FACULDADE DE ENGENHARIA DA UNIVERSIDADE DO PORTO

DEPARTAMENTO DE ENGENHARIA DE MINAS

ESTUDO DOS PROCESSOS DE CLASSIFICAÇÃO DE CAULINOS NUMA INSTALAÇÃO INDUSTRIAL

ENSAIO DE INTERPRETAÇÃO DE DADOS OBTIDOS EM REGIME NÃO PERMANENTE

VOLUME DE ANEXOS

Dissertação para a obtenção de grau de mestre
em Tecnologia e Gestão de Recursos Minerais

MARIA JOANA FRANÇA CABRAL DE SAMPAIO VEGA
(Licenciada em Engenharia de Minas pela FEUP)

(Fevereiro de 1996)

ANEXOS

ANEXO I

DETERMINAÇÃO EXPERIMENTAL DE DADOS

- AMOSTRAGEM 1

- HISTOGRAMA E CUMULANTE INFERIOR
-CURVAS GRANULOMÉTRICAS CUMULANTES
- OUTPUTS DO COULTER

- AMOSTRAGEM 2

- HISTOGRAMA E CUMULANTE INFERIOR
-CURVAS GRANULOMÉTRICAS CUMULANTES
- OUTPUTS DO COULTER

- AMOSTRAGEM 3

- HISTOGRAMA E CUMULANTE INFERIOR
-CURVAS GRANULOMÉTRICAS CUMULANTES
- OUTPUTS DO COULTER

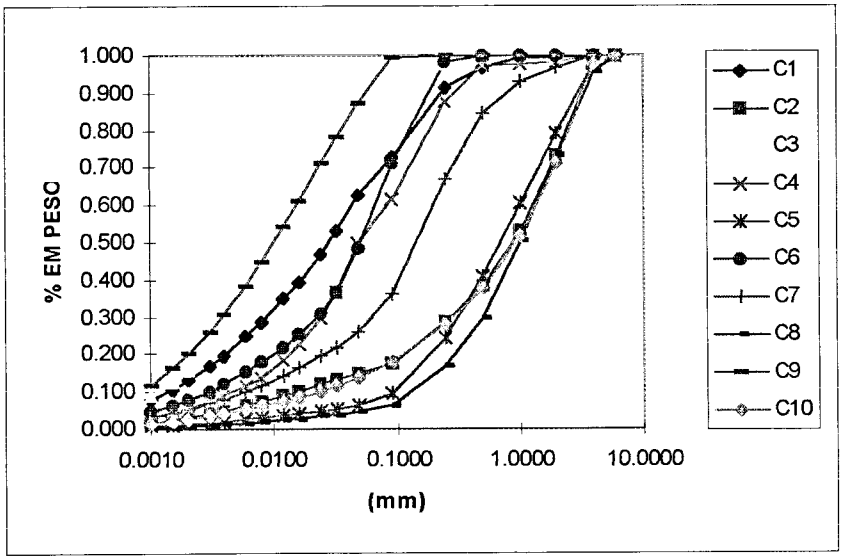
- PERCENTAGEM DE SÓLIDOS

AMOSTRAGEM 1, 2 E 3

AMOSTRAGEM Nº 1

HISTOGRAMA										
(mm)	C1	C2	C3	C4	C5	C6	C7	C8	C9	C10
6.0000	0.000	0.021	0.000	0.000	0.019	0.000	0.000	0.045	0.000	0.022
4.0000	0.003	0.247	0.000	0.014	0.186	0.000	0.027	0.222	0.000	0.268
2.0000	0.002	0.202	0.000	0.008	0.190	0.000	0.049	0.226	0.000	0.193
1.0000	0.004	0.147	0.000	0.005	0.196	0.002	0.091	0.207	0.000	0.137
0.5000	0.017	0.098	0.003	0.007	0.164	0.014	0.195	0.127	0.000	0.099
0.2500	0.162	0.107	0.072	0.147	0.151	0.269	0.308	0.106	0.005	0.098
0.0900	0.183	0.028	0.147	0.321	0.028	0.230	0.069	0.019	0.126	0.043
0.0480	0.099	0.017	0.107	0.132	0.011	0.119	0.040	0.008	0.089	0.023
0.0320	0.060	0.013	0.073	0.066	0.006	0.055	0.025	0.005	0.069	0.014
0.0240	0.074	0.018	0.094	0.074	0.008	0.057	0.031	0.006	0.099	0.017
0.0160	0.047	0.012	0.062	0.042	0.005	0.034	0.020	0.004	0.070	0.011
0.0120	0.062	0.017	0.081	0.046	0.007	0.042	0.027	0.005	0.097	0.013
0.0080	0.039	0.011	0.051	0.024	0.004	0.025	0.016	0.003	0.061	0.008
0.0060	0.049	0.014	0.065	0.026	0.005	0.031	0.021	0.004	0.078	0.011
0.0040	0.031	0.009	0.040	0.015	0.003	0.019	0.013	0.002	0.048	0.007
0.0030	0.037	0.010	0.048	0.017	0.004	0.023	0.015	0.003	0.058	0.008
0.0020	0.023	0.006	0.029	0.010	0.002	0.014	0.009	0.002	0.036	0.005
0.0015	0.030	0.007	0.036	0.013	0.003	0.018	0.012	0.002	0.046	0.006
0.0010	0.079	0.017	0.093	0.034	0.008	0.048	0.031	0.005	0.119	0.016
SUM	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000
CUMULANTE INFERIOR										
(mm)	C1	C2	C3	C4	C5	C6	C7	C8	C9	C10
6.0000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000
4.0000	1.000	0.979	1.000	1.000	0.981	1.000	1.000	0.955	1.000	0.978
2.0000	0.997	0.733	1.000	0.986	0.794	1.000	0.973	0.733	1.000	0.710
1.0000	0.996	0.530	1.000	0.978	0.604	1.000	0.924	0.506	1.000	0.518
0.5000	0.991	0.383	1.000	0.973	0.408	0.998	0.834	0.299	1.000	0.380
0.2500	0.974	0.285	0.997	0.966	0.244	0.984	0.639	0.172	1.000	0.281
0.0740	0.812	0.178	0.925	0.819	0.094	0.715	0.331	0.066	0.995	0.183
0.0480	0.629	0.150	0.779	0.498	0.066	0.485	0.261	0.047	0.870	0.140
0.0320	0.530	0.133	0.672	0.366	0.055	0.366	0.221	0.039	0.781	0.117
0.0240	0.470	0.120	0.599	0.300	0.049	0.311	0.196	0.035	0.712	0.103
0.0160	0.396	0.103	0.505	0.226	0.041	0.254	0.165	0.029	0.613	0.086
0.0120	0.349	0.090	0.443	0.184	0.036	0.220	0.145	0.025	0.543	0.075
0.0080	0.287	0.074	0.362	0.138	0.030	0.178	0.118	0.021	0.446	0.062
0.0060	0.249	0.063	0.311	0.115	0.026	0.153	0.101	0.018	0.385	0.053
0.0040	0.199	0.049	0.246	0.088	0.020	0.122	0.081	0.014	0.307	0.043
0.0030	0.169	0.041	0.205	0.073	0.017	0.102	0.068	0.011	0.259	0.036
0.0020	0.132	0.030	0.158	0.057	0.013	0.080	0.052	0.008	0.201	0.028
0.0015	0.109	0.024	0.129	0.047	0.011	0.066	0.043	0.007	0.165	0.022
0.0010	0.079	0.017	0.093	0.034	0.008	0.048	0.031	0.005	0.119	0.016

CURVAS GRANULOMÉTRICAS DOS PRODUTOS RESULTANTES DA 1ª AMOSTRAGEM

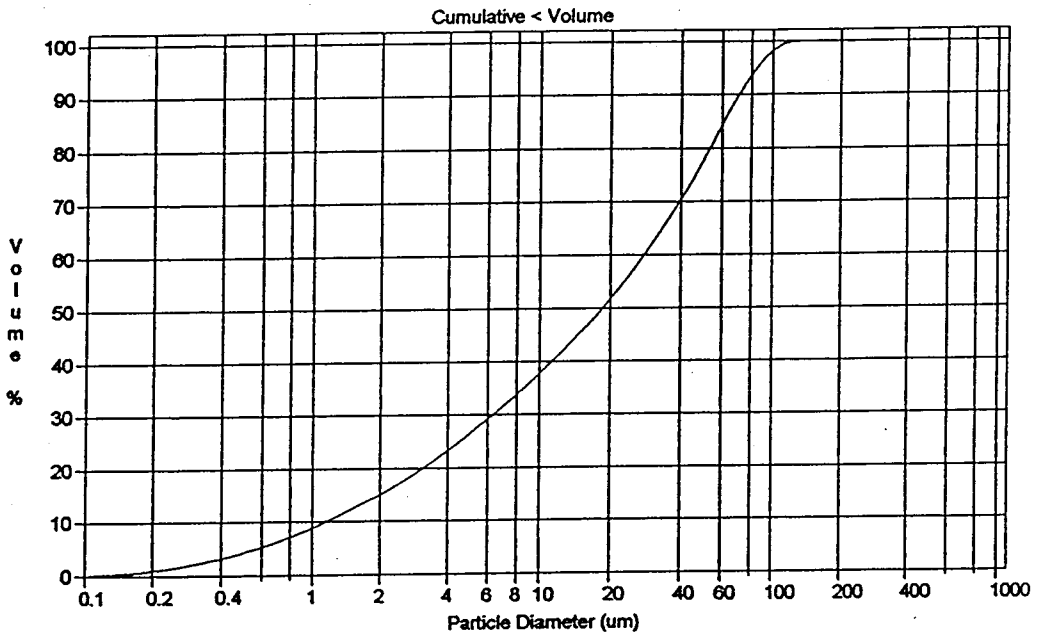


COULTER^R LS Particle ~ ze Analysis.

11:31 6 Jan 19

Run 1 of 1

File name:		Group ID:	3/5/94
Sample ID:	n°1		
Operator:		Run number:	2
Comments:			
Start time:	11:29 6 Jan 1995	Run length:	60 Seconds
Pump Speed:	75		
Obscuration:	10%		
Optical model:	Fraunhofer		
LS 130	Fluid module		
Software:	1.53	Firmware:	1.3 1.8



Volume Statistics (Arithmetic) (Untitled)

Calculations from 0.100 um to 900.0 um

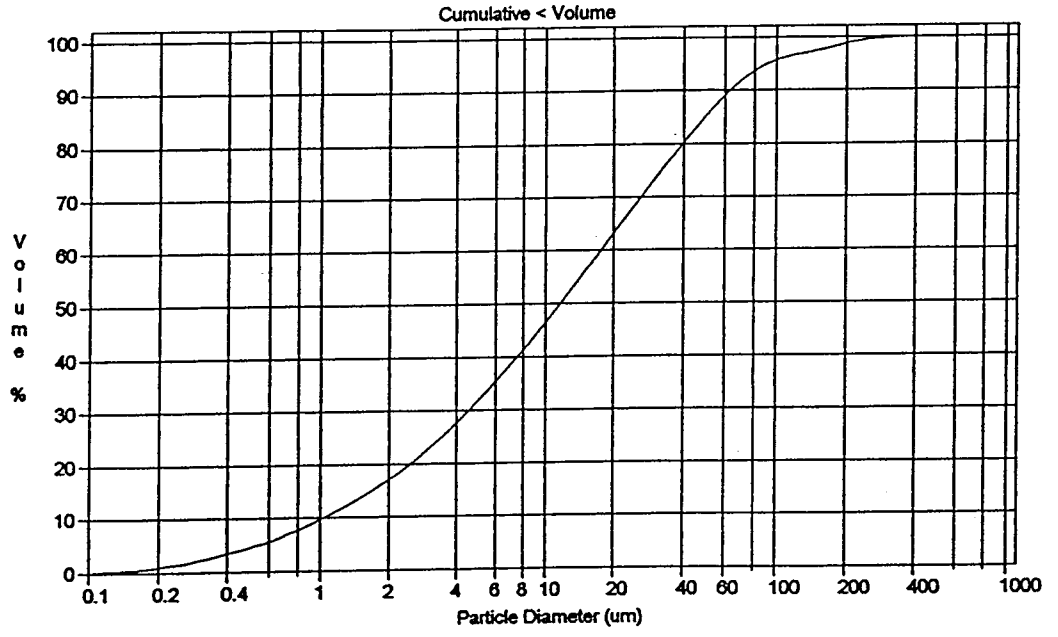
Volume	100.0%		
Mean:	28.18 um	95% Conf. Limits:	0-82.9 um
Median:	18.48 um	S.D.:	27.9 um
Mean/Median Ratio:	1.525	Variance:	779 um^2
Mode:	56.00 um	C.V.:	99.1%
		Skewness:	1.04 Right skewed
		Kurtosis:	0.268 Leptokurtic

% <	10	25	50	75	90
Size um	1.156	4.527	18.48	45.90	70.82

COULTER^R LS Particle Size Analysis 11:09 5 Jan 19

Run 1 of 1

File name:		Group ID:	3/5/94
Sample ID:	n°2		
Operator:		Run number:	1
Comments:			
Start time:	11:07 5 Jan 1995	Run length:	61 Seconds
Pump Speed:	75		
Obscuration:	11%		
Optical model:	Fraunhofer		
LS 130	Fluid module		
Software:	1.53	Firmware:	1.3 1.8



Volume Statistics (Arithmetic) (Untitled)

Calculations from 0.100 um to 900.0 um

Volume	100.0%		
Mean:	25.74 um	95% Conf. Limits:	0-103 um
Median:	11.64 um	S.D.:	39.3 um
Mean/Median Ratio:	2.211	Variance:	1540 um^2
Mode:	24.68 um	C.V.:	153%
		Skewness:	3.45 Right skewed
		Kurtosis:	15.4 Leptokurtic

% <	10	25	50	75	90
Size um	1.042	3.435	11.64	32.11	63.06

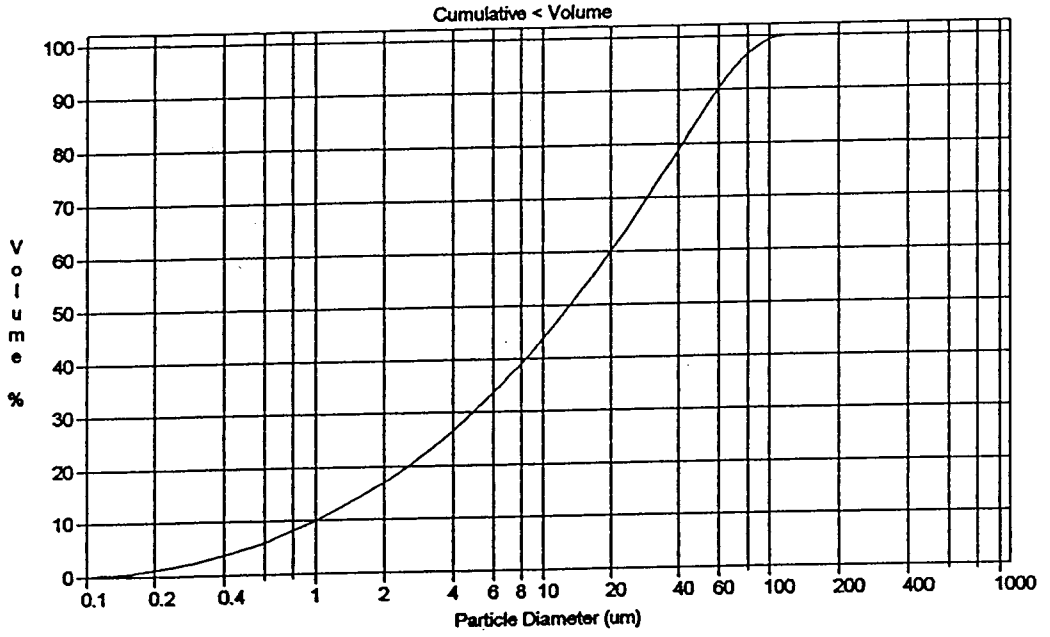
COULTER^R LS Particle Size Analysis

12:03 6 Jan 19

Run 1 of 1

File name:
Sample ID: n°3
Operator:
Comments:
Start time: 12:01 6 Jan 1995
Pump Speed: 75
Obscuration: 13%
Optical model: Fraunhofer
LS 130 Fluid module
Software: 1.53

Group ID: 3/5/94
Run number: 4
Run length: 61 Seconds
Firmware: 1.3 1.8



Volume Statistics (Arithmetic) (Untitled)

Calculations from 0.100 um to 900.0 um

Volume	100.0%		
Mean:	22.51 um	95% Conf. Limits:	0-69.6 um
Median:	13.18 um	S.D.:	24 um
Mean/Median Ratio:	1.709	Variance:	577 um^2
Mode:	42.62 um	C.V.:	107%
		Skewness:	1.32 Right skewed
		Kurtosis:	1.14 Leptokurtic

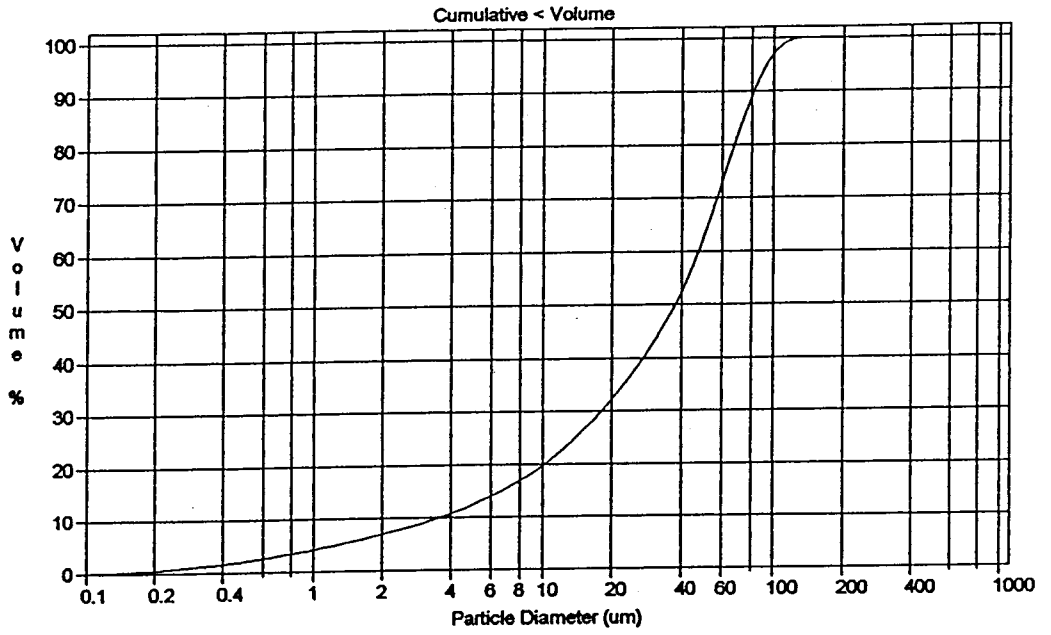
% <	10	25	50	75	90
Size um	0.999	3.628	13.18	34.87	59.44

COULTER^R LS Particle Size Analysis

11:14 6 Jan 19

Run 1 of 1

File name:		Group ID:	3/5/94
Sample ID:	n°4		
Operator:		Run number:	1
Comments:			
Start time:	11:12 6 Jan 1995	Run length:	61 Seconds
Pump Speed:	75		
Obscuration:	11%		
Optical model:	Fraunhofer		
LS 130	Fluid module		
Software:	1.53	Firmware:	1.3 1.8



Volume Statistics (Arithmetic) (Untitled)

Calculations from 0.100 um to 900.0 um

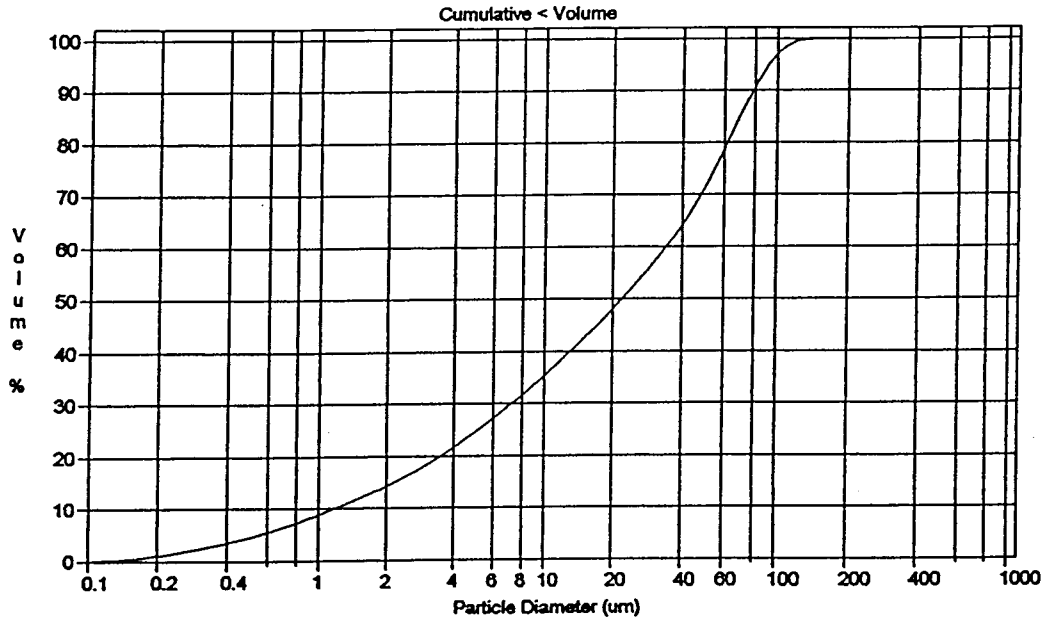
Volume	100.0%		
Mean:	40.32 um	95% Conf. Limits:	0-98.1 um
Median:	37.41 um	S.D.:	29.5 um
Mean/Median Ratio:	1.078	Variance:	870 um^2
Mode:	61.34 um	C.V.:	73.2%
		Skewness:	0.467 Right skewed
		Kurtosis:	-0.652 Platykurtic

% <	10	25	50	75	90
Size um	3.563	13.91	37.41	62.16	81.80

COULTER^R LS Particle Size Analysis 11:48 6 Jan 199

Run 1 of 1

File name:		Group ID:	3/5/94
Sample ID:	n*5		
Operator:		Run number:	3
Comments:			
Start time:	11:46 6 Jan 1995	Run length:	60 Seconds
Pump Speed:	75		
Obscuration:	10%		
Optical model:	Fraunhofer		
LS 130	Fluid module		
Software:	1.53	Firmware:	1.3 1.8



Volume Statistics (Arithmetic) (Untitled)

alculations from 0.100 um to 900.0 um

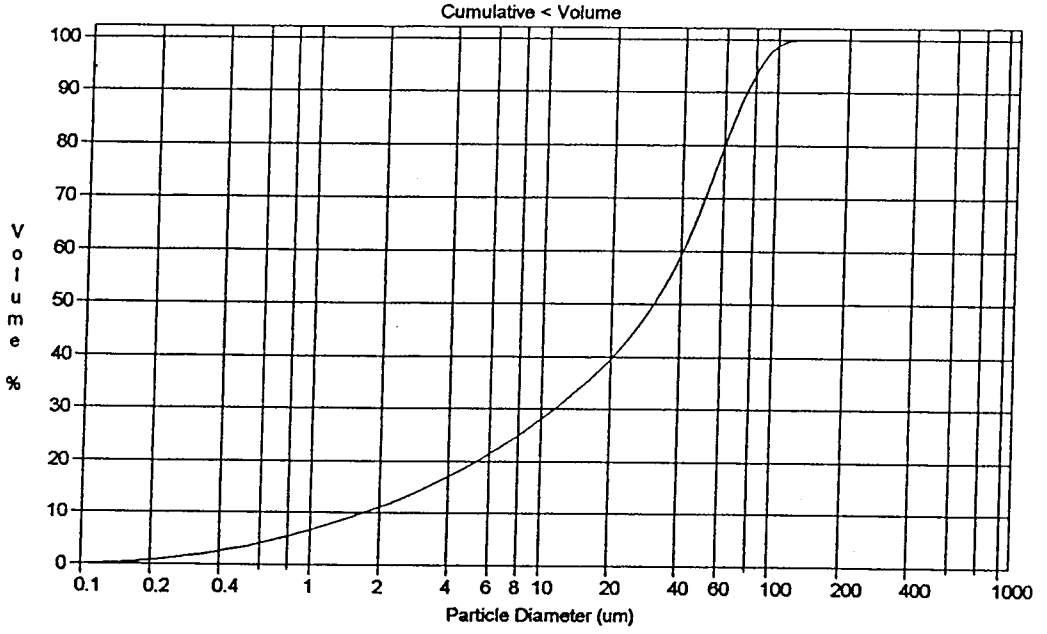
olume	100.0%		
lean:	32.34 um	95% Conf. Limits:	0-92.9 um
ledian:	22.02 um	S.D.:	30.9 um
lean/Median Ratio:	1.469	Variance:	954 um^2
ode:	67.19 um	C.V.:	95.5%
		Skewness:	0.857 Right skewed
		Kurtosis:	-0.229 Platykurtic

% <	10	25	50	75	90
Size um	1.172	5.138	22.02	54.78	78.67

COULTER^R LS Particle Size Analysis 11:58 11 Jan 19

Run 1 of 1

File name:		Group ID:	3/5/94
Sample ID:	6		
Operator:		Run number:	3
Comments:			
Start time:	11:56 11 Jan 1995	Run length:	61 Seconds
Pump Speed:	75		
Obscuration:	11%		
Optical model:	Fraunhofer		
LS 130	Fluid module		
Software:	1.53	Firmware:	1.3 1.8



Volume Statistics (Arithmetic) (Untitled)

Calculations from 0.100 um to 900.0 um

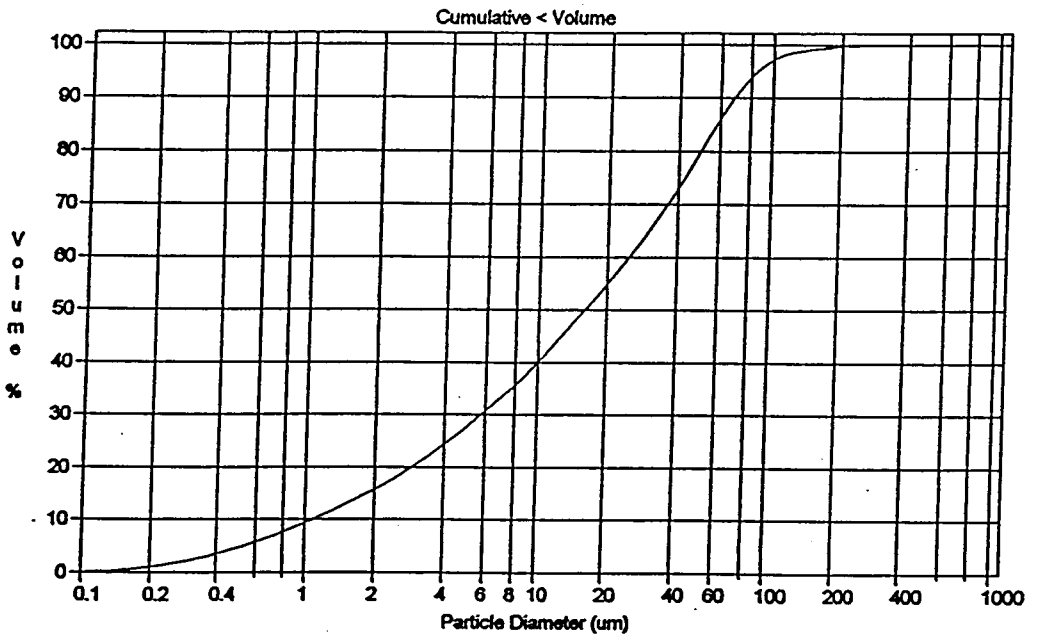
Volume	100.0%		
Mean:	34.26 um	95% Conf. Limits:	0-88.6 um
Median:	30.83 um	S.D.:	27.7 um
Mean/Median Ratio:	1.112	Variance:	767 um^2
Mode:	56.00 um	C.V.:	80.8%
		Skewness:	0.537 Right skewed
		Kurtosis:	-0.66 Platykurtic

% <	10	25	50	75	90
Size um	1.695	8.049	30.83	54.98	73.75

COULTER^R LS Particle Size Analysis 11:44 5 Jan 199

Run 1 of 1

File name:		Group ID:	3/5/94
Sample ID:	n°7		
Operator:		Run number:	3
Comments:			
Start time:	11:42 5 Jan 1995	Run length:	61 Seconds
Pump Speed:	75		
Obscuration:	10%		
Optical model:	Fraunhofer		
LS 130	Fluid module		
Software:	1.53	Firmware:	1.3 1.8



Volume Statistics (Arithmetic) (Untitled)

Calculations from 0.100 um to 900.0 um

Volume	100.0%		
Mean:	27.50 um	95% Conf. Limits:	0-88.9 um
Median:	16.05 um	S.D.:	31.3 um
Mean/Median Ratio:	1.713	Variance:	981 um^2
Mode:	51.13 um	C.V.:	114%
		Skewness:	2.12 Right skewed
		Kurtosis:	7.38 Leptokurtic

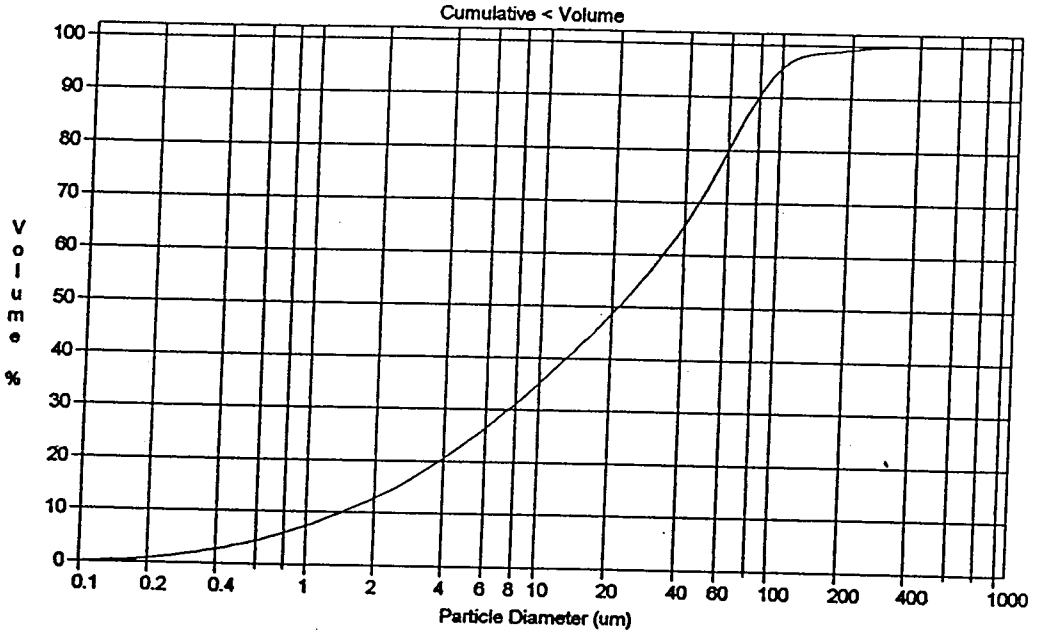
% <	10	25	50	75	90
Size um	1.085	4.178	16.05	42.37	68.52

COULTER^R LS Particle Size Analysis

11:21 11 Jan 19

Run 1 of 1

File name:		Group ID:	3/5
Sample ID:	8		
Operator:		Run number:	1
Comments:			
Start time:	11:19 11 Jan 1995	Run length:	61 Seconds
Pump Speed:	75		
Obscuration:	10%		
Optical model:	Fraunhofer		
LS 130	Fluid module		
Software:	1.53	Firmware:	1.3 1.8



Volume Statistics (Arithmetic) (Untitled)

Calculations from 0.100 um to 900.0 um

Volume	100.0%		
Mean:	33.67 um	95% Conf. Limits:	0-107 um
Median:	21.34 um	S.D.:	37.3 um
Mean/Median Ratio:	1.577	Variance:	1390 um^2
Mode:	61.34 um	C.V.:	111%
		Skewness:	2.26 Right skewed
		Kurtosis:	8.82 Leptokurtic

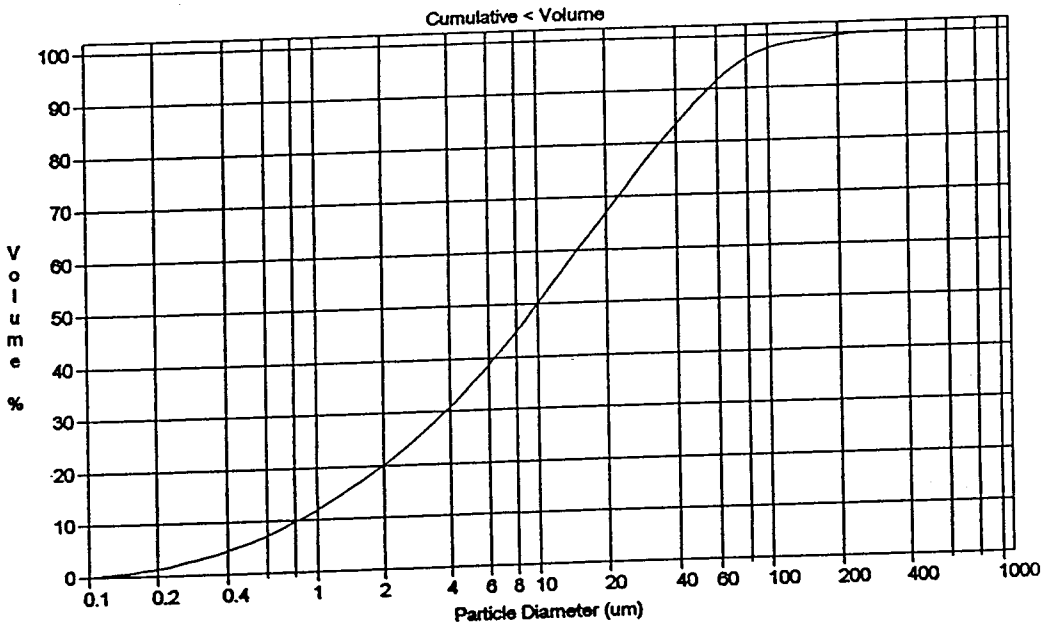
% <	10	25	50	75	90
Size um	1.442	5.452	21.34	52.58	79.44

11:26 5 Jan 19

COULTER^R LS Particle Size Analysis

Run 1 of 1

File name:		Group ID:	3/5/94
Sample ID:	n°9	Run number:	2
Operator:			
Comments:			
Start time:	11:24 5 Jan 1995	Run length:	61 Seconds
Pump Speed:	75		
Obscuration:	11%		
Optical model:	Fraunhofer		
LS 130	Fluid module		
Software:	1.53	Firmware:	1.3 1.8



Volume Statistics (Arithmetic) (Untitled)

Calculations from 0.100 um to 900.0 um

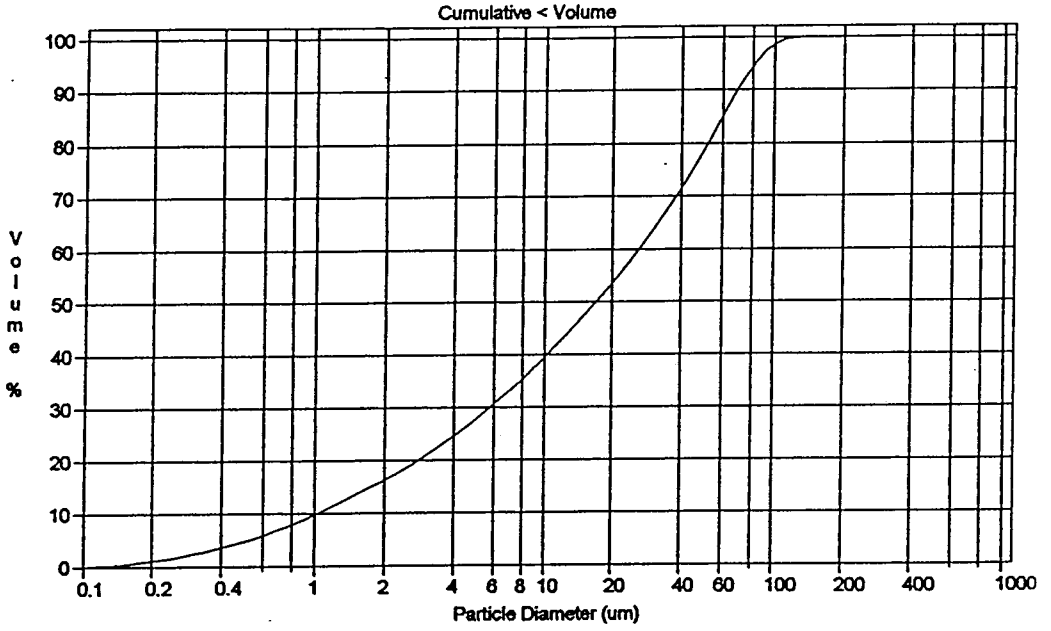
Volume	100.0%		
Mean:	21.20 um	95% Conf. Limits:	0-80.8 um
Median:	9.968 um	S.D.:	30.4 um
Mean/Median Ratio:	2.127	Variance:	924 um^2
Mode:	11.91 um	C.V.:	143%
		Skewness:	3.25 Right skewed
		Kurtosis:	15 Leptokurtic

% <	10	25	50	75	90
Size um	0.826	2.818	9.968	27.72	55.00

COULTER^R LS Particle Size Analysis 12:13 11 Jan 19

Run 1 of 1

File name:		Group ID:	3/5/94
Sample ID:	10		
Operator:		Run number:	4
Comments:			
Start time:	12:11 11 Jan 1995	Run length:	60 Seconds
Pump Speed:	75		
Obscuration:	15%		
Optical model:	Fraunhofer		
LS 130	Fluid module		
Software:	1.53	Firmware:	1.3 1.8



Volume Statistics (Arithmetic) (Untitled)

Calculations from 0.100 um to 900.0 um

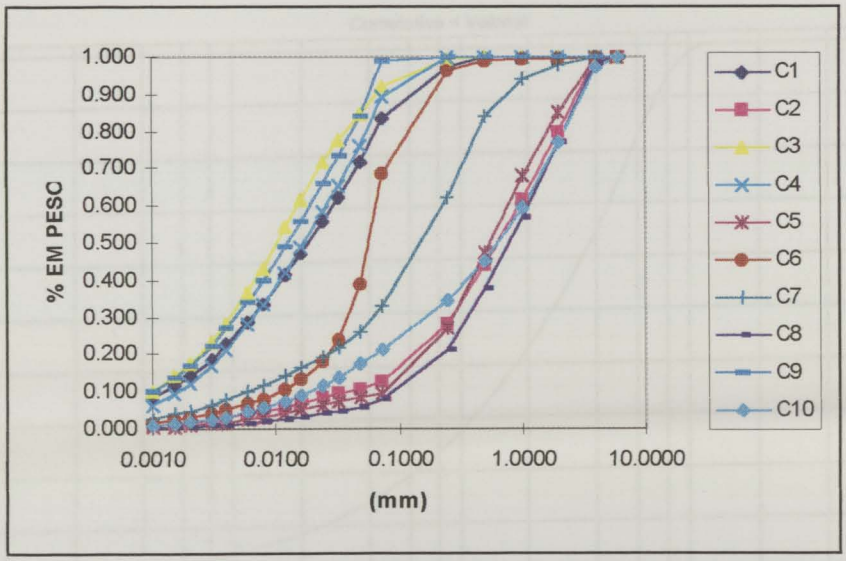
Volume	100.0%		
Mean:	27.08 um	95% Conf. Limits:	0-80.6 um
Median:	16.97 um	S.D.:	27.3 um
Mean/Median Ratio:	1.596	Variance:	747 um^2
Mode:	56.00 um	C.V.:	101%
		Skewness:	1.05 Right skewed
		Kurtosis:	0.26 Leptokurtic

% <	10	25	50	75	90
Size um	1.030	4.132	16.97	44.60	69.13

AMOSTRAGEM Nº 2

HISTOGRAMA										
(mm)	C1	C2	C3	C4	C5	C6	C7	C8	C9	C10
6.0000	0.000	0.006	0.000	0.000	0.005	0.000	0.000	0.016	0.000	0.025
4.0000	0.000	0.198	0.000	0.000	0.146	0.003	0.021	0.212	0.000	0.206
2.0000	0.000	0.180	0.000	0.000	0.171	0.001	0.039	0.204	0.000	0.174
1.0000	0.001	0.174	0.001	0.000	0.204	0.004	0.102	0.193	0.000	0.143
0.5000	0.023	0.158	0.006	0.002	0.203	0.027	0.216	0.163	0.000	0.108
0.2500	0.140	0.156	0.074	0.107	0.174	0.277	0.294	0.132	0.009	0.130
0.0740	0.119	0.019	0.070	0.132	0.015	0.301	0.070	0.023	0.150	0.040
0.0480	0.096	0.015	0.071	0.102	0.011	0.149	0.041	0.011	0.106	0.038
0.0320	0.065	0.010	0.062	0.072	0.009	0.055	0.024	0.007	0.075	0.022
0.0240	0.085	0.014	0.098	0.096	0.012	0.049	0.029	0.008	0.101	0.025
0.0160	0.059	0.009	0.077	0.066	0.009	0.026	0.020	0.005	0.069	0.015
0.0120	0.077	0.013	0.108	0.088	0.011	0.027	0.027	0.007	0.091	0.018
0.0080	0.048	0.008	0.067	0.054	0.006	0.014	0.017	0.004	0.057	0.010
0.0060	0.061	0.010	0.083	0.068	0.007	0.016	0.021	0.004	0.073	0.012
0.0040	0.038	0.006	0.050	0.042	0.004	0.009	0.013	0.002	0.045	0.007
0.0030	0.044	0.007	0.056	0.049	0.004	0.010	0.016	0.002	0.053	0.007
0.0020	0.027	0.004	0.033	0.028	0.002	0.006	0.010	0.001	0.032	0.004
0.0015	0.034	0.004	0.041	0.031	0.002	0.007	0.013	0.001	0.040	0.005
0.0010	0.084	0.009	0.103	0.063	0.005	0.019	0.028	0.004	0.100	0.012
SUM	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000
ACUMULANTE										
(mm)	1	2	3	4	5	6	7	8	9	10
6.0000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000
4.0000	1.000	0.994	1.000	1.000	0.995	1.000	1.000	0.984	1.000	0.975
2.0000	1.000	0.796	1.000	1.000	0.850	0.997	0.979	0.772	1.000	0.769
1.0000	1.000	0.615	1.000	1.000	0.679	0.996	0.940	0.569	1.000	0.595
0.5000	0.999	0.441	0.999	1.000	0.475	0.992	0.838	0.376	1.000	0.452
0.2500	0.976	0.283	0.993	0.998	0.272	0.965	0.622	0.213	1.000	0.343
0.0740	0.836	0.127	0.918	0.891	0.098	0.688	0.329	0.081	0.991	0.214
0.0480	0.717	0.109	0.848	0.759	0.084	0.387	0.258	0.058	0.842	0.174
0.0320	0.622	0.094	0.778	0.657	0.072	0.238	0.217	0.047	0.736	0.136
0.0240	0.557	0.084	0.716	0.585	0.064	0.183	0.193	0.040	0.661	0.115
0.0160	0.471	0.070	0.618	0.489	0.051	0.134	0.164	0.032	0.560	0.090
0.0120	0.413	0.060	0.541	0.423	0.043	0.109	0.144	0.027	0.491	0.074
0.0080	0.336	0.048	0.433	0.335	0.031	0.081	0.117	0.020	0.400	0.056
0.0060	0.287	0.040	0.366	0.282	0.025	0.067	0.100	0.016	0.343	0.046
0.0040	0.226	0.031	0.283	0.214	0.018	0.051	0.079	0.012	0.270	0.034
0.0030	0.189	0.024	0.233	0.171	0.014	0.042	0.066	0.009	0.226	0.028
0.0020	0.144	0.017	0.177	0.122	0.010	0.032	0.050	0.007	0.173	0.020
0.0015	0.118	0.014	0.144	0.095	0.008	0.026	0.040	0.005	0.140	0.016
0.0010	0.084	0.009	0.103	0.063	0.005	0.019	0.028	0.004	0.100	0.012

CURVAS GRANULOMÉTRICAS DOS PRODUTOS RESULTANTES DA 2ª AMOSTRAGEM



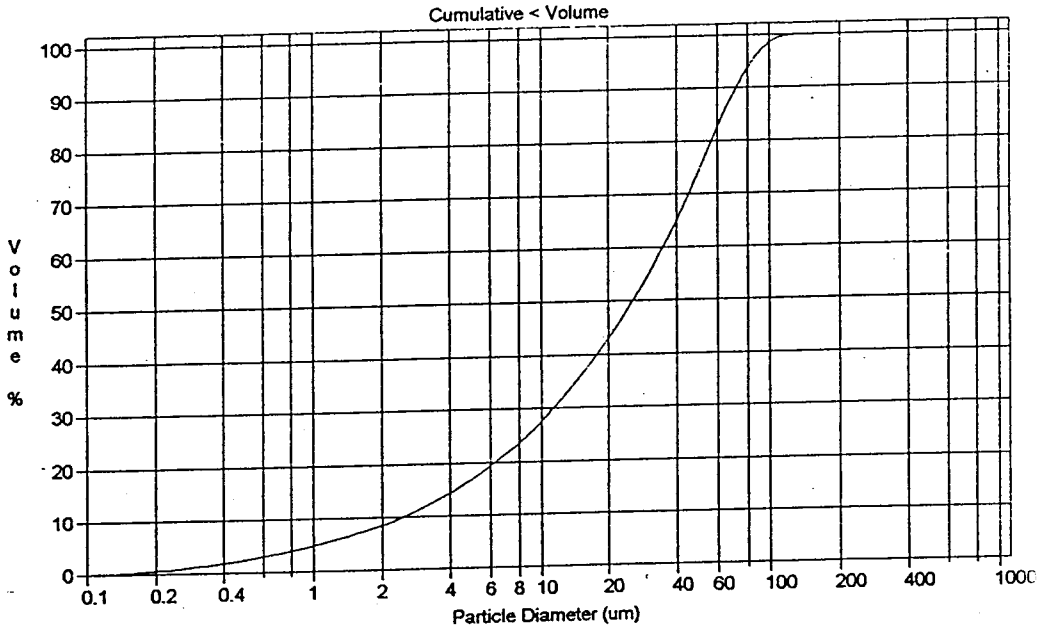
COULTER^R LS Particle Size Analysis

12:18 25 Nov 1

Run 1 of 1

File name:
Sample ID: Amostra n° 1
Operator:
Comments:
Start time: 12:16 25 Nov 1994
Pump Speed: 75
Obscuration: 11%
Optical model: Fraunhofer
LS 130 Fluid module
Software: 1.53

Group ID: Dia 05/05
Run number: 4
Run length: 60 Seconds
Firmware: 1.3 1.8



Volume Statistics (Arithmetic) (Untitled)

Calculations from 0.100 um to 900.0 um

Volume	100.0%		
Mean:	32.09 um	95% Conf. Limits:	0-85 um
Median:	25.71 um	S.D.:	27 um
Mean/Median Ratio:	1.248	Variance:	728 um^2
Mode:	56.00 um	C.V.:	84.1%
		Skewness:	0.805 Right skewed
		Kurtosis:	-0.125 Platykurtic

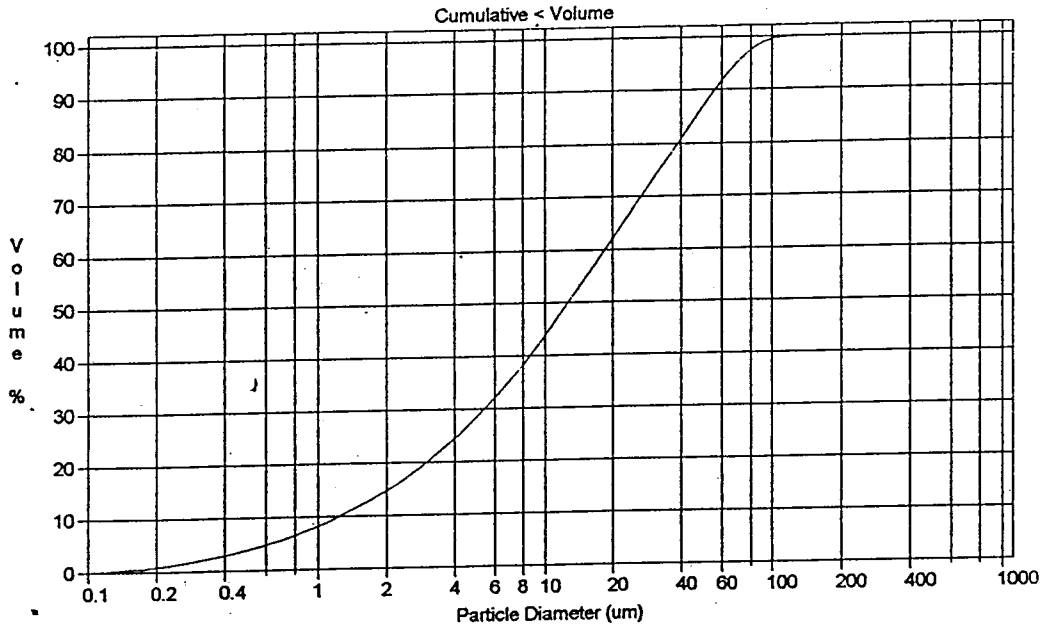
% <	10	25	50	75	90
Size um	2.465	8.708	25.71	50.50	71.82

COULTER^R LS Particle Size Analysis

12:03 25 Nov 19

Run 1 of 1

File name:		Group ID:	Dia 05/05
Sample ID:	Amostra n° 2		
Operator:		Run number:	3
Comments:			
Start time:	12:01 25 Nov 1994	Run length:	60 Seconds
Pump Speed:	75		
Obscuration:	11%		
Optical model:	Fraunhofer		
LS 130	Fluid module		
Software:	1.53	Firmware:	1.3 1.8



Volume Statistics (Arithmetic) (Untitled)

Calculations from 0.100 um to 900.0 um

Volume	100.0%		
Mean:	21.37 um	95% Conf. Limits:	0-65.6 um
Median:	12.69 um	S.D.:	22.6 um
Mean/Median Ratio:	1.684	Variance:	509 um^2
Mode:	35.52 um	C.V.:	106%
		Skewness:	1.4 Right skewed
		Kurtosis:	1.46 Leptokurtic

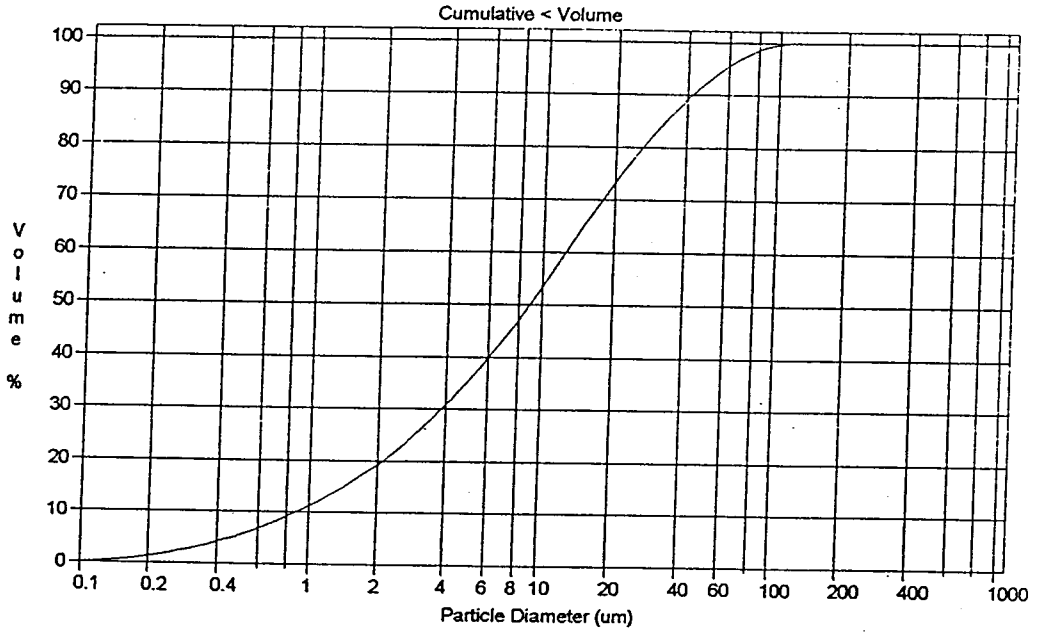
% <	10	25	50	75	90
Size um	1.240	4.123	12.69	32.20	55.88

COULTER^R LS Particle Size Analysis

11:46 25 Nov 19

Run 1 of 1

File name:		Group ID:	Dia 05/05
Sample ID:	Amostra n° 3		
Operator:		Run number:	2
Comments:			
Start time:	11:44 25 Nov 1994	Run length:	60 Seconds
Pump Speed:	75		
Obscuration:	16%		
Optical model:	Fraunhofer		
LS 130	Fluid module		
Software:	1.53	Firmware:	1.3 1.8



Volume Statistics (Arithmetic) (Untitled)

Calculations from 0.100 um to 900.0 um

Volume	100.0%		
Mean:	15.87 um	95% Conf. Limits:	0-52.8 um
Median:	8.879 um	S.D.:	18.8 um
Mean/Median Ratio:	1.787	Variance:	354 um^2
Mode:	11.91 um	C.V.:	119%
		Skewness:	1.97 Right skewed
		Kurtosis:	4.17 Leptokurtic

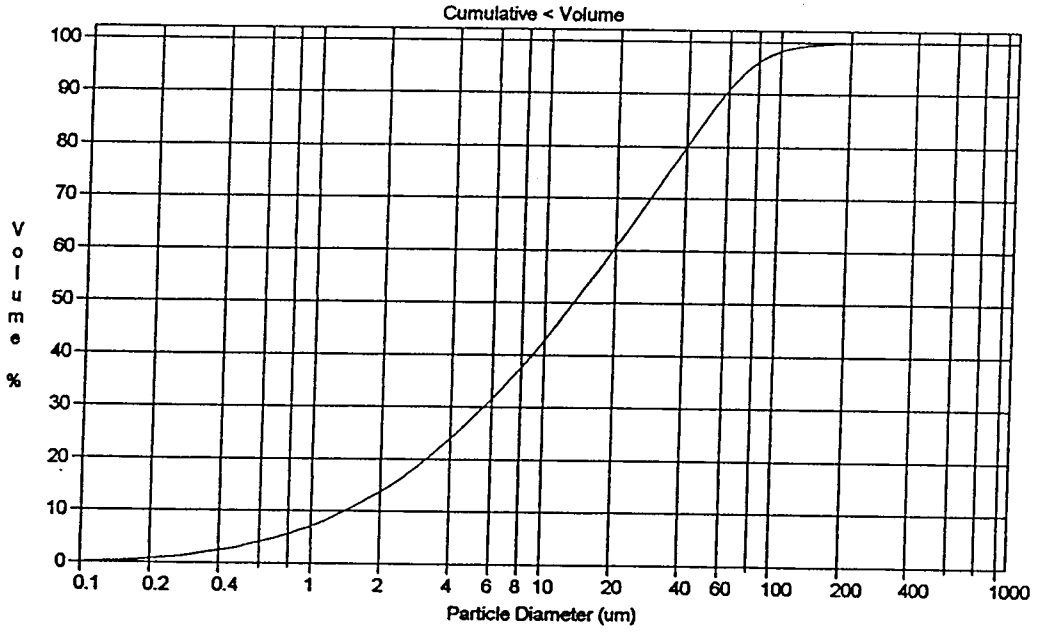
% <	10	25	50	75	90
Size um	0.881	2.931	8.879	21.34	41.79

COULTER^R LS Particle Size Analysis

15:23 13 Jan 19

Run 1 of 1

File name:		Group ID:	5/5/94
Sample ID:	4		
Operator:		Run number:	3
Comments:			
Start time:	15:21 13 Jan 1995	Run length:	61 Seconds
Pump Speed:	100		
Obscuration:	12%		
Optical model:	Fraunhofer		
LS 130	Fluid module		
Software:	1.53	Firmware:	1.3 1.8



Volume Statistics (Arithmetic) (Untitled)

Calculations from 0.100 um to 900.0 um

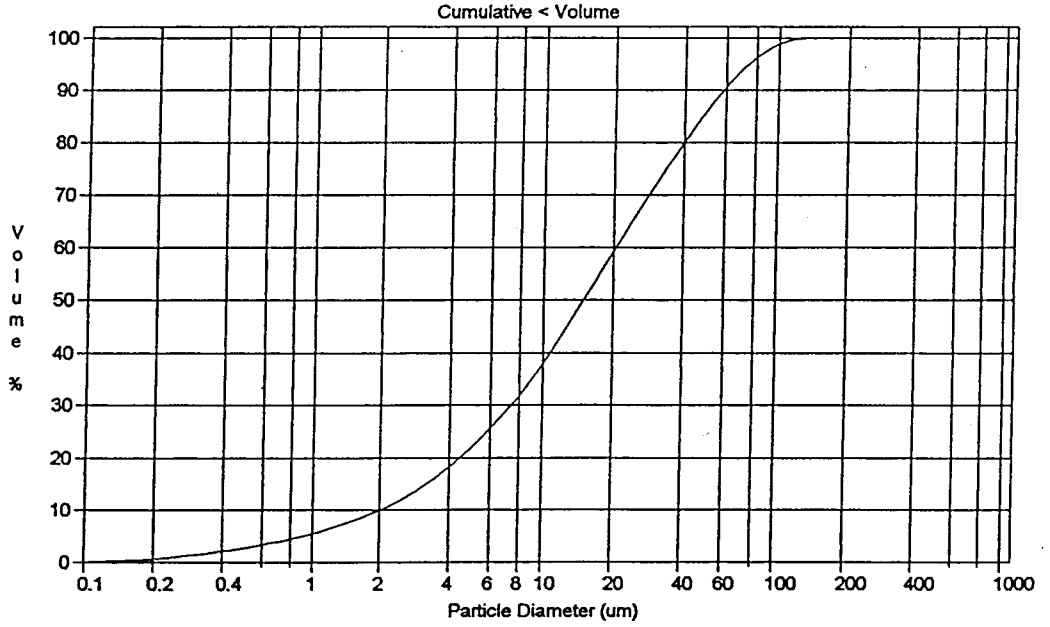
Volume	100.0%		
Mean:	22.95 um	95% Conf. Limits:	0-74.2 um
Median:	13.27 um	S.D.:	26.1 um
Mean/Median Ratio:	1.729	Variance:	682 um^2
Mode:	35.52 um	C.V.:	114%
		Skewness:	2.13 Right skewed
		Kurtosis:	6.83 Leptokurtic

% <	10	25	50	75	90
Size um	1.406	4.242	13.27	33.52	57.93

:OULTER^R LS Particle Size Analysis 11:31 28 Nov 1994

Run 1 of 1

File name:		Group ID:	Dia 05/05
Sample ID:	Amostra n° 5		
Operator:		Run number:	2
Comments:			
Start time:	11:29 28 Nov 1994	Run length:	60 Seconds
Pump Speed:	75		
Obscuration:	11%		
Optical model:	Fraunhofer		
LS 130	Fluid module		
Software:	1.53	Firmware:	1.3 1.8



Volume Statistics (Arithmetic) (Untitled)

Calculations from 0.100 um to 900.0 um

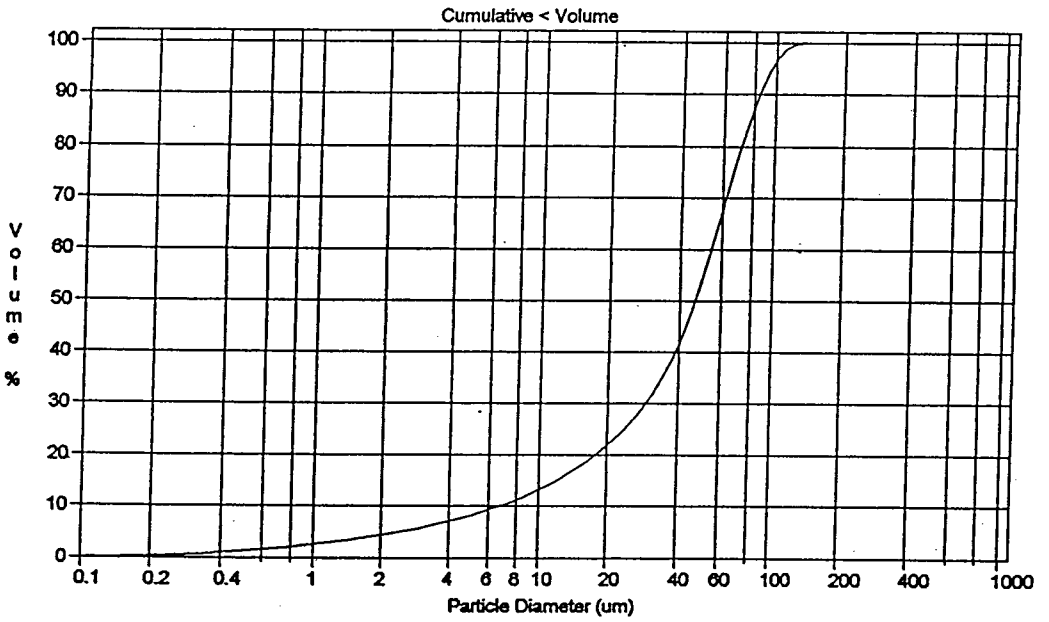
Volume	100.0%		
Mean:	23.38 um	95% Conf. Limits:	0-69.8 um
Median:	14.87 um	S.D.:	23.7 um
Mean/Median Ratio:	1.572	Variance:	562 um^2
Mode:	15.65 um	C.V.:	101%
		Skewness:	1.52 Right skewed
		Kurtosis:	2.13 Leptokurtic

% <	10	25	50	75	90
Size um	2.008	5.844	14.87	33.58	58.45

COULTER^R LS Particle Size Analysis 11:45 28 Nov 1994

Run 1 of 1

File name:		Group ID:	Dia 05/05
Sample ID:	Amostra n° 6		
Operator:		Run number:	3
Comments:			
Start time:	11:43 28 Nov 1994	Run length:	60 Seconds
Pump Speed:	75		
Obscuration:	11%		
Optical model:	Fraunhofer		
LS 130	Fluid module		
Software:	1.53	Firmware:	1.3 1.8



Volume Statistics (Arithmetic) (Untitled)

Calculations from 0.100 um to 900.0 um

Volume	100.0%		
Mean:	46.47 um	95% Conf. Limits:	0-102 um
Median:	46.44 um	S.D.:	28.5 um
Mean/Median Ratio:	1.001	Variance:	810 um^2
Mode:	61.34 um	C.V.:	61.2%
		Skewness:	0.232 Right skewed
		Kurtosis:	-0.604 Platykurtic

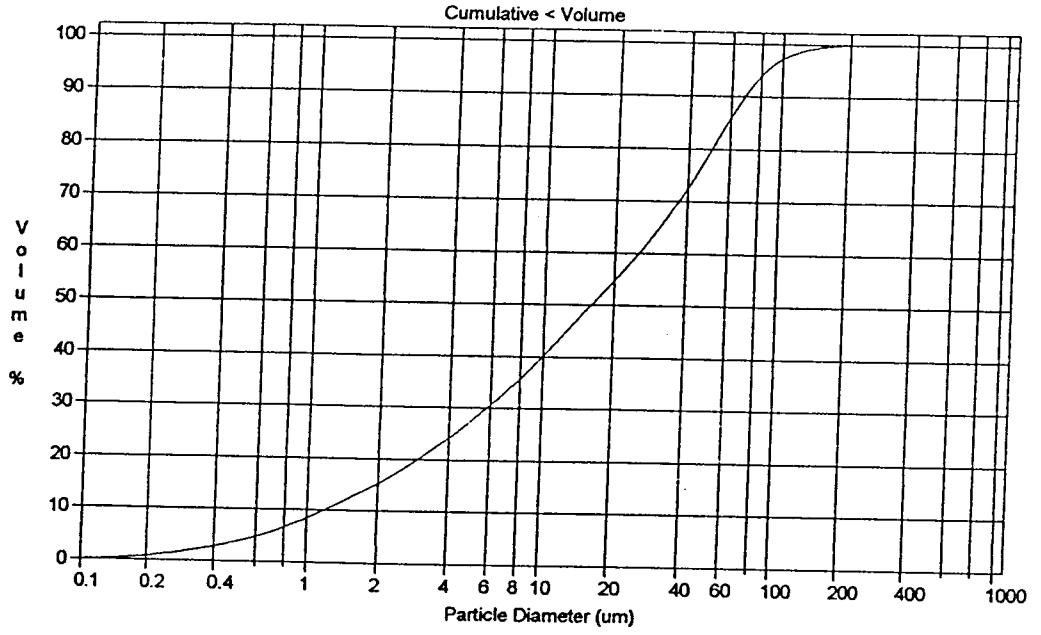
% <	10	25	50	75	90
Size um	6.730	23.65	46.44	66.59	84.37

COULTER^R LS Particle Size Analysis

15:09 13 Jan 1

Run 1 of 1

File name:		Group ID:	5/5/94
Sample ID:	7		
Operator:		Run number:	2
Comments:	repetida		
Start time:	15:07 13 Jan 1995	Run length:	60 Seconds
Pump Speed:	100		
Obscuration:	13%		
Optical model:	Fraunhofer		
LS 130	Fluid module		
Software:	1.53	Firmware:	1.3 1.8



Volume Statistics (Arithmetic) (Untitled)

Calculations from 0.100 um to 900.0 um

Volume	100.0%		
Mean:	27.35 um	95% Conf. Limits:	0-85.6 um
Median:	16.02 um	S.D.:	29.7 um
Mean/Median Ratio:	1.707	Variance:	884 um^2
Mode:	51.13 um	C.V.:	109%
		Skewness:	1.62 Right skewed
		Kurtosis:	3.27 Leptokurtic

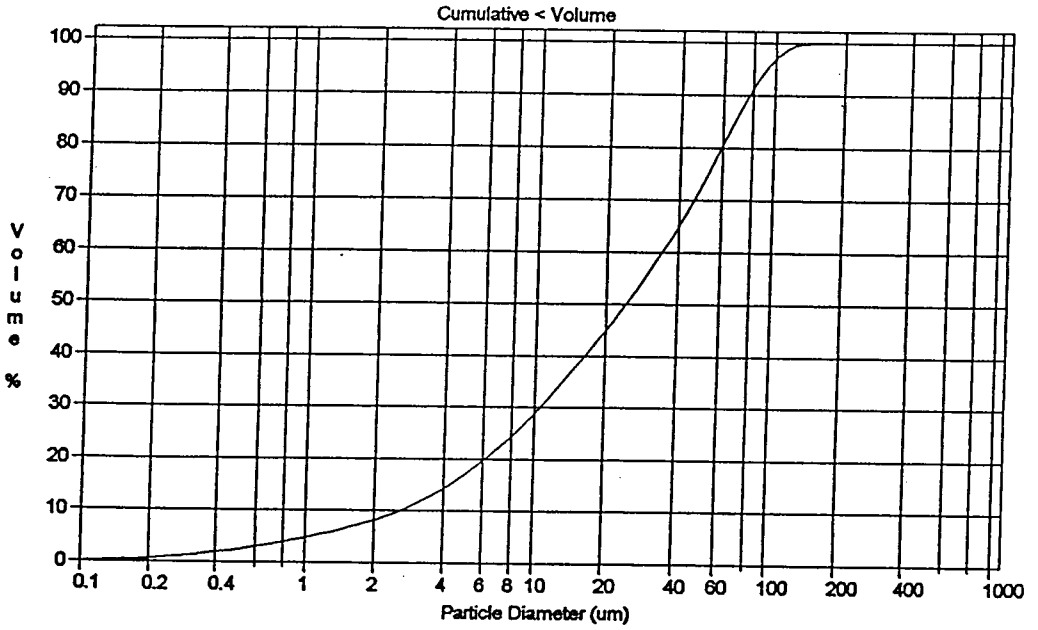
% <	10	25	50	75	90
Size um	1.190	4.234	16.02	43.08	68.50

COULTER^R LS Particle Size Analysis

12:02 28 Nov 199

Run 1 of 1

File name:		Group ID:	Dia 05/05
Sample ID:	Amostra n° 8		
Operator:		Run number:	4
Comments:			
Start time:	11:59 28 Nov 1994	Run length:	61 Seconds
Pump Speed:	75		
Obscuration:	11%		
Optical model:	Fraunhofer		
LS 130	Fluid module		
Software:	1.53	Firmware:	1.3 1.8



Volume Statistics (Arithmetic) (Untitled)

Calculations from 0.100 um to 900.0 um

Volume	100.0%		
Mean:	33.06 um	95% Conf. Limits:	0-90.9 um
Median:	24.22 um	S.D.:	29.5 um
Mean/Median Ratio:	1.365	Variance:	871 um^2
Mode:	61.34 um	C.V.:	89.3%
		Skewness:	0.952 Right skewed
		Kurtosis:	0.179 Leptokurtic

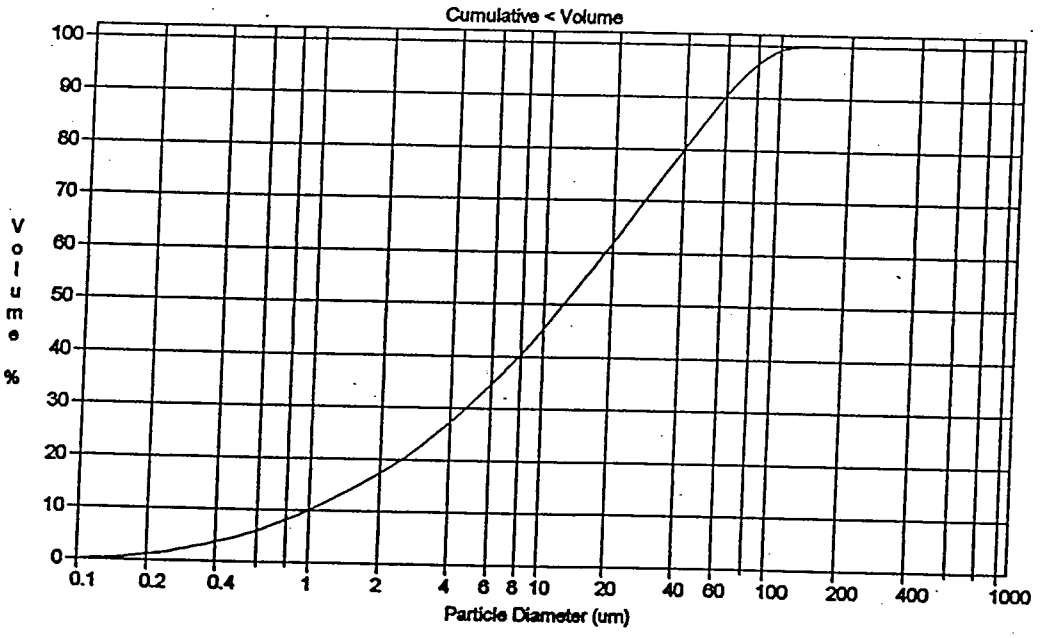
% <	10	25	50	75	90
Size um	2.593	8.256	24.22	52.37	76.99

COULTER^R LS Particle Size Analysis

11:41 11 Jan 19

Run 1 of 1

File name:		Group ID:	5/5
Sample ID:	9		
Operator:		Run number:	2
Comments:			
Start time:	11:39 11 Jan 1995	Run length:	61 Seconds
Pump Speed:	75		
Obscuration:	12%		
Optical model:	Fraunhofer		
LS 130	Fluid module		
Software:	1.53	Firmware:	1.3 1.8



Volume Statistics (Arithmetic) (Untitled)

Calculations from 0.100 um to 900.0 um

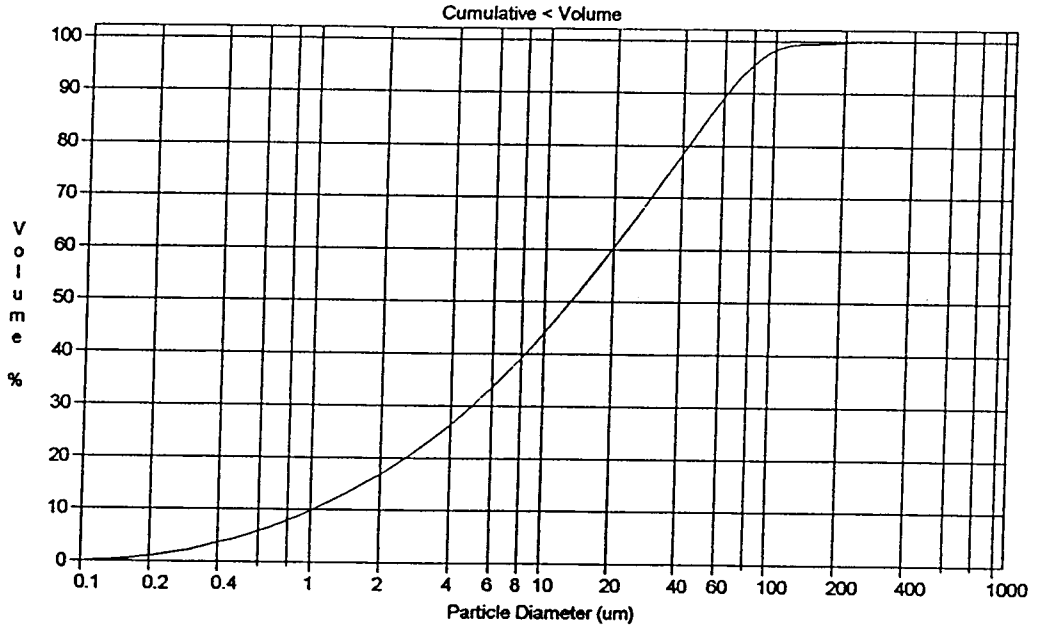
Volume	100.0%		
Mean:	21.84 um	95% Conf. Limits:	0-69 um
Median:	12.24 um	S.D.:	24.1 um
Mean/Median Ratio:	1.785	Variance:	580 um^2
Mode:	32.43 um	C.V.:	110%
		Skewness:	1.43 Right skewed
		Kurtosis:	1.54 Leptokurtic

% <	10	25	50	75	90
Size um	0.988	3.481	12.24	32.95	58.86

COULTER^R LS Particle Size Analysis 15:47 28 Dec 199

Run 1 of 1

File name:		Group ID:	lab IGM
Sample ID:	amostra 10		
Operator:		Run number:	4
Comments:			
Start time:	15:45 28 Dec 1994	Run length:	61 Seconds
Pump Speed:	75		
Obscuration:	15%		
Optical model:	Fraunhofer		
LS 130	Fluid module		
Software:	1.53	Firmware:	1.3 1.8



Volume Statistics (Arithmetic) (Untitled)

Calculations from 0.100 um to 900.0 um

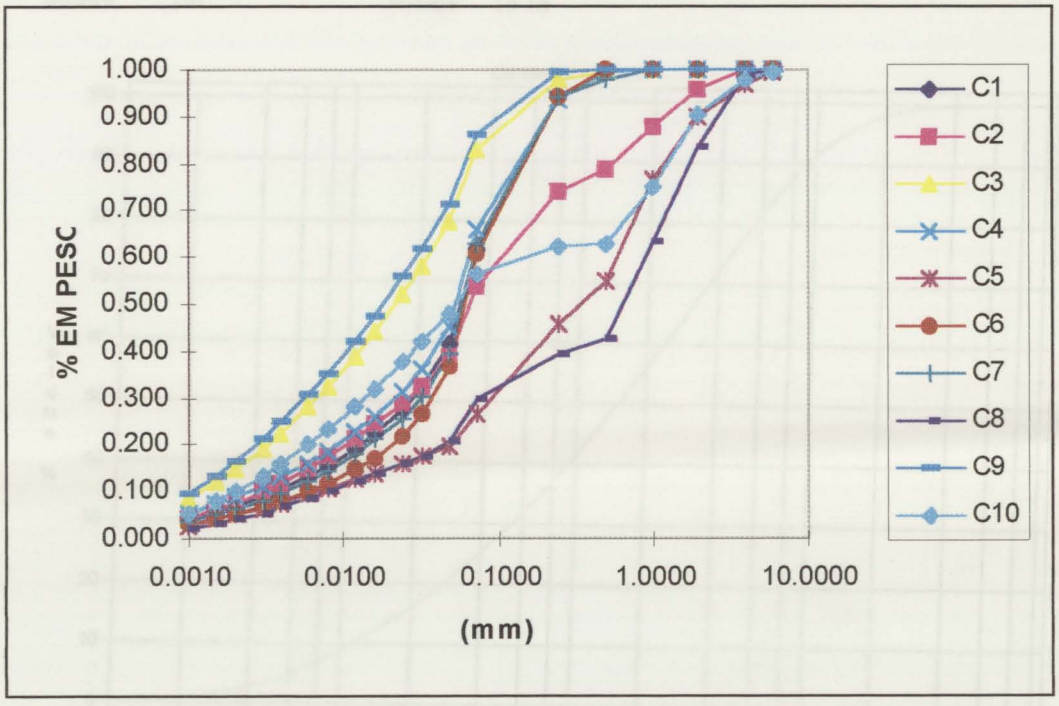
Volume	100.0%		
Mean:	23.71 um	95% Conf. Limits:	0-78.9 um
Median:	12.98 um	S.D.:	28.1 um
Mean/Median Ratio:	1.826	Variance:	792 um^2
Mode:	38.91 um	C.V.:	119%
		Skewness:	2.34 Right skewed
		Kurtosis:	9.29 Leptokurtic

% <	10	25	50	75	90
Size um	1.023	3.661	12.98	35.17	61.96

AMOSTRAGEM Nº3

HISTOGRAMA										
(mm)	C1	C2	C3	C4	C5	C6	C7	C8	C9	C10
6.0000	0.000	0.000	0.000	0.000	0.027	0.000	0.000	0.006	0.000	0.021
4.0000	0.000	0.040	0.000	0.000	0.069	0.000	0.000	0.157	0.000	0.072
2.0000	0.000	0.082	0.000	0.000	0.135	0.000	0.000	0.201	0.000	0.157
1.0000	0.005	0.088	0.003	0.008	0.215	0.001	0.019	0.207	0.000	0.123
0.5000	0.056	0.048	0.016	0.059	0.095	0.060	0.037	0.033	0.006	0.004
0.2500	0.322	0.205	0.150	0.277	0.192	0.334	0.314	0.093	0.133	0.058
0.0740	0.205	0.145	0.154	0.202	0.065	0.236	0.235	0.092	0.147	0.083
0.0480	0.090	0.066	0.094	0.094	0.025	0.105	0.092	0.031	0.094	0.060
0.0320	0.049	0.037	0.061	0.049	0.015	0.047	0.044	0.018	0.063	0.042
0.0240	0.053	0.045	0.079	0.053	0.020	0.045	0.047	0.023	0.081	0.056
0.0160	0.030	0.030	0.052	0.032	0.013	0.025	0.029	0.016	0.053	0.038
0.0120	0.036	0.039	0.069	0.040	0.019	0.029	0.036	0.021	0.070	0.052
0.0080	0.021	0.024	0.043	0.024	0.013	0.016	0.022	0.014	0.044	0.032
0.0060	0.026	0.030	0.054	0.031	0.017	0.020	0.026	0.018	0.058	0.041
0.0040	0.016	0.019	0.034	0.019	0.011	0.012	0.016	0.012	0.037	0.026
0.0030	0.020	0.023	0.043	0.024	0.014	0.015	0.019	0.015	0.047	0.032
0.0020	0.013	0.015	0.028	0.016	0.010	0.010	0.011	0.009	0.032	0.020
0.0015	0.017	0.019	0.036	0.021	0.013	0.012	0.015	0.011	0.039	0.026
0.0010	0.042	0.043	0.085	0.051	0.029	0.033	0.037	0.021	0.096	0.055
SUM	1.000	0.998	1.000	1.000	0.996	1.000	0.999	0.998	1.000	0.997
CUMULANTE INFERIOR										
(mm)	C1	C2	C3	C4	C5	C6	C7	C8	C9	C10
6.0000	1.000	0.998	1.000	1.000	0.996	1.000	0.999	0.998	1.000	0.997
4.0000	1.000	0.998	1.000	1.000	0.970	1.000	0.999	0.992	1.000	0.977
2.0000	1.000	0.958	1.000	1.000	0.901	1.000	0.999	0.834	1.000	0.905
1.0000	1.000	0.876	1.000	1.000	0.765	1.000	0.999	0.633	1.000	0.748
0.5000	0.995	0.788	0.997	0.992	0.550	0.999	0.980	0.426	1.000	0.625
0.2500	0.939	0.740	0.981	0.934	0.455	0.939	0.943	0.393	0.994	0.621
0.0740	0.618	0.535	0.831	0.657	0.264	0.605	0.629	0.300	0.861	0.563
0.0480	0.413	0.391	0.676	0.455	0.198	0.369	0.394	0.208	0.714	0.479
0.0320	0.323	0.325	0.582	0.361	0.173	0.264	0.301	0.177	0.619	0.419
0.0240	0.274	0.288	0.522	0.312	0.158	0.217	0.258	0.159	0.556	0.378
0.0160	0.221	0.242	0.443	0.259	0.139	0.171	0.210	0.136	0.475	0.322
0.0120	0.191	0.213	0.391	0.227	0.125	0.147	0.182	0.121	0.422	0.283
0.0080	0.155	0.174	0.322	0.187	0.106	0.118	0.145	0.099	0.352	0.232
0.0060	0.134	0.150	0.280	0.162	0.094	0.102	0.124	0.085	0.308	0.200
0.0040	0.108	0.119	0.226	0.132	0.077	0.082	0.097	0.067	0.250	0.159
0.0030	0.092	0.100	0.191	0.112	0.066	0.070	0.082	0.056	0.213	0.133
0.0020	0.072	0.077	0.149	0.088	0.051	0.055	0.063	0.041	0.166	0.101
0.0015	0.059	0.062	0.121	0.072	0.042	0.045	0.051	0.032	0.135	0.080
0.0010	0.042	0.043	0.085	0.051	0.029	0.033	0.037	0.021	0.096	0.055

CURVAS GRANULOMÉTRICAS DOS PRODUTOS RESULTANTES DA 3ª AMOSTRAGEM

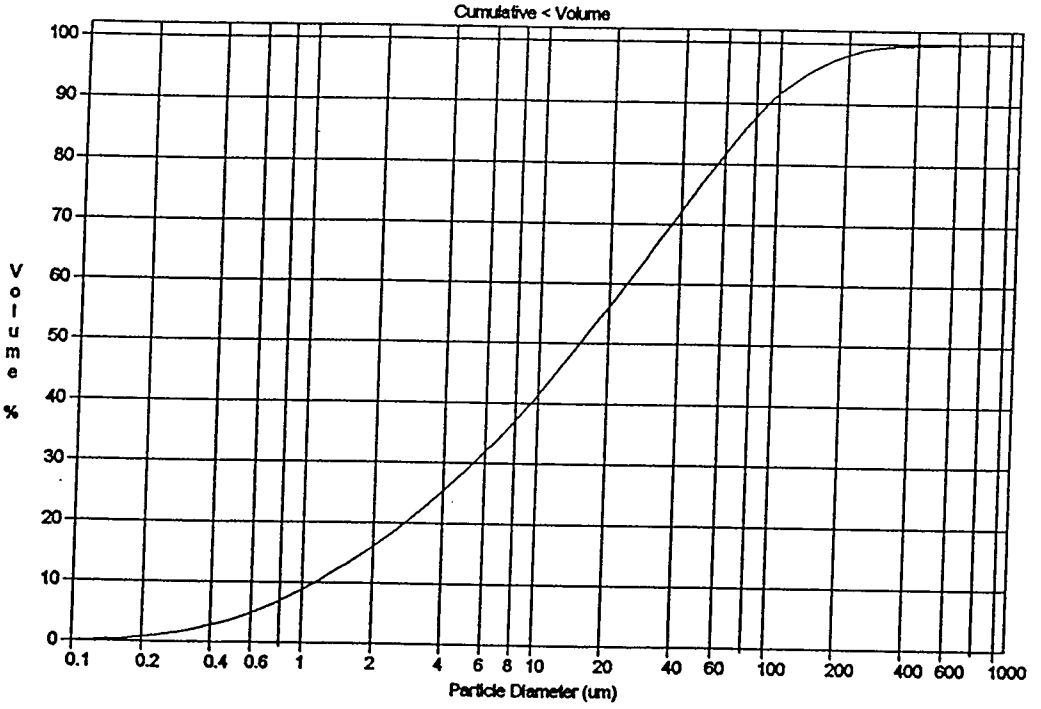


COULTER^R LS Particle Size Analysis

11:58 12 Dec 199

final.$02

File name:	FINAL.$02	Group ID:	final
Sample ID:	n°1		
Operator:		Run number:	2
Comments:			
Start time:	11:56 12 Dec 1995	Run length:	60 Seconds
Pump Speed:	75		
Obscuration:	10%		
Optical model:	Fraunhofer		
LS 130	Fluid module		
Software:	1.53	Firmware:	1.3 1.8



Volume Statistics (Arithmetic) final.$02

Calculations from 0.100 um to 900.0 um

Volume	100.0%		
Mean:	35.09 um	95% Conf. Limits:	0-142 um
Median:	15.01 um	S.D.:	54.8 um
Mean/Median Ratio:	2.338	Variance:	3000 um^2
Mode:	42.62 um	C.V.:	156%
		Skewness:	4.41 Right skewed
		Kurtosis:	34.4 Leptokurtic

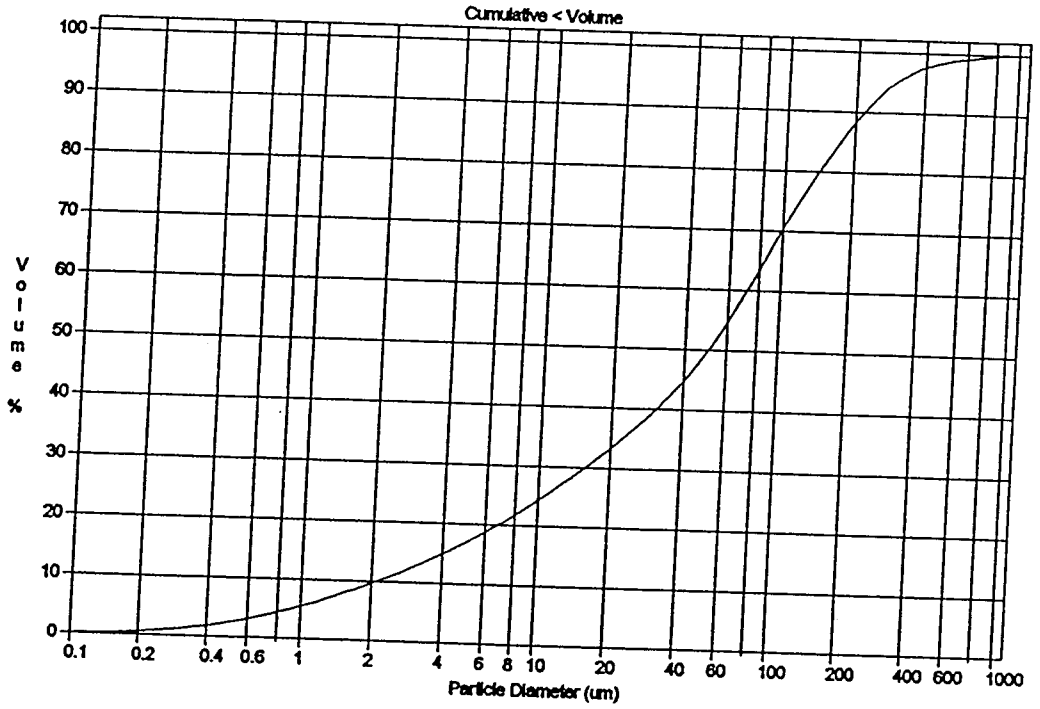
% <	10	25	50	75	90
Size um	1.140	3.918	15.01	45.02	90.82

COULTER^R LS Particle Size Analysis

final.$03

12:15 12 Dec 199

File name:	FINAL.$03	Group ID:	final
Sample ID:	n°2		
Operator:		Run number:	3
Comments:			
Start time:	12:13 12 Dec 1995	Run length:	60 Seconds
Pump Speed:	75		
Obscuration:	10%		
Optical model:	Fraunhofer		
LS 130	Fluid module		
Software:	1.53	Firmware:	1.3 1.8



Volume Statistics (Arithmetic) final.$03

Calculations from 0.100 um to 900.0 um

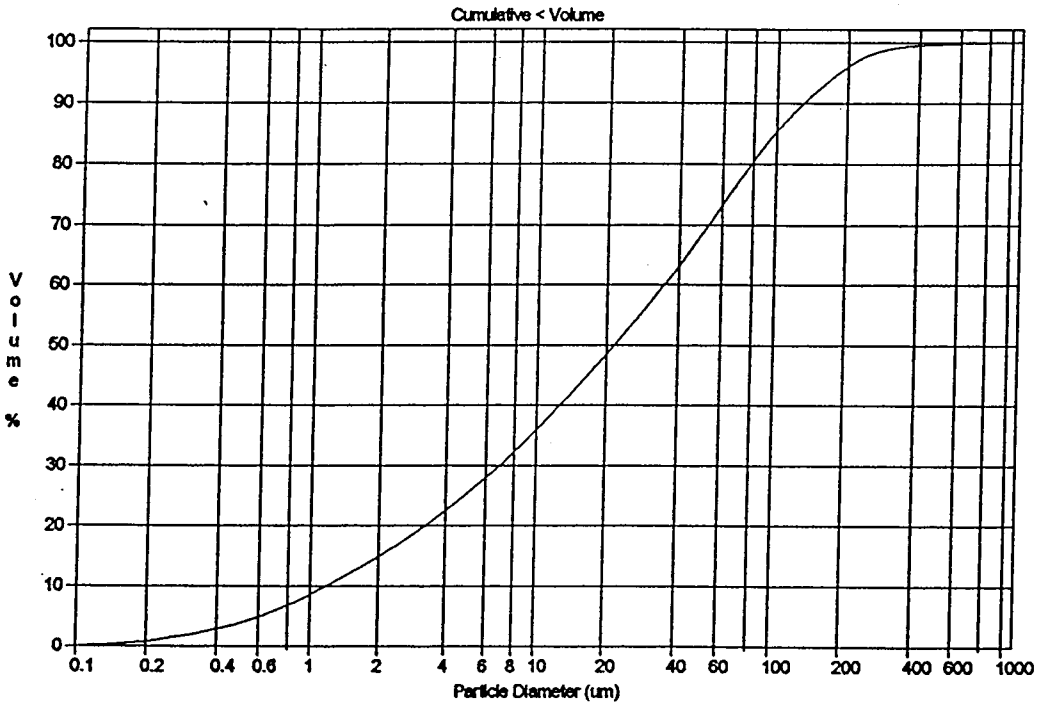
Volume	100.0%		
Mean:	86.58 um	95% Conf. Limits:	0-306 um
Median:	50.22 um	S.D.:	112 um
Mean/Median Ratio:	1.724	Variance:	1.25e+004 um^2
Mode:	80.61 um	C.V.:	129%
		Skewness:	2.72 Right skewed
		Kurtosis:	10.6 Leptokurtic

% <	10	25	50	75	90
Size um	2.110	10.55	50.22	118.1	217.1

COULTER^R LS Particle Size Analysis 12:29 12 Dec 199

final.$04

File name:	final.$04	Group ID:	final
Sample ID:	n°3		
Operator:		Run number:	4
Comments:			
Start time:	12:26 12 Dec 1995	Run length:	60 Seconds
Pump Speed:	75		
Obscuration:	10%		
Optical model:	Fraunhofer		
LS 130	Fluid module		
Software:	1.53	Firmware:	1.3 1.8



Volume Statistics (Arithmetic) final.$04

Calculations from 0.100 um to 900.0 um

Volume	100.0%		
Mean:	48.23 um	95% Conf. Limits:	0-187 um
Median:	21.54 um	S.D.:	70.8 um
Mean/Median Ratio:	2.240	Variance:	5010 um^2
Mode:	61.34 um	C.V.:	147%
		Skewness:	3.71 Right skewed
		Kurtosis:	24.3 Leptokurtic

% <	10	25	50	75	90
Size um	1.192	4.835	21.54	64.26	130.0

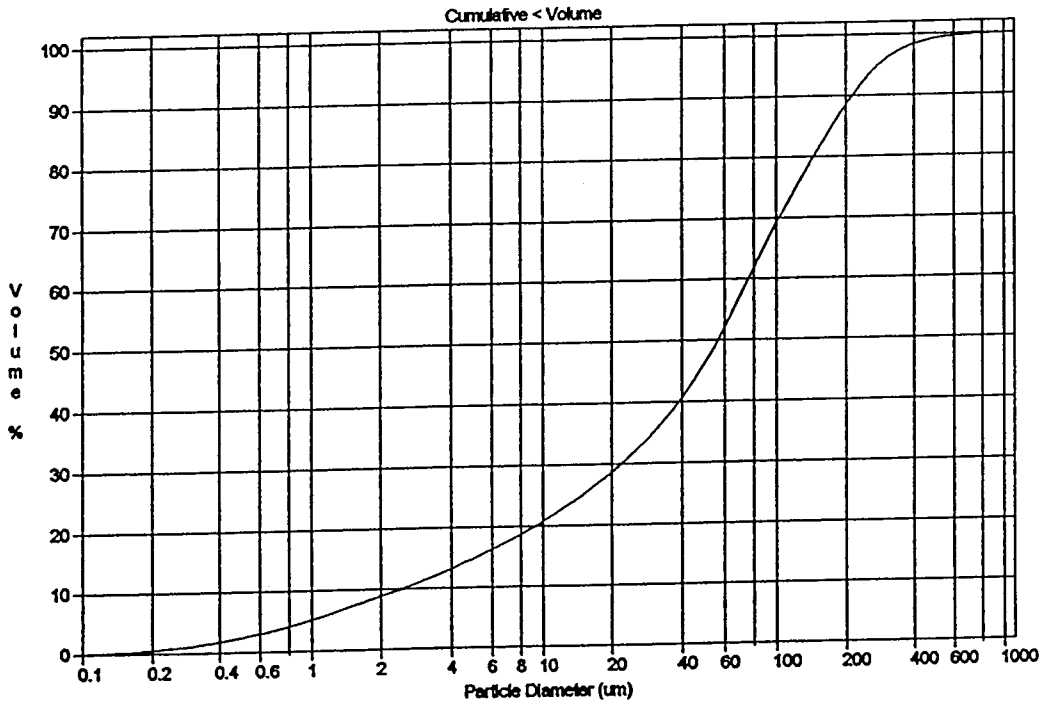
COULTER^R LS Particle Size Analysis

12:41 12 Dec 1995

final.$05

File name: FINAL.$05
Sample ID: n°4
Operator:
Comments:
Start time: 12:39 12 Dec 1995
Pump Speed: 100
Obscuration: 9%
Optical model: Fraunhofer
LS 130 Fluid module
Software: 1.53

Group ID: final
Run number: 5
Run length: 61 Seconds
Firmware: 1.3 1.8



Volume Statistics (Arithmetic) final.$05

Calculations from 0.100 um to 900.0 um

Volume	100.0%		
Mean:	86.81 um	95% Conf. Limits:	0-284 um
Median:	56.01 um	S.D.:	101 um
Mean/Median Ratio:	1.550	Variance:	1.01e+004 um^2
Mode:	73.59 um	C.V.:	116%
		Skewness:	2.42 Right skewed
		Kurtosis:	9.24 Leptokurtic

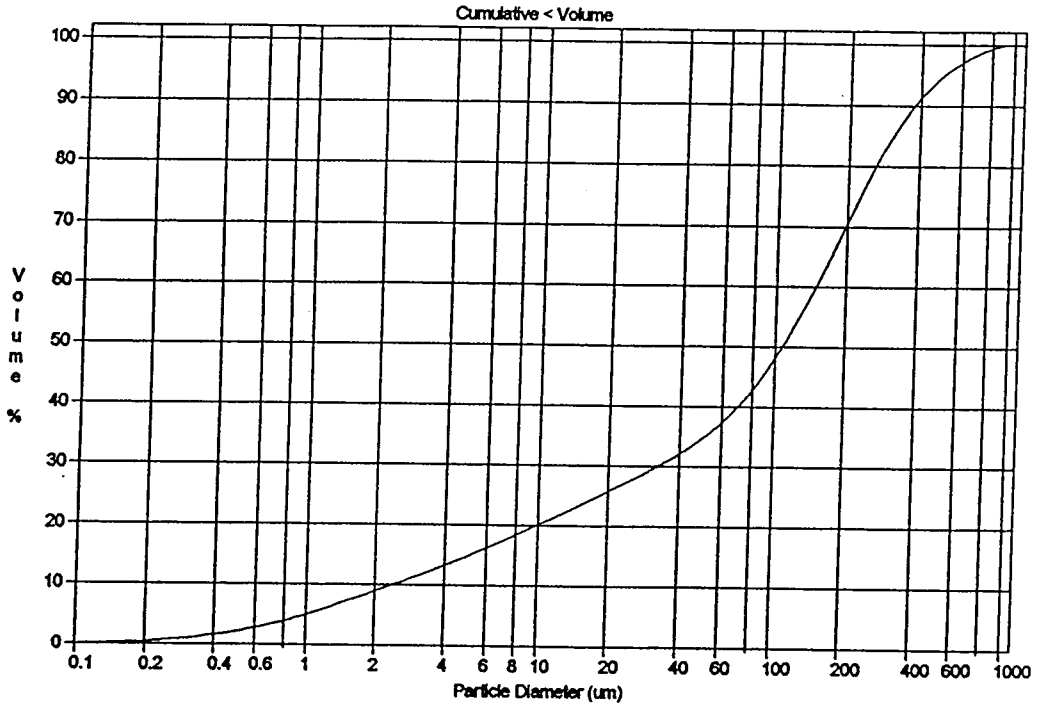
% <	10	25	50	75	90
Size um	2.465	14.85	56.01	121.8	212.3

COULTER® LS Particle Size Analysis

11:59 15 Dec 19

final.$11

File name:	FINAL.$11	Group ID:	Final
Sample ID:	n° 5		
Operator:		Run number:	5
Comments:			
Start time:	11:57 15 Dec 1995	Run length:	61 Seconds
Pump Speed:	75		
Obscuration:	10%		
Optical model:	Fraunhofer		
LS 130	Fluid module		
Software:	1.53	Firmware:	1.3 1.8



Volume Statistics (Arithmetic) final.$11

Calculations from 0.100 um to 900.0 um

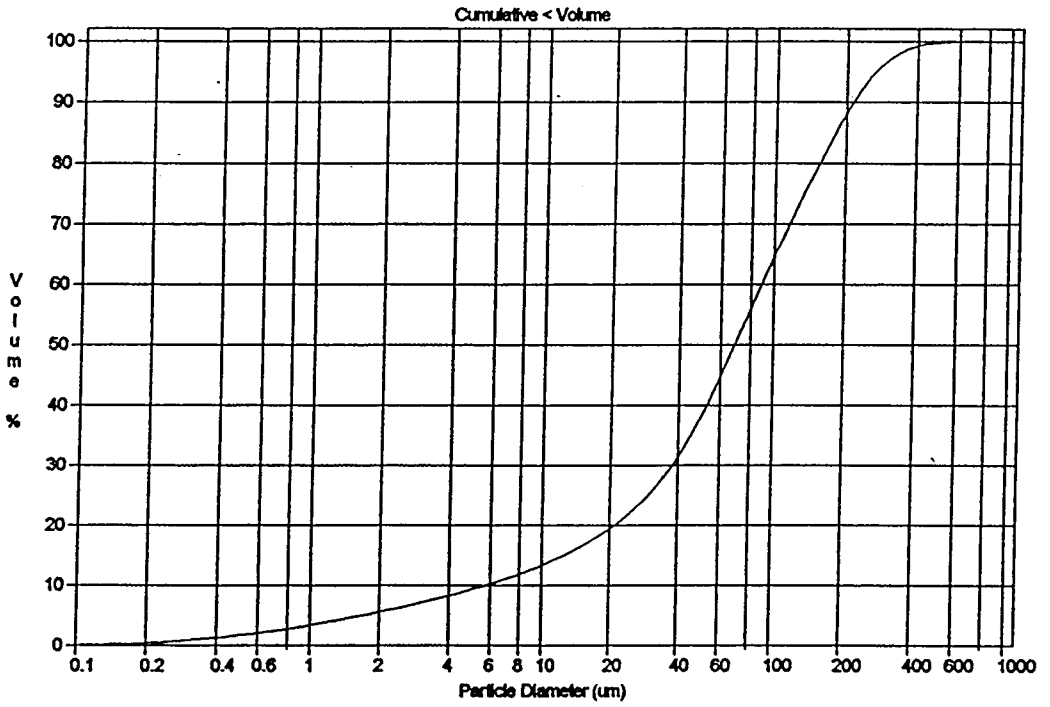
Volume	100.0%		
Mean:	154.1 um	95% Conf. Limits:	0-481 um
Median:	107.2 um	S.D.:	167 um
Mean/Median Ratio:	1.438	Variance:	2.78e+004 um^2
Mode:	200.4 um	C.V.:	108%
		Skewness:	1.61 Right skewed
		Kurtosis:	2.79 Leptokurtic

% <	10	25	50	75	90
Size um	2.412	18.29	107.2	225.9	375.8

COULTER^R LS Particle Size Analysis 12:55 12 Dec 1995

final.$06

File name:	FINAL.$06	Group ID:	final
Sample ID:	n°6		
Operator:		Run number:	6
Comments:			
Start time:	12:53 12 Dec 1995	Run length:	60 Seconds
Pump Speed:	100		
Obscuration:	11%		
Optical model:	Fraunhofer		
LS 130	Fluid module		
Software:	1.53	Firmware:	1.3 1.8



Volume Statistics (Arithmetic) final.$06

Calculations from 0.100 um to 900.0 um

Volume	100.0%		
Mean:	93.10 um	95% Conf. Limits:	0-261 um
Median:	68.71 um	S.D.:	85.9 um
Mean/Median Ratio:	1.355	Variance:	7370 um^2
Mode:	73.59 um	C.V.:	92.2%
		Skewness:	1.46 Right skewed
		Kurtosis:	2.55 Leptokurtic

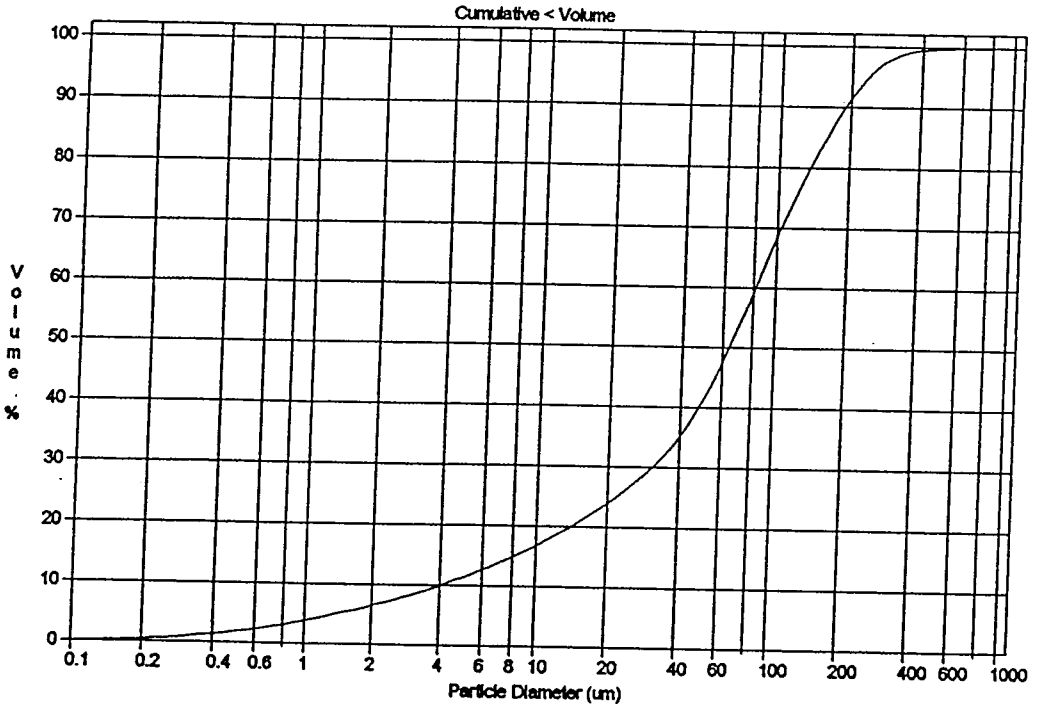
% <	10	25	50	75	90
Size um	5.791	29.70	68.71	134.2	213.2

COULTER^R LS Particle Size Analysis

11:34 15 Dec 199

final.$09

File name:	FINAL.$09	Group ID:	Final
Sample ID:	n° 7		
Operator:		Run number:	3
Comments:			
Start time:	11:32 15 Dec 1995	Run length:	60 Seconds
Pump Speed:	75		
Obscuration:	9%		
Optical model:	Fraunhofer		
LS 130	Fluid module		
Software:	1.53	Firmware:	1.3 1.8



Volume Statistics (Arithmetic) final.$09

Calculations from 0.100 um to 900.0 um

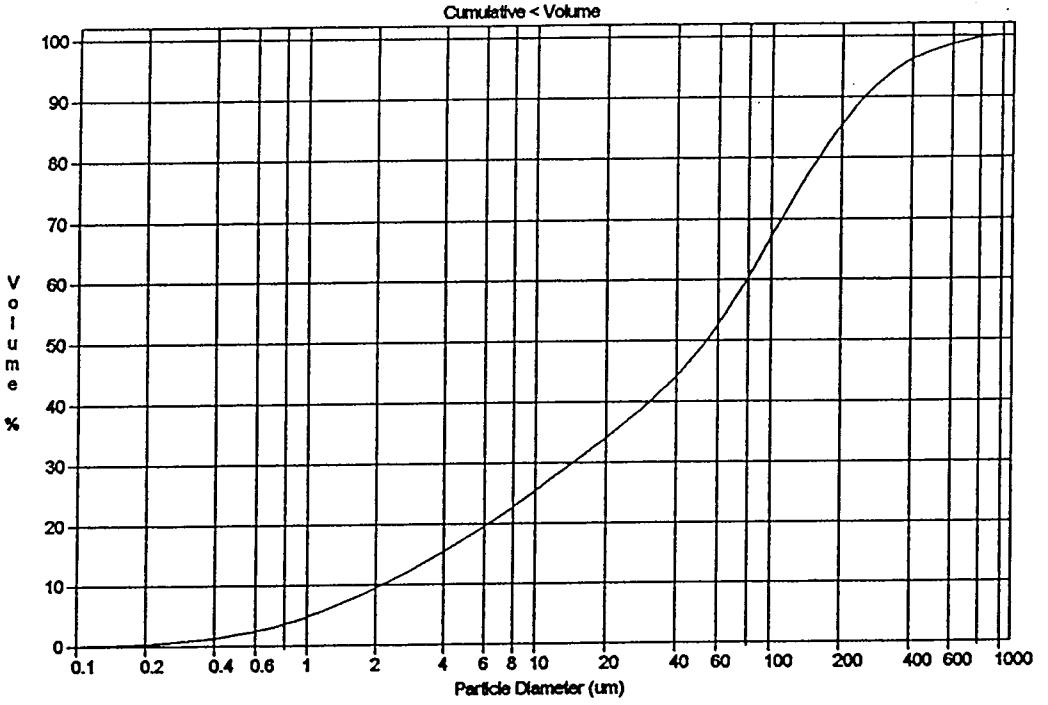
Volume	100.0%		
Mean:	83.15 um	95% Conf. Limits:	0-241 um
Median:	64.01 um	S.D.:	80.5 um
Mean/Median Ratio:	1.299	Variance:	6480 um^2
Mode:	80.61 um	C.V.:	96.8%
		Skewness:	2.05 Right skewed
		Kurtosis:	8.92 Leptokurtic

% <	10	25	50	75	90
Size um	4.059	21.81	64.01	118.8	189.1

COULTER^R LS Particle Size Analysis 11:21 15 Dec 1995

final.$08

File name:	FINAL.$08	Group ID:	Final
Sample ID:	n° 8		
Operator:		Run number:	2
Comments:			
Start time:	11:19 15 Dec 1995	Run length:	61 Seconds
Pump Speed:	75		
Obscuration:	10%		
Optical model:	Fraunhofer		
LS 130	Fluid module		
Software:	1.53	Firmware:	1.3 1.8



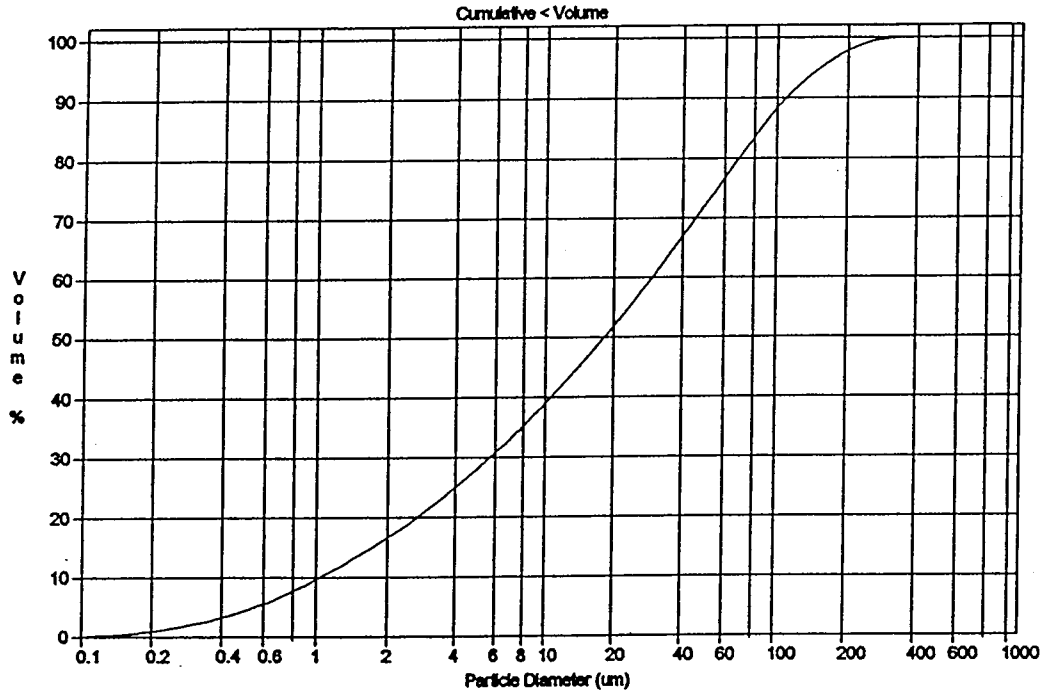
Volume Statistics (Arithmetic) final.$08

Calculations from 0.100 um to 900.0 um

Volume	100.0%		
Mean:	98.01 um	95% Conf. Limits:	0-353 um
Median:	53.43 um	S.D.:	130 um
Mean/Median Ratio:	1.834	Variance:	1.69e+004 um^2
Mode:	96.71 um	C.V.:	133%
		Skewness:	2.52 Right skewed
		Kurtosis:	8.11 Leptokurtic

% <	10	25	50	75	90
Size um	2.161	9.689	53.43	132.8	249.2

File name:	FINAL.$07	Group ID:	Final
Sample ID:	n° 9		
Operator:		Run number:	1
Comments:			
Start time:	11:03 15 Dec 1995	Run length:	60 Seconds
Pump Speed:	75		
Obscuration:	10%		
Optical model:	Fraunhofer		
LS 130	Fluid module		
Software:	1.53	Firmware:	1.3 1.8



Volume Statistics (Arithmetic) final.$07

Calculations from 0.100 um to 900.0 um

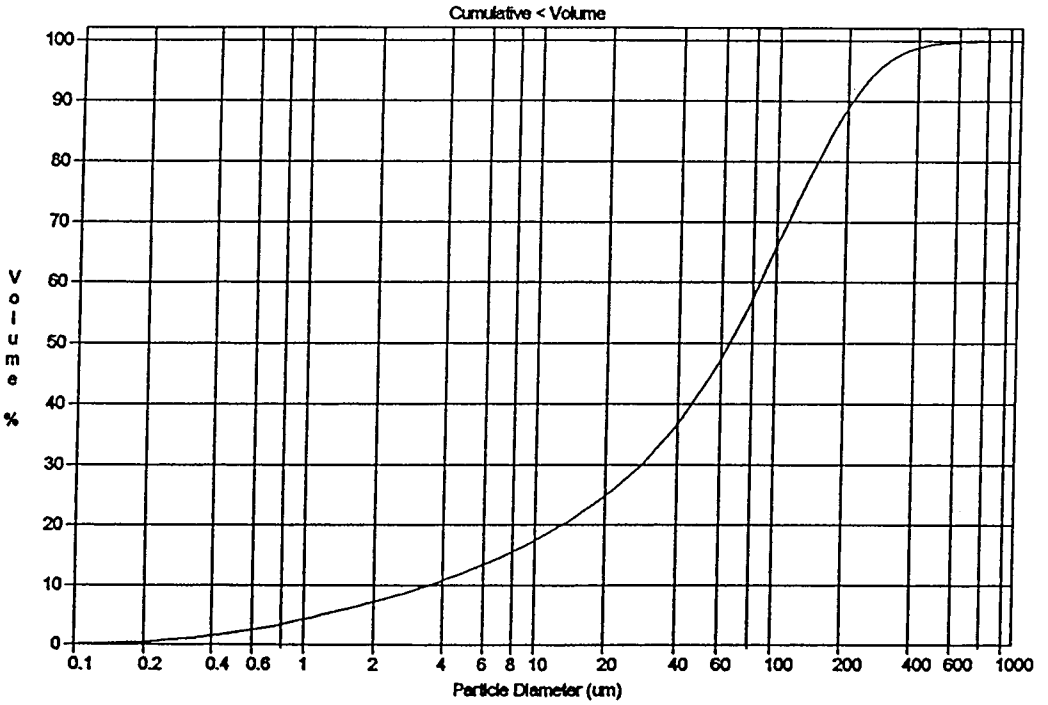
Volume	100.0%		
Mean:	39.75 um	95% Conf. Limits:	0-142 um
Median:	18.24 um	S.D.:	51.9 um
Mean/Median Ratio:	2.180	Variance:	2700 um^2
Mode:	56.00 um	C.V.:	131%
		Skewness:	2.05 Right skewed
		Kurtosis:	4.69 Leptokurtic

% <	10	25	50	75	90
Size um	1.049	4.002	18.24	55.94	109.8

COULTER^R LS Particle Size Analysis 11:46 15 Dec 1995

final.$10

File name:	FINAL.$10	Group ID:	Final
Sample ID:	n° 10		
Operator:		Run number:	4
Comments:			
Start time:	11:44 15 Dec 1995	Run length:	60 Seconds
Pump Speed:	75		
Obscuration:	10%		
Optical model:	Fraunhofer		
LS 130	Fluid module		
Software:	1.53	Firmware:	1.3 1.8



Volume Statistics (Arithmetic) final.$10

Calculations from 0.100 um to 900.0 um

Volume	100.0%		
Mean:	89.80 um	95% Conf. Limits:	0-271 um
Median:	64.73 um	S.D.:	92.6 um
Mean/Median Ratio:	1.387	Variance:	8570 um^2
Mode:	96.71 um	C.V.:	103%
		Skewness:	2 Right skewed
		Kurtosis:	6.72 Leptokurtic

% <	10	25	50	75	90
Size um	3.502	20.24	64.73	129.2	209.0

PERCENTAGEM DE SÓLIDOS E DILUIÇÃO PARA AS TRÊS AMOSTRAGENS REALIZADAS

	Amostragem Nº1		Amostagem Nº2		Amostragem Nº3	
	P_S %	D	P_S %	D	P_S %	D
Nº1	33.7	1.967	32.5	2.077	34.0	1.941
Nº 2	70.5	0.418	72.5	0.379	71.5	0.399
Nº3	30.0	2.333	30.6	2.266	34.7	2.155
Nº4	32.7	2.058	31.9	2.135	38.3	1.611
Nº5	83.1	0.203	82.2	0.217	78.9	0.267
Nº6	46.1	1.169	45.6	1.198	42.8	1.232
Nº7	49.3	1.028	60.5	0.653	55.1	0.957
Nº8	83.4	0.199	82.4	0.214	83.2	0.202
Nº9	24.3	3.115	26.8	2.731	25.6	2.759
Nº10	70.0	0.429	65.6	0.524	78.6	0.397

ANEXO II

ESTIMA DOS CAUDAIS MÁSSICOS RESULTADOS DE VÁRIAS HIPÓTESES

- AMOSTRAGEM 1

- HIPÓTESE DE ABANDONO DO FLUXO 4.
- HIPÓTESE DE ABANDONO DO FLUXO 7.
- HIPÓTESE DE ABANDONO DO FLUXO 8.

- AMOSTRAGEM 2

- HIPÓTESE DE ABANDONO DO FLUXO 1.

- AMOSTRAGEM 3

- HIPÓTESE DE ABANDONO DO FLUXO 1.

AMOSTRAGEM Nº1

RESULTADOS DO CÁLCULO DOS CAUDAIS MÁSSICOS RESULTANTES DA HIPÓTESE DO ABANDONO DO FLUXO 4

1 µ	1.5 µ	2 µ	3 µ	4 µ	6 µ	8 µ	12 µ	16 µ	24 µ	32 µ	48 µ	74 µ
-0.95	-1.62	-7.03	0.89	0.27	-0.01	-0.09	-0.14	-0.15	-0.16	-0.15	-0.14	-0.11
-0.06	0.82	8.02	-2.61	-1.78	-1.36	-1.19	-0.99	-0.89	-0.79	-0.73	-0.65	-0.56
-0.88	-2.44	-15.06	3.50	2.06	1.36	1.10	0.85	0.74	0.63	0.57	0.51	0.45
-0.02	0.34	3.67	-1.33	-0.94	-0.70	-0.58	-0.43	-0.34	-0.24	-0.19	-0.12	-0.04
-0.04	0.48	4.35	-1.28	-0.85	-0.66	-0.60	-0.57	-0.56	-0.54	-0.54	-0.53	-0.52
-0.99	-2.55	-15.17	3.39	1.95	1.25	1.00	0.75	0.64	0.52	0.46	0.39	0.32
-1.90	-3.11	-12.38	1.17	0.12	-0.35	-0.48	-0.57	-0.60	-0.61	-0.62	-0.61	-0.59
0.89	0.89	0.89	0.89	0.89	0.90	0.90	0.90	0.90	0.89	0.89	0.88	0.87
0.11	0.11	0.11	0.11	0.11	0.10	0.10	0.10	0.10	0.11	0.11	0.12	0.13

RESULTADOS DO CÁLCULO DOS CAUDAIS MÁSSICOS RESULTANTES DA HIPÓTESE DO ABANDONO DO FLUXO 7

1 µ	1.5 µ	2 µ	3 µ	4 µ	6 µ	8 µ	12 µ	16 µ	24 µ	32 µ	48 µ	74 µ
0.19	0.19	0.19	0.18	0.18	0.18	0.17	0.17	0.17	0.17	0.17	0.17	0.08
0.01	0.02	0.02	0.02	0.03	0.03	0.03	0.03	0.03	0.03	0.03	0.02	0.00
0.17	0.17	0.17	0.16	0.16	0.15	0.14	0.14	0.14	0.14	0.14	0.14	0.08
2.21	2.15	2.11	2.08	2.11	2.25	2.45	3.12	4.25	10.57	-52.63	-4.14	-1.27
-2.20	-2.13	-2.09	-2.06	-2.08	-2.22	-2.42	-3.09	-4.22	-10.54	52.66	4.17	1.28
0.06	0.06	0.06	0.05	0.05	0.04	0.04	0.04	0.04	0.03	0.03	0.02	-0.06
1.39	1.32	1.28	1.24	1.27	1.39	1.60	2.26	3.39	9.71	-53.49	-5.00	-2.20
0.89	0.89	0.89	0.89	0.89	0.90	0.90	0.90	0.90	0.89	0.89	0.88	0.87
0.11	0.11	0.11	0.11	0.11	0.10	0.10	0.10	0.10	0.11	0.11	0.12	0.13

RESULTADOS DO CÁLCULO DOS CAUDAIS MÁSSICOS RESULTANTES DA HIPÓTESE DO ABANDONO DO FLUXO 8

1 µ	1.5 µ	2 µ	3 µ	4 µ	6 µ	8 µ	12 µ	16 µ	24 µ	32 µ	48 µ	74 µ
-1.32	-1.33	-1.33	-1.34	-1.34	-1.33	-1.32	-1.32	-1.31	-1.28	-1.27	-1.28	-1.24
-0.09	-0.11	-0.13	-0.16	-0.18	-0.21	-0.22	-0.23	-0.24	-0.23	-0.22	-0.18	-0.06
-1.23	-1.22	-1.20	-1.17	-1.15	-1.12	-1.10	-1.09	-1.07	-1.05	-1.05	-1.10	-1.18
-0.39	-0.39	-0.39	-0.39	-0.38	-0.36	-0.35	-0.33	-0.31	-0.29	-0.28	-0.26	-0.23
0.30	0.28	0.27	0.23	0.20	0.16	0.13	0.09	0.07	0.06	0.06	0.08	0.17
0.03	0.04	0.05	0.07	0.09	0.10	0.11	0.13	0.14	0.17	0.21	0.28	0.44
-2.61	-2.61	-2.60	-2.56	-2.53	-2.49	-2.46	-2.41	-2.38	-2.34	-2.33	-2.36	-2.41
2.26	2.26	2.25	2.25	2.24	2.23	2.22	2.21	2.21	2.22	2.26	2.38	2.62
-1.26	-1.26	-1.25	-1.25	-1.24	-1.23	-1.22	-1.21	-1.21	-1.22	-1.26	-1.38	-1.62

AMOSTRAGEM Nº2

CALCULO DOS CAUDAIS DOS DADOS DA 2ª AMOSTRAGEM													
	74 µ	48 µ	32 µ	24 µ	16 µ	12 µ	8 µ	6 µ	4 µ	3 µ	2 µ	1.6 µ	1 µ
Q1	0.652	0.432	2.337	1.242	1.238	1.229	1.219	1.217	1.210	1.191	1.170	1.153	1.129
Q2	0.563	0.278	1.714	1.053	1.108	1.122	1.123	1.125	1.122	1.104	1.084	1.070	1.051
Q3	0.089	0.154	0.622	0.189	0.130	0.107	0.096	0.091	0.089	0.087	0.086	0.084	0.078
Q4	0.020	0.010	0.047	0.017	0.011	0.020	0.033	0.047	0.060	0.071	0.078	0.080	0.067
Q5	0.543	0.268	1.667	1.037	1.097	1.102	1.090	1.079	1.062	1.033	1.006	0.990	0.984
Q6	-0.047	-0.125	0.405	0.010	-0.025	-0.028	-0.023	-0.017	-0.012	-0.007	-0.003	-0.001	-0.003
Q7	-0.368	-0.578	1.289	0.225	0.227	0.209	0.186	0.170	0.150	0.121	0.092	0.073	0.062
Q8	0.864	0.721	0.783	0.821	0.845	0.865	0.881	0.892	0.900	0.906	0.911	0.915	0.919
Q9	0.136	0.279	0.217	0.179	0.155	0.135	0.119	0.108	0.100	0.094	0.089	0.085	0.081
Q10	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000

CALCULO DOS CAUDAIS DOS DADOS DA 2ª AMOSTRAGEM COM CUMULANTE											
	48 µ	32 µ	24 µ	16 µ	8 µ	6 µ	4 µ	3 µ	2 µ	1.6 µ	1 µ
Q1	1.159	1.181	1.190	1.190	1.185	1.177	1.171	1.162	1.154	1.143	1.137
Q2	1.014	1.061	1.083	1.094	1.093	1.089	1.086	1.078	1.072	1.063	1.057
Q3	0.145	0.119	0.107	0.096	0.091	0.087	0.085	0.083	0.082	0.081	0.080
Q4	0.037	0.039	0.041	0.046	0.051	0.059	0.064	0.069	0.072	0.073	0.071
Q5	0.976	1.022	1.042	1.048	1.042	1.030	1.022	1.009	1.000	0.990	0.986
Q6	-0.002	-0.010	-0.012	-0.013	-0.012	-0.009	-0.007	-0.005	-0.004	-0.003	-0.002
Q7	0.122	0.142	0.149	0.144	0.133	0.117	0.107	0.092	0.082	0.071	0.066
Q8	0.852	0.871	0.880	0.891	0.897	0.904	0.908	0.912	0.914	0.917	0.918
Q9	0.148	0.129	0.120	0.109	0.103	0.096	0.092	0.088	0.086	0.083	0.082
Q10	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000

AMOSTRAGEM Nº3

CÁLCULO DE CAUDAIS C/ HISTOGRAMA 3ª AMOSTRAGEM														
	600 µ	250 µ	74 µ	48 µ	32 µ	24 µ	16 µ	12 µ	8 µ	6 µ	4 µ	3 µ	2 µ	1.5 µ	1 µ
Q1	1.65	3.01	2.14	1.64	1.95	2.22	3.22	7.72	7.72	11.23	6.43	4.76	3.72	4.33	3.50
Q2	0.32	3.94	2.31	1.19	1.32	1.61	2.60	7.08	7.08	10.58	5.80	4.14	3.11	3.74	2.95
Q3	1.33	-0.94	-0.17	0.44	0.63	0.61	0.62	0.64	0.64	0.64	0.63	0.62	0.61	0.59	0.55
Q4	0.41	0.60	1.34	0.70	0.88	1.23	2.26	6.77	6.77	10.26	5.48	3.77	2.54	2.85	1.91
Q5	-0.09	3.34	0.97	0.49	0.44	0.38	0.33	0.32	0.32	0.32	0.32	0.37	0.57	0.89	1.04
Q6	0.24	-0.08	-0.01	-0.02	0.11	0.04	0.02	0.02	0.02	0.04	0.07	0.08	0.11	0.07	0.09
Q7	0.24	1.40	-0.20	-0.07	0.07	-0.01	-0.04	-0.04	-0.04	-0.03	-0.05	-0.01	-0.18	-0.48	-0.59
Q8	-0.09	1.85	1.16	0.54	0.48	0.44	0.39	0.38	0.38	0.39	0.44	0.46	0.50	0.48	0.54
Q9	1.09	-0.85	-0.16	0.46	0.52	0.56	0.61	0.62	0.62	0.61	0.56	0.54	0.50	0.52	0.46
Q10	1.00	0.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00

CÁLCULO DE CAUDAIS C/ CUMULANTE 3ª AMOSTRAGEM													
	250 µ	74 µ	48 µ	32 µ	24 µ	16 µ	8 µ	6 µ	4 µ	3 µ	2 µ	1.5 µ	1 µ
Q1	5.62	6.28	9.01	13.84	18.73	25.68	28.85	29.87	30.61	32.88	36.22	42.06	47.00
Q2	8.09	8.40	11.14	16.17	21.27	28.59	32.09	33.71	34.95	38.10	42.25	49.55	55.96
Q3	-2.46	-2.12	-2.12	-2.34	-2.54	-2.91	-3.25	-3.84	-4.34	-5.22	-6.02	-7.49	-8.96
Q4	4.81	5.80	8.36	13.11	17.91	24.70	27.68	28.25	28.50	29.58	31.50	34.74	37.94
Q5	3.27	2.60	2.78	3.06	3.36	3.89	4.41	5.46	6.44	8.52	10.75	14.81	18.03
Q6	-0.56	-0.25	-0.23	-0.24	-0.26	-0.30	-0.37	-0.49	-0.59	-0.76	-0.92	-1.20	-1.39
Q7	-0.19	-0.52	-0.35	-0.27	-0.18	-0.02	0.17	0.62	1.11	2.30	3.72	6.32	8.06
Q8	2.90	2.87	2.89	3.09	3.29	3.61	3.88	4.35	4.75	5.46	6.10	7.29	8.57
Q9	-1.90	-1.87	-1.89	-2.09	-2.29	-2.61	-2.88	-3.35	-3.75	-4.46	-5.10	-6.29	-7.57
Q10	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00

ANEXO III

PROGRAMAS EM PASCAL

-PROGRAMA CICLONE - AJUSTA MODELOS DE CURVAS DE PARTIÇÃO

-PROGRAMA A.P.C.V.1 - SIMULADOR C/ VARIAÇÃO DE As E D50 COM O RENDIMENTO PONDERAL.

-PROGRAMA A.P.C.V.2 - SIMULADOR C/ As E D50 FIXOS

PROGRAM CICLONE

```
                    PROGRAM CICLONE(INPUT,OUTPUT,RESULT);
USES wincrt;

LABEL 10,20,30,40,50,60;

TYPE VECTOR = Array [1..20] of Extended;
   PARAM = Array [1..4] of Extended;
   RESIDUO = Array [1..20] of Extended;

VAR  i,j,k,n,op,KK,IJ,IX,JX,JK,MAXE,MO,M,NE,NN,NP,FLAG:integer;
   m1,Pj,Corte,R,U,AM,Infra,Soma,DOWN,KOUNT,
   LAMBDA,EPS,HP,FM,F2,LO,PU,PQ,PO,SM,SQ,TOL,UP,D50,As,Beta:Extended;
   D,S,SO,CR,Luz,C,CO,F,FI,V1,V2,RI,UI,OS,OI,PartR,PartS:VECTOR;
   Nome,Dados:String[10];
   Filedatain:text;
   P,X,V,DM,H:PARAM;
   FO:RESIDUO;
   A,XA:ARRAY[1..25] of Extended;
   FJ:ARRAY[1..40,1..8] of Extended;
   RESULT: text;

FUNCTION FNP(X:Extended):Extended;

      BEGIN
         FNP:=SQRT(X*X+1)+X;
      END;


FUNCTION FNX(P:Extended):Extended;

      BEGIN
         FNX:=(P*P-1)*0.5/P;
      END;


PROCEDURE CUMULANTE(V1:Vector;  Var V2:Vector);
VAR i:integer;
  Soma:Real;

BEGIN
  Soma:=0;
  For i:=1 to n do
   Begin
      Soma:=Soma+V1[i];
      Infra:=1-Soma;
      V2[i]:=Soma;
   End;
   V2[1]:=Soma+Infra;
   For i:=2 to n do
    V2[i]:=V2[i-1]-V1[i-1];
END;

PROCEDURE PARTICAO (Beta:Real; V2,V3:Vector; Var V4:Vector);
 VAR i:integer;
```

```
    x:PARAM;

  BEGIN

    For i:=1 to NP do x[i]:=FNP(P[i]);
    d50:=x[1]; m1:=x[2]; As:=x[3];
    CICLONAGEM(Luz,FLAG,PartS);
    Clrscr;
    gotoxy(1,5);
    Writeln('D50=    ',D50:6:4,'  m1=  ',m1:6:4,'  As=  ',As:6:4);
     For j:=1 to n do
     F[j]:=PartS[j]-PartR[j];
  END;


  PROCEDURE RESULTADOS;

  BEGIN
    clrscr;
    SIMULADOR(P,F);
    clrscr;
    Write('                RESULTADOS DA OPTIMIZAÇÃO');

Writeln('=============================================================
================');
    Writeln('     D50=',D50:10:5,'    m1=',m1:10:5,'    As=',As:10:5);

Writeln('=============================================================
================');
    Writeln('    LUZ(mm)          Partição(Real)      Partição(Simul.)');
    For i:=1 to n do
     Begin
        Writeln('  ',LUZ[i]:10:4,'          ',PartR[i]:10:4,'          ',PartS[i]:10:4);
     End;

Write('=============================================================
============');
    Readln;

    Begin
       clrscr;
       Writeln(' Nome do ficheiro para guardar resultados?');Readln(Dados);
       Assign(result,Dados);
       rewrite(result);
       writeln(result,D50:8:4,m1:8:4,As:8:4);
       For i:=1 to n do
       writeln(result,luz[i]:12:5,PartR[i]:12:5,PartS[i]:12:5);
       close(result);
       end;
    Readln;


  END;
```

```
      2:BEGIN Writeln('Novo valor de Corte=     ');Readln(Corte);D50:=(Corte);END;
      3:BEGIN Writeln('Novo valor de As=      ');Readln(As);END;
      4:BEGIN Writeln('Novo valor de D50=     ');Readln(D50);END;
      5:BEGIN
          Writeln(' Exponenti.Sum (Lynch & Rao).....(1)');
          Writeln(' Rosin Ramler(Plitt).....(2)');
          Writeln(' Logistic(Lee & Plitt).....(3)');
          Writeln(' Escolha do tipo de Modelo:      '); Readln(Flag);
       END;
      6:CICLONAGEM( Luz.. AG, PartS);
      7:Goto 10;
      0:EXIT;
   End;
   until 1<>1;

                {*ROTINA MARQUARDT*}

10:READLN;
   P[1]:=D50;P[2]:=m1;P[3]:=s;
   Writeln('P[1]=    ',P[1]:7:5
   Writeln('P[2]=    ',P[2]:7:5
   Writeln('P[3]=    ',P[3]:7:5
   readln;
   clrscr;
   N:=i;
   M:=N-2;
   NP:=3;
   NN:=TRUNC((NP+1)*NP/2

   BEGIN
     FOR I:=1 TO NP DO
      BEGIN
        H[I]:=0;
        P[I]:=FNX(P[I]);
      END;
  20:TOL:=0.00001;
     UP:=10;
     DOWN:=0.1;
     LAMBDA:=1;
     EPS:=0.001;
     SIMULADOR(P,F);
     SM:=0;
     SQ:=0;
     FOR I:=1 TO M DO
      BEGIN
        FO[I]:=F[I];
        F2:=F[I]*F[I];
        SQ:=SQ+F2;
        SM:=SM+F2*F2
      END;
     PU:=SM;
     PQ:=SQ;
     WRITELN;
     WRITELN;
     WRITELN(LAMBDA,PU,

  30:LAMBDA:=DOWN*LAMBDA;
  PO:=PQ;
```

```
 FOR JX:=1 TO NP DO
  BEGIN
    PJ:=P[JX];
    HP:=ABS(PJ)*EPS+EPS;
    P[JX]:=PJ+HP;
    SIMULADOR(P,F);
    P[JX]:=PJ;
    FOR IX:=1 TO M DO FJ[IX,JX]:=(F[IX]-FO[IX])/HP;
  END;
 JK:=0;
 FOR J:=1 TO NP DO
  BEGIN
    SM:=0;
    FOR I:=1 TO M DO SM:=FJ[I,J]*FO[I]+SM;
    V[J]:=SM;
    FOR K:=1 TO J DO
     BEGIN
       JK:=JK+1;
       SM:=0;
       FOR I:=1 TO M DO SM:=FJ[I,K]*FJ[I,J]+SM;
       XA[JK]:=SM
     END;
  END;
 FOR J:=1 TO NP DO DM[J]:=P[J];
40:FOR K:=1 TO NN DO A[K]:=XA[K];
   FOR J:=1 TO NP DO
    BEGIN
      KK:=TRUNC((J+1)*J/2);
      A[KK]:=XA[KK]+LAMBDA;
      X[J]:=-V[J]
    END;
   FOR J:=1 TO NP DO
    BEGIN
      KK:=TRUNC((J+1)*J/2);
      IF J=1 THEN GOTO 50;
      FOR I:=J TO NP DO
       BEGIN
         IJ:=TRUNC((I-1)*I/2+J);
         SM:=A[IJ];
         FOR K:=1 TO J-1 DO SM:=SM-A[IJ-K]*A[KK-K];
         A[IJ]:=SM
       END;
    50:IF A[KK]<=0 THEN GOTO 60;
      SM:=SQRT(A[KK]);
      FOR I:=J TO NP DO
       BEGIN
         IJ:=TRUNC((I-1)*I/2+J);
         A[IJ]:=A[IJ]/SM;
       END;
    END;
   X[1]:=X[1]/A[1];
   KK:=1;
   FOR I:=2 TO NP DO
    BEGIN
      FOR J:=1 TO I-1 DO
       BEGIN
         KK:=KK+1;
         X[I]:=X[I]-A[KK]*X[J]
```

```
            END;
          KK:=KK+1;
          X[I]:=X[I]/A[KK]
        END;
      X[NP]:=X[NP]/A[NN];
      I:=NP;
      REPEAT
        KK:=TRUNC((I-1)*I/2);
        FOR J:=1 TO I-1 DO X[J]:=X[J]-X[I]*A[KK+J];
        X[I-1]:=X[I-1]/A[KK];
        I:=I-1;
      UNTIL I<2;
      KOUNT:=0;
      FOR I:=1 TO NP DO
       BEGIN
        P[I]:=DM[I]+X[I];
        IF P[I]=DM[I] THEN KOUNT:=KOUNT+1
                ELSE END;
      IF KOUNT=NP THEN
      BEGIN
        RESULTADOS;
        EXIT;
      END;

      SIMULADOR(P,F);
      SM:=0;
      SQ:=0;
      FOR I:=1 TO M DO
       BEGIN
        FO[I]:=F[I];
        F2:=F[I]*F[I];
        SQ:=SQ+F2;
        SM:=SM+F2*F2
       END;
      PU:=SM;
      PQ:=SQ;
      WRITELN;
      WRITELN;
      WRITELN(LAMBDA,PQ);
      IF PQ<PO THEN GOTO 30;
    60:LAMBDA:=UP*LAMBDA;
      IF LAMBDA=0 THEN LAMBDA:=TOL;
      GOTO 40;
  END;

END.
```

```
PROGRAM APCV1(INPUT,OUTPUT,RESULT);
USES wincrt;

TYPE VECTOR = Array [1..20] of Extended;

VAR  i,j,k,n,op,FLAG:integer;
   m1,m2,m3,R,U,AUX,ALM1,ALM2,ALM3,SUP1,SUP2,SUP3,SUP4,INF1,INF2,INF3,
   INF4,D501,D502,D503,As1,As2,As3,dc501,dc502,dc503,b501,b502,b503,
   dcAs1,dcAs2,dcAs3,bAs1,bAs2,bAs3,Rp1,Rp2,Rp3,Infra,Soma:Extended;
   Luz,CUMI1,F,ALMI1,ALMI2,ALMI3,SUPI1,SUPI2,SUPI3,SUPI4,INFI1,INFI2,INFI3,
   INFI4,QSUPI1,QSUPI2,QSUPI3,QSUPI4,QINFI1,QINFI2,QINFI3,QINFI4,PartS1,
   PartS2,PartS3,PartS4,V1,V2,AUXI:VECTOR;
   Nome,Dados:String[10];
   Filedatain,result:text;


PROCEDURE VINTEPOLEGADAS ( Luz:Vector;FLAG:INTEGER; Var PartS1:Vector);

VAR
  i:integer;
  xi:Extended;

BEGIN
   For i:=1 to n do
      Begin
          xi:=(Luz[i]/D501);
      Case FLAG of
    1: PartS1[i]:=(As1+(1-As1)*(EXP(m1*xi)-1)/(EXP(m1*xi)+EXP(m1)-2));
    2: PartS1[i]:=(((1-EXP(-0.693*EXP(m1*ln(xi))))*(1-AS1))+As1);
    3: PartS1[i]:=(((1/(1+EXP(m1*ln(1/xi))))*(1-As1))+As1);

      End;
      End;


END;

PROCEDURE QUATORZEPOLEGADAS ( Luz:Vector;FLAG:INTEGER; Var PartS2:Vector);

VAR
  i:integer;
  xi:Extended;

BEGIN
   For i:=1 to n do
      Begin
          xi:=(Luz[i]/D502);
      Case FLAG of
    1: PartS2[i]:=(As2+(1-As2)*(EXP(m2*xi)-1)/(EXP(m2*xi)+EXP(m2)-2));
    2: PartS2[i]:=(((1-EXP(-0.693*EXP(m2*ln(xi))))*(1-AS2))+As2);
    3: PartS2[i]:=(((1/(1+EXP(m2*ln(1/xi))))*(1-As2))+As2);

      End;
      End;
```

```
END;

PROCEDURE DORR (Luz: Vector; Var PartS3:Vector);

VAR
  i:integer;
  xi:Extended;

BEGIN
   For i:= 1 to n do
     Begin
        PartS3[1]:=1.00;
        PartS3[2]:=1.00;
        PartS3[3]:=1.00;
        PartS3[4]:=1.00;
        PartS3[5]:=0.9963;
        PartS3[6]:=0.8725;
        PartS3[7]:=0.2092;
        PartS3[8]:=0.2915;
        PartS3[9]:=0.4081;
        PartS3[10]:=0.4785;
        PartS3[11]:=0.5392;
        PartS3[12]:=0.6052;
        PartS3[13]:=0.6634;
        PartS3[14]:=0.6996;
        PartS3[15]:=0.7217;
        PartS3[16]:=0.7345;
        PartS3[17]:=0.7351;
        PartS3[18]:=0.7290;
        PartS3[19]:=0.7106;
     End;


END;



   PROCEDURE CRIVO ( Luz:Vector;FLAG:INTEGER; Var PartS4:Vector);
VAR
  i:integer;
  xi:Extended;

BEGIN
   For i:=1 to n do
     Begin
        xi:=(Luz[i]/D503);
     Case FLAG of
    1: PartS4[i]:=(As3+(1-As3)*(EXP(m3*xi)-1)/(EXP(m3*xi)+EXP(m3)-2));
    2: PartS4[i]:=(((1-EXP(-0.693*EXP(m3*ln(xi))))*(1-AS3))+As3);
    3: PartS4[i]:=(((1/(1+EXP(m3*ln(1/xi))))*(1-As3))+As3);

     End;
     End;


END;
```

```
PROCEDURE FECHADO;

VAR i,j,k:integer;
  TESTE:Real;

BEGIN
  SUP1:=0;SUP2:=0;SUP3:=0;INF1:=0;INF2:=0;INF3:=0;INF4:=0;ALM2:=0;ALM3:=0;

  For i:=1 to n do
   Begin
     SUPI1[i]:=0;
     INFI1[i]:=0;
     SUPI2[i]:=0;
     INFI2[i]:=0;
     SUPI3[i]:=0;
     INFI3[i]:=0;
     SUPI4[i]:=0;
     INFI4[i]:=0;

   End;


   clrscr;
   Repeat

   AUX:=ALM2;

   VINTEPOLEGADAS(LUZ,Flag,PartS1);

      SUP1:=0;INF1:=0;ALM2:=0;QINFI1[i]:=0;QSUPI1[i]:=0;INFI1[i]:=0;SUPI1[i]:=0;
      ALM2:=ALM1+INF3+INF4;

      For i:=1 to n do
        ALMI2[i]:=(ALM1*ALMI1[i]+INF3*INFI3[i]+INF4*INFI4[i])/(ALM1+INF3+INF4);
{alimentação ciclone 20"}

       For j:=1 to n do
         Begin
           QINFI1[j]:=ALM2*ALMI2[j]*(1-PartS1[j]);   {*UNDERFLOW20"*}
           INF1:=INF1+QINFI1[j];
           QSUPI1[j]:=ALM2*ALMI2[j]*PartS1[j];       {*SUPRA20"*}
           SUP1:=SUP1+QSUPI1[j];
         End;

       For j:=1 to n do

         Begin
           INFI1[j]:=QINFI1[j]/INF1;
           SUPI1[j]:=QSUPI1[j]/SUP1;
         End;

       Rp1:=SUP1/ALM2;
       D501:=dc501*Rp1+b501; {*CÁLCULO DE As E D50 DO CICLONE DE 20"*}
       As1:=dcAs1*Rp1+bAs1;



   QUATORZEPOLEGADAS(LUZ,Flag,PartS2);
```

```
QINFI2[i]:=0;QSUPI2[i]:=0;INF2:=0;SUP2:=0;INFI2[i]:=0;SUPI2[i]:=0;
For j:=1 to n do
    Begin
      QINFI2[j]:=INF1*INFI1[j]*(1-PartS2[j]);   {*UNDERFLOW14"*}
      INF2:=INF2+QINFI2[j];
      QSUPI2[j]:=INF1*INFI1[j]*PartS2[j];       {*SUPRA14"*}
      SUP2:=SUP2+QSUPI2[j];
    End;

For j:=1 to n do
  Begin
     INFI2[j]:=QINFI2[j]/INF2;
     SUPI2[j]:=QSUPI2[j]/SUP2;
  End;


Rp2:=SUP2/INF1;
D502:=dc502*Rp2+b502;  {*CÁLCULO DE As E D50 DO CICLONE DE 14"*}
As2:=dcAs2*Rp2+bAs2;


DORR(Luz,PartS3);
 QINFI3[i]:=0;QSUPI3[i]:=0;INF3:=0;SUP3:=0;INFI3[i]:=0;SUPI3[i]:=0;
 For j:=1 to n do
    Begin
      QINFI3[j]:=SUP1*SUPI1[j]*(1-PartS3[j]);   {*UNDERFLOW DORR*}
      INF3:=INF3+QINFI3[j];
      QSUPI3[j]:=SUP1*SUPI1[j]*PartS3[j];       {*SUPRA DORR*}
      SUP3:=SUP3+QSUPI3[j];
    End;

For j:=1 to n do
  Begin
     INFI3[j]:=QINFI3[j]/INF3;
     SUPI3[j]:=QSUPI3[j]/SUP3;
  End;



CRIVO (LUZ,Flag,PartS4);


ALM3:=0;ALMI3[i]:=0;QINFI4[i]:=0;QSUPI4[i]:=0;INF4:=0;SUP4:=0;INFI4[i]:=0;SUPI4[i]:=0;
 ALM3:=SUP3+SUP2;

For i:=1 to n do
    ALMI3[i]:=(SUP3*SUPI3[i]+SUP2*SUPI2[i])/ALM3; {*ALIMENTAÇÃO CRIVO*}


For j:=1 to n do
    Begin
      QINFI4[j]:=ALM3*ALMI3[j]*(1-PartS4[j]);   {*UNDERFLOW CRIVO*}
      INF4:=INF4+QINFI4[j];
      QSUPI4[j]:=ALM3*ALMI3[j]*PartS4[j];       {*SUPRA CRIVO*}
      SUP4:=SUP4+QSUPI4[j];
    End;
```

```
      For j:=1 to n do
        Begin
          INFI4[j]:=QINFI4[j]/INF4;
          SUPI4[j]:=QSUPI4[j]/SUP4;
        End;



    Rp3:=SUP4/ALM3;
    D503:=dc503*Rp3+b503; {*CÁLCULO DE As E D50 DO CRIVO*}
    As3:=dcAs3*Rp3+bAs3;

  clrscr;
  gotoxy(1,1);
  Writeln('                RESULTADOS FINAIS');

Writeln('=============================================================================
================');
  Writeln(' Caudal de Alimentação(tn/h)=',ALM1:5:3,'      Caudal do Tanque(tn/h)=',ALM2:5:3);
  Writeln;
  Writeln(' Caudal de Infra 20"=',INF1:5:3,'            Caudal de Supra 20"=',SUP1:5:3);
  Writeln;
  Writeln(' Caudal de Infra 14"=',INF2:5:3,'            Caudal de Supra 14"=',SUP2:5:3);
  Writeln;
  Writeln(' Caudal de Infra do DORR=',INF3:6:5,'       Caudal de Supra do DORR=',SUP3:5:3);
  Writeln;
  Writeln(' Caudal de Infra do Crivo=',INF4:7:3,'      Caudal de Supra do Crivo=',SUP4:5:3);
  Writeln;
  Writeln(' Caudal de Retorno=',(INF3+INF4):7:3);
  Writeln;
  Writeln(' Rp1=',Rp1:8:4,'      Rp2=',Rp2:8:4,'      Rp3=',Rp3:8:4);

Writeln('=============================================================================
================');
  Clrscr;

  Gotoxy(1,1);
  Writeln('      Luz    ALIMENTAÇÃO    TANQUE    PRODUTO FINAL    AREIAS');
  For k:=1 to n do
  Writeln('   ',Luz[k]:8:3,'   ',100*ALMI1[k]:8:3,'      ',100*ALMI2[K]:8:3,'     ',INFI2[k]*100:8:4,
  '      ',SUPI4[k]*100:8:4);

Writeln('=============================================================================
================');
  UNTIL(ABS(AUX-ALM2)<0.000000000000000001);

  Repeat until keypressed;
  Readln;

     Begin
       clrscr;
       Writeln(' Nome do ficheiro para guardar resultados?');Readln(Dados);
       Assign(result,Dados);
       rewrite(result);
       writeln(result,'ALM20"=',ALM2:6:3,'  ALIM14"=  ',INF1:10:4,'  INFRA14"=  ',INF2:10:4,'
SUPRA14"= ',SUP2:8:4);
       writeln(result,'SUPRA20"=',SUP1:6:4,' INFRADORR= ',INF3:10:4,'  SUPRADORR=
',SUP3:10:4);
```

```
        writeln(result,'ALMCRI"=',ALM3:6:4,'  INFRACRIVO=',INF4:10:4,'
SUPRACRIVO=',SUP4:10:4);
        writeln(result,'  ');
        Writeln(result,'D501=',d501:6:5,'      D502=',d502:10:5,'          D503=',D503:10:5);
        Writeln(result,'m1=',m1:6:5,'          m2=',m2:8:5,'              m3=',m3:10:5);
        Writeln(result,'As1=',As1:6:5,'        As2=',As2:8:5,'            As3=',As3:10:5);
        writeln(result,'LUZ    ALM20" INF20" SUP20"  INF14" SUP14" INFDORR  SUPDORR
ALMCRIVO INFCRIVO SUPCRIVO');
        For i:=1 to n do
        writeln(result,luz[i]:5:3,",ALMI2[i]:8:3,",INFI1[i]:8:3,",SUPI1[i]:8:4,' ',INFI2[i]:8:4,
        ",SUPI2[i]:8:4,' ',INFI3[i]:8:4,'  ',SUPI3[i]:8:4,",ALMI3[i]:8:4,'  ',INFI4[i]:8:4,
        '  ',SUPI4[i]:8:4);
        close(result);
        end;

    Readln;

 END;




                    { ROTINA PRINCIPAL }


 BEGIN

    clrscr;
    Writeln(' Número de Lotes Granulométricos:   ');Readln(n);
    Writeln(' Nome do Ficheiro de Dados?         ');Readln(Nome);
    Assign(filedatain,Nome);
    Reset(filedatain);
    i:=0;
    clrscr;
 Writeln;
 Writeln('              DISTRIBUIÇÃO GRANULOMÉTRICA INICIAL');
 Writeln;

Writeln('=============================================================================
==========');
 Writeln;
 Writeln('          Luz(mm)','          ','Histograma','       ','Cumulante');
 Writeln;
    i:=i+1;
    For i:=1 to n do
      Begin
        Readln(Filedatain,Luz[i],ALMI1[i],CUMI1[i]);
      End;
 Begin
 For i:=1 to n do
 Writeln('          ',Luz[i]:8:4,'          ',ALMI1[i]:8:4,'        ',CUMI1[i]:8:4);
 End;
 Writeln;
 Readln;
 ALM1:=1;Flag:=1;m1:=2.09531;m2:=2.09932;m3:=0.62311;D501:=0.15482;D502:=0.07773;
 D503:=0.29669;As1:=0.3878;As2:=0.20077;As3:=0.78788;dc501:=-1.057471;
```

```
dc502:=-0.4463;dc503:=-0.7508;b501:=1.016994;b502:=0.2446;b503:=1.0253;
dcAs1:=1.201149;dcAs2:=0.5237;dcAs3:=2.5716;bAs1:=-0.576930;bAs2:=-0.0200;bAs3:=-1.6520;
Repeat
clrscr;
Writeln;
Writeln('   PARÂMETROS DO MODELO  ');
Writeln('=====================================');
Writeln('   m1:= ',m1:3:4,'                (1)');
Writeln('   m2:= ',m2:3:4,'                (2)');
Writeln('   m3:= ',m3:3:4,'                (3)');
Writeln('   As1:= ',As1:3:4,'               (4)');
Writeln('   As2:= ',As2:3:4,'               (5)');
Writeln('   As3:= ',As3:3:4,'               (6)');
Writeln('   D501:= ',D501:2:4,'              (7)');
Writeln('   D502:= ',D502:2:4,'              (8)');
Writeln('   D503:= ',D503:2:4,'              (9)');
Writeln('   Caudal de Alimentação(tn/h):= ',ALM1:2:4,'  (10)');
Writeln;
Writeln('   TIPO DE SIMULAÇÃO ');
Writeln('=====================================');
Writeln;
Writeln('  Escolha do Modelo de Ciclonagem..... (11)');
Writeln('  SIMULAÇÃO..... (12)');
Writeln('  Terminar..... (0)');
Writeln;
Repeat
 Writeln('   ESCOLHA O PROCEDIMENTO DESEJADO ->  ');Readln(op);
 until (op>=0) and (op<=13);
 GOTOXY(1,22);
     case op of
      1:BEGIN Writeln('Novo Valor de m/20"=     ');Readln(m1);END;
      2:BEGIN Writeln('Novo Valor de m/14"=     ');Readln(m2);END;
      3:BEGIN Writeln('Novo Valor de m/Crivo=     ');Readln(m3);END;
      4:BEGIN Writeln('Novo Valor de As/20"=     ');Readln(As1);END;
      5:BEGIN Writeln('Novo Valor de As/14"=     ');Readln(As2);END;
      6:BEGIN Writeln('Novo Valor de As/Crivo=     ');Readln(As3);END;
      7:BEGIN Writeln('Novo Valor de D50/20"=     ');Readln(D501);END;
      8:BEGIN Writeln('Novo Valor de D50/14"=     ');Readln(D502);END;
      9:BEGIN Writeln('Novo Valor de D50/Crivo=     ');Readln(D503);END;
      10:BEGIN Writeln('Novo Valor da Alimentação=     ');Readln(ALM1);END;
      11:BEGIN
          Writeln(' Exponential Sum (Lynch & Rao).....(1)');
          Writeln(' Rosin Rammler(Plitt).....(2)');
          Writeln(' Logistic(Lilge & Plitt).....(3)');
          Writeln(' Escolha do Tipo de Modelo:       '); Readln(Flag);
        END;

      12:FECHADO;
      0:EXIT;
    End;

    until 1<>1;

    END.
```

```
PROGRAM APCV2(INPUT,OUTPUT,RESULT);
USES wincrt;

TYPE VECTOR = Array [1..20] of Extended;

VAR  i,j,k,n,op,FLAG:integer;
     m1,m2,m3,Corte,R,U,AUX,ALM1,ALM2,ALM3,SUP1,SUP2,SUP3,SUP4,INF1,INF2,INF3,
     INF4,D501,D502,D503,As1,As2,As3,Infra,Soma:Extended;
     Luz,CUMI1,F,ALMI1,ALMI2,ALMI3,SUPI1,SUPI2,SUPI3,SUPI4,INFI1,INFI2,INFI3,
     INFI4,QSUPI1,QSUPI2,QSUPI3,QSUPI4,QINFI1,QINFI2,QINFI3,QINFI4,PartS1,
     PartS2,PartS3,PartS4,V1,V2,AUXI:VECTOR;
     Nome,Dados:String[10];
     Filedatain,result:text;


PROCEDURE VINTEPOLEGADAS ( Luz:Vector;FLAG:INTEGER; Var PartS1:Vector);

VAR
  i:integer;
  xi:Extended;

BEGIN
   For i:=1 to n do
      Begin
          xi:=(Luz[i]/D501);
      Case FLAG of
     1: PartS1[i]:=(As1+(1-As1)*(EXP(m1*xi)-1)/(EXP(m1*xi)+EXP(m1)-2));
     2: PartS1[i]:=(((1-EXP(-0.693*EXP(m1*ln(xi))))*(1-AS1))+As1);
     3: PartS1[i]:=(((1/(1+EXP(m1*ln(1/xi))))*(1-As1))+As1);

      End;
      End;


END;

PROCEDURE QUATORZEPOLEGADAS ( Luz:Vector;FLAG:INTEGER; Var PartS2:Vector);

VAR
  i:integer;
  xi:Extended;

BEGIN
   For i:=1 to n do
      Begin
          xi:=(Luz[i]/D502);
      Case FLAG of
     1: PartS2[i]:=(As2+(1-As2)*(EXP(m2*xi)-1)/(EXP(m2*xi)+EXP(m2)-2));
     2: PartS2[i]:=(((1-EXP(-0.693*EXP(m2*ln(xi))))*(1-AS2))+As2);
     3: PartS2[i]:=(((1/(1+EXP(m2*ln(1/xi))))*(1-As2))+As2);

      End;
      End;

END;
```

```
PROCEDURE DORR (Luz: Vector; Var PartS3:Vector);

VAR
  i:integer;
  xi:Extended;

BEGIN
   For i:= 1 to n do
      Begin
         PartS3[1]:=1.0000;
         PartS3[2]:=1.0000;
         PartS3[3]:=1.0000;
         PartS3[4]:=1.0000;
         PartS3[5]:=0.9963;
         PartS3[6]:=0.8725;
         PartS3[7]:=0.2092;
         PartS3[8]:=0.2915;
         PartS3[9]:=0.2915;
         PartS3[10]:=0.2915;
         PartS3[11]:=0.2915;
         PartS3[12]:=0.2915;
         PartS3[13]:=0.2915;
         PartS3[14]:=0.2915;
         PartS3[15]:=0.2915;
         PartS3[16]:=0.2915;
         PartS3[17]:=0.2915;
         PartS3[18]:=0.2915;
         PartS3[19]:=0.2915;

      End;


END;



    PROCEDURE CRIVO ( Luz:Vector;FLAG:INTEGER; Var PartS4:Vector);
VAR
  i:integer;
  xi:Extended;

BEGIN
  For i:=1 to n do
     Begin
        xi:=(Luz[i]/D503);
     Case FLAG of
    1: PartS4[i]:=(As3+(1-As3)*(EXP(m3*xi)-1)/(EXP(m3*xi)+EXP(m3)-2));
    2: PartS4[i]:=(((1-EXP(-0.693*EXP(m3*ln(xi))))*(1-AS3))+As3);
    3: PartS4[i]:=(((1/(1+EXP(m3*ln(1/xi))))*(1-As3))+As3);

     End;
     End;



END;
```

```
PROCEDURE FECHADO;

VAR i,j,k:integer;
  TESTE:Real;

BEGIN
  SUP1:=0;SUP2:=0;SUP3:=0;INF1:=0;INF2:=0;INF3:=0;INF4:=0;ALM2:=0;ALM3:=0;

  For i:=1 to n do
   Begin
     SUPI1[i]:=0;
     INFI1[i]:=0;
     SUPI2[i]:=0;
     INFI2[i]:=0;
     SUPI3[i]:=0;
     INFI3[i]:=0;
     SUPI4[i]:=0;
     INFI4[i]:=0;

   End;


   clrscr;
   Repeat

     AUX:=ALM2;


   VINTEPOLEGADAS(LUZ,Flag,PartS1);

     SUP1:=0;INF1:=0;
     ALM2:=ALM1+INF3+INF4;

     For i:=1 to n do
      ALMI2[i]:=(ALM1*ALMI1[i]+INF3*INFI3[i]+INF4*INFI4[i])/(ALM1+INF3+INF4);
{alimentação ciclone 20"}
       For j:=1 to n do
        Begin
          QINFI1[j]:=ALM2*ALMI2[j]*(1-PartS1[j]);   {*UNDERFLOW20"*}
          INF1:=INF1+QINFI1[j];
          QSUPI1[j]:=ALM2*ALMI2[j]*PartS1[j];       {*SUPRA20"*}
          SUP1:=SUP1+QSUPI1[j];
        End;

       For j:=1 to n do

        Begin
          INFI1[j]:=QINFI1[j]/INF1;
          SUPI1[j]:=QSUPI1[j]/SUP1;
        End;


   QUATORZEPOLEGADAS(LUZ,Flag,PartS2);

   INF2:=0;SUP2:=0;
   For j:=1 to n do
      Begin
```

```
        QINFI2[j]:=INF1*INFI1[j]*(1-PartS2[j]);   {*UNDERFLOW14"*}
        INF2:=INF2+QINFI2[j];
        QSUPI2[j]:=INF1*INFI1[j]*PartS2[j];       {*SUPRA14"*}
        SUP2:=SUP2+QSUPI2[j];
      End;

For j:=1 to n do
   Begin
      INFI2[j]:=QINFI2[j]/INF2;
      SUPI2[j]:=QSUPI2[j]/SUP2;
   End;



DORR(Luz,PartS3);
 INF3:=0;SUP3:=0;
 For j:=1 to n do
     Begin
        QINFI3[j]:=SUP1*SUPI1[j]*(1-PartS3[j]);   {*UNDERFLOW DORR*}
        INF3:=INF3+QINFI3[j];
        QSUPI3[j]:=SUP1*SUPI1[j]*PartS3[j];       {*SUPRA DORR*}
        SUP3:=SUP3+QSUPI3[j];
     End;

For j:=1 to n do
   Begin
      INFI3[j]:=QINFI3[j]/INF3;
      SUPI3[j]:=QSUPI3[j]/SUP3;
   End;



CRIVO (LUZ,Flag,PartS4);

INF4:=0;SUP4:=0;
ALM3:=SUP3+SUP2;

For i:=1 to n do
     ALMI3[i]:=(SUP3*SUPI3[i]+SUP2*SUPI2[i])/ALM3; {*ALIMENTAÇÃO CRIVO*}


For j:=1 to n do
     Begin
        QINFI4[j]:=ALM3*ALMI3[j]*(1-PartS4[j]);   {*UNDERFLOW CRIVO*}
        INF4:=INF4+QINFI4[j];
        QSUPI4[j]:=ALM3*ALMI3[j]*PartS4[j];       {*SUPRA CRIVO*}
        SUP4:=SUP4+QSUPI4[j];
     End;

For j:=1 to n do
   Begin
      INFI4[j]:=QINFI4[j]/INF4;
      SUPI4[j]:=QSUPI4[j]/SUP4;
   End;
```

```
        end;

    Readln;

END;

                    { ROTINA PRINCIPAL }

BEGIN

    clrscr;
    Writeln(' Número de Lotes Granulométricos:  ');Readln(n);
    Writeln(' Nome do Ficheiro de Dados?        ');Readln(Nome);
    Assign(filedatain,Nome);
    Reset(filedatain);
    i:=0;
    clrscr;
Writeln;
Writeln('              DISTRIBUIÇÃO GRANULOMÉTRICA INICIAL');
Writeln;

Writeln('=============================================================
==========');
Writeln;
Writeln('          Luz(mm)','          ','Histograma','       ','Cumulante');
Writeln;
   i:=i+1;
   For i:=1 to n do
    Begin
      Readln(Filedatain,Luz[i],ALMI1[i],CUMI1[i]);
    End;
Begin
For i:=1 to n do
Writeln('          ',Luz[i]:8:4,'          ',ALMI1[i]:8:4,'       ',CUMI1[i]:8:4);
End;
Writeln;
Readln;
ALM1:=1;Flag:=1;m1:=2.09531;m2:=2.09932;m3:=0.62311;D501:=0.06886;D502:=0.22095;
D503:=0.30018;As1:=0.50003;As2:=0.00775;As3:=0.83165;

Repeat
clrscr;
Writeln;
Writeln('  PARÂMETROS DO MODELO  ');
Writeln('============================');
Writeln('  m1:= ',m1:3:4,'              (1)');
Writeln('  m2:= ',m2:3:4,'              (2)');
Writeln('  m3:= ',m3:3:4,'              (3)');
Writeln('  As1:= ',As1:3:4,'             (4)');
Writeln('  As2:= ',As2:3:4,'             (5)');
Writeln('  As3:= ',As3:3:4,'             (6)');
Writeln('  D501:= ',D501:2:4,'             (7)');
Writeln('  D502:= ',D502:2:4,'             (8)');
Writeln('  D503:= ',D503:2:4,'             (9)');
Writeln('  Caudal de Alimentação(tn/h):= ',ALM1:2:4,'  (10)');
Writeln;
```

```
  clrscr;
  gotoxy(1,1);
  Writeln('                RESULTADOS FINAIS');

Writeln('=================================================================
================');
  Writeln(' Caudal de Alimentação(tn/h)=',ALM1:5:3,'      Caudal do Tanque(tn/h)=',ALM2:5:3);
  Writeln;
  Writeln(' Caudal de Infra 20"=',INF1:5:3,'          Caudal de Supra 20"=',SUP1:5:3);
  Writeln;
  Writeln(' Caudal de Infra 14"=',INF2:5:3,'          Caudal de Supra 14"=',SUP2:5:3);
  Writeln;
  Writeln(' Caudal de Infra do DORR=',INF3:6:5,'      Caudal de Supra do DORR=',SUP3:5:3);
  Writeln;
  Writeln(' Caudal de Infra do Crivo=',INF4:7:3,'     Caudal de Supra do Crivo=',SUP4:5:3);
  Writeln;
  Writeln(' Caudal de Retorno=',(INF3+INF4):7:3);
  Writeln;

Writeln('=================================================================
================');
  Clrscr;
  Gotoxy(1,1);
  Writeln('      Luz    ALIMENTAÇÃO    TANQUE    PRODUTO FINAL    AREIAS');
  For k:=1 to n do
  Writeln('  ',Luz[k]:8:3,'  ',100*ALMI1[k]:8:3,'    ',100*ALMI2[K]:8:3,'   ',INFI2[k]*100:8:4,
  '     ',SUPI4[k]*100:8:4);

Writeln('=================================================================
================');
  UNTIL(ABS(AUX-ALM2)<0.000000000000000001);

  Repeat until keypressed;
  Readln;

     Begin
       clrscr;
       Writeln(' Nome do ficheiro para guardar resultados?');Readln(Dados);
       Assign(result,Dados);
       rewrite(result);
       writeln(result,'ALM20"=',ALM2:6:3,'  ALIM14"=  ',INF1:10:4,'  INFRA14"= ',INF2:10:4,'
SUPRA14"= ',SUP2:8:4);
       writeln(result,'SUPRA20"=',SUP1:6:4,' INFRADORR= ',INF3:10:4,'  SUPRADORR=
',SUP3:10:4);
       writeln(result,'ALMCRI"=',ALM3:6:4,' INFRACRIVO=',INF4:10:4,'
SUPRACRIVO=',SUP4:10:4);
       writeln(result,'  ');
       Writeln(result,'m1=',m1:6:5,'      m2=',m2:8:5,'      m3=',m3:10:5);
       Writeln(result,'D501=',d501:6:5,'   D502=',d502:10:5,'     D503=',D503:10:5);
       Writeln(result,'As1=',As1:6:5,'    As2=',As2:8:5,'     As3=',As3:10:5);
       writeln(result,'  ');
       writeln(result,'LUZ  ALM20" INF20" SUP20" INF14" SUP14" INFDORR SUPDORR
ALMCRIVO INFCRIVO SUPCRIVO');
       For i:=1 to n do
       writeln(result,luz[i]:5:3,",ALMI2[i]:6:3,",INFI1[i]:8:3,",SUPI1[i]:8:4,",INFI2[i]:8:4,
       ",SUPI2[i]:8:4,' ',INFI3[i]:8:4,' ',SUPI3[i]:8:4,",ALMI3[i]:8:4,' ',INFI4[i]:8:4,
       '  ',SUPI4[i]:8:4);
       close(result);
```

```
Writeln('   TIPO DE SIMULAÇÃO ');
Writeln('=============================');
Writeln;
Writeln(' Escolha do Modelo de Ciclonagem..... (11)');
Writeln(' SIMULAÇÃO..... (12)');
Writeln(' Terminar..... (0)');
Writeln;
Repeat
 Writeln('  ESCOLHA O PROCEDIMENTO DESEJADO ->  ');Readln(op);
 until (op>=0) and (op<=13);
 GOTOXY(1,22);
    case op of
      1:BEGIN Writeln('Novo Valor de m/20"=     ');Readln(m1);END;
      2:BEGIN Writeln('Novo Valor de m/14"=     ');Readln(m2);END;
      3:BEGIN Writeln('Novo Valor de m/Crivo=     ');Readln(m3);END;
      4:BEGIN Writeln('Novo Valor de As/20"=     ');Readln(As1);END;
      5:BEGIN Writeln('Novo Valor de As/14"=     ');Readln(As2);END;
      6:BEGIN Writeln('Novo Valor de As/Crivo=     ');Readln(As3);END;
      7:BEGIN Writeln('Novo Valor de D50/20"=     ');Readln(D501);END;
      8:BEGIN Writeln('Novo Valor de D50/14"=     ');Readln(D502);END;
      9:BEGIN Writeln('Novo Valor de D50/Crivo=     ');Readln(D503);END;
      10:BEGIN Writeln('Novo Valor da Alimentação=     ');Readln(ALM1);END;
      11:BEGIN
          Writeln(' Exponential Sum (Lynch & Rao).....(1)');
          Writeln(' Rosin Rammler(Plitt).....(2)');
          Writeln(' Logistic(Lilge & Plitt).....(3)');
          Writeln(' Escolha do Tipo de Modelo:       '); Readln(Flag);
       END;

      12:FECHADO;
      0:EXIT;
   End;

   until 1<>1;

   END.
```

ANEXO IV

RESULTADOS DAS SIMULAÇÕES

-SIMULAÇÃO PADRÃO

-SIMULAÇÕES DE NOVAS CONDIÇÕES OPERATÓRIAS

-OUTRAS SIMULAÇÕES

SIMULAÇÃO PADRÃO

ALM20"=	1.155	ALIM14"=	0.1094	ALIM DORR=	1.0355	ALMCRI=	0.9178
INFRA 20"=	0.1094	INF14"=	0.1036	INFDORR=	0.1235	INFCRIVO	0.0314
SUPRA20"=	1.0355	SUPRA14"=	0.0058	SUPDORR=	0.912	SUPCRIVO=	0.8864
RP SUPRA	1.0355	RP INFRA	0.1036	RECUP. -12µ	61.483	RECUP. -2µ	61.942
	m1=	2.095	m1=	2.099	m1=	0.062	
	D501=	0.069	D502=	0.221	D503=	0.300	
	As1=0	0.500	As2=	0.008	As3=	0.832	

LUZ	ALIM CIRC.	ALM20"	INF20"	SUP20"	INF14"	SUP14"	INFDORR	SUPDORR	ALMCRIVO	INFCRIVO	SUPCRIVO
6.000	1.000	0.990	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000
4.000	0.978	0.969	1.000	0.976	1.000	1.000	1.000	0.973	0.973	1.000	0.972
2.000	0.710	0.737	1.000	0.718	1.000	1.000	1.000	0.680	0.682	1.000	0.671
1.000	0.518	0.570	1.000	0.531	1.000	1.000	1.000	0.468	0.471	0.986	0.453
0.500	0.380	0.449	1.000	0.396	1.000	1.000	1.000	0.314	0.319	0.903	0.298
0.250	0.281	0.358	1.000	0.294	1.000	1.000	0.997	0.199	0.204	0.722	0.186
0.074	0.183	0.250	0.998	0.174	0.999	0.978	0.869	0.080	0.086	0.396	0.075
0.048	0.140	0.178	0.824	0.112	0.840	0.547	0.457	0.066	0.069	0.324	0.060
0.032	0.117	0.138	0.679	0.083	0.700	0.324	0.281	0.056	0.058	0.275	0.050
0.024	0.103	0.118	0.593	0.070	0.614	0.236	0.216	0.050	0.051	0.245	0.044
0.016	0.086	0.096	0.491	0.055	0.511	0.154	0.154	0.042	0.043	0.207	0.037
0.012	0.075	0.083	0.428	0.048	0.446	0.118	0.124	0.037	0.038	0.183	0.033
0.008	0.062	0.067	0.350	0.038	0.365	0.083	0.093	0.031	0.031	0.152	0.027
0.006	0.053	0.058	0.302	0.033	0.316	0.066	0.078	0.027	0.027	0.132	0.023
0.004	0.043	0.046	0.241	0.026	0.253	0.048	0.061	0.021	0.022	0.105	0.019
0.003	0.036	0.039	0.203	0.022	0.213	0.038	0.051	0.018	0.018	0.088	0.016
0.002	0.028	0.030	0.157	0.017	0.165	0.028	0.040	0.014	0.014	0.068	0.012
0.002	0.022	0.025	0.128	0.014	0.134	0.023	0.033	0.011	0.011	0.055	0.010
0.001	0.016	0.018	0.092	0.010	0.097	0.016	0.024	0.008	0.008	0.039	0.007

SIMULAÇÃO PADRÃO

SIMULAÇÕES DE NOVAS CONDIÇÕES OPERATÓRIAS

SIMULAÇÃO Nº 2 C/ As DO DORR = 30%

ALM20"=	1.191	ALIM14"=	0.1265	ALIM DORR=	1.0544	ALMCRI=	0.8977
INFRA 20"=	0.1265	INF14"=	0.1204	INFDORR=	0.1628	INFCRIVO	0.0281
SUPRA20"=	1.0544	SUPRA14"=	0.0061	SUPDORR=	0.8916	SUPCRIVO=	0.8696
RP SUPRA	1.0544	RP INFRA	0.1204	RECUP. -12µ	78.6386	RECUP. -2µ	79.9072
	m1=	2.09531	m1=	2.09932	m1=	0.062311	
	D501=	0.06886	D502=	0.22095	D503=	0.30018	
	As1=0	0.50003	As2=	0.00775	As3=	0.83165	

LUZ	ALIM CIRC.	ALM20"	INF20"	SUP20"	INF14"	SUP14"	INFDORR	SUPDORR	ALMCRIVO	INFCRIVO	SUPCRIVO
6.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000
4.000	0.978	0.971	0.998	0.977	1.000	1.000	1.000	0.972	0.973	1.000	0.972
2.000	0.710	0.746	0.998	0.723	1.000	1.000	1.000	0.672	0.675	1.000	0.664
1.000	0.518	0.584	0.998	0.540	1.000	1.000	1.000	0.456	0.459	0.984	0.443
0.500	0.380	0.466	0.998	0.407	1.000	1.000	1.000	0.299	0.303	0.891	0.285
0.250	0.281	0.378	0.998	0.307	1.000	1.000	0.998	0.181	0.187	0.689	0.170
0.074	0.183	0.273	0.996	0.189	0.999	0.979	0.900	0.059	0.066	0.325	0.057
0.048	0.140	0.203	0.846	0.128	0.862	0.573	0.588	0.044	0.048	0.245	0.042
0.032	0.117	0.164	0.721	0.099	0.741	0.362	0.455	0.034	0.036	0.190	0.032
0.024	0.103	0.143	0.639	0.085	0.660	0.270	0.389	0.029	0.031	0.162	0.027
0.016	0.086	0.118	0.537	0.069	0.557	0.182	0.316	0.024	0.025	0.131	0.021
0.012	0.075	0.103	0.472	0.059	0.490	0.142	0.273	0.021	0.021	0.114	0.018
0.008	0.062	0.084	0.389	0.048	0.405	0.100	0.222	0.017	0.017	0.092	0.015
0.006	0.053	0.073	0.337	0.042	0.351	0.080	0.191	0.014	0.015	0.079	0.013
0.004	0.043	0.058	0.270	0.033	0.281	0.058	0.152	0.011	0.012	0.063	0.010
0.003	0.036	0.049	0.227	0.028	0.237	0.047	0.127	0.010	0.010	0.053	0.009
0.002	0.028	0.038	0.175	0.021	0.183	0.034	0.098	0.007	0.008	0.040	0.007
0.002	0.022	0.031	0.143	0.017	0.149	0.027	0.080	0.006	0.006	0.033	0.005
0.001	0.016	0.022	0.102	0.012	0.107	0.019	0.057	0.004	0.004	0.024	0.004

SIMULAÇÃO Nº 3 C/ AS CICLONE DE 20" = 30%

ALM20"=	1.115	ALIM14"=	0.1335	ALIM DORR=	0.9815	ALMCRI=	0.8904
INFRA 20"=	0.1335	INF14"=	0.1266	INFDORR=	0.0881	INFCRIVO	0.027
SUPRA20"=	0.9815	SUPRA14"=	0.0069	SUPDORR=	0.8934	SUPCRIVO=	0.8634
RP SUPRA	0.9815	RP INFRA	0.1266	RECUP. -12μ	77.8985	RECUP. -2μ	78.8684
	m1=	2.095	m1=	2.099	m1=	0.062	
	D501=	0.069	D502=	0.221	D503=	0.300	
	As1=0	0.300	As2=	0.008	As3=	0.832	

LUZ	ALIM CIRC.	ALM20"	INF20"	SUP20"	INF14"	SUP14"	INFDORR	SUPDORR	ALMCRIVO	INFCRIVO	SUPCRIVO
6.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000
4.000	0.978	0.969	1.000	0.975	1.000	1.000	1.000	0.972	0.972	1.000	0.972
2.000	0.710	0.729	1.000	0.700	1.000	1.000	1.000	0.669	0.672	1.000	0.662
1.000	0.518	0.556	1.000	0.501	1.000	1.000	1.000	0.451	0.455	0.983	0.438
0.500	0.380	0.430	1.000	0.357	1.000	1.000	1.000	0.292	0.298	0.887	0.279
0.250	0.281	0.336	1.000	0.248	1.000	1.000	0.996	0.173	0.180	0.677	0.164
0.074	0.183	0.229	0.998	0.120	0.999	0.974	0.816	0.051	0.058	0.298	0.051
0.048	0.140	0.162	0.832	0.072	0.847	0.552	0.392	0.040	0.044	0.231	0.038
0.032	0.117	0.127	0.694	0.051	0.713	0.334	0.231	0.033	0.035	0.190	0.031
0.024	0.103	0.109	0.610	0.042	0.630	0.245	0.174	0.029	0.031	0.167	0.027
0.016	0.086	0.089	0.508	0.033	0.527	0.163	0.122	0.024	0.025	0.139	0.022
0.012	0.075	0.077	0.444	0.028	0.462	0.126	0.097	0.022	0.022	0.122	0.019
0.008	0.062	0.063	0.364	0.023	0.380	0.088	0.072	0.018	0.018	0.100	0.016
0.006	0.053	0.054	0.315	0.019	0.329	0.071	0.060	0.015	0.016	0.087	0.014
0.004	0.043	0.043	0.252	0.015	0.263	0.051	0.047	0.012	0.013	0.069	0.011
0.003	0.036	0.036	0.212	0.013	0.222	0.041	0.039	0.010	0.011	0.058	0.009
0.002	0.028	0.028	0.164	0.010	0.171	0.030	0.030	0.008	0.008	0.044	0.007
0.002	0.022	0.023	0.134	0.008	0.140	0.024	0.025	0.006	0.007	0.036	0.006
0.001	0.016	0.016	0.096	0.006	0.100	0.017	0.018	0.005	0.005	0.025	0.004

SIMULAÇÃO Nº 4 C/ As DO CRIVO = 30%

ALM20"=	1.336	ALIM14"=	0.1422	ALIM DORR=	1.1938	ALMCRI=	1.0281
INFRA 20"=	0.1422	INF14"=	0.1347	INFDORR=	0.163	INFCRIVO	0.1728
SUPRA20"=	1.1938	SUPRA14"=	0.0075	SUPDORR=	1.0308	SUPCRIVO=	0.8553
RP SUPRA	1.1938	RP INFRA	0.1347	RECUP. -12μ	81.142	RECUP. -2μ	81.907
	m1=	2.095	m1=	2.099	m1=	0.062	
	D501=	0.069	D502=	0.221	D503=	0.300	
	As1=0	0.500	As2=	0.008	As3=	0.300	

LUZ	ALIM CIRC.	ALM20"	INF20"	SUP20"	INF14"	SUP14"	INFDORR	SUPDORR	ALMCRIVO	INFCRIVO	SUPCRIVO
6.000	1.000	0.993	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000
4.000	0.978	0.975	1.000	0.979	1.000	1.000	1.000	0.976	0.976	1.000	0.971
2.000	0.710	0.775	1.000	0.753	1.000	1.000	1.000	0.714	0.716	1.000	0.658
1.000	0.518	0.629	1.000	0.589	1.000	1.000	1.000	0.523	0.526	0.989	0.433
0.500	0.380	0.518	1.000	0.463	1.000	1.000	1.000	0.377	0.382	0.922	0.272
0.250	0.281	0.422	1.000	0.354	1.000	1.000	0.997	0.252	0.257	0.755	0.156
0.074	0.183	0.283	0.998	0.198	0.999	0.975	0.852	0.094	0.100	0.389	0.041
0.048	0.140	0.201	0.823	0.127	0.839	0.540	0.444	0.076	0.080	0.318	0.031
0.032	0.117	0.157	0.682	0.094	0.702	0.323	0.276	0.065	0.067	0.272	0.026
0.024	0.103	0.135	0.598	0.079	0.619	0.236	0.213	0.058	0.059	0.242	0.022
0.016	0.086	0.110	0.497	0.064	0.517	0.156	0.153	0.050	0.050	0.206	0.019
0.012	0.075	0.095	0.434	0.055	0.452	0.120	0.124	0.044	0.044	0.183	0.016
0.008	0.062	0.077	0.356	0.044	0.371	0.084	0.093	0.037	0.037	0.152	0.013
0.006	0.053	0.066	0.308	0.038	0.322	0.067	0.078	0.032	0.032	0.132	0.012
0.004	0.043	0.052	0.246	0.030	0.257	0.049	0.061	0.025	0.025	0.105	0.009
0.003	0.036	0.044	0.207	0.025	0.217	0.039	0.051	0.021	0.021	0.088	0.008
0.002	0.028	0.034	0.160	0.019	0.167	0.029	0.040	0.016	0.016	0.068	0.006
0.002	0.022	0.028	0.131	0.016	0.137	0.023	0.033	0.013	0.013	0.055	0.005
0.001	0.016	0.020	0.094	0.011	0.098	0.016	0.024	0.009	0.009	0.039	0.003

SIMULAÇÃO Nº 5 C/ D50 CICLONE DE 14" = 40 µm

ALM20"=	1.165	ALIM14"=	0.1125	ALIM DORR=	1.0525	ALMCRI=	0.9526
INFRA 20"=	0.1125	INF14"=	0.074	INFDORR=	0.1289	INFCRIVO	0.0365
SUPRA20"=	1.0525	SUPRA14"=	0.0385	SUPDORR=	0.9236	SUPCRIVO=	0.9161
RP SUPRA	1.0525	RP INFRA	0.074	RECUP. -12µ	59.4720	RECUP. -2µ	61.5384
	m1=	2.095	m1=	2.099	m1=	0.623	
	D501=	0.069	D502=	0.040	D503=	0.300	
	As1=0	0.500	As2=	0.008	As3=	0.832	

LUZ	ALIM CIRC.	ALM20"	INF20"	SUP20"	INF14"	SUP14"	INFDORR	SUPDORR	ALMCRIVO	INFCRIVO	SUPCRIVO
6.000	1.000	1.000	1.001	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000
4.000	0.978	0.970	1.001	0.976	1.000	1.000	1.000	0.973	0.974	1.000	0.973
2.000	0.710	0.740	1.001	0.720	1.000	1.000	1.000	0.680	0.693	1.000	0.681
1.000	0.518	0.574	1.001	0.535	1.000	1.000	1.000	0.469	0.491	0.988	0.471
0.500	0.380	0.454	1.001	0.400	1.000	1.000	1.000	0.316	0.344	0.916	0.321
0.250	0.281	0.364	1.001	0.299	1.000	1.000	0.997	0.201	0.233	0.761	0.212
0.074	0.183	0.257	0.999	0.180	1.000	0.994	0.874	0.082	0.119	0.481	0.105
0.048	0.140	0.180	0.818	0.114	0.964	0.536	0.452	0.067	0.086	0.357	0.075
0.032	0.117	0.138	0.669	0.083	0.878	0.267	0.274	0.056	0.065	0.276	0.056
0.024	0.103	0.118	0.583	0.070	0.797	0.171	0.209	0.050	0.055	0.235	0.048
0.016	0.086	0.095	0.481	0.055	0.683	0.092	0.149	0.042	0.044	0.191	0.038
0.012	0.075	0.082	0.418	0.047	0.603	0.062	0.119	0.037	0.038	0.166	0.033
0.008	0.062	0.066	0.341	0.038	0.500	0.036	0.089	0.031	0.031	0.135	0.027
0.006	0.053	0.057	0.294	0.033	0.435	0.026	0.075	0.027	0.027	0.116	0.023
0.004	0.043	0.045	0.235	0.026	0.350	0.016	0.058	0.021	0.021	0.092	0.018
0.003	0.036	0.038	0.198	0.022	0.295	0.012	0.049	0.018	0.018	0.077	0.015
0.002	0.028	0.029	0.153	0.017	0.229	0.008	0.038	0.014	0.014	0.059	0.012
0.002	0.022	0.024	0.125	0.014	0.187	0.006	0.031	0.011	0.011	0.048	0.009
0.001	0.016	0.017	0.090	0.010	0.135	0.004	0.023	0.008	0.008	0.034	0.007

SIMULAÇÃO Nº 6 C/ As1, As3 E As DORR = 30% E C/ m1 E m2 = 4

ALM20"=	1.252	ALIM14"=	0.1601	ALIM DORR=	1.0919	ALMCRI=	0.9626
INFRA 20"=	0.1601	INF14"=	0.1565	INFDORR=	0.1225	INFCRIVO	0.1291
SUPRA20"=	1.0919	SUPRA14"=	0.0036	SUPDORR=	0.9694	SUPCRIVO=	0.8335
RP SUPRA	1.0919	RP INFRA	0.1565	RECUP. -12µ	95.8168	RECUP. -2µ	96.4145
	m1=	4.000	m1=	4.000	m1=	0.623	
	D501=	0.069	D502=	0.221	D503=	0.300	
	As1=0	0.300	As2=	0.008	As3=	0.300	

LUZ(mm)	ALIM CIRC.	ALM20"	INF20"	SUP20"	INF14"	SUP14"	INFDORR	SUPDORR	ALMCRIVO	INFCRIVO	SUPCRIVO
6.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000
4.000	0.978	0.974	1.000	0.977	1.000	1.000	1.000	0.974	0.975	1.000	0.970
2.000	0.710	0.760	1.000	0.730	1.000	1.000	1.000	0.695	0.697	1.000	0.650
1.000	0.518	0.604	1.000	0.550	1.000	1.000	1.000	0.492	0.494	0.985	0.418
0.500	0.380	0.485	1.000	0.412	1.000	1.000	1.000	0.337	0.340	0.896	0.253
0.250	0.281	0.382	1.000	0.293	1.000	1.000	0.996	0.203	0.207	0.673	0.134
0.074	0.183	0.234	1.000	0.122	1.000	0.999	0.803	0.035	0.039	0.182	0.016
0.048	0.140	0.165	0.839	0.066	0.845	0.590	0.409	0.021	0.024	0.117	0.009
0.032	0.117	0.133	0.704	0.049	0.711	0.394	0.305	0.016	0.018	0.088	0.006
0.024	0.103	0.116	0.620	0.042	0.627	0.312	0.260	0.014	0.015	0.076	0.005
0.016	0.086	0.096	0.518	0.034	0.524	0.232	0.212	0.011	0.012	0.062	0.004
0.012	0.075	0.084	0.454	0.030	0.460	0.192	0.184	0.010	0.011	0.054	0.004
0.008	0.062	0.069	0.373	0.024	0.378	0.149	0.150	0.008	0.009	0.044	0.003
0.006	0.053	0.060	0.323	0.021	0.327	0.125	0.129	0.007	0.007	0.038	0.003
0.004	0.043	0.048	0.258	0.017	0.262	0.097	0.103	0.005	0.006	0.030	0.002
0.003	0.036	0.040	0.217	0.014	0.220	0.080	0.087	0.004	0.005	0.025	0.002
0.002	0.028	0.031	0.167	0.011	0.170	0.061	0.067	0.003	0.004	0.019	0.001
0.002	0.022	0.025	0.136	0.009	0.138	0.049	0.054	0.003	0.003	0.016	0.001
0.001	0.016	0.018	0.097	0.006	0.099	0.035	0.039	0.002	0.002	0.011	0.001

SIMULAÇÃO Nº 7 C/ As1, As3 E As DORR = 30% E C/ m1 E m2 = 4

ALM20"=	1.289	ALIM14"=	0.182	ALIM DORR=	1.107	ALMCRI=	1.002
INFRA 20"=	0.182	INF14"=	0.143	INFDORR=	0.134	INFCRIVO	0.155
SUPRA20"=	1.107	SUPRA14"=	0.039	SUPDORR=	0.973	SUPCRIVO=	0.847
RP SUPRA	1.107	RP INFRA	0.143	RECUP. -12µ	88.623	RECUP. -2µ	83.270
	m1=	4.000	m1=	4.000	m1=	0.623	
	D501=	0.069	D502=	0.221	D503=	0.300	
	As1=0	0.300	As2=	0.200	As3=	0.300	

LUZ(mm)	ALIM CIRC.	ALM20"	INF20"	SUP20"	INF14"	SUP14"	INFDORR	SUPDORR	ALMCRIVO	INFCRIVO	SUPCRIVO
6.000	1.000	0.993	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000
4.000	0.978	0.974	1.000	0.978	1.000	1.000	1.000	0.974	0.975	1.000	0.971
2.000	0.710	0.766	1.000	0.734	1.000	1.000	1.000	0.697	0.708	1.000	0.655
1.000	0.518	0.615	1.000	0.556	1.000	1.000	1.000	0.495	0.514	0.988	0.428
0.500	0.380	0.499	1.000	0.421	1.000	1.000	1.000	0.340	0.365	0.914	0.265
0.250	0.281	0.399	1.000	0.304	1.000	1.000	0.997	0.207	0.237	0.727	0.148
0.074	0.183	0.255	1.000	0.135	1.000	1.000	0.821	0.039	0.076	0.317	0.032
0.048	0.140	0.181	0.844	0.073	0.849	0.823	0.425	0.024	0.055	0.238	0.022
0.032	0.117	0.146	0.710	0.055	0.717	0.683	0.318	0.018	0.044	0.193	0.017
0.024	0.103	0.127	0.626	0.047	0.633	0.600	0.272	0.016	0.038	0.169	0.014
0.016	0.086	0.105	0.523	0.038	0.530	0.499	0.222	0.013	0.031	0.140	0.012
0.012	0.075	0.092	0.459	0.033	0.465	0.437	0.193	0.011	0.027	0.123	0.010
0.008	0.062	0.075	0.377	0.027	0.382	0.358	0.157	0.009	0.022	0.101	0.008
0.006	0.053	0.065	0.326	0.023	0.331	0.310	0.136	0.008	0.019	0.087	0.007
0.004	0.043	0.052	0.261	0.019	0.265	0.247	0.108	0.006	0.016	0.070	0.006
0.003	0.036	0.044	0.219	0.016	0.223	0.208	0.091	0.005	0.013	0.059	0.005
0.002	0.028	0.034	0.169	0.012	0.172	0.160	0.070	0.004	0.010	0.045	0.004
0.002	0.022	0.028	0.138	0.010	0.140	0.131	0.057	0.003	0.008	0.037	0.003
0.001	0.016	0.020	0.099	0.007	0.100	0.093	0.041	0.002	0.006	0.026	0.002

SIMULAÇÃO Nº 8 C/ D50 CICLONE DE 20" = 100 µm E As1, As3 E As4 = 30%

ALM20"=	1.231	ALIM14"=	0.1699	ALIM DORR=	1.0611	ALMCRI=	0.9595
INFRA 20"=	0.1699	INF14"=	0.1586	INFDORR=	0.1025	INFCRIVO	0.1281
SUPRA20"=	1.0611	SUPRA14"=	0.0113	SUPDORR=	0.9586	SUPCRIVO=	0.8314
RP SUPRA	1.0611	RP INFRA	0.1586	RECUP. -12µ	95.48	RECUP. -2µ	96.27
	m1=	2.095	m1=	2.099	m1=	0.623	
	D501=	0.100	D502=	0.040	D503=	0.300	
	As1=0	0.300	As2=	0.008	As3=	0.300	

LUZ	ALIM CIRC.	ALM20"	INF20"	SUP20"	INF14"	SUP14"	INFDORR	SUPDORR	ALMCRIVO	INFCRIVO	SUPCRIVO
6.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000
4.000	0.978	0.972	1.001	0.977	1.000	1.000	1.000	0.974	0.974	1.000	0.970
2.000	0.710	0.755	1.001	0.722	1.000	1.000	1.000	0.692	0.696	1.000	0.649
1.000	0.518	0.597	1.001	0.537	1.000	1.000	1.000	0.487	0.493	0.985	0.417
0.500	0.380	0.476	1.001	0.395	1.000	1.000	1.000	0.330	0.338	0.895	0.251
0.250	0.281	0.371	1.001	0.273	1.000	0.999	0.995	0.195	0.204	0.670	0.132
0.074	0.183	0.222	0.973	0.103	0.987	0.757	0.773	0.030	0.039	0.186	0.016
0.048	0.140	0.170	0.799	0.070	0.826	0.413	0.506	0.023	0.027	0.135	0.011
0.032	0.117	0.138	0.667	0.053	0.696	0.250	0.386	0.017	0.020	0.101	0.007
0.024	0.103	0.120	0.587	0.045	0.615	0.184	0.328	0.015	0.017	0.085	0.006
0.016	0.086	0.099	0.490	0.036	0.515	0.122	0.264	0.012	0.013	0.067	0.005
0.012	0.075	0.086	0.429	0.031	0.452	0.095	0.227	0.010	0.011	0.058	0.004
0.008	0.062	0.070	0.352	0.025	0.372	0.067	0.184	0.008	0.009	0.046	0.003
0.006	0.053	0.060	0.305	0.022	0.322	0.053	0.158	0.007	0.008	0.039	0.003
0.004	0.043	0.048	0.244	0.017	0.258	0.039	0.125	0.006	0.006	0.031	0.002
0.003	0.036	0.040	0.205	0.014	0.217	0.031	0.105	0.005	0.005	0.026	0.002
0.002	0.028	0.031	0.158	0.011	0.167	0.023	0.080	0.004	0.004	0.020	0.001
0.002	0.022	0.025	0.129	0.009	0.136	0.018	0.065	0.003	0.003	0.016	0.001
0.001	0.016	0.018	0.092	0.006	0.098	0.013	0.047	0.002	0.002	0.012	0.001

OUTRAS SIMULAÇÕES

SIMULAÇÃO Nº 9 C/ m1 E m2 = 4, As1, As3 E As4 = 30% E As2= 10%

ALM20"=	1.268	ALIM14"=	0.1697	ALIM DORR=	1.0887	ALMCRI=	0.9801
INFRA 20"=	0.1697	INF14"=	0.1505	INFDORR=	0.1278	INFCRIVO	0.1406
SUPRA20"=	1.0887	SUPRA14"=	0.0192	SUPDORR=	0.9609	SUPCRIVO=	0.8395
RP SUPRA	1.0887	RP INFRA	0.1505	RECUP. -12µ	76.49	RECUP. -2µ	49.23
	m1=	2.095	m1=	2.099	m1=	0.623	
	D501=	0.100	D502=	0.040	D503=	0.300	
	As1=0	0.300	As2=	0.008	As3=	0.300	

LUZ	ALIM CIRC.	ALM20"	INF20"	SUP20"	INF14"	SUP14"	INFDORR	SUPDORR	ALMCRIVO	INFCRIVO	SUPCRIVO
6.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000
4.000	0.978	0.974	0.920	0.990	0.920	0.932	0.979	0.992	0.990	1.000	0.988
2.000	0.710	0.763	0.920	0.744	0.920	0.932	0.979	0.713	0.717	1.000	0.670
1.000	0.518	0.610	0.920	0.565	0.920	0.932	0.979	0.511	0.519	0.987	0.440
0.500	0.380	0.493	0.920	0.429	0.920	0.932	0.979	0.356	0.367	0.905	0.276
0.250	0.281	0.392	0.920	0.310	0.920	0.932	0.976	0.222	0.236	0.700	0.158
0.074	0.183	0.246	0.920	0.140	0.920	0.932	0.791	0.054	0.071	0.249	0.041
0.048	0.140	0.174	0.761	0.082	0.766	0.729	0.396	0.040	0.053	0.177	0.032
0.032	0.117	0.141	0.626	0.064	0.633	0.583	0.290	0.034	0.045	0.140	0.029
0.024	0.103	0.123	0.542	0.057	0.549	0.500	0.245	0.032	0.041	0.121	0.027
0.016	0.086	0.102	0.440	0.048	0.446	0.401	0.196	0.029	0.036	0.100	0.025
0.012	0.075	0.089	0.376	0.044	0.382	0.341	0.168	0.027	0.033	0.088	0.024
0.008	0.062	0.073	0.295	0.038	0.299	0.267	0.133	0.025	0.030	0.072	0.023
0.006	0.053	0.063	0.245	0.034	0.248	0.221	0.112	0.024	0.028	0.062	0.022
0.004	0.043	0.050	0.180	0.030	0.183	0.163	0.085	0.023	0.025	0.050	0.021
0.003	0.036	0.042	0.139	0.027	0.141	0.126	0.068	0.022	0.024	0.042	0.021
0.002	0.028	0.032	0.089	0.024	0.090	0.081	0.047	0.021	0.022	0.032	0.020
0.002	0.022	0.026	0.058	0.022	0.059	0.054	0.035	0.020	0.021	0.026	0.020
0.001	0.016	0.019	0.019	0.019	0.019	0.019	0.019	0.019	0.019	0.019	0.019

SIMULAÇÃO Nº 10 C/ D50 CICLONE DE 20" = 100 µm E As1=30%

ALM20"=	1.095	ALIM14"=	0.1421	ALIM DORR=	0.9529	ALMCRI=	0.8831
INFRA 20"=	0.1421	INF14"=	0.1329	INFDORR=	0.0688	INFCRIVO	0.026
SUPRA20"=	0.9529	SUPRA14"=	0.0092	SUPDORR=	0.8841	SUPCRIVO=	0.8571
RP SUPRA	1.0611	RP INFRA	0.1586	RECUP. -12µ	95.48	RECUP. -2µ	96.27
	m1=	2.095	m1=	2.099	m1=	0.623	
	D501=	0.100	D502=	0.221	D503=	0.300	
	As1=0	0.300	As2=	0.008	As3=	0.832	

LUZ	ALIM CIRC.	ALM20"	INF20"	SUP20"	INF14"	SUP14"	INFDORR	SUPDORR	ALMCRIVO	INFCRIVO	SUPCRIVO
6.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000
4.000	0.978	0.970	1.001	0.974	1.000	1.000	1.000	0.972	0.972	1.000	0.971
2.000	0.710	0.729	1.001	0.692	1.000	1.000	1.000	0.661	0.664	1.000	0.655
1.000	0.518	0.555	1.001	0.488	1.000	1.000	1.000	0.437	0.443	0.981	0.427
0.500	0.380	0.429	1.001	0.341	1.000	1.000	1.000	0.274	0.282	0.873	0.265
0.250	0.281	0.334	1.001	0.229	1.000	0.999	0.995	0.152	0.161	0.635	0.148
0.074	0.183	0.222	0.980	0.102	0.991	0.802	0.818	0.030	0.038	0.214	0.033
0.048	0.140	0.172	0.814	0.071	0.837	0.446	0.546	0.023	0.027	0.157	0.024
0.032	0.117	0.141	0.685	0.054	0.711	0.274	0.421	0.017	0.020	0.119	0.017
0.024	0.103	0.123	0.605	0.046	0.630	0.203	0.359	0.015	0.017	0.101	0.015
0.016	0.086	0.102	0.506	0.038	0.530	0.136	0.290	0.012	0.013	0.080	0.011
0.012	0.075	0.089	0.444	0.032	0.466	0.105	0.251	0.010	0.011	0.069	0.010
0.008	0.062	0.073	0.365	0.026	0.384	0.074	0.203	0.008	0.009	0.055	0.008
0.006	0.053	0.063	0.316	0.023	0.333	0.059	0.174	0.007	0.008	0.047	0.007
0.004	0.043	0.050	0.253	0.018	0.266	0.043	0.138	0.006	0.006	0.037	0.005
0.003	0.036	0.042	0.213	0.015	0.224	0.035	0.116	0.005	0.005	0.031	0.004
0.002	0.028	0.032	0.164	0.012	0.173	0.025	0.089	0.004	0.004	0.024	0.003
0.002	0.022	0.026	0.134	0.009	0.141	0.020	0.072	0.003	0.003	0.019	0.003
0.001	0.016	0.019	0.096	0.007	0.101	0.014	0.052	0.002	0.002	0.014	0.002

RESULTADOS DA OPTIMIZAÇÃO DE PARÂMETROS

CAUDAIS							
ALM20"=	1.289	ALIM14"=	0.1816	ALIMDORR=	1.0974	ALMCRI"=	1.0016
SUPRA20"=	1.0974	INFRA14"=	0.1431	INFDORR=	0.1343	SUPRACRIV	0.8469
INFRA 20"	0.1816	SUPRA14"=	0.0385	SUPRADORR	0.9632	INFCRIVO	0.1547

PARÂMETROS					
CICLONE 20"		CICLONE 14"		CRIVO	
m1=	4.0000	m2=	4.0000	m3=	0.6231
D501=	0.0689	D502=	0.2210	D503=	0.3002
As1=	0.3000	As2=	0.2000	As=	0.3000
		As= 0.3			

LUZmm	ALIM CIRC	ALM20"	INF20"	SUP20"	INF14"	SUP14"	INFDORR	SUPDORR	ALMCRIVO	INFCRIVO	SUPCRIVO
6.000	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
4.0000	0.98	0.97	1.00	0.98	1.00	1.00	1.00	0.97	0.98	1.00	0.97
2.0000	0.71	0.77	1.00	0.73	1.00	1.00	1.00	0.70	0.71	1.00	0.66
1.0000	0.52	0.62	1.00	0.56	1.00	1.00	1.00	0.49	0.51	0.99	0.43
0.5000	0.38	0.50	1.00	0.42	1.00	1.00	1.00	0.34	0.37	0.91	0.27
0.2500	0.28	0.40	1.00	0.30	1.00	1.00	1.00	0.21	0.24	0.73	0.15
0.0740	0.18	0.26	1.00	0.13	1.00	1.00	0.82	0.04	0.08	0.32	0.03
0.0480	0.14	0.18	0.84	0.07	0.85	0.82	0.43	0.02	0.06	0.24	0.02
0.0320	0.12	0.15	0.71	0.05	0.72	0.68	0.32	0.02	0.04	0.19	0.02
0.0240	0.10	0.13	0.63	0.05	0.63	0.60	0.27	0.02	0.04	0.17	0.01
0.0160	0.09	0.11	0.52	0.04	0.53	0.50	0.22	0.01	0.03	0.14	0.01
0.0120	0.08	0.09	0.46	0.03	0.46	0.44	0.19	0.01	0.03	0.12	0.01
0.0080	0.06	0.08	0.38	0.03	0.38	0.36	0.16	0.01	0.02	0.10	0.01
0.0060	0.05	0.07	0.33	0.02	0.33	0.31	0.14	0.01	0.02	0.09	0.01
0.0040	0.04	0.05	0.26	0.02	0.26	0.25	0.11	0.01	0.02	0.07	0.01
0.0030	0.04	0.04	0.22	0.02	0.22	0.21	0.09	0.01	0.01	0.06	0.00
0.0020	0.03	0.03	0.17	0.01	0.17	0.16	0.07	0.00	0.01	0.05	0.00
0.0015	0.02	0.03	0.14	0.01	0.14	0.13	0.06	0.00	0.01	0.04	0.00
0.0010	0.02	0.02	0.10	0.01	0.10	0.09	0.04	0.00	0.01	0.03	0.00

RESUMO

Este trabalho tem por objectivo o estudo critico e a avaliação da eficiência do circuito de classificação da instalação de tratamento de caulinos da Mina de Valverde, pertencente à Companhia Anglo Portuguesa de Caulinos de Viana, grupo English China Clay (ECC Ltd).

Devido às dificuldades encontradas em relação ao tratamento dos dados experimentais e à determinação dos parâmetros de cada classificador, resultantes principalmente do facto constatado de que nem o circuito nem os classificadores se encontravam em regime permanente, desenvolveu-se uma metodologia própria para a determinação dos parâmetros que modelam as curvas de partição dos classificadores e da avaliação global do desempenho do circuito.

Este método resulta ser de extrema utilidade sempre que nos encontramos em situações idênticas às encontradas neste trabalho, em que o regime de funcionamento se encontra afastada do estado permanente, dado que esta é uma das condições necessàrias para aplicação das metodologias existentes para a modelização de operações e de circuitos de tratamento de minérios.

Por último, realizaram-se algumas reflexões sobre a eficiência de cada classificador e propuseram-se alternativas às suas condições de funcionamento, efectuando a simulação do circuito para diferentes condições operatórias. Estas simulações permitiram propor algumas alterações a efectuar no circuito existente de modo a optimizar os seus resultados, principalmente em relação a aumentos da recuperação global do circuito e eventual melhoria da composição granulométrica do produto final.