LABORATOIRE D'HYGIENE ET DE CONTROLE DES FIBRES MINÉRALES

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Paris, April 4th 1991

Mrs JANIS WOODSON REYNOLDS

CERTAINTEED CORPORATION
750 E.SWEDESFORD ROAD
VALLEY FORGE 05
PA 19482
U.S.A.

Ref.: AIA Fibre Counting Trial - 1990

Dear Mrs JANIS WOODSON REYNOLDS,

You will find enclosed a copy of the final report of the 1990 - A.I.A.- Fibre Counting Trial in which counting results of each participant are taken into account.

In this report, an individual position data sheet for each counter of your laboratory is included giving his classification among 3 groups according to his performances.

Yours sincerely.

Alain Baujon
Director

PLAINTIFF'S EXHIBIT
CT-672

A.I.A. - FIBRE COUNTING TRIAL - 1990

INDIVIDUAL POSITION DATA SHEET

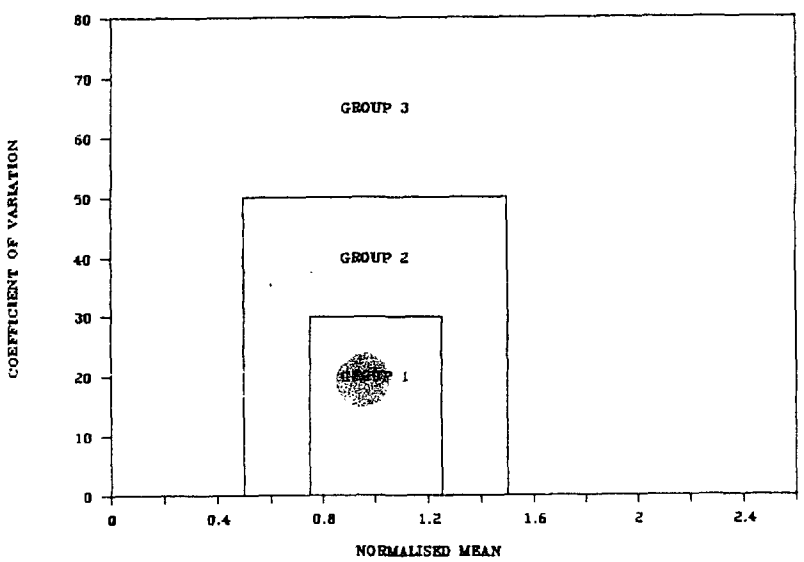
Name : Mrs LAURA SHEMANSKI
Company : CERTAINTEED

Your countings and corresponding normalised results are reported below.

Slide N°	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
Results F/mm²	87.3	269.8	128.7	231.5	123.6	191.1	82.1	66.2	259.7	66.9	404.1	49.7	200.8	338.6	175.4
Norm. Results	0.96	0.84	0.84	0.99	0.89	1.06	1.06	0.73	0.87	0.57	0.90	0.82	1.26	1.19	0.98

Normalised Mean	:	0.93
Coefficient of Variation	:	18.4
Group	:	1

Your individual position is plotted on the following diagram:



Group 1 : Counters with normalised mean in the range 0,75 - 1,25 and coefficient of variation below 30 %

Group 2 : Counters with normalised mean in the range 0,5 - 1,5 and coefficient of variation below 50 %

Group 3 : Counters with normalised mean outside the range 0,5 - 1,5 or coefficient of variation above 50 %

A.I.A. - FIBRE COUNTING TRIAL - 1990

INDIVIDUAL POSITION DATA SHEET

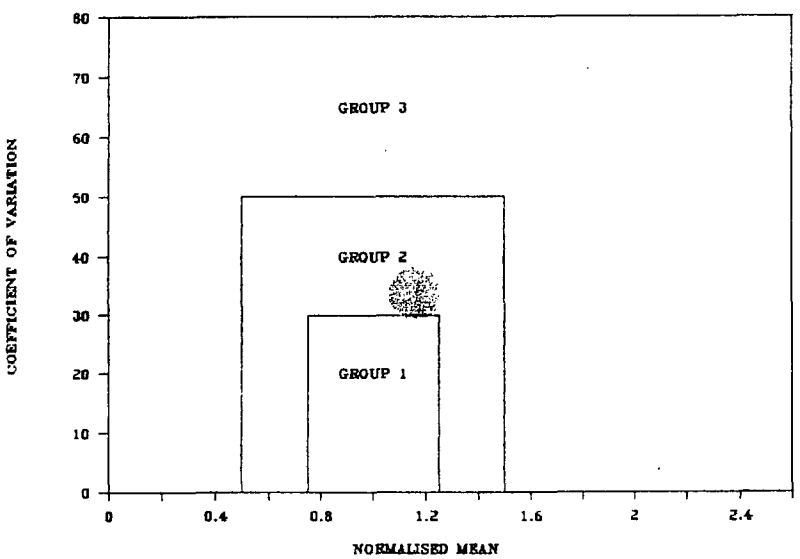
Name : Mrs JANIS WOODSON REYNOLDS
Company : CERTAINTEED

Your countings and corresponding normalised results are reported below.

Slide N°	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
Results F/mm²	60.3	447.9	161.6	359.3	113.2	185.1	32.1	78.2	412.2	132.7	866.2	90.5	200.7	388.0	242.8
Norm. Results	0.66	1.40	1.06	1.54	0.82	1.03	0.42	0.87	1.39	1.14	1.93	1.49	1.26	1.36	1.35

Normalised Mean	:	1.18
Coefficient of Variation	:	32.6
Group	:	2

Your individual position is plotted on the following diagram:



Group 1 : Counters with normalised mean in the range 0,75 - 1,25 and coefficient of variation below 30 %

Group 2 : Counters with normalised mean in the range 0,5 - 1,5 and coefficient of variation below 50 %

Group 3 : Counters with normalised mean outside the range 0,5 - 1,5 or coefficient of variation above 50 %

A.I.A. - FIBRE COUNTING TRIAL - 1990

INDIVIDUAL POSITION DATA SHEET

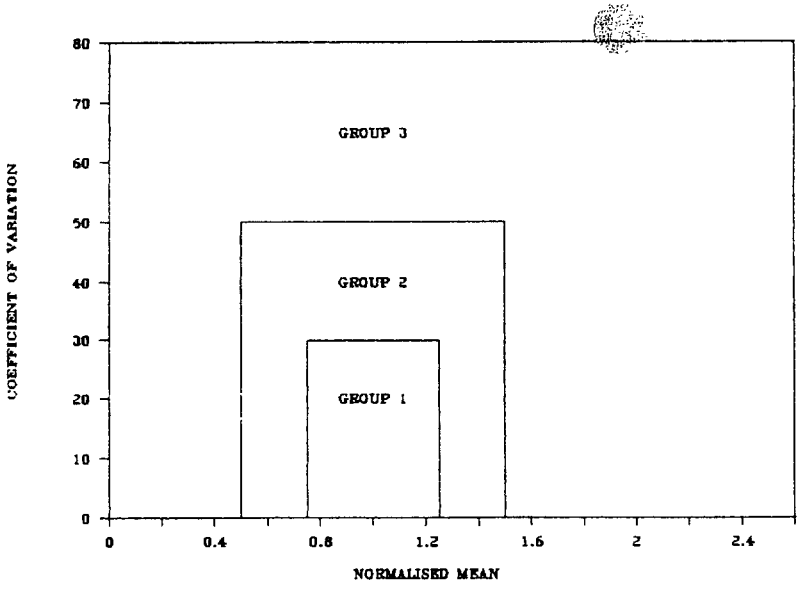
Name : Mr SCOTT HOWARD
Company : CERTAINTEED

Your countings and corresponding normalised results are reported below.

Slide N°	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
Results F/mm²	126.1	745.2	374.9	141.5	338.6	93.0	119.7	228.0	276.9	673.3	77.7	289.5	378.6	250.4	127.4
Norm. Results	1.38	2.33	2.46	0.61	2.44	0.51	1.55	2.53	0.93	5.78	0.17	4.76	2.37	0.88	0.71

Normalised Mean	:	1.96
Coefficient of Variation	:	80.6
Group	:	3

Your individual position is plotted on the following diagram:



Group 1 : Counters with normalised mean in the range 0,75 - 1,25 and coefficient of variation below 30 %

Group 2 : Counters with normalised mean in the range 0,5 - 1,5 and coefficient of variation below 50 %

Group 3 : Counters with normalised mean outside the range 0,5 - 1,5 or coefficient of variation above 50 %

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RESULTS OF THE A.I.A. FIBRE COUNTING TRIAL - 1990 -

MARCH 1991

Director: Alain BAUJON

Report prepared for:

ASBESTOS INTERNATIONAL ASSOCIATION
10 rue de la Pépinière
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FRANCE

LABORATOIRE D'HYGIENE ET DE CONTROLE DES FIBRES MINÉRALES

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March 1991

RESULTS OF THE A.I.A. ASBESTOS COUNTING TRIAL - 1990 -

1/ - INTRODUCTION :

The 1990 slide exchange for asbestos fibres counting is the third 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 repeatability 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 A.I.A. slide exchanges was applied (as approved by the A.I.A. Dust Advisory Panel, and participants have been classified into 3 categories of performance.

.../...

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 according to the recommended acetone-triacetin method (see RTM1).

The 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 circulation of the slides. Furthermore, the validity of this procedure was further checked using the counting results found by the group 1 counters.

The 4 sets of slides were then 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 :

17 countries took part in the exchange involving counters from 40 laboratories whose experience in fibre counting was evaluated through a questionnaire. 1035 results from 70 individual counters have been collected .

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

60 counters reported to apply the A.I.A. RTM.1 method or a similar home one while 7 counters reported to use the NIOSH method as a standard.

The surface area of the graticules used for counting are distributed as follows:

Graticule Area mm^2	< 7500	7500 - 8200 (ϕ=100±2 mm)	8200 - 10000	> 10000
Number of counters	5	56	7	2

.../...

4 / - FIBRE LOADINGS

11 out of the 15 samples were taken from asbestos factories or mines, and 4 asbestos-free samples were mounted with rockwool, ceramic fibres and wollastonite.

Product group categories related to the samples and their corresponding mean fibre density (fibres per mm^2), are given in the following table:

SAMPLE N°	PRODUCT GROUP	MEAN DENSITY FIBRES / mm^2
1	Friction Material	91
2	Wollastonite	321
3	Asbestos Mine	152
4	Asbestos Board	234
5	Rockwool	139
6	Asbestos Mine	181
7	Ceramic Fibres	77
8	Friction Material	90
9	Asbestos Cement	297
10	Friction Material	116
11	Asbestos Cement	448
12	Asbestos Board	61
13	Asbestos Cement	159
14	Ceramic Fibres	285
15	Asbestos Cement	179

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 provisionaly classified into 2 groups :

   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:

CLASSIFICATION OF COUNTERS ACCORDING TO THEIR NORMALIZED MEAN AND COEFFICIENT OF VARIATION

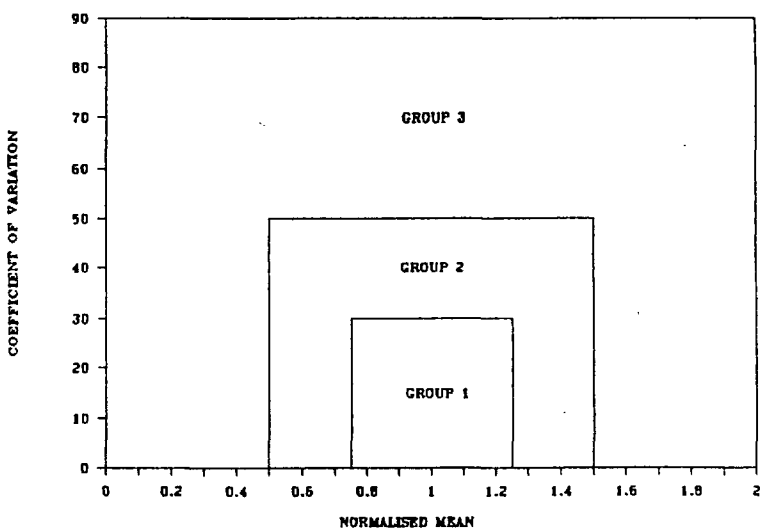

Diagram n° 1

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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 evaluation 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 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 of variation (CV's).

- 31 counters (44.9 %) have been classified in GROUP 1.
- 26 counters (37.7 %) have been classified in GROUP 2.
- 13 counters (17.4 %) have been classified in GROUP 3.

POSITION OF THE 70 COUNTERS ACCORDING TO THEIR NORMALIZED MEAN AND COEFFICIENT OF VARIATION

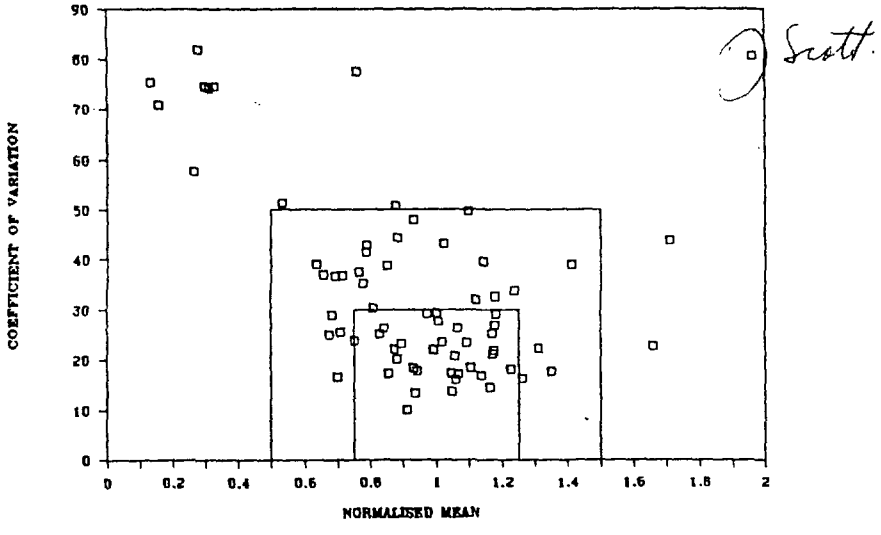

Diagram n° 2

.../...

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 1035 normalized values :

Diagram n° 3 shows that 76.6 % of the results are within 50 % of the expected mean and 46.9 % within 30 %.

DISTRIBUTION OF 1035 NORMALIZED RESULTS

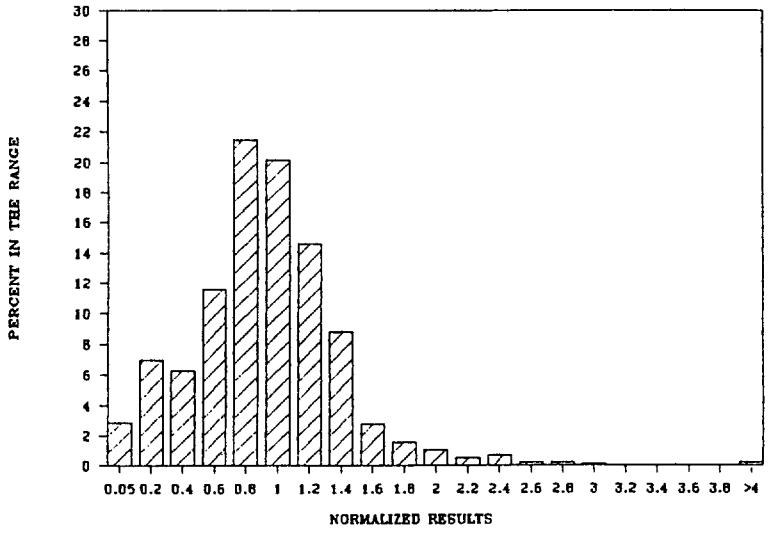

Diagram n° 3

A few counts are much too high or too low, raising up to 6 times or falling 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 the 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 59 out the of 70 (84.3 %) counters' performance are within the range 0.50-1.50 and 47 (67.1 %) are within the range 0,75 - 1.25 .

DISTRIBUTION OF NORMALIZED MEANS

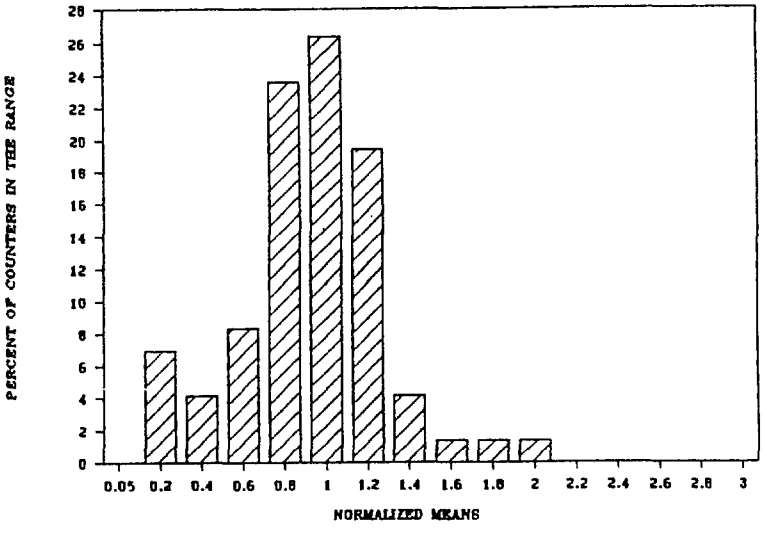

Diagram n° 4

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 sometimes result in a normalized mean figure well within an acceptable range.

As shown on diagram n° 5, 58 out of the 70 values (82.9 %) are below 50 %, but the proportion of values below 30% drops down to 54.3 % (38 values).

DISTRIBUTION OF COEFFICIENTS OF VARIATION

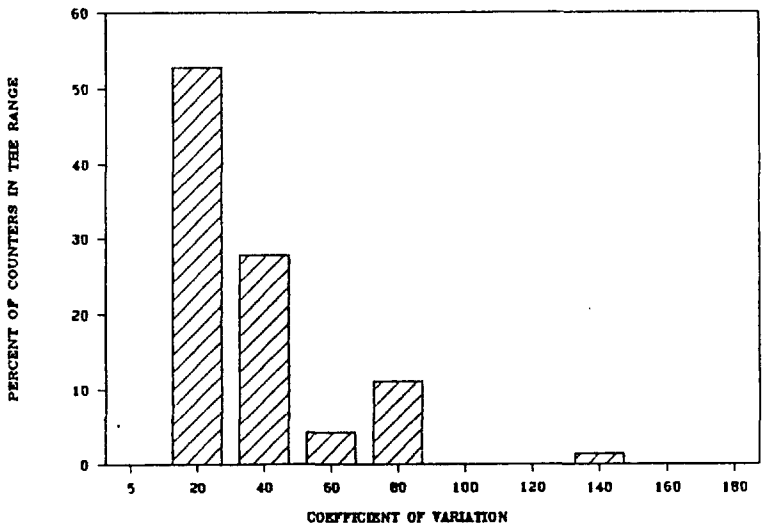

Diagram n° 5

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7/ - NON-ASBESTOS FIBRES SAMPLES

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

As their number is small,a cautious interpretation of the results is required.

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".

However, some counters obviously ignore the fibrous particles which morphology does not meet the typical asbestos one.

Despite the small number of non-asbestos samples, it was possible to classify the counters according to the WHO-EURO-MMMF criteria which applies to the mean only:

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 :

- 50 counters (71.5%) have been classified in GROUP 1
- 5 counters (7.1%) have been classified in GROUP 2
- 15 counters (21.4%) have been classified in GROUP 3

Diagram n°6 shows the distribution of 280 normalized results (all non asbestos counts): 79.1% of the results are within ± 50% of the expected mean, and 64.4% are within ± 30%.

The distribution is significantly better than that of all fibre type countings (diagram n°3). Such a finding is coherent with the fact that it is often 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.

DISTRIBUTION OF 280 NORMALIZED RESULTS
(NON ASBESTOS SAMPLES ONLY)

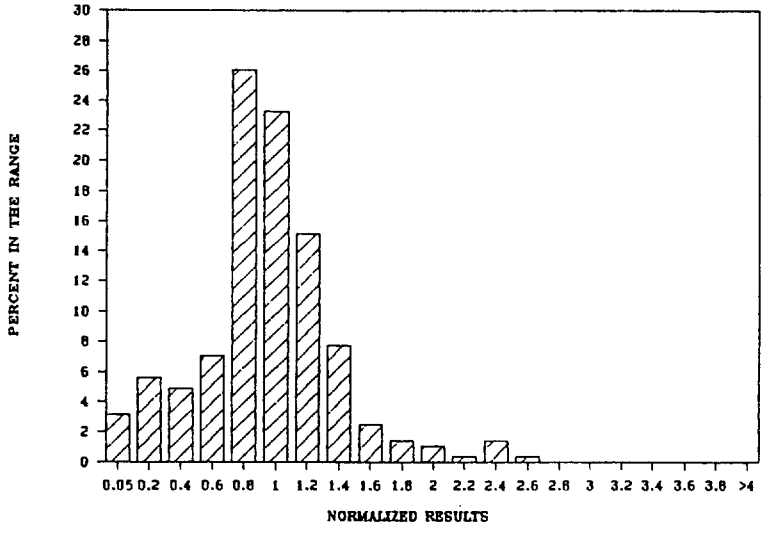

Diagram n° 6

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 the counter's normalized results. It is an indication of systematic 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 dispersion of counter's results.

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