VCl [illegible] Foreign VCl Misc

UC 140-2

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MAY 15 1975
R. N. WHEELER, JR.

UNION CARBIDE INTERNAL COR[illegible]

CHEMICALS AND PLASTICS

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

TO (NAME) Mr. R. W. Sesler, 515
COMPANY Mr. J. B. Leverton, 515
LOCATION Mr. D. E. Deese, 515
Mr. K. E. Ross, 515
Mr. R. L. Frantz, 515
Mr. G. F. Tacquard, 515
COPY TO Dr. D. R. Montgomery, 515
Mr. J. L. Carvajal, 514
Mr. R. N. Wheeler, 514

DATE April 30, 1975

SUBJECT VCM Standard - England/Germany

The attached, forwarded by Art Steele, you may find of interest. For those who have no desire to wade through the entire document, pages 4, 5, and the first paragraph of page 6 are an interesting discussion of monitoring.

Page 13 reviews the German thinking on the matter. If I interpret this correctly, Germany will have a 10 ppm TWA and 30 ppm TLV. I believe England at this time has a 25 ppm TWA and 50 ppm TLV. Both of these are reasonable standards and should be fully protective of workers' health.

As Mr. Lutz requests, please hold these documents in confidence.

M. E. Eisenhour

M. E. Eisenhour

MEE/ebm

4/30/75
to 31424

UCC
031422

UNION CARBIDE CORPORATION
Chemicals & Plastics
270 Park Avenue, New York, N. Y.

April 18, 1975

TO: Dr. A. B. Steele
28th Floor

CC: Mr. T. W. Carmody

SUBJECT: ICI's Position - VCM

Art,

As I told you on the phone, one of the people I ran across in Europe was A. W. (Barry) Barnes, who is in charge of ICI's vinyls activity.

I was interested to find that their position and concerns are much the same as ours. They seem to feel that only a relative handful of European concerns are measuring thoroughly enough and with sufficient accuracy to understand what the problem really is. They are most concerned by the damaging comments being made by both U.S. and European companies to the effect that the 1 and 5 limits are relatively easily attainable. They suggested that we exchange information including plant visits, so that actual, experimental techniques and analyzer probe placement, which drastically affect results, may be examined in detail. To this end, I have instructed them to contact Merle Eisenhour directly to arrange the details.

I am also enclosing a number of documents which they gave me including the British Standard, which we may already have, and the German Standard, which was just issued. It is evident from these that the approach being taken in Europe by government agencies is much more rational and that the effect is a cooperative one rather than an adverse one. Also included are two "white papers" one of which is a basic document put together last Fall and the other a recent update. These data represent all manufacturing plants of all producers in the United Kingdom. These position papers have been circulated to Government and Labor in the United Kingdom, but we have been asked to hold them confidential within our organization. Please feel free to circulate them to anyone within

our organization to whom they might be useful, but with the stricture that they hold them confidential.

A. W. Lutz

AWL:cr
Attachments

VINYL CHLORIDE: EXPOSURE LEVELS IN UK PVC PLANTS

This report summarises the available information on the current vinyl chloride in atmosphere levels in the reaction sections of the UK PVC plants both for personal exposure data and for the results from area monitoring. Measurements carried out in the downstream drying, packing and warehouse areas continue to confirm that levels are generally significantly lower than in the respective reaction sections.

1 Personal Exposure Data - Reactor Operators.

As outlined in the previous report (A W Barnes 13/12/74, Vinyl Chloride Levels in UK Plants - Note to the Tripartite Working Group) measurements are carried out on all plants using a technique based on a portable continuous 'personal' air sampling device carried by individual operators for a 4 or 8 hour period during the normal working day or shift. The results are a direct measure of the average exposure over the sample period and hence relate directly to the 8 hour TWA referred to in the interim hygiene standard.

The results for each of the UK plants can be summarised as follows:

Plant	Period 1975	Number Results	Distribution of 8 hour TWA Results (%)					
			0-5	6-10	11-15	16-20	21-25	25-50
A	March	33	46	22	18	6	6	2
B	March	38	40	25	22	6	5	2
C	Jan	12	90	10	-	-	-	-
D	Jan	18	63	21	11	5	-	-
E	Jan	14	92	8	-	-	-	-
F	Feb	14	100	-	-	-	-	-
G	March	63	77	12	5	5	-	1
H	Feb	18	44	28	17	6	-	5
I	Feb	12	92	8	-	-	-	-

The overall industry situation can be obtained by adding together the results from the individual plants as follows:

		No. of Results	Distribution of individual 8 hour TWA Results					
			0-5	6-10	11-15	16-20	21-25	25-50 ppm
Industry Situation	Period 1st Quarter 1975	222	146	37	22	9	4	4

In appraising these results it is important to remember that the UK Code of Practice allows no personnel to be exposed above the interim hygiene standard and hence all the 8 hour TWA results should be below 25 ppm.

2 Area Monitoring Results - Reaction Sections.

The reaction sections on all plants except Plant I are now equipped with fixed multi-point analyser systems based on either gas chromatography or infra red analysis. These systems which are based on 'instantaneous' sampling with an analysis time for each sample of approximately one minute, produce approximately 10,000 results per week and hence on line computer facilities are necessary to process the data. Plant I is currently being equipped with a multi-point analyser system which will be operational by the end of April. Although all plants are installing in line computer facilities, to date only Plant A, B, G and F have such equipment operational.

The area monitoring results for the reaction sections can be summarised as follows:

Plant	Period 1975	VCM in Atmosphere Levels from Multi-Point Analysers		
		Average (ppm)	% Results >25 ppm	% Results >50 ppm
A	March	7	3.5	1.2
B	March	4	2.1	0.8
C	Jan	-	1.7	0.4
D	Jan	-	6.2	1.7
E	Jan	-	2.7	0.4
F	March	4	2.3	1.4
G	March	6	3.8	1.5
H	March	4	1.8	0.7
I	Jan (Based on 'spot' samples)	12	10.0	3.3

It is important to stress that this data is generally based on either one week or one month average and hence is not directly related to the interim hygiene standard which is based on 8 hour/day averages. The data for Plant A has been extracted for a one week period in February to demonstrate the sort of differences which can occur:

Plant A	Distribution of the 21 Individual 8 hour Shift Averages (%)		
Weekly Average	0 - 5 ppm	6 - 10 ppm	11 - 15 ppm
9ppm	5	71	24

Routine full analysis of the individual results from the multi-point analyser on a shift basis is not practicable until in line computer facilities are installed.

3 General Progress.

During the last three months further procedural changes have been instituted on the plants while the plant modification programmes aimed at minimising VCM exposure levels have continued as a matter of urgency. The major effect has been a further reduction in the average VCM in atmosphere levels in the plants and hence in the average 8 hour TWA results.

In addition the proportion of individual area monitoring results over 50 ppm has shown a marked decrease over the period. However, the main problem continues to be the small proportion of high area monitoring and personal monitoring results arising as a direct consequence of periodic vinyl chloride leakages. All plants are currently installing local zoned alarm systems based on the multi-point analyser results and this will enable immediate action to be taken in the event of an excursion in VCM levels.

The current major engineering programmes on the various plants are directed at eliminating known sources of vinyl chloride leakage and it is still expected that when the work is completed at the end of 1975 the maximum 8 hour TWA exposure will be substantially below the 25 ppm level.

WFM/MEW/8 April 1975

CONFIDENTIAL

CHEMICAL INDUSTRIES ASSOCIATION

VINYL CHLORIDE : EXPOSURE LEVELS ON UK PLANTS

At the last meeting of the Tripartite Working Group, I was asked if the industry could present a report indicating the current level of achievement in controlling vinyl chloride levels in plant atmospheres. The following paragraphs summarise the position: they deal successively with the following items: (a) the methods of measurement and the significance of results obtained (b) the detailed position on one UK plant (c) the summarised position on each of the UK plants.

(a) Methods of Measurement

Two basically different methods of measurement and control exist.

(i) The first of these involves the repeated and frequent measurement of vinyl chloride concentrations in the plant atmosphere at a number of positions on the plant, selected to be representative of areas where personnel normally work. This method tells us what the actual vinyl chloride concentrations are at a number of places on the plant, and provided enough places are monitored and the frequency of measurement is high, it gives us an accurate and continuous picture of the state of the atmosphere throughout the plant.

What we are primarily concerned to control, however, is the total exposure of any individual person and since all plant personnel move from one area to another during their normal activities, we could only find this out, from fixed point monitoring alone by noting how long and when each individual was in each monitored area, and then calculating from the results what his total 8 hour exposure had been. A second parallel method of monitoring is therefore needed, to measure directly the exposure of an individual, and to ensure that calculations of this sort are and continue to be reliable.

(ii) The second basic method therefore is "personal" monitoring. With this, the individual is supplied with a portable apparatus which samples continuously the air he is breathing over a 4 or 8 hour period. The total sample is collected at the end of the period and its vinyl chloride content measured in a laboratory. The result should be a direct measurement of the exposure of the person concerned over the period and should therefore tell us unambiguously that the wearer has or has not operated within the hygiene standard. The method does have its deficiencies though in terms of accuracy it depends, for example, on the wearer remembering to switch off the sampling device when he puts on a respirator and to note how long the period is before it is switched on again. If he doesn't do the first of these, the apparatus will continue to absorb possibly high concentrations of vinyl chloride, to which the worker is not in fact exposed, and the overall result will be too high: if he does the first, but forgets to switch the apparatus on again the result could be

lower than the true exposure. So the method does depend for its accuracy on continuous vigilance and concentration on the part of the wearer; and this would be difficult for anyone to achieve consistently over many 8-hour periods.

A more serious deficiency of the method, if used alone however is that the result is not available till after the end of the period of sampling; and if the result then proves to be too high, the time for action is long past. This is not a deficiency of the fixed point monitor referred to in (i) above since, with this, instantaneous measurements of plant atmospheres are made with a time lag between sampling and measurement of only a few seconds; and action can be taken immediately if adverse movements in vinyl chloride levels are recorded.

To ensure complete protection of workers on PVC plants both methods are required. The fixed point sequential monitor will tell us the actual atmospheric concentration at any one place on the plant every 25 minutes; and points close to one another will be measured every 1-2 minutes. It is the results from this equipment which will enable action to be taken immediately, through procedures already agreed, whenever a significant change in the levels is observed. Complementary to this, periodic checks with personal monitors should show directly that individual exposures are indeed at the level suggested by the fixed point results, and are within the prescribed hygiene limits. Because of the variation in VCM levels between different points on the plant and because operators do move from place to place, the personal monitor results should always be below the average levels recorded at the worst point, so that plant action to keep atmospheric levels below a particular figure should result in each operator having a personal exposure level which is reduced below this figure.

This summarises the methods and philosophy of measurement and control which we are aiming at. The present position in the UK is that five plants already have continuous 6, 12 or 24 point monitors installed and by January 1 eight of the nine major operating plants will be equipped with 12, 24 or 30 point analysers. The ninth plant, and the other smaller plants presently shut down through lack of orders, will be equipped in the first quarter of 1975. In the meanwhile, the plants which still await equipment are being monitored through the use of grab sampling and a variety of off-line measuring devices. The results from these plants are necessarily fewer in number since a fully equipped 24 point monitor produces at least 10,000 measurements per week whereas off-line measurements are limited to tens per day. Where measurements are few the results usually tend to suggest an average VCM level which is lower than it really is. This is because PVC plants are characterised by a generally low continuous level of VCM interspersed with peak concentrations which are of short duration, but which nevertheless contribute significantly to the time-weighted average. When few measurements are taken, the chances of recording these higher levels are very low.

My purpose in describing measuring methods at some length is partly to indicate where the industry now stands but primarily to emphasise that the results so far available come from a variety of different techniques (varying markedly in frequency and in type of sampling and analysis) and from two quite different philosophies of approach (personal and fixed point) which, by their nature, will give different numerical results, even when describing the same situation. In any discussion of vinyl chloride levels, we have to be absolutely precise in our definition of what we are talking about, for a single number (x ppm) can describe several quite different actual situations depending on the method used to obtain it.

(b) Detailed Results for one Plant (A)

I have chosen one plant for detailed analysis in order to illustrate some of the points made above. The particular choice was made because, in mid 1974, this was the plant with the highest average VCM concentration of all UK plants and because it now has had the most sophisticated measurement system for the longest period and as a result is most fully characterised.

The polymerisation section of the plant has continuous sequential measurement at 24 points. The weekly average of all 24 points, over the period February to November, is shown in the attached graph and summarised below.

	Feb	June	Sept	Nov 7-13
Weekly average all points (ppm)	60	35-40	30	13

The decrease, from February to September, came from alteration of procedures and many detailed engineering modifications. The large change between September and November resulted from major increases in ventilation. Still further detailed modifications have yet to be done but these do not include any further single major change and it is expected that future progress will be only gradual and its extent is not yet predictable. Note especially though that the figure of 13 ppm represents the average, for the week of Nov 7-13, of results from 24 points. This is not how the interim hygiene standard is defined and so the result is not a measure of how easily we are meeting that standard.

The standard is concerned with each individual and no one man can be in 24 places at once! If, as a first approximation to possible individual exposures, we take the weekly averages for each of the 24 points separately (ie. we assume a man might remain in one position throughout a week) then we find the range of results spreading from a low of 3 to a high of 22 ppm, with no particular plant logic explaining the differences between points ie. these are random, very small leaks which may occur in a different place next time we measure. The hygiene standard however requires a 25 ppm limit measured over 8 hours not over a week: our computer does not yet automatically give us the results for each measurement point and for any 8-hour period but, with one point showing a weekly average of 22 ppm, this point must, for some 8 hour periods, have exceeded 25 ppm. Indeed a back-check of the results shows that the maximum 8 hour figure for any single point varied, through the week, from 17 to 47 ppm.

Turning now to the hygiene standard's maximum of 50 ppm, a different computer analysis (the lower curve on the graph) shows the percentage of results which exceeded 50 ppm over the complete period. Again I summarise the graph below

	Feb	June	Sept	Nov 7-13
% of results above 50 ppm	45	15-20	15	4

A marked improvement can once again be seen, particularly after September as a result of improved ventilation. And if we recall that the hygiene standard is concerned, not with instantaneous, transient readings, but with peaks over a 15-30 minute period then the percentage results outside the standard will decrease below the figures shown above.

This is about all we can extract from the fixed point monitoring results. They show that a lot of progress has been made but that if the hygiene standard were concerned with positions rather than people we should be exceeding it for a significant time, even though the plant might be characterised in general terms as operating at 13 ppm. The table shows how different numbers, all correct, can give different impressions of our achievements so far.

	ppm	Comments
Weekly average all 24 points	13	Suggests we are well inside standard
Weekly average individual points	range 3-22	50% of results are between 13 and 22 ppm so, contrary to impression above, we are working close to standard for high proportion of time
8 hour average individual points	range 3-47	Borderline to standard for part of time, over standard on significant number of occasions.

The first conclusion is that if we were to regard the standard as a positional and not a personal one, then, read in conjuction with the detailed monitoring requirements, we are just going to meet it by the year-end; the position would, of course, be different if monitoring was a more infrequent affair. The second conclusion is that the problem of meeting it lies in the random spread of results about the mean. To improve the situation we must narrow the range of results by eliminating the higher figures: but this will only be achieved by a sustained effort from engineers, plant management and plant operating groups working together as a team.

However, the hygiene standard is a personal one and we must, therefore, consider what we know of the plant's progress against the standard proper. In October, after the weekly average results had fallen to 15 ppm, a number of personal monitoring measurements were taken. The results gave an average of 23 ppm, with 26% of them greater than 25 ppm and a tail of figures up to 60 ppm.

There were disturbing figures, since personal results should be below the plant average, certainly not above it: and 4 hour figures as high as 60 ppm are difficult to explain when only 7% of all fixed point results are above 50 ppm. A repeat operation was, therefore, carried out in November with all participants operating in pairs (to remind one another of the need for control and recording), and with a third operator checking atmospheric concentrations with a portable meter. Good agreement was this time reached within groups; and with a plant average of 13 ppm, the personal exposure levels (32 results) averaged 10 ppm and ranged up to 20 ppm. These are early results and need confirmation, but they do suggest that this particular plant may now be just inside the interim hygiene standard. Proof of this, however, requires extreme care in the use of personal monitoring equipment and even when this is achieved there are strong indications of a quite wide range of results. As with fixed point results, the conclusion must be that a sustained investigative effort is required over several months to eliminate results at the high end of the range and thus to bring down both the average and peak exposures. This effort is already deployed and will be maintained by the whole team.

(c) Situation on all UK Plants

Having discussed one plant in detail, we can now examine the position throughout the industry. The fold-out table attached summarises this, starting with Plant A which has been discussed above.

Plants A to E

These are all sequentially monitored and so are best characterised and should therefore be best controlled. Points to note in the table are

(1) Atmospheric concentrations

(a) The figures for Plant B may be overoptimistic since a six-point analyser is inadequate for complete characterisation.

(b) At this point, analysis of performance on all except Plant A is incomplete since installation of monitors is very recent on the other plants.

(c) The average figure quoted is very sensitive to a relatively few short-duration peaks: and in calculating the average figure it is assumed that a peak figure at any point persists until that position is monitored again 24 minutes later. To illustrate the influence of peaks, a plant which has 95% of its results at 10 ppm but 5% at 100 ppm will have a calculated average figure of 14.5 ppm: and the real average may be between 10 and 14.5 ppm if the peaks in fact are very transient.

(d) In view of this sensitivity, and the incidence of peaks - up to 5% - it seems clear that the problem now is not one of controlling the general background level but of decreasing the number of peaks.

(ii) Personal Monitoring Results

The results suggest that on these plants we are close to achieving a 25 ppm TWA since the average TWA's are in the 10-12 ppm range: but we still, on the majority of the plants get 6-15% of all TWA's above 25 ppm. The example of Plant A might suggest however, that some improvement of the figures would result from more accurate personal monitoring.

(iii) In Summary,

there is a need for more work on all these plants to achieve closer correlation between sequential and personal monitoring so that accurate control can be established. The indications, though, are that, with close attention to detail, all these plants can be brought within the personal TWA of 25 ppm and that with continuing team effort and further engineering changes an 8 hour TWA for every operator significantly below 25 ppm should be achievable.

Plants G to I

Information on atmospheric levels in these plants is so far derived solely from grab-sampling. It is much more limited; and action to deal with specific causes of VCM emissions has therefore been more difficult. For the reasons given earlier when discussing grab sampling, the average results for atmospheric concentrations in the table may be giving an optimistic picture of the true situation. However the (limited) personal monitor results suggest a similar position to that of the sequentially monitored plants (A to E), which is what we would hope for, since the same types of process and engineering modifications have or are being incorporated on all plants.

Plants E and F

These are important results since both these plants are of the open-air type; and Plant F is the newest in the UK with the largest autoclaves, and already incorporates most of the modifications planned for the other plants. The plant therefore represents the best that has been achieved in modern practice and technology, and it ought to give us some guidance on the ultimate we can strive towards with all our plants. In using it as a guide however we must note that the other plants, with all modifications completed, will probably always run at somewhat higher levels than Plant F since they do not have the intrinsic advantage of large reactors and open structures.

Unfortunately, in view of its importance, this plant has been operating at low output for the last few months. As a result the average atmospheric concentration of 5 ppm may be optimistically low. Certainly, an all-out approach at full output, to minimising concentrations has not been possible: and the measurement of meaningful personal exposures has equally been impossible so that we do not know what these are. By analogy with Plant E however it seems possible that personal TWA's ought to be at the 10 ppm average level: and the distribution of results may be quite narrow.

(d) Conclusions from Total Data

(i) More work needs to be done and data obtained on atmospheric levels and personal exposures in all plants.

(ii) Adequate sequential monitoring methods for atmospheric measurement are known and are being installed.

(iii) Development of improved, more reliable personal monitors is required and is under way - but will take time.

(iv) In the meanwhile, more precise correlation between the two methods is required in order that the main control mechanism may be through sequential monitoring.

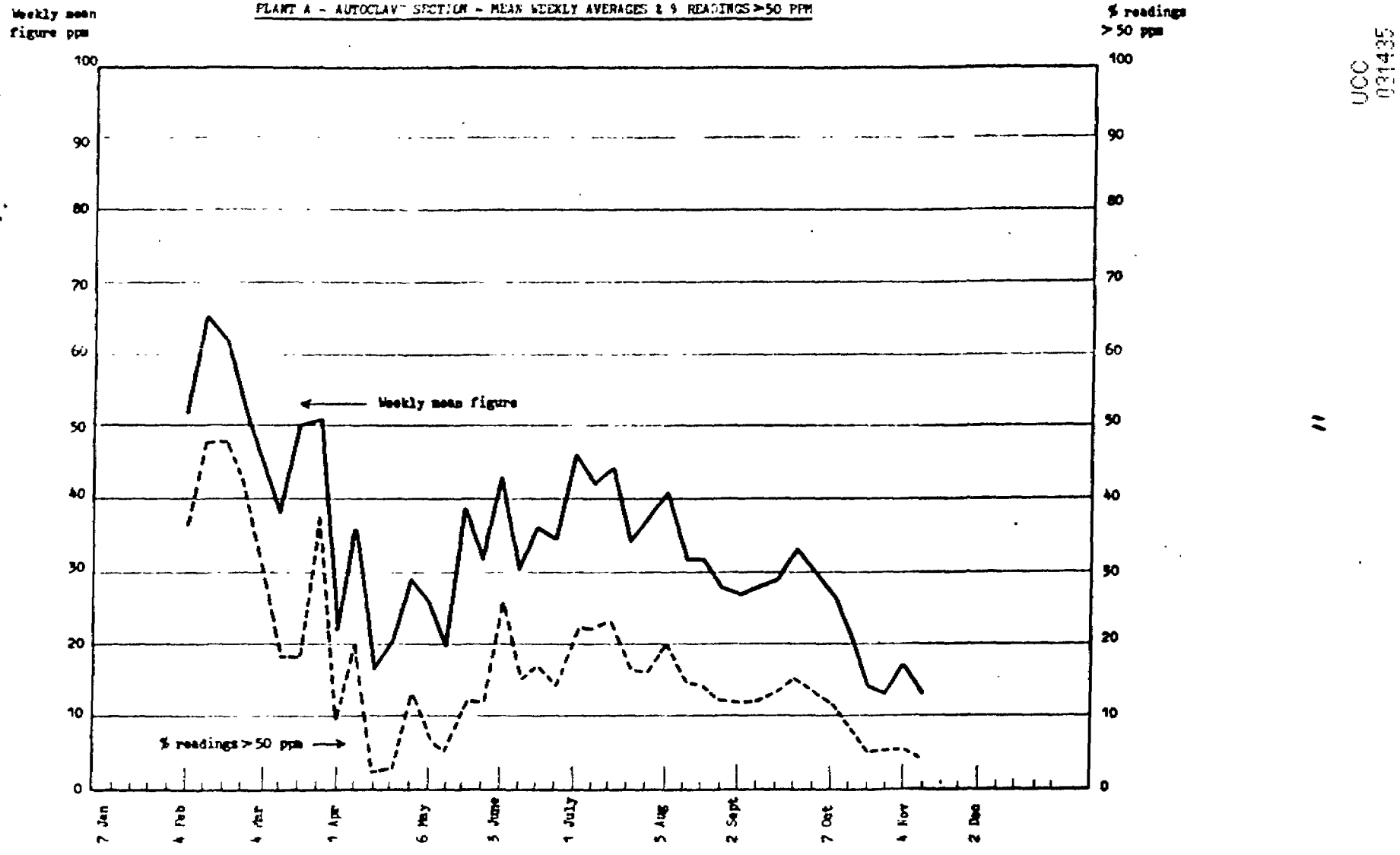
(v) Despite their present limitations, however, it appears that all plants are approaching conditions where all personal exposures will be below 25 ppm in any 8-hour period. The total achievement of this depends however on engineering work still in progress and then on sustained effort by the whole plant team to reduce the number of short term, higher concentration emissions.

(vi) The industry is already committed to the expenditure of £6m on engineering and process modifications for the reduction of VCM concentrations in the plant atmosphere. (In addition further expenditure will go on reducing environmental emissions and reducing monomer contents of PVC).

(vii) With all this work done, levels will be lower than those recorded in the table. The CIA, in June, mentioned a 10 ppm average concentration in the atmosphere as a possible ultimate target for existing plants. The results so far from all plants suggest that this is achievable but we are now more aware of the spread of results about the mean, and therefore of the increased difficulty of achieving this level for every 8-hour period at every point on the plant. The very limited results from Plant F confirm too that about 10 ppm may be an ultimate level for other plants which do not have its intrinsic advantages: but we shall be able to speak more positively when we have operated this plant normally under controlled conditions.

(viii) One point can be stated categorically. The industry does not regard the achievement of a 25 ppm TWA/50 ppm maximum atmospheric concentration as a stopping point in its efforts. Actions already under way are aimed at getting the lowest possible atmospheric concentrations and, as a result, the lowest possible personal exposures for all plant personnel all of the time. It is expected therefore that the achieved personal TWA levels will, in fact, decrease below 25 ppm as this engineering work is completed and as the work of the plant operating teams becomes increasingly effective It is not expected that the maximum atmospheric levels will decrease so markedly since present indications are that biggest improvements will come from progressive reduction in the number of "leaks" rather than from a reduction in the size of each of them.

A W Barnes


PLANT A - AUTOCLAVE SECTION - MEAN WEEKLY AVERAGES & % READINGS >50 PPM
Weekly mean figure ppm
% readings >50 ppm
100
90
80
70
60
50
40
30
20
10
0
Weekly mean figure
% readings > 50 ppm
7 Jan
4 Feb
4 Mar
1 Apr
6 May
3 June
1 July
5 Aug
2 Sept
7 Oct
4 Nov
2 Dec

PLANT	ATMOSPHERIC CONCENTRATIONS		PERSONAL MONITORING RESULTS		FURTHER IMPROVEMENT EXPECTED THROUGH
A	24 point sequential				
	weekly average (all points)	13 ppm	Average	10 ppm	Team approach and detailed
	8 hour average (all points)	3-22 ppm	Range up to	20 ppm	engineering changes
	8 hour av. (single point)	3-47 ppm	Results over 25 ppm	Nil	
	results over 50 ppm	4%			
B	6 point sequential				
	weekly average (all points)	10 ppm	Average	12 ppm	Ventilation improvement (Feb '75)
	results over 50 ppm	5%	Range up to	44 ppm	Hydrodynamic cleaning
			Results over 25 ppm	15%	Detailed engineering changes
C	12 point sequential (since 9/74)				
	weekly average (all points)	10 ppm	Average	6 ppm	Team approach and detailed
	results over 25 ppm	2%	Range up to	15 ppm	engineering changes
	results over 50 ppm	0.4%	Results over 25 ppm	Nil	Automatic cleaning
D	12 point sequential (since 11/74)				
	weekly average (all points)	15 ppm	Average	13 ppm	Ventilation improvement (3rd Qtr '75)
	results over 50 ppm	2.3%	Range up to	29 ppm	Automatic cleaning
			Results over 25 ppm	5%	
E	12 point sequential (since 10/74)				
	weekly average (all points)	5 ppm	Average	10.5 ppm	Team approach and detailed
	results over 50 ppm	1%	Range up to	24 ppm	engineering changes
			Results over 25 ppm	Nil	
F	Grab samples (40-50 per day)				
	average	5 ppm	No personal figures		Team approach and further
	occasional excursions	>100 ppm	available yet		engineering changes
G	Grab samples				
	weekly average	15 ppm	Average	14 ppm	Ventilation improvement (Jan '75)
	results over 50 ppm	6%	Range up to	42 ppm	Detailed engineering changes
			Results over 25 ppm	10%	Automatic cleaning
H	Grab samples				
	average	14 ppm	Average	13 ppm	Detailed engineering changes
	occasional excursions	>100 ppm	Range up to	40 ppm	Automatic cleaning
			Results over 25 ppm	10%	
I	Grab samples				
	3 monthly average	14 ppm	Average	20 ppm	Engineering and process changes?
	results over 50 ppm	3.5%	Range up to	100 ppm	
			Results over 25 ppm	18%	

DANGEROUS MATERIALS

FEDERAL REPUBLIC

DECISIONS OF THE DANGEROUS MATERIALS COMMITTEE

BMA Notification of 19 March 1975 - IIIb 4-3899.7 - 1387/75

Reference: Artbeitsschutz, 4 April 1975

Recommended industrial concentration (TRK) for vinyl chloride

The recommended industrial concentration for vinyl chloride as from 1.7.75 will be 5 ppm. The TRK value is to be interpreted as the annual mean. The mean concentration over a period of 1 hour must not exceed 3 times the TRK value.

The TRK value applies in particular to fields of activity involving:

a) the production, recovery, storage, drawing-off, conveying and use of vinyl chloride monomer

b) the conversion of vinyl chloride into unshaped vinyl chloride polymers (eg. the production of PVC)

c) dealing with unshaped vinyl chloride polymers and their moulding compositions.

A TRK value of 10 ppm will be imposed for existing plants for the conversion of vinyl chloride into unshaped vinyl chloride polymers (eg. the producti n of PVC). Under a transitional arrangement a value of 20 ppm will be allowed in these plants up to 1.7.76.

The TRK values for vinyl chloride will be reviewed at 1.1.77 and adapted to suit the state of industrial development at that time, taking account of th latest findings in the field of industrial medicine.

Grounds

The decisive factor in establishing the TRK value[1] as an annual mean was that vinyl chloride is currently regarded from the toxicological and industrial medical standpoints as being a harmful substance with a primarily chronic mode of action. It is therefore admissible to use as a basis a long term mean covering a period of one year, assuming an average working week of up to 45 hours.

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(1) For broad definition see: Technische Richtkonzentration für gefährliche Arbeitsstoffe (Recommended industrial concentration for dangerous materials) Arbeitsschutz (1974) No. 5, pp. 169-170

The establishment of three times the TRK value as the mean concentration over 1 hour sets a limit on peak loads. It also makes allowance for the natural fluctuations in the concentration of harmful substances[2].

The following were the decisive factors in establishing the magnitude of TRK value:

a) The results of the steps already taken with regard to process and ventilation technology, giving due consideration to what is likely to be achieved industrially in the near future;

b) The facilities for the analytical determination of the vinyl chloride concentration in the vicinity of the TRK value and for monitoring and recording it[3].

c) The fact that in the light of experiences to date in the industrial hygiene field, the proposed TRK value reduces the risk of endangering health compared with the working conditions used hitherto.

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(2) For industrial regulation on "Measurement planning, statistical assessment" (in preparation) in association with "Recommendations for the measurement and assessment of toxic dusts" see Staub-Reinhalt Luft (1973), No. 1, pp. 1-3 and Coenen W: "Measurement and assessment of the concentration of toxic dusts, particularly those containing silica, in working areas in surface industries", Staub-Reinhalt Luft 31, 1971, No. 12, pp. 484-490.

(3) Brochure entitled "VC/PVC: Procedures for Safeguarding Health" published by the Verband Kunststofferzeugender Industrie eV, Frankfurt (1974).