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Imperial
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Plastics
Division

JUL 09 1974

R. N. WHEELER, JR.

BY AIR MAIL

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U S A

Your ref.	Our ref	Tel ext	Date
RNWJr/ra	WFM/MEW	5161	4 July 1974

Dear Nick

Many thanks for the documents which you sent me under cover of your letter dated 1 June.

I am conscious that currently you will be very involved in the judicial hearings and needless to say on this side of the Atlantic we are all watching the outcome very closely.

I am enclosing herewith a copy of some recent UK press releases which will summarise for you the present position here. In addition, I enclose a copy of the proposed German Code of Practice which we will be discussing shortly with representatives from the German PVC industry.

Regards

Bill Madden
W F Madden

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Department of Employment

8 St James's Square
London SW1Y 4JB
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PRESS NOTICE

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May 17 1974

NEW CODE OF PRACTICE PLANNED TO REDUCE VINYL CHLORIDE RISK

Mr Harold Walker, Parliamentary Under-Secretary at the Department of Employment, today announced that discussions would take place with the TUC and the CBI on the preparation of a code of practice to control the possible health risks from the use of vinyl chloride in industry.

He was answering a question in the House of Commons from Mr Kenneth Lomas MP (Huddersfield West) who asked for a further statement to be made about the action being taken on the known hazards arising from the use in industry of vinyl chloride.

Mr Walker replied:

"The Chief Inspector of Factories has recently invited the TUC and the CBI to participate in discussions with the object of preparing a Code of Practice.

The Code of Practice would deal among other matters with:

1. Methods of limitation of exposure. While the medical information is not yet sufficient to enable a safe limit to be determined we think that, at this stage, it would be sensible to adopt as an interim standard a ceiling value of 50 parts per million and a time weighted average of 25 parts per million, allowing that wherever practicable exposure should be brought as nearly as possible to zero concentrations.
2. A system of monitoring.
3. A system of medical supervision.
4. Methods for the information and training of workpeople in dangers and precautions."

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NOTES TO EDITORS:

1. Vinyl chloride is the basic material from which polyvinyl chloride (PVC) is manufactured. There are four main producers with six main plants. In the UK approximately 500 employees could be exposed to vinyl chloride vapour in the polymerisation process.

2. On January 24, 1974 the Factory Inspectorate received information from the USA that suggested a link between exposure to vinyl chloride vapour and a rare form of cancer, angio-sarcoma. A subsequent search of records in the USA has revealed a total of 13 cases of angio-sarcoma of the liver in vinyl chloride workers. A similar search revealed only one in the UK. The USA cases appear to be associated with very large exposures to vapour over a long period; the one UK case was to an autoclave worker who had entered such vessels for cleaning over a period of some 20 years.

3. Immediately the Factory Inspectorate received this information the six main plants were asked to inform their employees of the risk, which they did. A Chemical Inspector visited the plants to consider improved control methods. Although the published Threshold Limit Value for vinyl chloride was 200 parts per million the industry began immediately endeavouring to reduce exposures to a maximum of 50 parts per million. Monitoring carried out by the Factory Inspectorate Industrial Hygiene Unit showed that substantial progress was being made in improved control. The main exposure was at one stage of the process where workers had to enter autoclaves for cleaning purposes; steps were taken to reduce the need for entry by using high pressure hoses to clean the vessels from the outside. The problems were discussed at all stages with the TUC and the Chemical Industries Association and the proposal to formulate a Code of Practice is the culmination of these discussions. The monitoring work carried out by the Chemical Inspectors gives grounds for believing that it is practicable to adopt a ceiling value of 50 parts per million together with a time weighted average of 25 parts per million.

4. The information is of cases of angio-sarcoma possibly linked with vinyl chloride vapour present at one stage of the polymerisation process; the evidence does not show a link with PVC is in the final manufactured state.

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PRESS
NOTICE

June 18, 1974

VINYL CHLORIDE CODE OF PRACTICE

New evidence on the health hazards associated with vinyl chloride and a reduction in exposure levels were discussed at a meeting on Friday, June 14, between the Factory Inspectorate, and representatives of the TUC, CBI and Chemical Industries Association.

Mr Bryan Harvey, Chief Inspector of Factories, who chaired the meeting, stressed that although only one case of angio sarcoma of the liver probably associated with vinyl chloride had been traced in Great Britain it was necessary to take a cautious attitude. It was agreed that the published standard of 200 parts per million should no longer be accepted and that an interim hygiene standard should be substituted of a ceiling of 50 parts per million and a time weighted average of 25 parts per million, allowing that wherever practicable exposure should be brought as near as possible to zero concentrations. The meeting further agreed that the interim standard would be reviewed as further information became available.

Action was also agreed on the early preparation of a Code of Practice giving detailed backing to the policy of limiting exposure to vinyl chloride. To this end two working parties were set up, one to deal with medical aspects and the other with occupational hygiene. The main working group is to meet at the beginning of August to receive progress reports.

Additionally epidemiological studies of vinyl chloride workers are being mounted, and a prospective mortality study of workers involved in the manufacture and polymerisation of vinyl chloride monomer, separated according to the level of exposure is being set up. A retrospective mortality study of all cases of angio sarcoma is already under way. A census of all processing workers is being considered as the basis of a prospective mortality study of this group, from which it is hoped to provide confirmation of safe exposure levels.

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News Release

Chemical Industries Association Limited,
Alembic House, 93 Albert Embankment, London SE1 7TU

FOR PUBLICATION FRIDAY, 21ST JUNE, 1974

VINYL CHLORIDE - REDUCTION OF VCM CONTENT IN PLANT ATMOSPHERES

Progress on the programme to reduce the level of VCM gas (VCM) in the atmosphere of the UK plants is reported by the VC Committee of the CIA.

Based on many thousands of analyses, the current figures (in parts per million) for the weekly average levels in the working areas within the polymerisation sections are:

<u>Plant</u>	<u>Weekly Average Levels</u>
A	25
B	10
C	10
D	25
E	20
F	40
G	30

These averages are much lower than at the beginning of the present programme.

An indication of the progress which has already been made comes from plant G. This plant now has continuous monitoring of atmospheric levels at six key points, with every point being monitored once every twelve minutes. The current results thus give a very precise indication of the situation at any time. Typical readings from the chart records of this continuous monitoring system over a 12 hour period are shown in the attached photo-reproduction of an actual chart.

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As a result of this monitoring system, about 5000 separate measurements are taken on the plant every week. An indication of the current levels of VCM concentration achieved, and of the progressive reduction since the beginning of the year, are shown in the graph.

Continuous monitoring of this sort, coupled with the use of portable sensing apparatus, makes it possible to track down the source of the very tiny leaks which account for much of the small amount of VCM still present in the plant atmosphere. Once the sources have been identified, design modifications or immediate maintenance can be undertaken to reduce VCM concentrations still further.

Continuous monitoring equipment such as that already installed in plant G, has now been ordered for all the PVC plants, and where necessary this will include the purchase of on-line computer equipment to calculate the average concentration in any area and the exposure of each individual on the plant during any shift.

Measurements have shown that, in all plants, peaks of up to 1-200 parts per million can occur, generally because of minor leakage in the VC handling equipment, but these are of very short duration. Modifications have been put in hand in all plants with the objective of further reducing the short duration peaks, but because of delays in equipment deliveries, these modifications may not be complete for some months. Further reduction in the average levels is also dependant on the rate at which equipment becomes available.

Analytical Techniques

The following analytical techniques are currently in use in UK PVC plants for monitoring the atmosphere in working areas.

When talking about accuracies of measurement, it is necessary to separate two entirely different aspects - the measurement accuracy on a given

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sample and the extent to which that sample represents the general atmosphere. It is accepted in the general field of atmosphere pollution analysis that plant atmospheres are in a state of continual change. As a consequence, we use a number of different sampling techniques according to whether we want instantaneous concentrations or averaged concentrations over various periods and these must be expected to give different results.

1. Gas Chromatography

This is used mainly as a laboratory instrument to which samples are taken from the plant.

The sensitivity of GC to VCM depends on the type of detector used. Those currently in use can easily detect 0.1 part per million of VCM in air injected directly on to the column. Certain sampling techniques involve a stage of preconcentration of the VCM in which case the ultimate sensitivity is less than 1 part in a thousand million. Once a sample of a plant atmosphere has been obtained, the GC technique will measure the concentration in that sample to an accuracy of $\pm 10\%$ down to 1 ppm.

2. Flame Ionisation Detection

This is used both as a detector for a fixed point monitoring system and as a portable analyser.

The sensitivity of FID to VCM is about 1 part per million. The accuracy of the technique depends on the particular equipment in use, fixed equipment usually being rather more accurate than portable equipment.

However, the FID is not specific to VCM and detects practically all organic compounds with approximately the same sensitivity. The accuracy of any particular measurement, therefore, depends on the concentration of other organic compounds in the sample. In practice the reading is usually assumed to be due entirely to VCM and so the instrument will normally give a value which is higher than the true VCM concentration.

3. Infra Red Absorption

This technique is used at present in transportable analysers, but will shortly be used in fixed sample point monitors. The measurement is made at a wavelength at which VCM absorbs strongly but at which other compounds likely to be present absorb only very weakly. The measurement therefore is practically specific for VCM.

The sensitivity of the equipment currently in use is such that 1 part per million can be measured.

The accuracy of the instrument for the analysis of VCM in atmospheres is $\pm 10\%$ down to 10 ppm.



News Release

Chemical Industries Association Limited,
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CIA/1932/2/ER

22nd June, 1974.

CIA BACKGROUND BRIEF:

VINYL CHLORIDE: DEFINITION OF ACRO-OSTEOLYSIS

In some reports in the press and elsewhere, the term "acro-osteolysis" (AOL) is being used unselectively and incorrectly to describe three clinical conditions which have been observed in very small numbers of workers exposed to vinyl chloride and it is felt, therefore, that some clarification is needed.

The first condition is scleroderma, which is a thickening of the skin of the fingers and hands. This occurs in the general population and is not caused only by VC exposure.

The second condition is "Raynaud's phenomenon". This is a condition in which, as a result of the narrowing of the very small blood vessels in the extremities, the fingers become white and painful when exposed to cold. Raynaud's condition is not exclusively caused by VC exposure either. It is also associated with the use of vibrating tools (road drills etc.) and also occurs spontaneously in the general population.

Acro-osteolysis itself is a condition in which, when it is fully developed, there is a softening and wasting of the end bone of the fingers, resulting in a stubbiness of the finger-tips. In a few patients, other

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bones have been affected but deformities have not resulted. The cases discovered have occurred almost exclusively in autoclave workers and it has been found that, on withdrawal from exposure to VC, the bone regenerates, though some stubbiness of the affected fingers remains.

A patient who is loosely described as having "AOL" may, in fact, be suffering from any one or a combination of these three conditions.

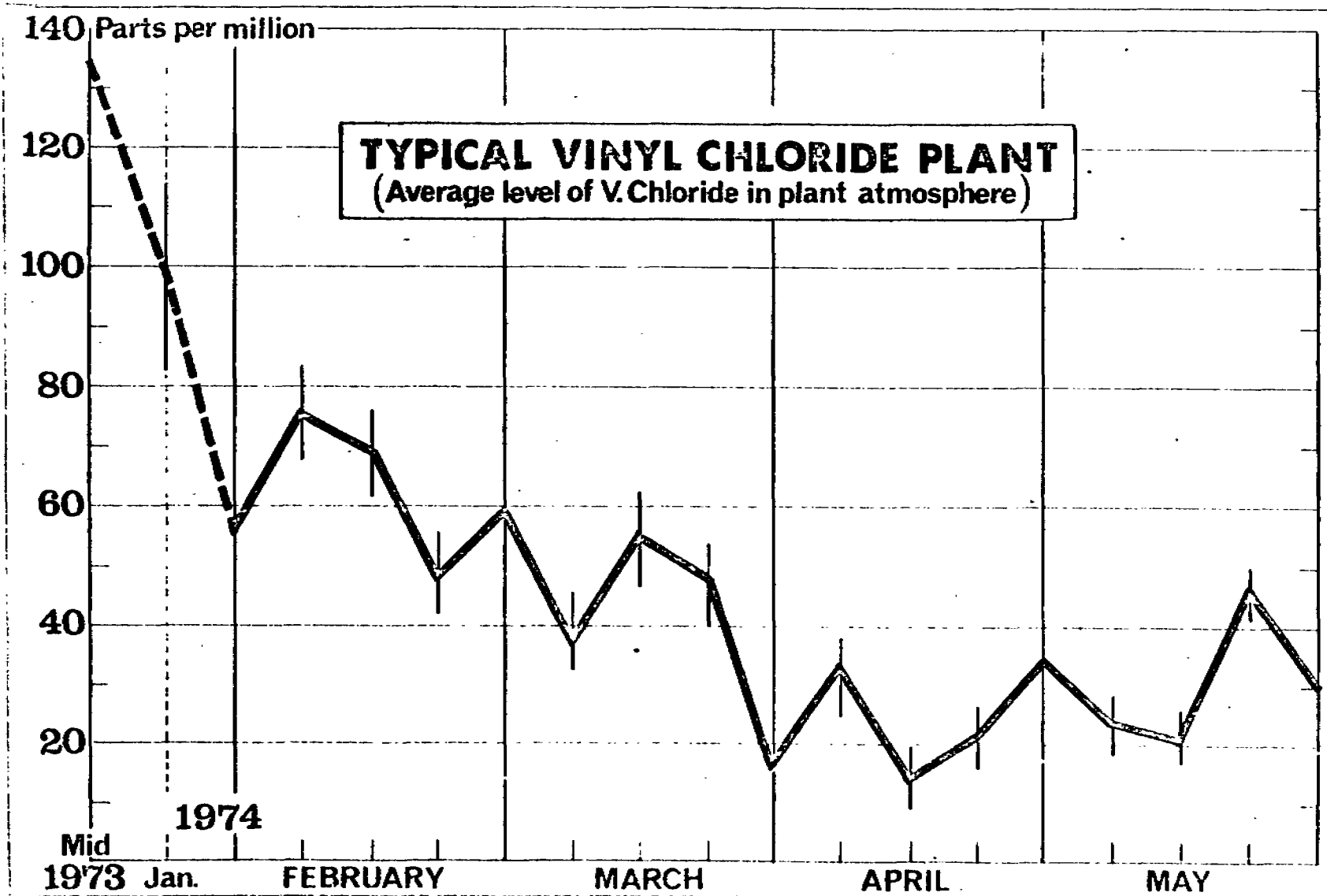
The first case of any of these conditions among workers exposed to high concentrations of VCM was discovered by industry in 1966 and was described in a paper to the medical press in the same year. Since then, there have been six cases of acro-osteolysis among workers in British industry, twenty-one cases of Raynaud's condition (two of them exhibiting scleroderma also) and one case of scleroderma alone.

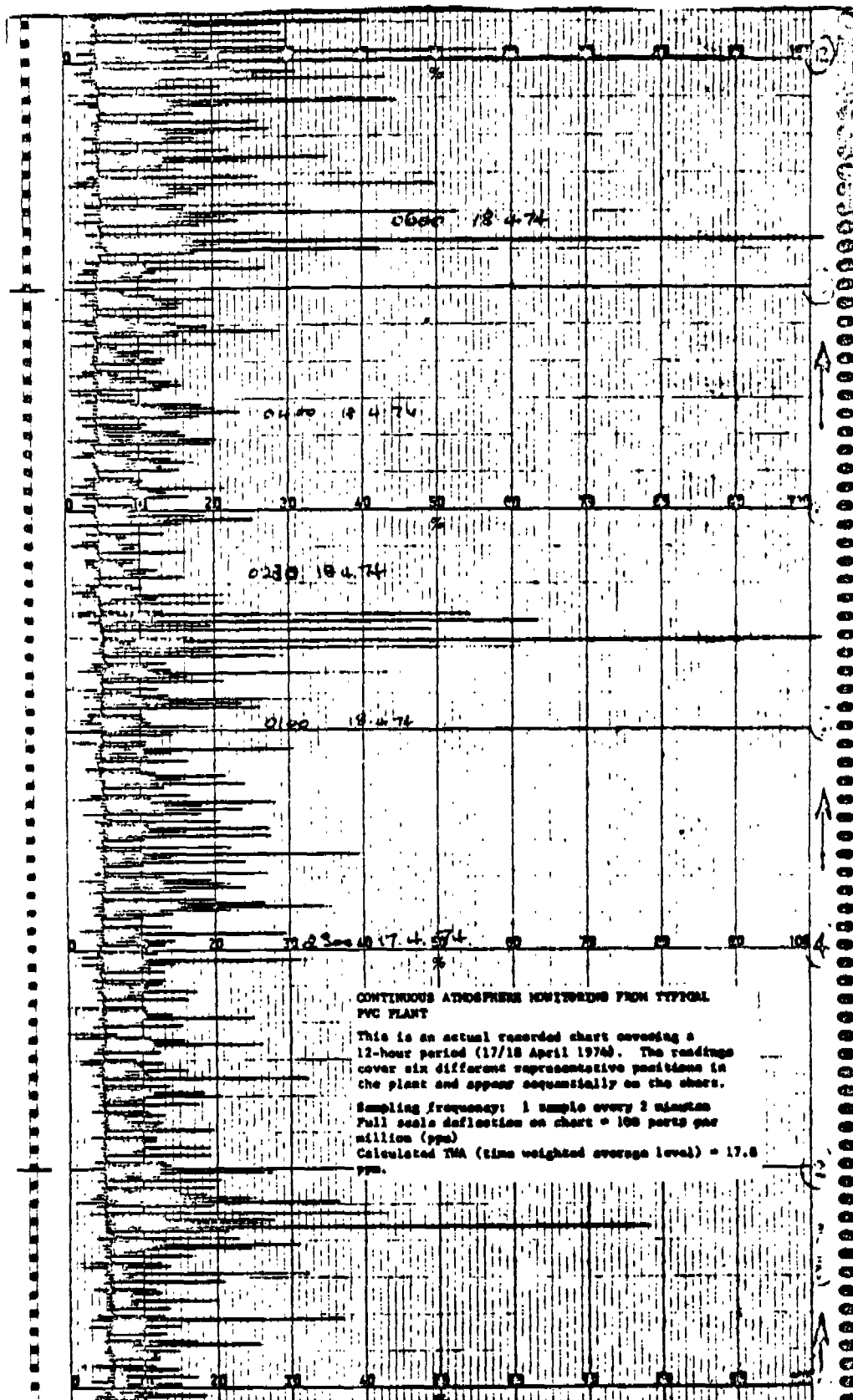
Since the conditions were first observed, rigorous measures have been taken to prevent their occurrence. These measures include an annual X-ray examination of the hands of workers exposed to the highest concentrations of VCM, and continuing efforts to reduce the concentration of VCM on plants to the lowest possible level.

In none of the cases of angiosarcoma (a rare liver cancer) reported from the USA, Germany or the UK has the patient previously suffered from AOL.

WMCM/JC

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10 June 1974

GERMAN ASSOCIATION OF CHEMICAL INDUSTRY EMPLOYERS

CODE OF PRACTICE

for protective measures against health risks when
dealing with vinyl chloride

(Code of Practice for vinyl chloride)

Introduction

Various types of illnesses concerning which nothing or very little is so far known have recently been found in employees engaged in vinyl chloride processing, and particularly in VC polymerisation plants. In this context vinyl chloride includes vinyl chloride together with any additives required for processing. This Code of Practice describes the particular protective measures to be taken during the production and processing of vinyl chloride in order to prevent such illnesses.

1. Scope

This Code of Practice applies to industrial organisations producing, polymerising or in other ways using vinyl chloride. The Code also applies to any industrial process in which the migration of monomeric vinyl chloride from semi-finished or finished products could constitute a health hazard.

2. Existing regulations

Particular attention should be paid to the relevant requirements relating to affected rooms and working areas of §§ 35 and 36 of Section 1 "General Regulations" and § 12 (2) of Section 1.2 "Silos and Bunkers" of the Safety Regulations published by the Employers Association of the Chemical Industry. These are as follows:

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(Extract from Safety Regulations)

UVV Section 1 "General Regulations"

§ 35 (1)

So far as is possible, having regard to local and operational conditions, rooms exposed to dangerous quantities of injurious gases, vapours or dusts should be well illuminated, airy and easy to ventilate; their floors, walls, ceilings and equipment, etc., should be made of materials resistant to the process materials or substances in use and should be easy to clean, wash down and maintain in a clean condition.

(2)

Processes in which the production of dangerous quantities of noxious or highly inflammable gases, vapours and dusts cannot be avoided, are to be carried out, so far as local and operational conditions allow, in closed or protectively housed equipment. If this is not possible, provision is to be made for the safe removal of the toxic substances from the points at which they emanate. If this is also not possible, the rooms should be suitably ventilated, if necessary by air conditioning or other appropriate means. The working places or working areas should be arranged in such a way that employees are protected as far as possible from the injurious effects of gases, vapours and dusts. If necessary, protective clothing (breathing equipment (15), overalls, gloves etc.) should be provided and used.

(4)

In areas exposed to the hazard of large quantities of rapidly spreading dangerous gases a suitable warning signal is to be agreed with the insured parties. In the event of danger the warning signal should be used and the insured parties should leave the area immediately.

(5)

All steps should be taken to prevent waste material present in drainage systems from generating toxic or combustible gases. In every case measures are to be taken to prevent such gases from leaking from the drainage systems into working areas, store rooms, or wash rooms and toilets, etc.

§ 36 (1)

Entry into rooms or equipment, vessels, ducts, or shafts etc. liable to contain accumulations of toxic or narcotic gases or vapours should only be permitted under supervision and only using such particular safety precautions as may be in force at any time (eg continuous ventilation with fresh air, use of breathing equipment (15), ropes secured to the person, etc. (16)).

(2)

The provisions of § 1 also apply to modifications, repairs etc. carried out externally on such rooms, equipment etc.

(3)

Equipment, vessels, containers, shafts etc. into which vapours, or hot or caustic liquids could possibly leak, should only be entered after they have cooled and after they have been sealed off by blank flanges and

(14) See Appendix 4 "Hazardous Chemical Substances" and Appendix 5 "Maximum Allowable Concentration (MAC values)".

(15) See "Directives for the use of breathing equipment designed for toxic gases, vapours and dusts and low oxygen levels" on page 35 and the pamphlet on dust protection published by the German Committee for Breathing Equipment, Carl Heymanns-Verlag, Cologne, Gereonstr.18-32.

(16) See also "Protective measures to be taken on entering containers", page 22 et seq.

all feed pipes, etc., have been turned off.

UVV Section 1.2 "Silos and Bunkers"

§ 12 (2)

Silos and bunkers in which noxious (particularly poisonous), corrosive or irritant gases, vapours or dusts may be present or form or which may be subject to low oxygen levels should only be entered by personnel wearing appropriate breathing equipment.

Regulation relating to implementation of § 12, para. 2:

This requirement is satisfied by the use of breathing equipment approved and tested by the German Committee for Breathing Equipment for the particular conditions obtaining. In the presence of low oxygen levels the breathing equipment used should be independent of the ambient atmosphere.

(End of extract from Safety Regulations)

Particular attention should be paid to the implementing regulations for § 36 of Section 1 "Protective measures to be taken when entering containers" when cleaning or inspecting autoclaves.

3. General requirements

3.1. The management of the industrial enterprises described in Section 1 is responsible for ensuring that this Code of Practice and the generally recognised technical procedures are observed, in addition to complying with existing regulations.

Deviations from this Code of Practice are admissible providing that the same degree of safety is ensured by other means.

3.2. All industrial processes are to be made safe from health hazards due to vinyl chloride. This requirement can be deemed satisfied if the MAC value is not exceeded over prolonged periods or is only slightly exceeded for short periods and provided that protective clothing is worn in possible cases of direct contact (see 4.4.2.4.).

Note: For MAC value see Appendix 5 of Safety Regulations of Employers Association of the Chemical Industry; concentrations in the region of the MAC value are not perceptible by the sense of smell.

3.3. The regulations relating to safe operating procedures and precautions to be taken by the employees are to be drawn up in the form of written instructions.

3.4. Before taking up their employment, the attention of all employees should be drawn to the risks involved in vinyl chloride processing, the relevant safety regulations and all related operating instructions. This should be done at appropriate intervals, and at least once every 6 months, and records to this effect should be maintained.

4. Safety measures

4.1. Ventilation

4.1.1. No special ventilation is normally required on plants standing out in the open.

4.1.2. Plants in enclosed buildings should be naturally ventilated or provided with the necessary air extraction equipment in order to comply with the conditions of 3.2.

4.1.3. Enclosed areas in which vinyl chloride leakages are possible should be provided with extraction equipment ensuring that the vinyl chloride can be safely removed from the leakage points.

Note: For safety precautions when cleaning autoclaves, see 4.4.

4.2. Breathing equipment

Where vinyl chloride is likely to leak in dangerous quantities during the course of maintenance and repair work, appropriate breathing equipment should be worn. Appropriate breathing equipment should be carried by all personnel working in the neighbourhood of safety valves or similar pressure relief equipment.

Note: For appropriate types of breathing equipment, see pamphlet on breathing safeguards ZH 1/134.

4.3. Concentration measurements

4.3.1. The effectiveness of the ventilation methods described under Section 4.1. should be monitored by concentration measurements. The measurement results should be carefully recorded and kept for a period of at least 10 years.

4.3.2. The number and location of measurement points should be clearly indicated in management directives, etc. The requirements for continuous or discontinuous measurements should also be clearly stated, depending on the conditions obtaining at the particular location and on

the type of ventilation methods employed.

4.3.3. Where discontinuous measurements are sufficient, the time intervals between measurements should be clearly indicated in all management directives. At least one measurement at each measurement point should be made during each shift.

4.4. Safety measures to be taken when cleaning polymerisation autoclaves.

The plants and the process should be planned in such a way that the autoclaves only have to be cleaned as seldom as possible. Manual methods of cleaning should be eliminated whenever this can be done.

4.4.1. Mechanised cleaning without entering the autoclaves.

4.4.1.1. Before opening the autoclaves all appropriate measures, eg discharging, washing with water, ventilating, wearing of breathing equipment, etc., should be taken to ensure that personnel are not exposed to health hazards from vinyl chloride.

4.4.1.2. Cleaning equipment, eg automatic spraying devices, should be introduced into pressure vessels, etc., by mechanical methods wherever possible and be operated from the outside with manholes covered.

4.4.1.3. Where cleaning equipment, eg spraying equipment, is operated by hand at open manholes, appropriate measures, eg discharging, washing with water, ventilation and the wearing of breathing equipment, should be taken to ensure that personnel are not subject to any health hazard from vinyl chloride.

4.4.2. Manual cleaning with entry to autoclaves.

4.4.2.1. Before manual cleaning is carried out, mechanised cleaning methods as described in 4.4.1. should be employed, subject to the requirements of 4.4.2.2. below.

4.4.2.2. Where mechanised cleaning methods cannot be used, eg with bulk polymerisation, errors in charge, etc., manual cleaning can be carried out. As vinyl chloride can be given off from gas inclusions in encrusted material during cleaning operations, the following safety measures should be adopted:

4.4.2.2.1. Autoclaves must be ventilated before entry and while work is being carried out in the interior. The airflow should be sufficient to ensure that all parts of the autoclave are adequately ventilated. The air will usually be extracted at the base of the autoclave. The efficiency of the ventilation should be continuously monitored by carrying out measurements of the VC concentration. Continuous measurements can be dispensed with when final cleaning is carried out, provided that no injurious VC concentrations are present.

4.4.2.2.2. If injurious VC concentrations are found to be present, employees are required to leave the autoclaves immediately.

4.4.2.2.3. If injurious VC concentrations cannot be disposed of by ventilation, eg in the case of erroneous charging, breathing equipment functioning independently of the ambient atmosphere should be worn. The foregoing also applies when carrying out cleaning with solvents.

4.4.2.3. Time spent in the autoclaves should be restricted and should not exceed 4 hours in two consecutive shifts for any employee.

4.4.2.4. Durable protective gloves and strong shoes should be worn during the course of all manual operations carried out in autoclaves.

5. First aid

5.1. A doctor should always be consulted whenever personnel engaged on work connected with vinyl chloride complain of sickness or feel unwell. The doctor should always be informed that the person concerned is engaged on work connected with vinyl chloride.

5.2. In cases of acute VC poisoning the victim should be brought immediately into fresh air or placed in a well ventilated room. Clothing contaminated with VC should be removed from the wearer and taken out of the room. To avoid hypothermia the patient should be wrapped in blankets. A doctor should be called immediately.

5.3. The patient should be laid on his side in a secure position (to prevent suffocation) and should not be left unattended.

5.4. If the patient ceases to breathe, artificial respiration should be commenced immediately, if possible using the "kiss of life" method (mouth to mouth or mouth to nose). Oxygen breathing equipment, if available, should then be used to continue respiration. If circulation ceases, the kiss of life should be employed and external heart massage given. Only a suitably trained individual, however, should be allowed to carry out the latter operation. First-aid should continue to be rendered during transport of the patient or until the arrival of a doctor.

5.5. In no case should liquids be administered to an unconscious person.

6. Medical Examinations

No person shall be employed in any of the undertakings or operations mentioned in Section 1 above who has not first been medically examined and passed as fit for such employment by the works medical officer. The medical inspection carried out is to conform with the medical welfare requirements laid down by the German Chemical Industry Employers' Association.

Circulation

Mr G J Sleddon, DSO-320 (6 copies)

Translations Unit, R-J/G.5

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