LABORATOIRE D'HYGIENE ET DE CONTROLE DES FIBRES MINÉRALES

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Trial 91

Paris, April 30th 1992

REC'D MAY 8 1992

Mrs JANIS REYNOLDS

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Ref. : A.I.A. Fibre Counting Trial 1991-1992

Dear Mrs REYNOLDS

Please find enclosed the final report on the 1991-1992 Fibre Counting Trial. This exchange took place between May 1991 and April 1992, and is increasingly successful as 52 laboratories from 27 countries have participated.

This report contains the individual classification of 4 counters from your laboratory who took part in this exchange.

It is intended that the next slide exchange will start in september 1992, and you will receive information and a registration form to be completed from your National Asbestos Association or directly from L.H.C.F. in a short delay .

Yours sincerely.

Alain BAUJON
Director

Encl. : 1 Report

PLAINTIFF'S EXHIBIT
CT-674
CTD026186

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RESULTS OF THE A.I.A. FIBRE COUNTING TRIAL 1991-1992

APRIL 1992

Director : Alain BAUJON

Report prepared for :

ASBESTOS INTERNATIONAL ASSOCIATION
10 rue de la Pépinière
75008 PARIS
FRANCE

Association régie par la loi de 1901

April 1992

RESULTS OF THE A.I.A. FIBRE COUNTING TRIAL 1991-1992

1/ - INTRODUCTION :

The 1991-92 slide exchange for asbestos and other fibres counting is the fourth one organized by the Asbestos International Association (A.I.A.) among its company members where microscopists have to evaluate asbestos samples taken at the workplace in factories or at production sites.

The main objective of this slide exchange is to improve the reliability and the repeatibility of the fibre countings, as it is recognised that large variations in the results can arise if the method is not correctly applied.

The same procedure as for the previous slide exchanges was applied as approved by the Dust Advisory Panel), and participants have been classified into 3 categories of performance.

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2/ - PROCEDURE :

Asbestos dust samples were collected in various manufacturing plants (abestos-cement, friction materials, textiles and mines) to cover the main applications of this raw material, and 4 laboratory samples were prepared from non-asbestos fibres.

Samples were taken on 47mm membranes cut after sampling into 4 equal parts and clarified using the recommended acetone-triacetin method (see RTM1).

This method allows to prepare 4 equivalent sets of 15 slides assuming that each 1/4 sector of a filter has the same fibre density. This criteria was first checked by the L.H.C.F. prior to the circulation of slides. Furthermore, the validity of this procedure was further checked using the counting results found by the group 1 counters.

Two series of 4 sets of slides were prepared by this way, the fibres densities being rather equivalent in the 2 series.

Then 6 sets of slides out of the 8 ones were circulated among the A.I.A. association members which in turn were responsible for organizing their own slide distribution among the participants.

All the counting results were returned to the L.H.C.F. according to a standard format.

3/ - PARTICIPANTS :

27 countries took part in the exchange involving counters from 52 laboratories whose experience in fibre counting was evaluated through a questionnaire. 1410 results from 94 participants have been collected. List of participating laboratories is given in annex.

Participants were asked to count the slides according to the method which they normally use or which is required by their national regulation.

87 counters reported to apply the A.I.A. RTM.1 or a national method which is close to that method and 7 counters reported to use the NIOSH method as a standard.

The surface area of the graticule used for counting are the following:

Graticule Area m2	< 7500	7500-8200 (ø = 100µm ± 2µm)	8200-10000	> 10000
Number of counters	3	69	8	14

4/ - FIBRE LOADINGS :

10 out of the 15 samples were taken in asbestos factories or mines, and 5 asbestos-free samples were mounted with rockwool, ceramic fibres and wollastonite.

Product group categories related to the samples are given in the following table:

SAMPLE N°	TYPE OF DUST INDUSTRIAL BRANCH	MEAN DENSITY FIBRES / MM²	
		SET REFERENCE B-C-D	F-G-H
1	Asbestos Mine	150	227
2	Ceramic Fibres	245	249
3	Asbestos Mine	398	449
4	Asbestos Board	188	359
5	Rockwool	210	128
6	Asbestos Mine	231	296
7	Ceramic Fibres	60	37
8	Friction Material	76	93
9	Asbestos Cement	153	143
10	Friction Material	283	239
11	Asbestos Cement	137	200
12	Asbestos Board	281	212
13	Asbestos Cement	168	172
14	Ceramic Fibres	118	76
15	Asbestos Cement	255	469

.../...

5 / - RESULTS :

5.1. Data Processing :

The following calculations are used to classify the participants into 3 different groups :

1) A provisional mean of the counting results for each sample is calculated

2) Results are converted to normalized values (1) by reference to the mean of the counts.

3) Counters are then temporarily classified into 2 categories according to the following criterias :

   A - Those whose normalized mean (1) is outside the range 0.5 - 1.5 OR whose coefficient of variation (1) is greater than 50 %.

   B - All the others.

4) Steps 1 and 2 are repeated without the A counters results.

5) Finally, all the counters (including category A) are classified into 3 groups as shown on diagram 1 :

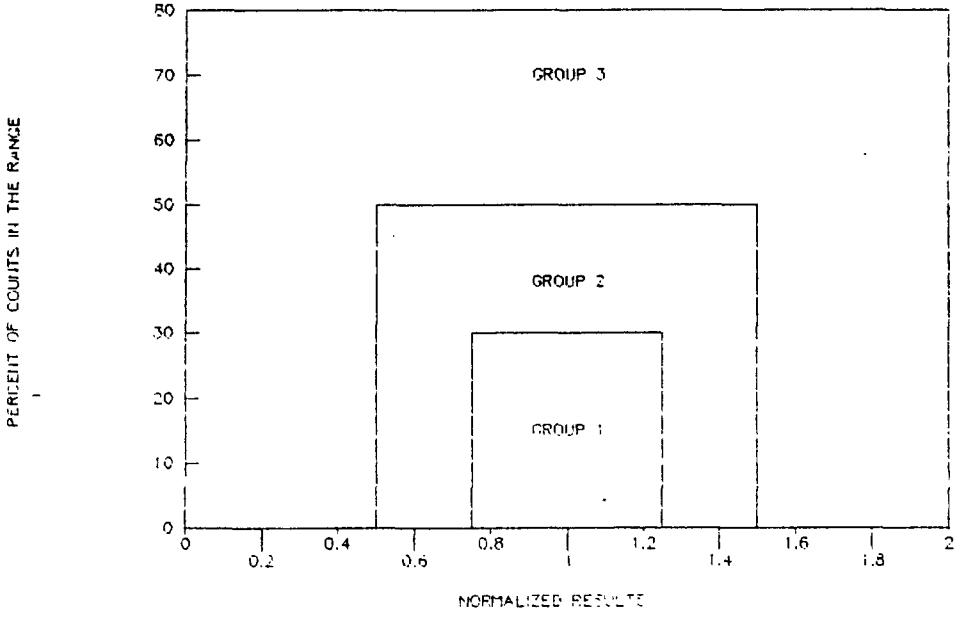

Diagram N° 1 : CLASSIFICATION OF COUNTERS ACCORDING TO THEIR NORMALIZED MEAN AND COEFFICIENT OF VARIATION

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(1) See Chap. 8 for definitions

.../...

5.2. Interpretation of the results :

5.2.1. - This two steps procedure gives a better evalution of the mean counts, excluding those counters whose performance appears to be largely outside the range accepted by the D.A.P.

5.2.2. - GROUP 1 defines a group of counters whose performance appears to be quite good in view of the experience accumulated in this field;

5.2.3. - GROUP 2 is intermediate either because the coefficients of variation (CV's) are too high or the counts are too far away from the mean and in some cases for both reasons.

5.3. Final results :

The position of each individual counter is indicated on Diagram N° 2 below showing the X.Y. plotting of their normalized means and coefficients or variation.

- 44 counters (46.8 %) have been classified in GROUP 1.
- 29 counters (30.9 %) have been classified in GROUP 2.
- 21 counters (22.3 %) have been classified in GROUP 3.

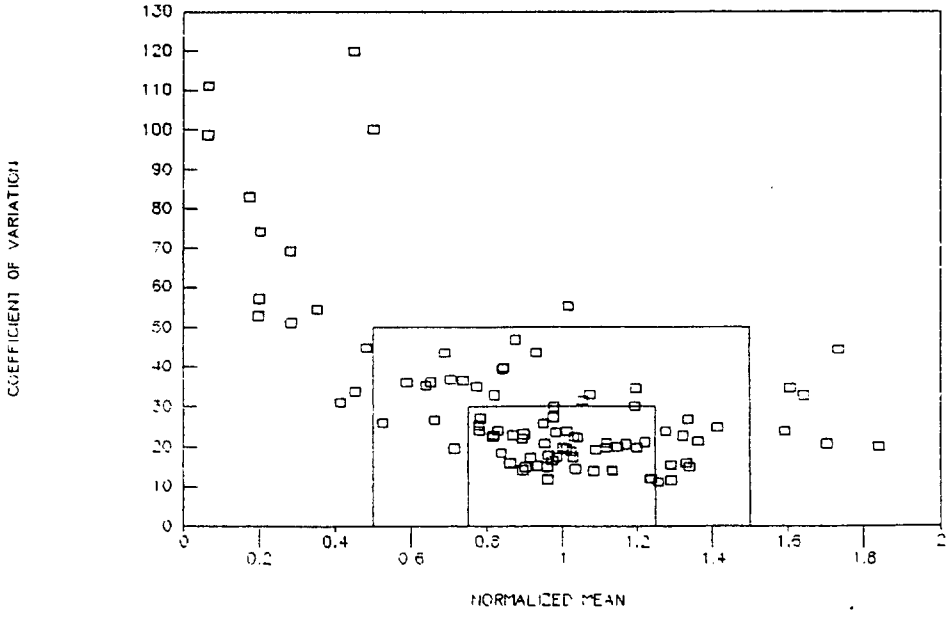

Diagram N° 2 : POSITION OF THE 94 COUNTERS ACCORDING TO THEIR NORMALIZED MEAN AND COEFFICIENT OF VARIATION

.../...

6/ - STATISTICAL ANALYSIS OF THE DATA :

Some further informations are presented in this chapter to allow a better understanding of the evaluation procedure.

6.1. Distribution of the 1410 normalized values :

Diagram N° 3 shows that 75.8 % of the results are within 50 % of the expected mean and 56.1 % within 30 %.

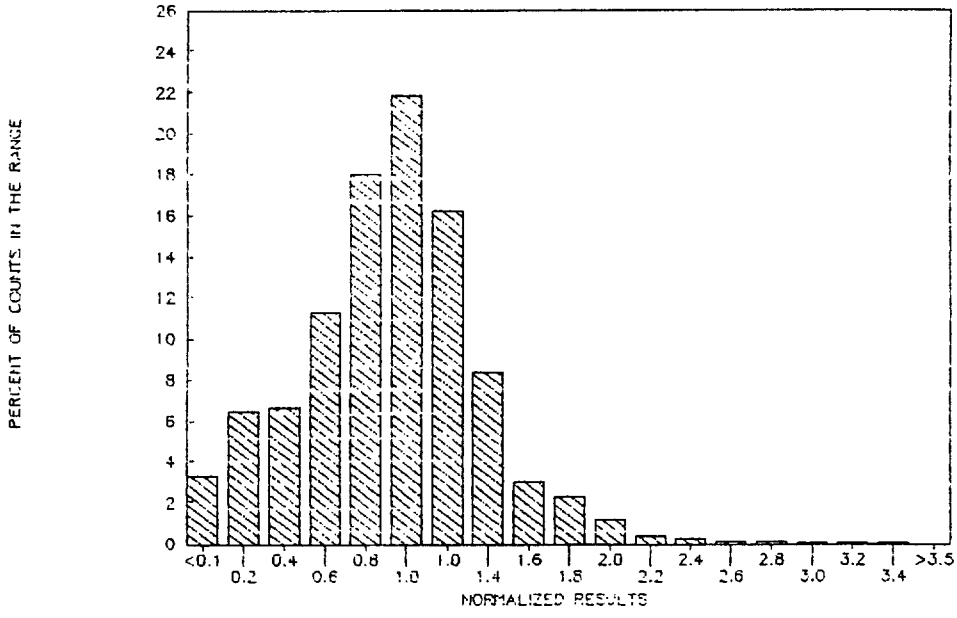

Diagram N° 3 : DISTRIBUTION OF 1410 NORMALIZED RESULTS

A few counts are much too high or too low, raising up to 6 times or falling down down to 1/10 of the expected mean, and therefore cannot be considered within the acceptable variations of the method.

.../...

6.2. Normalized mean of a counter :

This parameter shows the trend for a counter either to count higher or lower than mean of his colleagues. However it is of limited interest if isolated from any information on the variability of the same counter (coefficient of variation - see chap. 6.3)

With regard to the mean, diagram N° 4 shows that 75 out the of 94 (79.8 %) values are within 0.50 to 1.50 and 6247 (67.1 %) are within 0,75 and 1,25.

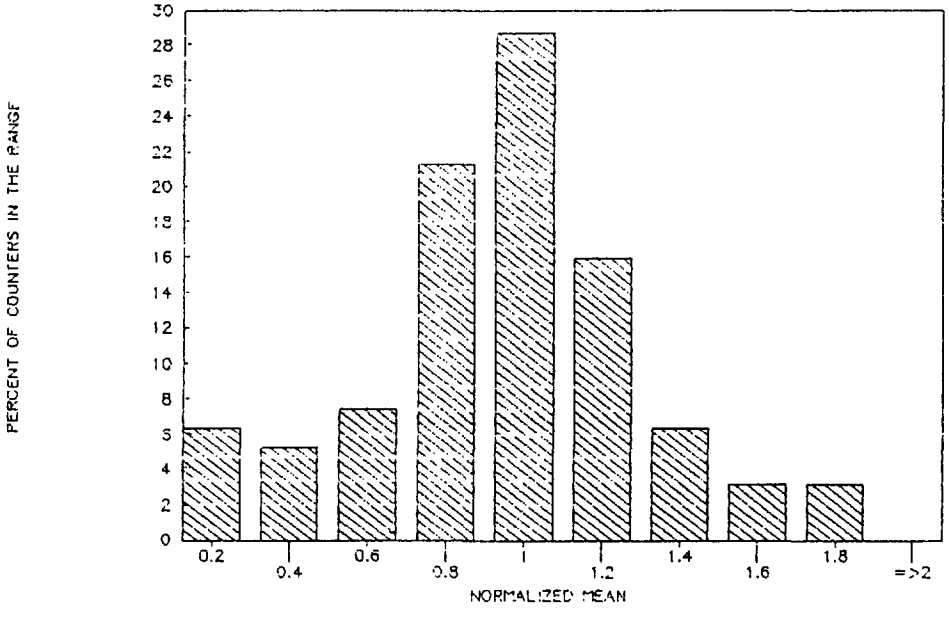

Diagram N° 4 : DISTRIBUTION OF NORMALIZED MEANS

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6.3. Coefficient of variation (C.V.) :

As reported under chapter 6.2, the individual coefficients of variation are very important to classify the counters because even high unsteady countings may somatimes result in a normalized mean figure well within an acceptable range.

As shown on diagram N° 5, 82 out of the 94 values (87.2 %) are below 50 %, but the proportion of values below 30 % drops down to 62.7% (53 values).

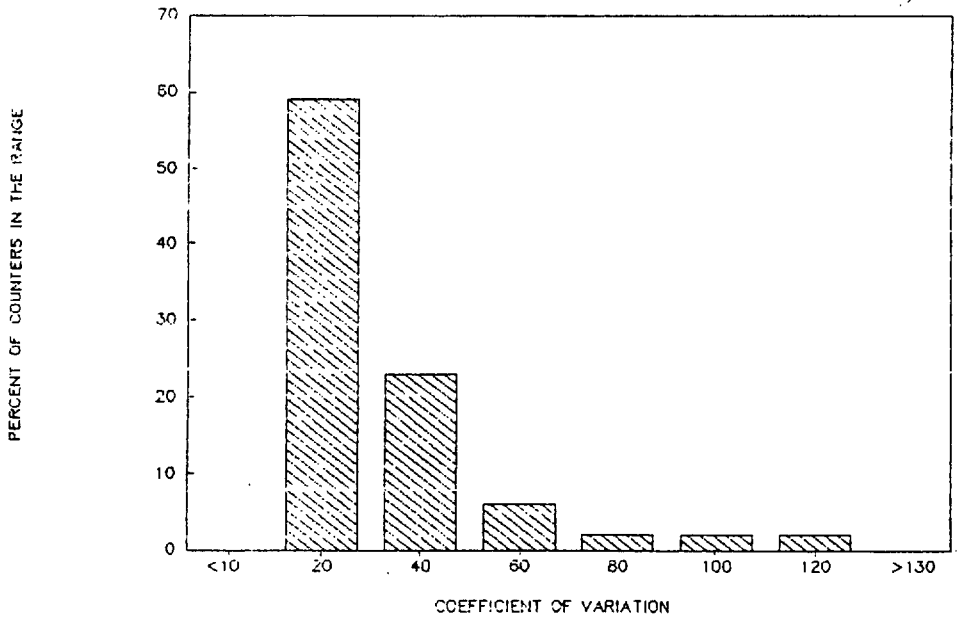

Diagram N° 5 : DISTRIBUTION OF COEFFICIENTS OF VARIATION

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7/ - NON-ASBESTOS FIBRES SAMPLES

5 samples of each set of slides are non-asbestos. They were prepared articially from rockwool, ceramic fibres and wollastonite.

It must be reminded that optical microscopy does not allow to discriminate asbestos from non-asbestos fibres and that every fibrous particle should be counted as a "fibre".

Despite the small number of non-asbestos samples, it is possible to classify the counters according to the WHO-EURO-MMMF criteria, but a cautious interpretation of the results is required.

GROUP 1 : Counters having 75% of their counts in the range 0.70 - 1.70

GROUP 2 : Counters having 75% of their counts in the range 0.55 - 2.20

GROUP 3 : Counters having more than 25% of their counts outside of the range 0.55 - 2.20

Correspondingly, the counters fall into the following groups :

- 64 counters (68.1%) have been classified in GROUP 1
- 14 counters (14.9%) have been classified in GROUP 2
- 16 counters (17.0%) have been classified in GROUP 3

Diagram N° 6 shows the distribution of 470 normalized results (all non-asbestos counts): 79.6% of the results are within ±50% of the expected mean, and 63.0% are within ±30%.

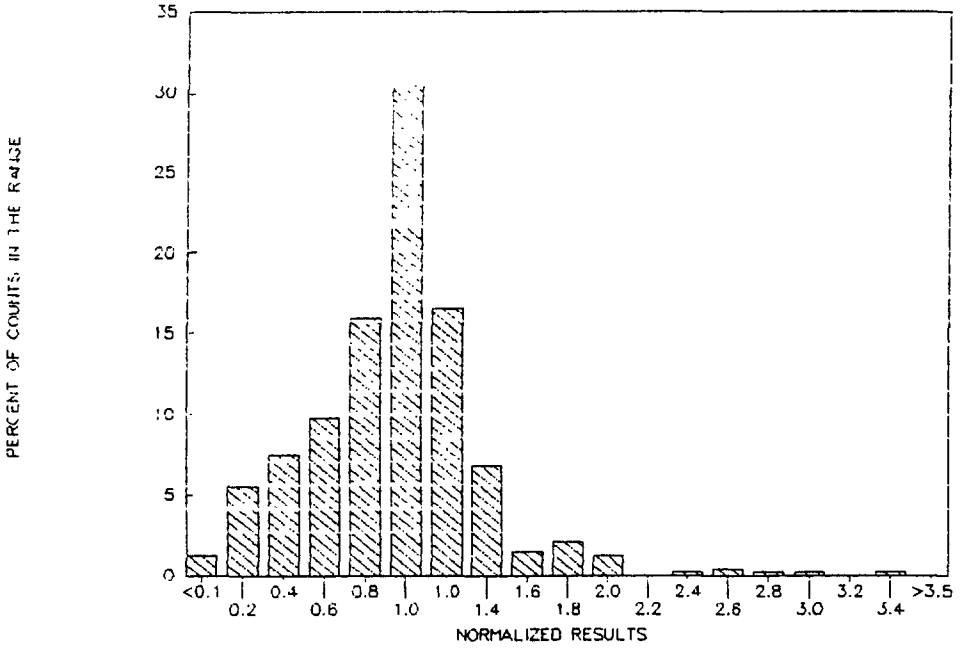

Diagram N° 6 : DISTRIBUTION OF 470 NORMALIZED RESULTS
(NON ASBESTOS SAMPLES ONLY)

This distribution is significantly better than that of the 940 asbestos fibres countings (diagram N° 7), where 64.7% and 36.6% of the counts are respectively within ±50% and ±30%.

Such a finding is coherent with the fact that it is easier to count non-asbestos fibres than asbestos fibres because their diameters are generaly greater, and countings fields containing agglomerates or split fibres are very rare.

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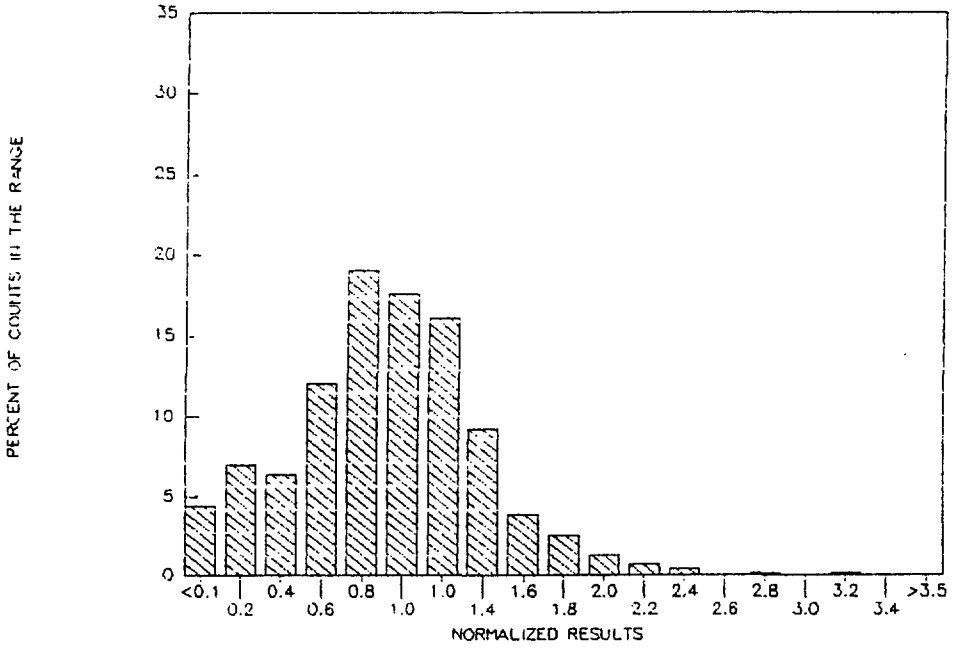

Diagram N° 7 : DISTRIBUTION OF 940 NORMALIZED RESULTS
(ASBESTOS SAMPLES ONLY)

8/ - DEFINITIONS :

(1) Normalized result = ratio of a counting result to the mean of counts on the samples.

(2) Normalized mean (inter-lab index) = average of a counter's normalized results. It is an indication of overestimation or underestimation.

(3) Coefficient of variation (intra-lab index) = the standard deviation (of a counter's normalized results) divided by the normalized mean. It is an index of the dispersion of a counter's results.

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ANNEX

LIST OF LABORATORIES HAVING TAKEN PART IN THE 1991-1992 A.I.A. SLIDE EXCHANGE

ARGENTINA	- ASOCIACION RIOPLATENSE DE ASBESTO
AUSTRIA	- ÖSTEREICHISCHE STAUB BEKÄMPFUNGSTELLE TECHNISCHE ABTEILUNG - ETERNITWERKE LUDWIG HATSCHEK ACTIENGESELLSCHAFT
BELGIUM	- ETERNIT - SCHEERDERS VAN KERCHOVE
BRASIL	- ASSOCIACAO BRAILEIRA DO AMIANTO - ASBERIT LTDA - S.A. MINERACAO DE AMIANTO - ENGEDIS DISTRIBUICAO E SERVICOS LTDA - LABORATORIO DE MEDICAO ETERNIT S.A.
CANADA	- THE ASBESTOS INSTITUTE
C.E.C.	- JOINT RESEARCH CENTER - ENVIRONMENT INST.
CHILE	- STE INDUSTRIAL PIZZARENO
COSTA RICA	- CENTRO DE EVALUACION, MEDICION Y SECURIDAD OCUPACIONAL
CZECHOSLOVAKIA	- INSTITUTE OF PREVENTIVE AND CLINICAL MEDICINE
FRANCE	- LABORATOIRE D'HYGIENE ET DE CONTROLE DES FIBRES MINERALES - BENDIX - MATERIAUX DE FRICTION - CEFILAC - CARBONE LORRAINE - ETERNIT INDUSTRIES - EVERITE - FLERTEX - FERODO - ABEX - LATTY INTERNATIONAL
INDIA	- RAMCO INDUSTRIES - SUNDARAM-ABEX LTD
IRELAND	- TEGRAL BUILDING PRODUCTS LTD

.../...

ISRAEL	- ETANIT BUILDING PRODUCTS LTD - MINISTRY OF LABOUR - INDUSTRIAL HYGIENE LABORATORY - RESEARCH INSTITUTE FOR ENVIRONMENTAL HEALTH
ITALY	- ECOCONSULT
JAPAN	- NICHIAS CORPORATION - KITASATO HEALTH SCIENCE CENTER - INSTITUTE FOR SCIENCE OF LABOUR - NIPPON VALQUA INDUSTRY LTD - NATIONAL INSTITUTE OF INDUSTRIAL HEALTH
KENYA	- SIMBARITE LTD
NIGERIA	- NIGERIAN ASBESTOS INDUSTRIES LIMITED - NIGERITE LTD
PAKISTAN	- DADEX ETERNIT LTD
POLAND	- INSTITUTE OF OCCUPATIONAL MEDICINE
PORTUGAL	- ASBESTO INFORMACION PORTUGESE ASOCIACION
ROMANIA	- INSTITUTE OF HYGIENE AND PUBLIC HEALTH
SOUTH AFRICA	- AFRICAN CHRYSOTILE ASBESTOS - GEFCO LTD - GEFCO PENGE MINE
SPAIN	- URALITA S.A.
TURKEY	- ISCI SAGLIGI VE IS GUVENLI ENSTITUSU
U.A.E.	- GULF ETERNIT INDUSTRIES
UNITED KINGDOM	- BBA GROUP PLC
U.S.A.	- NUTURN CORPORATION - CERTAINTEED CORPORATION - ENVIRONMENT ONE CORP.

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A.I.A. – FIBRE COUNTING TRIAL – 1991–92

PERSONAL RESULTS

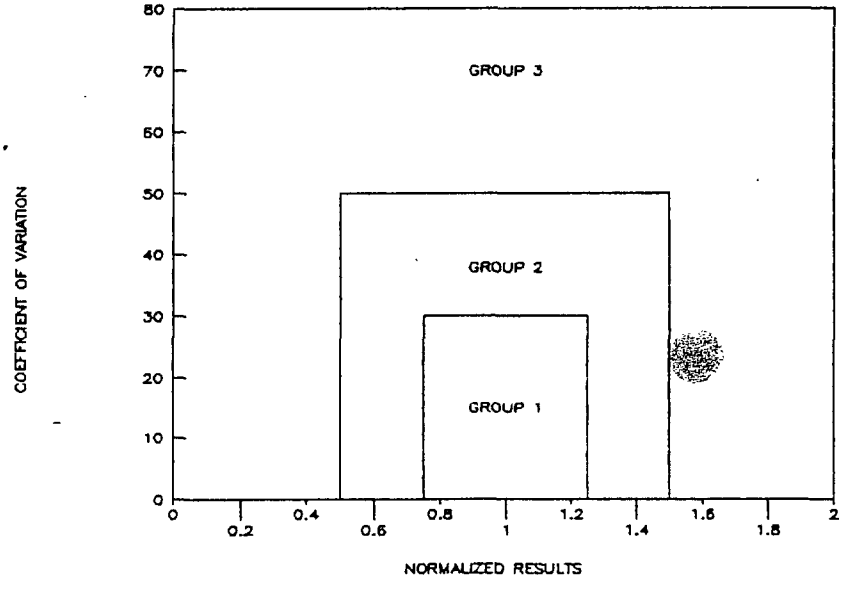
Name : Mr THOMAS E. CASE

Your countings and corresponding normalized results are reported below.

Slide N° D	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
Results F/mm²	289	291	866	291	281	423	120	104	200	308	267	512	362	192	288
Norm. Results	1.86	1.16	2.14	1.53	1.30	1.83	2.03	1.33	1.29	1.04	1.91	1.75	2.09	1.54	1.10

Normalised Mean	:	1.59
Coefficient of Variation		23.6
Group		3

Your individual position is plotted on the following graph:



Group 1 : Counters with normalized mean in the range 0.75 – 1.25 and coefficient of variation below 30%

Group 2 : Counters with normalized mean in the range 0.50 – 1.50 and coefficient of variation below 50%

Group 3 : Counters with normalized mean outside the range 0.50 – 1.50 or coefficient of variation above 50%

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A.I.A. – FIBRE COUNTING TRIAL – 1991–92

PERSONAL RESULTS

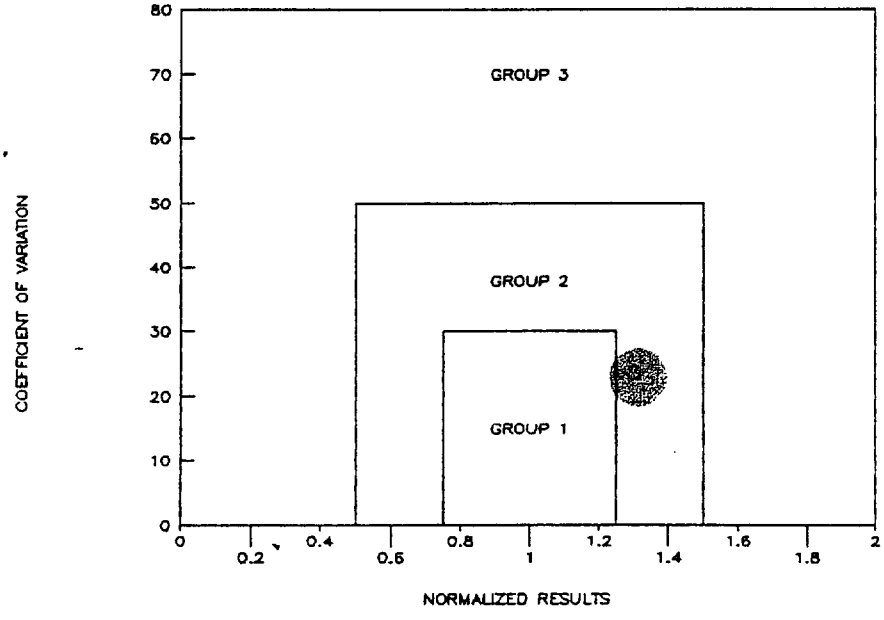
Name : Mrs JANIS REYNOLDS

Your countings and corresponding normalized results are reported below.

Slide N° D	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
Results F/mm²	246	274	479	261	222	290	72	93	153	541	162	498	299	203	233
Norm. Results	1.59	1.09	1.18	1.37	1.03	1.25	1.22	1.19	0.98	1.83	1.16	1.70	1.73	1.63	0.89

Normalised Mean	:	1.32
Coefficient of Variation		22.6
Group		2

Your individual position is plotted on the following graph:



Group 1 : Counters with normalized mean in the range 0.75 – 1.25 and coefficient of variation below 30%

Group 2 : Counters with normalized mean in the range 0.50 – 1.50 and coefficient of variation below 50%

Group 3 : Counters with normalized mean outside the range 0.50 – 1.50 or coefficient of variation above 50%

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A.I.A. – FIBRE COUNTING TRIAL – 1991–92

PERSONAL RESULTS

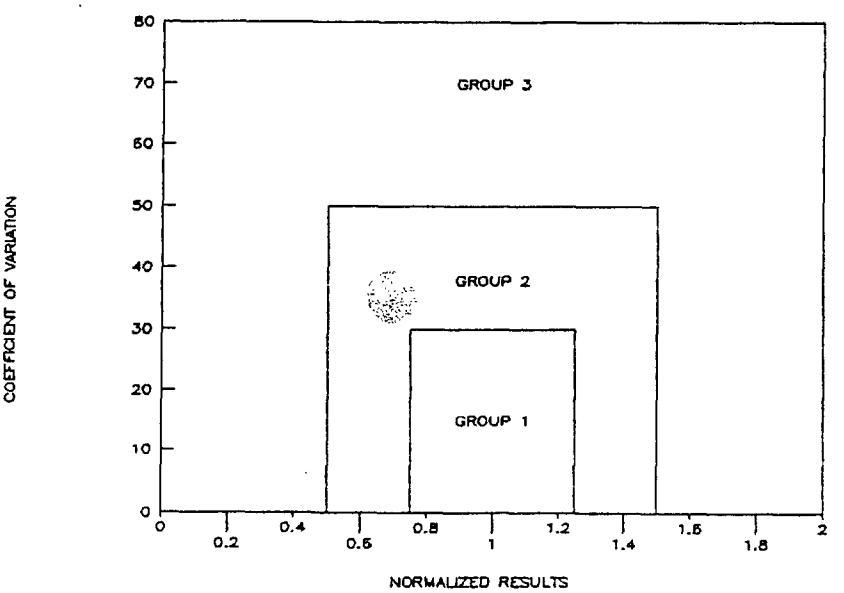
Name : Mrs MARTHA J. BIXBY

Your countings and corresponding normalized results are reported below.

Slide N° D	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
Results F/mm²	71	205	245	140	156	222	29	23	156	222	89	386	78	69	196
Norm. Results	0.46	0.82	0.60	0.74	0.72	0.96	0.49	0.29	1.01	0.75	0.64	1.32	0.45	0.55	0.75

Normalised Mean	:	0.70
Coefficient of Variation		36.7
Group		2

Your individual position is plotted on the following graph:



Group 1 : Counters with normalized mean in the range 0.75 – 1.25 and coefficient of variation below 30%

Group 2 : Counters with normalized mean in the range 0.50 – 1.50 and coefficient of variation below 50%

Group 3 : Counters with normalized mean outside the range 0.50 – 1.50 or coefficient of variation above 50%

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A.I.A. – FIBRE COUNTING TRIAL – 1991–92

PERSONAL RESULTS

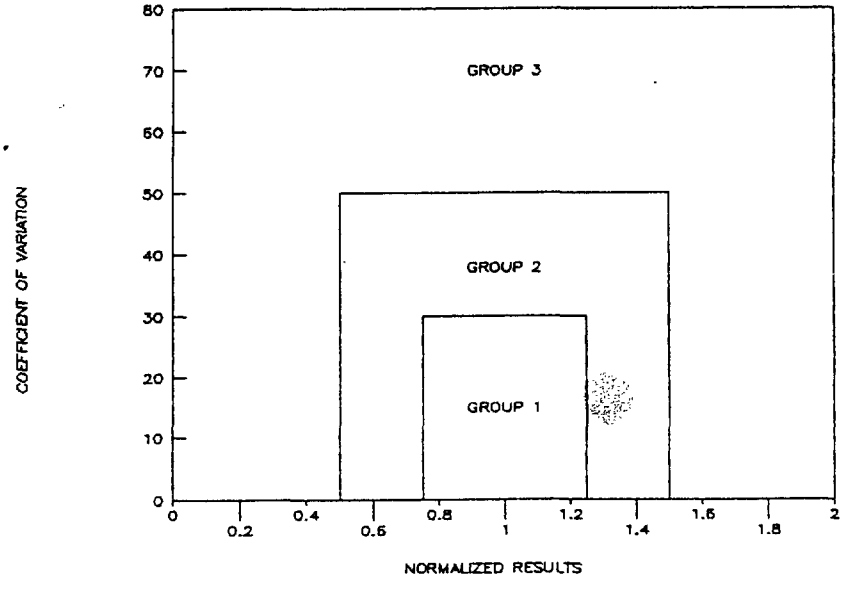
Name : Mrs LAURA SHEMANSKI

Your countings and corresponding normalized results are reported below.

Slide N° D	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
Results F/mm²	205	268	556	294	318	340	89	83	192	323	141	481	281	163	330
Norm. Results	1.32	1.07	1.37	1.55	1.47	1.47	1.50	1.07	1.24	1.09	1.01	1.64	1.62	1.31	1.26

Normalised Mean	:	1.33
Coefficient of Variation		15.7
Group		2

Your individual position is plotted on the following graph:



Group 1 : Counters with normalized mean in the range 0.75 – 1.25 and coefficient of variation below 30%

Group 2 : Counters with normalized mean in the range 0.50 – 1.50 and coefficient of variation below 50%

Group 3 : Counters with normalized mean outside the range 0.50 – 1.50 or coefficient of variation above 50%

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