



UNION CARBIDE CORPORATION
CHEMICALS AND PLASTICS

P. O. BOX 471, TEXAS CITY, TEXAS 77590

April 21, 1980

Mr. Howard Houston (2)
Texas Air Control Board
6330 Highway 290 East
Austin, TX 78723

Subject: Supplemental Statistical Evaluation of Additional Six-month Analytical Data, Request for Change in Sampling and Analytical Program Under Part 61, NESHAPS Regulation for Vinyl Chloride Monomer Control

Dear Mr. Houston:

In January 1980, we sent you a request for the above noted change and have received your response that you had directed it to the TACB Source Evaluation Section for review and subsequent forwarding to the Regional EPA office in Dallas with TACB recommendations. We would appreciate your forwarding us a copy of the recommendations developed by your Source Evaluation staff when it is available. We would like to keep this issue alive and accordingly would need to know to whom in the Dallas EPA offices you had sent this communication so we can answer any questions or determine what course to follow to expedite the request. We are spending considerable funds (over \$50,000/year) wastefully in order to follow the program specified in the NESHAPS Regulation and would like to get relief as soon as possible, realizing that the route will be circuitous and involved in bureaucratic procedures and personnel.

Since the original request was made, we have accumulated an additional six months of data for this regulation under the same provisions as before. We have analyzed the new data statistically in the same manner as before and have again come to the conclusion that our prior request for a once-per-week schedule of sampling and testing would more than meet the needs of the regulation and would afford us savings of over \$50,000 per year. Please see the attached information developed for the period September 1979 thru February 1980.

Please direct any questions and comments on this matter to my attention. We would appreciate receiving the information requested in the first paragraph of this letter at your earliest convenience. Thank you for your help and understanding.

Very truly yours,

J. F. Erdmann
J. F. Erdmann, P.E.
Environmental Protection
Coordinator (713) 948-5126

JFE:ir
Attachments

cc: Mr. Sabino Gomez, Region VII, Bellaire, Texas

Dr. E. R. Ibert, GCACD

bcc: R. E. O'Bryan/NESHAPS (VCM) File

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DATA EVALUATION, SEPTEMBER 1979 - FEBRUARY 1980

(Data Tables Appended)

Individual twenty-four hour weighted average VCM concentrations (dry resin basis), A_{Ti} , were determined and reported for this period in our last Semiannual Report submitted April 7, 1980.

The following statistical parameters were determined from these daily VCM concentrations:

- 1) Number of daily average values of $A_{Ti} = n = 182$
- 2) Population Mean, $\mu = 20.45$
- 3) Standard Deviation, $S_x = 72.59$
- 4) Predicted upper range for mean values, 99% confidence level,

$$\mu = \bar{X} + \frac{S_x}{\sqrt{n}} (Z), \quad Z \text{ for 99\% level} = 2.33, \text{ for } n > 30, \text{ upper limit only.}$$

$$\mu = 33.00$$

This valuation indicates that the mean value for the VCM concentrations based on this second six-month data period would be below 33 ppm 99% of the time. This compares to an upper limit of 400 ppm specified by the regulation.

$$\text{Determine } t = \frac{\mu - \text{maximum specification level}}{\text{standard deviation, } S_x}$$

$$t = \frac{20.45 - 400}{72.59} = \frac{-379.55}{72.59} = -5.23$$

However, from Table A in the text, a t-value of -3.1 is shown for a 99.9% confidence level (0.0010).

The larger t-value of -5.23 would correspond to a considerably greater degree of confidence than expressed by the 99.9% level.

By using the following notation, a calculation can be made to determine the sample size (n), which would provide 99.9% confidence that we would not exceed the 400 ppm limit.

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Let α = risk of rejecting an acceptable value = 0.001 and

let β = risk of accepting a rejectable value = 0.001

$$\text{for } \alpha = 0.001, T_1 = 3.1 = \frac{K - \mu}{\frac{S_x}{\sqrt{n}}} = \frac{K - 20.45}{\frac{72.59}{\sqrt{n}}} \quad (A)$$

$$\text{For } \beta = 0.001, T_2 = -3.1 = \frac{K - \text{upper limit}}{\frac{S_x}{\sqrt{n}}} = \frac{K - 400}{\frac{72.59}{\sqrt{n}}} \quad (B)$$

Subtracting equation (A) from equation (B):

$$T_2 - T_1 = -3.1 - (3.1) = \frac{K - 400}{\frac{72.59}{\sqrt{n}}} - \frac{K - 20.45}{\frac{72.59}{\sqrt{n}}}$$

$$-6.2 = \frac{K - 400 - K + 20.45}{\frac{72.59}{\sqrt{n}}} = \frac{-379.55}{\frac{72.59}{\sqrt{n}}}$$

$$6.2 = \frac{379.55 \sqrt{n}}{72.59}, \quad \sqrt{n} = 1.186 \quad (\text{just over one sample required})$$

$$n = 1.41$$

This value for n is slightly greater than 1, so a sample of 2 is the next nearest whole number.

If we use this value of $n = 1.41$ to solve for K , the mean value of A_{T_i} that would assure not exceeding 400 ppm more than 0.1% of the time, we get the following:

$$-3.1 = \frac{K - 400}{\frac{72.59}{1.186}} \quad -3.1 = \frac{K - 400}{61.20}$$

$$K - 400 = -189.7; \quad K = \underline{210.3}$$

However, we can't take part of a sample, so using $n = 2$, $\sqrt{n} = 1.414$

$$\begin{array}{rcl} -3.1 = K - 400 & & -3.1 = K - 400 \\ \hline \frac{72.59}{1.414} & & \frac{51.33}{1} \end{array}$$

$$K - 400 = -159.1 \qquad K = \underline{240.8}$$

which is the value of A_{Ti} for two samples every six months below which there is over 99.9% confidence that the 400 ppm limit has not been exceeded.

However, we plan to sample once per week to get A_{Ti} for a regular 3-shift day, sampling each stripper each shift for a total of 12 samples from which one weighted average concentration can be determined for that day. In six months, 26 such A_{Ti} values would be available, and if their mean value doesn't exceed the following K value, there is 99.9% chance that all values are below the 400 ppm limit.

$$\begin{array}{rcl} -3.1 = K - 400 & = & K - 400 & = & K - 400 \\ \hline \frac{72.59}{\sqrt{26}} & & \frac{72.59}{5.1} & & 14.23 \end{array}$$

$$-(3.1) (14.23) = K - 400 = -44.1, \quad K = \underline{356 \text{ ppm}}$$

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SEPTEMBER, 1979

<u>Date</u>	<u>Ati</u>
1	4.49
2	1.81
3	0.18
4	596.67
5	2.36
6	0.64
7	2.04
8	0.17
9	1.50
10	0.00
11	0.00
12	5.97
13	18.14
14	31.61
15	3.25
16	2.41
17	0.88
18	25.41
19	5.57
20	2.86
21	2.71
22	1.15
23	0.15
24	4.33
25	6.64
26	23.70
27	11.60
28	14.40
29	368.20
30	168.35

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OCTOBER, 1979

<u>Date</u>	<u>Ati</u>
1	7.17
2	4.99
3	0.91
4	7.93
5	0.03
6	1.77
7	5.79
8	18.80
9	41.84
10	118.33
11	5.44
12	17.52
13	5.58
14	0.69
15	30.87
16	4.30
17	7.72
18	13.47
19	17.14
20	37.86
21	6.42
22	40.56
23	54.93
24	2.33
25	181.66
26	49.26
27	58.61
28	4.06
29	6.89
30	6.33
31	1.46

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NOVEMBER, 1979

<u>Date</u>	<u>Ati</u>
1	4.09
2	18.66
3	19.30
4	2.89
5	34.60
6	22.40
7	27.33
8	5.68
9	12.70
10	5.88
11	2.16
12	4.90
13	0.35
14	3.48
15	0.43
16	1.00
17	0.86
18	5.97
19	147.27
20	6.44
21	2.32
22	2.03
23	11.68
24	1.31
25	0.87
26	0.00
27	0.84
28	8.38
29	9.91
30	6.75

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DECEMBER, 1979

<u>Date</u>	<u>Ati</u>
1	0.00
2	167.13
3	6.49
4	7.31
5	3.49
6	17.97
7	60.82
8	2.51
9	0.34
10	0.40
11	0.26
12	4.80
13	1.40
14	8.90
15	2.70
16	73.90
17	4.20
18	8.50
19	13.28
20	6.90
21	4.37
22	6.76
23	31.71
24	8.58
25	18.06
26	2.28
27	7.15
28	2.21
29	14.35
30	1.06
31	0.00

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JANUARY, 1980

<u>Date</u>	<u>Ati</u>
1	0.22
2	8.01
3	3.89
4	611.95
5	2.27
6	.48
7	.44
8	.52
9	2.16
10	1.73
11	2.11
12	0.00
13	24.71
14	52.84
15	.33
16	.10
17	0.00
18	.35
19	1.93
20	.13
21	.83
22	2.68
23	.71
24	.58
25	.03
26	3.52
27	.33
28	5.17
29	9.50
30	.65
31	1.43

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FEBRUARY, 1980

<u>Date</u>	<u>Ati</u>
1	.23
2	.31
3	.45
4	1.46
5	.52
6	3.26
7	1.11
8	.57
9	.15
10	1.29
11	6.44
12	.55
13	.13
14	.26
15	7.15
16	.38
17	3.12
18	2.74
19	6.77
20	1.99
21	3.02
22	2.03
23	1.10
24	1.89
25	.38
26	0.00
27	.97
28	8.48
29	0.00

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