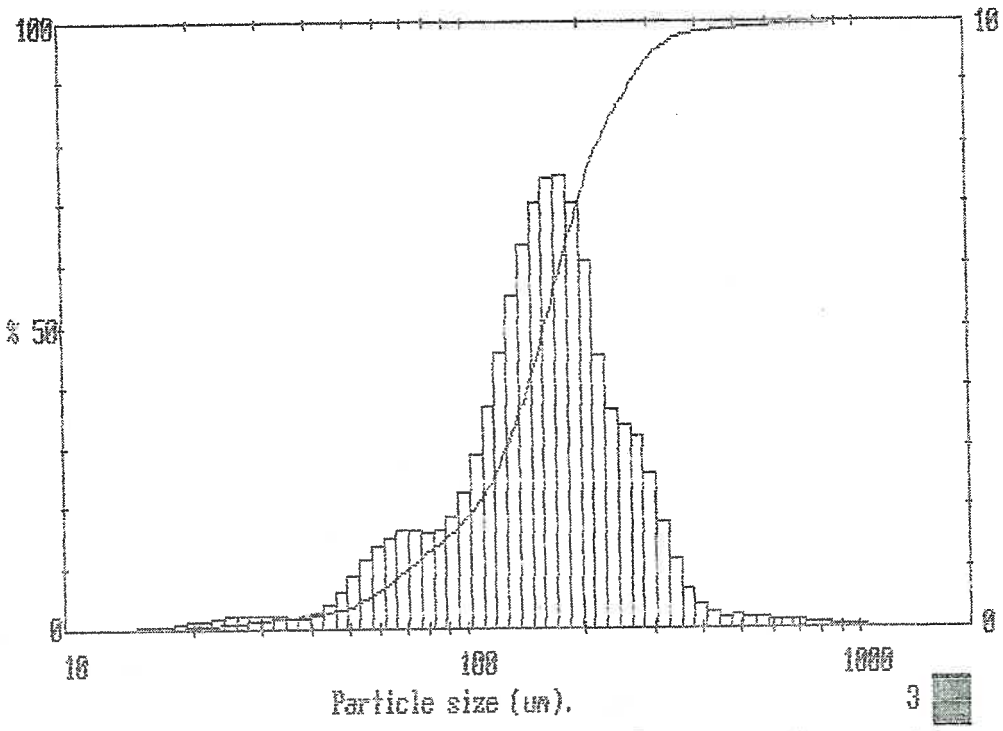
2750 lds 1M00414



Upper	in	Lower	Under	Upper	in	Lower	Under	Upper	in	Lower	Under	Span 1.25
				461	0.5	399	98.2	78.5	3.3	67.7	8.9	
				399	1.2	344	97.0	67.7	3.0	58.4	5.8	D[4,3] 170.67µm
				344	2.5	296	93.5	58.4	2.2	50.4	3.6	
				296	6.1	256	87.3	50.4	1.1	43.5	2.5	
1504	0.0	1297	100	256	7.6	220	79.7	43.5	0.5	37.5	2.0	D[3,2] 125.12µm
1297	0.0	1120	100	220	11.7	191	68.0	37.5	0.4	32.4	1.6	
1120	0.0	965	100	191	15.4	164	52.7	32.4	0.5	27.9	1.1	
965	0.1	833	99.9	164	14.3	141	38.4	27.9	0.4	24.1	0.7	D[v,0.9] 271.37µm
833	0.2	719	99.7	141	10.8	122	27.5	24.1	0.3	20.8	0.4	
719	0.3	620	99.4	122	7.4	105	20.1	20.8	0.2	17.9	0.2	
620	0.3	535	99.1	105	4.6	90.9	15.6	17.9	0.1	15.5	0.1	D[v,0.1] 71.23µm
535	0.4	461	98.7	90.9	3.3	78.5	12.2	15.5	0.1	4.00	0.0	

Source = Res.:spectrum	Beam length = 200.0 mm	Model indp	D[v,0.5] 159.75µm
Record No. = 5	Log. Diff. = 3.559		
Focal length = 800 mm	Obscuration = 0.0290	Volume Conc. = 0.0006%	Shape OFF
Presentation = lds	Volume distribution	Sp.S.A 0.0480 m²/cc.	

MALVERN Instruments SB.0D 26 Mar 1992 2:59 pm

Spectrum Electrostatic Nozzles (2 stacked) WMIRE
Water
62 m/s : 340 kPa

000051487

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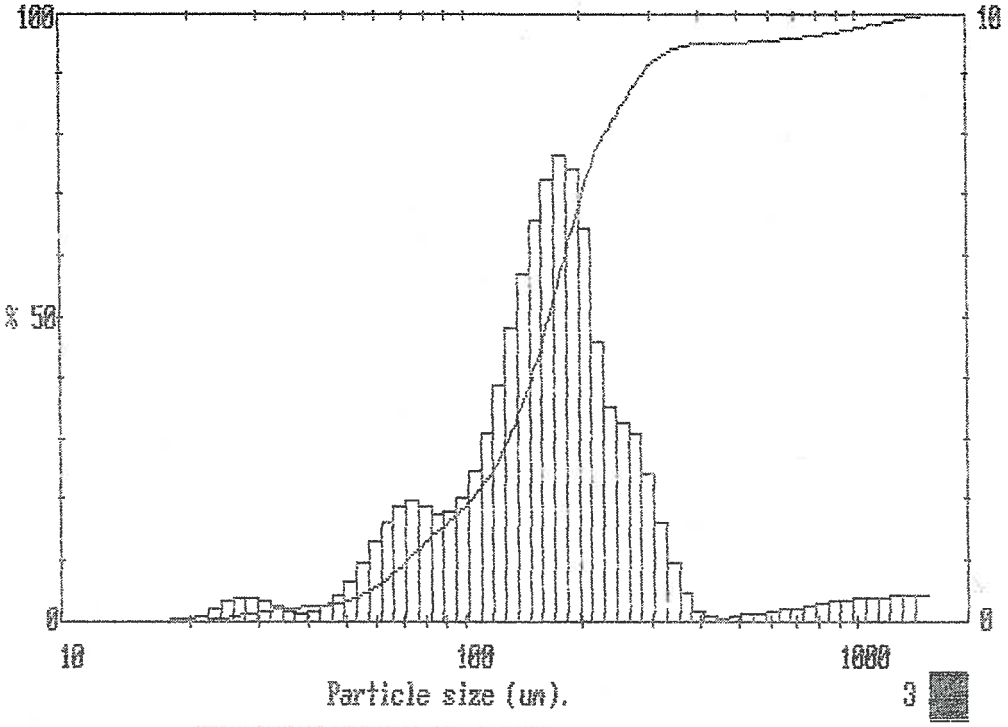
2750 lds 1N00414



Upper	in	Lower	Under	Upper	in	Lower	Under	Upper	in	Lower	Under	Span 1.31
				461	0.1	399	95.1	78.5	4.0	67.7	8.6	
				399	0.9	344	94.3	67.7	3.2	58.4	5.4	D[4,3] 202.52µm
				344	3.2	296	91.1	58.4	1.9	50.4	3.5	
				296	5.9	256	85.1	50.4	0.8	43.5	2.7	
1504	0.9	1297	99.1	256	7.5	220	77.7	43.5	0.3	37.5	2.4	D[3,2] 128.79µm
1297	0.8	1120	98.3	220	12.3	191	65.4	37.5	0.4	32.4	2.0	
1120	0.8	965	97.5	191	15.7	164	49.7	32.4	0.8	27.9	1.2	
965	0.7	833	96.8	164	13.4	141	36.3	27.9	0.7	24.1	0.5	D[v,0.9] 287.05µm
833	0.6	719	96.2	141	9.5	122	26.8	24.1	0.4	20.8	0.1	
719	0.4	620	95.8	122	6.3	105	20.5	20.8	0.1	17.9	0.0	
620	0.3	535	95.5	105	4.2	90.9	16.3	17.9	0.0	15.5	0.0	D[v,0.1] 71.27µm
535	0.2	461	95.3	90.9	3.6	78.5	12.7	15.5	0.0	4.00	0.0	

Source = Res.:spectrum	Beam length = 200.0 mm	Model indp	D[v,0.5] 164.56µm
Record No. = 4	Log. Diff. = 3.637		
Focal length = 800 mm	Obscuration = 0.0285	Volume Conc. = 0.0005%	
Presentation = lds	Volume distribution	Sp.S.A 0.0466 m²/cc.	Shape OFF