Annonio - 33

The Society of the Plastics Industry, Inc.
355 Lexington Avenue
New York, New York 10017
(212) 573 9400

RECEIVED
JAN 23 1978
R. W. LASHER

RECEIVED
JAN 30 1978
R. N. WHEELER, JR.

RECEIVED
JAN 12 1978
G. W. YULE

January 4, 1977

RECEIVED
JAN 1 · 1978
R. W. ANNONIO

TO: The PVC Safety Group -

Steering Committee
Health Committee
Manufacturing Technology Committee

Gentlemen:

Attached is material which is being sent to us by Mr. John Stafford of Imperial Chemical Industries Limited (ICI) of London, covering the regulations on vinyl chloride for Germany.

You may wish to review it for comparison with our regulations in the same area.

Very truly yours,

John R. Lawrence

John R. Lawrence
Technical Director

JRL:gm
Attachment

cc: J . E. Hadley, Jr. - Keller & Heckman
G. H. Baise - Beveridge, Fairbanks & Diamond
M. Swetonic - Hill & Knowlton, Inc.

Ronnie Sloane
Please send cc to R.N. Wheeler,
Thanks
Dick

Nick -
any opinions.
Dick

UCC
008094

PO Box No 6
Bessemer Road
Welwyn Garden City Hertfordshire AL7 1HD

Telephone Welwyn Garden 23400 (STD Code 07073)
STD Code from London Area 96
Telex 264251 iciplast Welwyn

Imperial Chemical Industries Limited

Plastics Division

Mr J Lawrence
The Society of the Plastics Industry, Inc
355 Lexington Avenue
New York
New York 10017
USA

RECEIVED JAN 3 1978

Your ref.	Our ref	Tel ext	Date
	JS/MJE/DSO-107	3162	29 December 1977

Dear John

You may care to have the enclosed translation which we have made of a German vinyl chloride directive. It is not an easy document to work through and contains some quite extraordinary provisions, particularly the requirement laid down in 4.4 for a 40 ppm/5 minute alarm level. The Germans have a bee in their bonnets about this 5 minute alarm level and we are doing our best to get some medical/biological explanation of it from the man who originated it. If I get any further information I will let you know.

To those of us who have been involved in arguing with the EEC draft directive on its way through the various stages of the Commission machinery some of the definitions given in this document are familiar. Indeed this sort of German directive obviously played quite a part in the thinking of the Commission when they started out on their draft directive which is still with the Council of Ministers Working Group and looks as if it will be there for some months yet.

With best wishes

Yours sincerely

J Stafford
Division Manager
Health & Environment Protection

FREELANCE TRANSLATION

Languages Unit/TR.15.063a/EHG-H/HDM

8 December 1977

BERUFSGENOSSENSCHAFT DER CHEMISCHEN INDUSTRIE*		
Directive No 2	VINYL CHLORIDE DIRECTIVE	Issued 7.1977
DIRECTIVE ON MEASURES FOR THE PREVENTION OF INJURY TO HEALTH IN THE HANDLING OF VINYL CHLORIDE		

CONTENTS

INTRODUCTION

Characteristic illnesses described as "vinyl chloride disease" have occurred among insured persons in vinyl chloride producing and processing works, particularly in polymerisation plant.

---

* Chemical Industry Employers' Association (particularly concerned with employers' liability insurance)

** There is no direct equivalent for this in English. It is usually referred to by the abbreviation "TRK". Rough translation: Technical Reference Concentration.

The following directive sets forth the industrial hygiene precautions to be observed in the production and processing of vinyl chloride in order to prevent these illnesses.

1 SCOPE

This directive applies to plant in which vinyl chloride (VC) is produced, recovered, transferred, conveyed, converted to unshaped polymers - hereinafter referred to as PVC - or otherwise used. It also applies to plant in which PVC is worked up or processed if insured persons are exposed to the effects of vinyl chloride in the course of their duties.

There are no effects from vinyl chloride if the conditions set out under item 3 of Appendix 2, "Effects of vinyl chloride", are satisfied.

2 CURRENT REGULATIONS

For areas and work-places at risk the relevant provisions of Sections 45, 47 and 4 of Chapter 1 "General Provisions" and Section 12 (2) of Chapter 1.2 "Silos and Bunkers" of the Unfallverhütungsvorschriften (Accident Prevention Regulations) of the Berufsgenossenschaft der chemischen Industrie must in particular be observed.

Accident Prevention Regulations Chapter 1 "General Provisions" (VBG 1)

Section 45

(1) If insured persons are exposed to materials injurious to health, r pathogenic micro-organisms, vibrations, radiation, cold or heat or other influences injurious to health, the employer must, without prejudice t other legal provisions, determine the extent of the danger. If he is unable t

(2) Work in which the evolution of gases, vapours, fogs or dusts injurious to health in dangerous amounts cannot be avoided must

(i) be carried out in enclosed apparatus, or if this is technically impossible or unsuitable,

(ii) the gases, vapours, fogs or dusts injurious to health must be safely extracted at their point of production or emission.

If even this is impossible, the areas must be suitably ventilated, if necessary artificially.

Section 47

Areas in which materials hazardous to health have been found likely to occur in dangerous concentrations or quantities may only be entered by expresaly authorised persons using the necessary safety precautions.

For entry to autoclaves, special attention must be paid to the "Schutzmassnahmen beim Befahren von Behältern" (Safety Precautions for Entry to Autoclaves). They are appended to the Unfallverhütungsvorschrift Abschnitt 1 "Allgemeine Vorschriften" (Accident Prevention Regulati ns, Chapter 1: General Provisions)

Section 4

(1) If exposure of the insured persons to accident or health hazards is not excluded by the plant operating procedures, the employer must make suitable personal protective equipment available and maintain this in proper condition.

(2) The employer must, in particular, make available:

1 Protective headgear, if there is a likelihood of head injuries from collisions, from swinging objects, from objects falling down or falling over, or flying objects, or from loose long hair.

2 Protective footwear, if there is a likelihood of foot injuries from impact or trapping or from objects falling over or falling down or rolling, or from stepping on sharp, pointed objects or from hot materials or hot or corrosive liquids.

3 Protective goggles or masks if there is a likelihood of eye or facial injuries from flying objects, liquid splashes or hazardous radiation.

4 Breathing apparatus, if the insured persons may be exposed to gases, vapours, fogs or dusts which are injurious to health, in particular toxic, corrosive or irritant, or if lack of oxygen can occur.

5 Body protection, if work is carried out with or in the vicinity of materials leading to skin damage or able to penetrate into the human body through the skin, or where there is a risk of burns, chemical burns, scalds, excessive chilling, electric shocks, penetrating wounds or cuts.

Accident Prevention Regulations Chapter 1.2 "Silos and Bunkers", Section 12 (2)

Silos and bunkers in which gases, vapours or dusts which are injurious to health, in particular, toxic, corrosive or irritant gases, vapours or dusts are present or can form, or in which oxygen deficiency can occur, may only be entered with breathing apparatus.

Rule for the implementation of Section 12 Paragraph 2:

This provision is satisfied if breathing apparatus tested by the Deutscher Ausschuss für Atemschutzgeräte and permitted for the purpose in question is used. In the event of oxygen deficiency, breathing apparatus operating independently of the ambient atmosphere must be used.

3 GENERAL REQUIREMENTS

3.1 The employer must ensure that in plant in accordance with Section 1 this directive and the generally recognised rules of the art are observed as well as the existing regulations.

Departures from this directive are permissible if the same safety is ensured by other means.

3.2 Adequate precautions must be taken for reducing the vinyl chloride concentration below the TRK value in all working areas.

For details of the TRK values currently established see Appendix 1.

Concentrations in the region of the TRK are not detectable by odour.

3.3 The conduct of the insured persons in trouble-free operation and in case of break-down must be laid down in a written operating manual.

3.4 The insured persons - even those employed for short periods and occasionally - must be instructed of the danger of handling vinyl chloride, the safety provisions and the operating manual before they take up their duties. The instructions must be repeated at suitable intervals, but at least every six months.

Proof of this must be furnished.

4 SAFETY PRECAUTIONS

4.1 Ventilation

4.1.1 No artificial ventilation precautions are usually necessary in out-door installations.

4.1.2 If emission of vinyl chloride cannot be prevented by artificial methods with plant in enclosed areas, observance of the requirements of Section 3.2 must be ensured by natural or artificial ventilation, depending on the type of structure.

4.1.3 With plant in which vinyl chloride can escape as a result of the process it must be ensured by means of extractors that the vinyl chloride is led safely away at the points of emission.

For safety precautions in the cleaning of autoclaves see Section 4.5.

4.2 Personal Protective Equipment

4.2.1 Breathing apparatus

If vinyl chloride can escape during maintenance and repair work suitable breathing apparatus must be worn. Breathing apparatus must be taken along when working in the vicinity of outlet apertures of safety and venting equipment.

Rules for the proper use of suitable breathing equipment are contained in the "Atemschutzmerkblatt" (ZH 1/134), (Breathing apparatus instructions) published by the Deutscher Ausschuss für Atemschutzgeräte (German Breathing Apparatus Committee).

In the event of oxygen deficiency, or excessive concentrations of injurious material, breathing apparatus operating independently of the ambient atmosphere is required.

The currently valid reports of the Deutscher Ausschuss für Atemschutzgeräte (German Breathing Apparatus Committee) give information on breathing apparatus which has been tested and declared suitable by the German Breathing Apparatus Committee.

4.2.2 Body protection - miscellaneous personal protective equipment.

To avoid direct contact of the skin with liquid vinyl chloride or unstripped crude polymer suitable protective equipment, eg body protection, goggles or masks must be worn.

4.3 Concentration Measurements

4.3.1 The vinyl chloride concentration in the working area must be monitored by suitable test methods. A written record of the test results, eg test strips, hourly averages, must be maintained and kept for at least 2 years. The monthly and yearly average figures for each working area must be kept for 20 years. The same holds for break-downs.

For the use of suitable test systems corresponding to the state of the art and for the evaluation of the test-results reference is made to the "NAMUR-Arbeitsblatt über Vinylchlorid-Messtechnik" ("NAMUR work-sheet on vinyl chloride test methods") (in preparation) and to the Technische Regel (Technical Regulation) "Messplanung, statistische Beurteilung" ("Planning of tests, statistical evaluation") (in preparation).

Unselective test systems may only be used if the measured value for the sum of all the compounds does not exceed the applicable limiting value for vinyl chloride, or if the value of the base-level consisting of other compounds is demonstrated.

4.3.2 The number and location of the test points must be so selected that the results of the tests give a representative picture of the concentration in the whole of the working area. Whether testing must be continuous or discontinuous must be decided on the basis of the production process, the spatial relations and the ventilation procedures used.

In working areas of plant for the production of vinyl chloride polymers in enclosed buildings discontinuous concentration measurements are not generally adequate.

4.3.3 If discontinuous measurements are adequate the time intervals between the measurements must be laid down in the operating manual so that the average value of the vinyl chloride concentration can be determined with sufficient accuracy. The times at which the measurements are made must be chosen on a random basis, and a sufficient number of samples must be taken.

4.4 Break-downs

If the vinyl chloride concentration in a working area rises to more than 40 ppm this must be signalled by an automatic alarm within at most 5 min. The working area must then be evacuated immediately or breathing apparatus must be worn.

With break-downs lasting more than 5 minutes the cause of the break-down must be discovered and the precautions of Section 4.3.1 must be taken.

The warning is only logical where plant conditions require continuous measurement of vinyl chloride.

4.5 Safety Precautions in Cleaning Polymerisation Autoclaves

Plant and processes must be so designed that cleaning operations in the autoclaves are required as rarely as possible. Hand cleaning operations must be substantially excluded.

4.5.1 Mechanised Cleaning Without Entering the Autoclave

4.5.1.1 Cleaning equipment, for example mechanically driven spray equipment, must as far as possible be introduced into the vessel by mechanical means and operated from outside with the manhole covered.

4.5.1.2 If cleaning equipment, eg hand-held spray equipment, is used with the man-hole open, it must be ensured by suitable precautions before opening the autoclave, eg by evacuation, washing with water, ventilation, and the wearing of breathing apparatus that the operator is not exposed to vinyl chloride concentrations above the TRK.

4.5.2 Manual Cleaning where the Autoclave must be Entered

4.5.2.1 Before manual cleaning, save where provided by Section 4.5.2.2, mechanised cleaning must be carried out in accordance with Section 4.5.1.

4.5.2.2 If mechanised cleaning is impossible because of process factors, eg in bulk polymerisation or with faulty batches, manual cleaning may be carried out. Since vinyl chloride may be liberated from gaseous inclusions in the build-up in cleaning or re-cleaning, the following precautions must be taken.

4.5.2.2.1 Before entry and during work inside them the autoclaves must be ventilated. The extent and conduct of the ventilation must be such that the TRK is not exceeded in any part of the autoclave during the work inside it.

This requirement is satisfied if there are not less than 30 changes of air per hour.

In the general case the air will be extracted from the bottom of the vessel.

If this number of changes of air is not achieved the vinyl chloride concentration must be continuously monitored by check measurements.

If a VC concentration of 40 ppm is exceeded the employees must immediately evacuate the autoclaves or wear breathing apparatus.

4.5.2.2.2 If it is impossible to achieve values below the TRK by changing the air, eg with faulty batches, breathing apparatus independent of the ambient atmosphere must be worn. The same applies to cleaning with solvents.

4.5.2.3 The time spent inside must be limited.
The time spent inside shall not exceed 4 hours in two consecutive shifts for any employee.

4.5.2.4 In all manual work in autoclaves sturdy protective gloves and sturdy shoes must be worn.

5 FIRST AID

5.1 If insured persons handling vinyl chloride complain about health disturbances a doctor must be consulted immediately. The doctor must be informed that the patient has been working with vinyl chloride.

5.2 In acute vinyl chloride poisoning the victim must be brought into the fresh air or a well-ventilated room as soon as possible. Garments contaminated with vinyl chloride must be taken off and removed from the room. To avoid chills the victim must be wrapped up. A doctor must be called immediately.

5.3 The victim must be laid on his side and supported in that position (otherwise there is a danger of suffocation). If possible he should not be left unattended.

5.4 If the patient is not breathing, artificial respiration must be administered immediately by suitable means, if possible by mouth-to-mouth or mouth-to-nose resuscitation. If oxygen breathing apparatus is available, further resuscitation must be continued with this. If circulation has stopped, external heart massage must be carried out in addition. However, the latter must only be carried out by First-Aiders who have received special instructions in this method. The life-saving measures must be continued during transport or until a doctor arrives.

5.5 Unconscious persons must not be given any liquids.

6 PRECAUTIONARY WORKS MEDICAL EXAMINATIONS

If there is a likelihood that insured persons will be exposed to the effects of vinyl chloride in the course of their duties, the employer may employ in his plant and departments according to Section 1 only insured persons who have been examined by an authorised doctor before employment and at the prescribed intervals during their employment and for whom there is a certificate that there are no health objections to their employment.

The selection of the insured persons to be examined must be based on the

The examinations must be carried out in accordance with "Der Grundsatz für arbeitsmedizinische Vorsorgeuntersuchungen bei Einwirkung von* Vinylchlorid" ("Fundamentals of Precautionary Works Medical Examinations where there are effects from vinyl chloride") published by the Berufsgenossenschaft der chemischen Industrie, Heidelberg.

---

* Translator's note: The words "bei Einwirkung von" do not appear in the text but have been restored from the complete title given in Appendix 2.

APPENDIX 1

THE TRK FOR VINYL CHLORIDE*

A value of 2 ppm was laid down on 1.7.77. as the TRK value. The concentration must not on average exceed three times the TRK value for a period of one hour. This value applies in particular to working areas in:-

(a) the production (newly built plant), recovery, storage, transfer, conveying and use of vinyl chloride monomer.

(b) the conversion of vinyl chloride to unshaped vinyl chloride polymers (newly erected PVC production plant).

(c) the handling of unshaped vinyl chloride polymers and their moulding compounds.

A TRK value of 5 ppm has been laid down for existing plant for producing vinyl chloride monomer and existing plants for producing PVC.

EXPLANATIONS[1)]

The TRK values are to be understood as yearly average values for a daily exposure generally not exceeding 8 hours and not longer than 40 hours weekly - or in four-shift working 42 hours per week as an average of four successive shifts.

---

* Decision of the Ausschuss für gefährliche Arbeitestoffe

1) Arbeitsschutz (1977), No 6, p 128

APPENDIX 2

EFFECTS OF VINYL CHLORIDE

The definition of the term "effect" which applies is in essence the general definition laid down by the Ausschuss für gefährliche Arbeitsstoffe (Hazardous Materials Committee), published in Arbeitsschutz 5/74 p 170, which reads as follows:-

"An effect within the meaning of the Order must be assumed wherever there is a risk of a hazardous material causing acute or chronic injury to health, in particular if

1) the concentration measured in the work-place is repeatedly found not to be below the maximum concentration for the work-place and/or

2) the results of determinations of the material or its metabolites in the body or body fluids of the employee or other medical investigations demonstrate that under the existing working conditions and in the light of our knowledge of industrial hygiene and toxicology there is a likelihood of an injury to health.

An effect within the meaning of this Order is not to be assumed if on the basis of sufficient medical or industrial experience the risk of injury to health does not exist.

In handling carcinogenic materials the presence of an effect must be supposed as a rule.

The concentration may not on average exceed three times the TRK value for a period of 1 hour.

Thus a limit is also placed on peak levels; the amplitudes of fluctuation of the concentration of injurious material are taken into account at the same time.

The decisive factors for fixing the TRK value are:-

- the ability to determine the concentration of the injurious material in the region of the TRK value.

- the current technical state of the process and ventilation precauti ns having regard to what is within technical reach in the near future.

- that present knowledge of industrial hygiene is not inconsistent with it.

If there is a likelihood of insured persons being exposed to the effects of vinyl chloride during their duties they must undergo precautionary works medical examinations in accordance with No 21 of Supplement 2*) to Section 50 No 1 of the UVV (Unfallverhütungsvorschriften, Accident Prevention Regulations). The first re-examination must take place 6 to 12 months after the first examination, further re-examinations after 12 to 24 months.

The examinations must be made by authorised doctors having regard to "Der Grundsatz fur arbeitsmedizinische Vorsorgeuntersuchungen bei Einwirkung von Vinylchlorid", published by the Berufsgenossenschaft der chemischen Industrie.

A guide to the selection of the group of persons to be examined is given by the following material-related definition of the term "Effect of vinyl chloride".

Physico-chemical Properties of Vinyl Chloride

Vinyl chloride (monochloroethylene) under normal conditions is a colourless, readily flammable gas with a faint sweetish odour. At 760 mm Hg it condenses at -14°C to a colourless, mobile liquid. Vinyl chloride is readily soluble in almost all organic liquids. It is only sparingly soluble in water; when suspension media, stabilisers or emulsifiers are used it can be finely dispersed in water by stirring. In the absence of air and light, pure, dry vinyl chloride is stable in the gaseous and liquid state and non-corrosive. The chemical reactions of vinyl chloride are restricted almost

*) In preparation

exclusively to the reaction of the double bond. The chlorine atom, as the second functional group, can only be replaced with great difficulty. The most important property of vinyl chloride is its ability to polymerise.

Formula:	$CH_2 = CHCl$
Melting point:	- 154°C
Boiling point:	- 14°C
Density at 20°C:	0.91 g/cm^3
Vapour-density (air = 1):	2.16
Vapour-pressure at 20°C:	2,580 mm Hg
Explosive limits in air:	3.8 - 29.3% v/v 95 - 770 g/m^3

Because of its carcinogenic action vinyl chloride is no longer given an MAK value. For this reason the Ausschuss für Gefährliche Arbeitsstoffe (Hazardous Materials Committee) has laid down a TRK value for vinyl chloride. For existing VC- and PVC- production plant this is 5 ppm or 13 mg/m^3 and for other plant 2 ppm or 5 mg/m^3. (TRgA 102, published in "Arbeitsschutz" 6/77, pp 127-128).

Material-related definition of the term "Effect of vinyl chloride"*.

1 An effect of vinyl chloride is in general to be assumed where work with vinyl chloride or vinyl chloride-containing materials is carried out and vinyl chloride is absorbed by inhalation or there is contact of the skin with liquid vinyl chloride, if the conditions set out in Nos 3 or 4 below do not apply.

*

2 An effect of vinyl chloride or vinyl chloride-containing materials is in particular to be assumed for the modes of operation, jobs or activities mentioned in the Appendix,
or modes of operation, jobs or activities comparable with these.

3 An effect of vinyl chloride or vinyl chloride-containing materials is <u>not</u> to be assumed for a mode of operation or job or for activities:

3.1 if it is demonstrated by years of experience of industrial hygiene - including the available data on exposure - that no injury to the health of employees from vinyl chloride has occurred and none is to be expected if the working conditions remain the same.

3.2 if, failing such industrial hygiene experience, it is demonstrated, by measurements on the job, that the vinyl chloride concentration in the ambient air is below 2 ppm**).

**) The controlling factor here is the yearly average figure of 2 ppm.
For the period of one hour the concentration may not exceed an average value of 6 ppm (See also on this point the Technische Regel (Technical Rule) TRgA 102 to the Arbeitsstoffverordnung (Working Materials Order), published in "Arbeitsschutz" 6/77, pp 127-128).
For the planning and carrying out of the tests and the statistical evaluation of the data in relation to the question of whether or not the limits are exceeded the currently valid Technische Regeln (Technical Rules) must be followed. See Technische Regel "Messplanung und statistische Beurteilung" (Planning of tests and statistical evaluation, in preparation).

In PVC processing plant the value may be assumed to be safely below the above-mentioned value - so that concentration measurements may as a rule be omitted - if raw materials containing less than 20 mg vinyl chloride monomer per kg* of polyvinyl chloride are used and appropriate ventilation precautions are taken.

4 Short-term or occasional exposure to vinyl chloride or vinyl chloride-containing materials can signify the absence of an effect.

4.1 There is short-term exposure if the working areas are entered for not more than half an hour a day. In this case the average value of the vinyl chloride concentration in the area may not exceed 15 ppm and there must be no direct contact with liquid vinyl chloride.

Typical examples of short-term exposure are patrols by inspection, supervisory, maintenance or management personnel and repair work by craftsmen on previously cleaned apparatus.

4.2 There is occasional exposure if the working areas are only rarely entered. In this case the average value of the vinyl chloride concentration in the ambient air may not exceed 15 ppm and there must be no direct contact with liquid vinyl chloride.

---

* Translator's note: Presumably. The unit is omitted in the original. See attached passage from Sichere Chemiearbeit (p 58) where the "kg" is given.

Typical examples of occasional exposure are visits to factories and work-places by works doctors, safety engineers, inspectors, customers or visitors.

Work by craftsmen which is not directly connected with production or processing is to be treated under the remaining provisions f Paragraph 1 as occasional exposure up to 4 weeks per annum. Typical examples of this are painting of walls and ceilings, laying electric cable and lighting fixtures, installation of a new plant.

APPENDIX TO ITEM 2

There is likelihood of an effect in plant for the production, polymerisation or other use of vinyl chloride and in working areas in which vinyl chloride can arise in significant quantities from intermediate or final products. (see also 3.2).

There is, in particular, likelihood of an effect with jobs (including long-term cleaning and repair work) in the following areas:

Vinyl chloride production

Vinyl chloride transfer equipment

Polyvinyl chloride production, including the following work-up plant:

- Emulsion and suspension tank installations
- Centrifuges
- Driers
- Bagging equipment (if in the same building as the work-up plant)
- Intermediate store for PVC

Semi-technical plant.

SICHERE CHEMIEARBEIT P 21811E XXIX,8,1977, PP 57-60

(BULLETIN OF THE BERUFSGENOSSENSCHAFT DER CHEMISCHEN INDUSTRIE)

CHANGES IN THE VINYL CHLORIDE DIRECTIVE

The Board of the Berufsgenossenschaft der chemischen Industrie has decided to amend the "Richtlinien über Schutzmassnahmen zur Verhütung von Gesundheitsschäden beim Umgang mit Vinylchlorid" (Vinylchlorid-Richtlinien) ("Directive on safety precautions for preventing damage to health in the handling of vinyl chloride" (Vinyl Chloride Directive)). The new directive comes into force on 1.7.77.

The changes in the previously current Vinyl Chloride Directive have become necessary for the following reasons.

1 The Ausschuss für gefährliche Arbeitsstoffe (Hazardous Materials Committee) has decided on a new TRK value for vinyl chloride, which applies from 1.7.77.

2 The provisions of the Unfallverhütungsvorschrift Abschnitt 1 "Allgemeine Vorschriften" (Accident Prevention Regulations Chapter 1 "General Provisions") set out in Section 2 "Current Regulations" of the vinyl chloride directive must be replaced by the corresponding provisions of the Accident Prevention Regulations which apply from 1.4.77.

3 Break-downs in which a permissible VC concentration is exceeded need to be subject to regulations.

The important changes relate to the following sections:

In Section 1, "Scope", the applicability of the directive to plant in which PVC is finished and processed is aimed at the effects of vinyl chloride. In general there are only very few working areas in these plants affected by vinyl chloride.

There is no effect from vinyl chloride if the conditions set out under numbered item 3 of Appendix 2 "Effects of vinyl chloride" are satisfied.

In Section 2, "Current Regulations", as already stated, the provisions f the Unfallverhütungsvorschriften Abschnitt 1 "Allgemeine Vorschriften" (Accident Prevention Regulations Chapter 1, "General Provisions") which apply from 1.4.77. have been incorporated.

Section 3.2 has been amended in that the aim of protection is now specified as the reduction of the VC concentration below the TRK value.

The requirement for the monthly and yearly average values for each working area to be kept for at least 20 years has been newly incorporated in Section 4.3.1. The same applies to break-downs. The test results, eg test stripe, hourly averages, on the other hand only need to be kept for at least 2 years.

In respect of the appropriate test system in accordance with the state of the art reference is made to the "Namur-Arbeitsblatt über Vinylchlorid - Messtechnik"and the Technische Regeln "Messplanung, statistische Beurteilung" ("Namur Work sheet on vinyl chloride test methods" and Technical Rule "Planning of tests, statistical evaluation"), which are both in preparation.

In addition, this section sets out the conditions under which non-selective test-systems may be used for measuring the vinyl chloride concentration.

Section 4.4 "Break-downs" has been newly incorporated in the directive. The test-system must be so adjusted that if the vinyl chloride concentration exceeds 40 ppm in a working area an alarm is given automatically after not more than 5 minutes.

A further note must be drawn up on these regulations giving suggestions of how this requirement may be satisfied with the test systems installed.

Section 4.5.2.2.1, which corresponds to previous Section 4.4.2.2.1, goes further and has been re-worded, since the extent and conduct of the ventilation during the cleaning work in the autoclaves must be such that the TRK value is not exceeded in any part of the autoclave.

This requirement is in all cases satisfied by 30 changes of air per hour. If this number of changes of air is not attained the vinyl chloride must be continuously monitored by check measurements.

If a VC concentration of 40 ppm is exceeded the employees must immediately evacuate the autoclave or wear breathing apparatus.

The wording of Section 6 "Precautionary Works Medical Examinations" has been adapted to Section IV "Arbeitsmedisinische Vorsorge" ("Industrial Hygiene") in the Unfallverhütungsvorschrift Abschnitt 1 "Allgemeine Vorschriften" (Accident Prevention Regulations, Chapter 1,"General Provisions").

Appendix 1 "Technische Richtkonzentration für Vinylchlorid" (Technical Reference Concentration for vinyl chloride) has been amended in accordance with the new TRK values of 5 ppm for existing VC and PVC production plant and 2 ppm for all other plant, which apply from 1.7.77.

The "Effects of vinyl chloride" has been added to the directive as an Appendix.

EFFECTS OF VINYL CHLORIDE

SELECTION OF THE GROUP OF PERSONS TO BE EXAMINED

Vinyl chloride disease has occurred for some years in the German Federal Republic in some plants in the VC/PVC producing industry. In the present state of our knowledge this occurrence was to be ascribed to the high concentrations of vinyl chloride monomer in the ambient air of these plants. After drastic reduction of the concentration of vinyl chloride monomer in the ambient air of the plants concerned by observing the directive "Vinylchlorid-Richtlinien" (Vinyl Chloride Directive) published by the Berufsgenossenschaft der chemischen Industrie, there is a reasonable hope that if all the safety precautions are observed present working conditi ns may no longer cause damage to health.

On the first cases of sickness becoming known the Berufsgenossenschaft der chemischen Industrie laid the foundations for special precautionary works medical examinations, in which the insured persons exposed to the effects of vinyl chloride are examined. As with all other materials injurious to health and hazardous activities the question arises with vinyl chloride of the selection of the group of persons to be examined. In future specific definitions of the term "effect" will be a guide to the employer responsible for this matter. A panel of works doctors, technologists, toxicologists and representatives of Berufsgenossenschaften and public bodies will give the employer from their expert knowledge suggestions for the selection of the group of persons to be examined. Such a definition now exists for the effects of vinyl chloride.

The group of persons to be examined is mainly to be sought among those employed in VC or PVC production plant in which vinyl chloride disease has occurred in the past. Even in this area, however, a concentration of less than 2 ppm in the ambient air or brief or occasional exposure may justify dispensing with the carrying out of precautionary works medical examinations. There will therefore also be working areas in the PVC processing industry in which, because of present working conditions, special precautionary works medical examinations are unnecessary. If, however, personnel are employed who have earlier been exposed to fairly high vinyl chloride concentrations, their state of health must continue to be monitored by subsequent examinations.

Practical experience has shown that special precautionary works medical examinations are in principle unnecessary in plant of the PVC processing industry. There is a reference to the conditions necessary for this in item 3.2 of the definition of "effect". Plant in which a raw material (PVC powder or granules) is processed, whose producer guarantees a content of less than

20 mg of vinyl chloride per kg of PVC, may dispense with precautionary works medical examinations. This statement is based on the fact that if the ventilation precautions usual in this plant are maintained the vinyl chloride concentration in the working area is certainly below 2 ppm.

If the producer cannot guarantee the above-mentioned vinyl chloride level, measurements of the concentration in the ambient air must be made in the PVC processing plant. If as a result, it is not certain that the vinyl chloride in the ambient air is below 2 ppm, safety precautions and/or special precautionary works medical examinations are necessary. The competent technical inspector will advise on questions connected with this. It must be clearly stated that vinyl chloride disease does not occur on working with the finished PVC plastic. If this plastic is subjected to hot working (eg welding) hydrogen chloride may be split off by thermal decomposition. The problems connected with this may be safely overcome by ventilation and have nothing to do with vinyl chloride disease.

[The bottom half of p 58 and the top half of p 59, which have been reproduced in the body of the text, (pp 17-21) are not repeated here.]

HANDLING OF HAZARDOUS MATERIALS

NEW TRK VALUES

The Ausschuss für gefährliche Arbeitsstoffe (AgA) (Hazardous Materials Committee) in its session of 17.3.77. inter alia approved the new text of Technische Regel (Technical Rule, TRgA) 102 "Technische Richtkonzentration (TRK) für gefährliche Arbeitsstoffe" ("Technical Reference Concentrations for hazardous materials") (See Arbeitsschutz 6/1977).

TRK List

Material	ppm	TRK mg/m^2	Notes
Arsenic and its compounds (except arsine[1])	-	0.2	Calculated as As in total dust
Asbestos[2] Chrysotile, Amosite	-	0.1 or 2 fibres/cm^3	Asbestos as fine dust[4] Definite of fibre: Length > 5 µm Diameter < 3 µm Length/ Diameter > 3:1
Fine dust[2] containing asbestos (chrysotile, amosite)	-	4.0	Fine dust[4]
Benzene	8	26	-
Nickel and its compounds (except nickel carbonyl[1])			
Nickel electrolysis and plating baths	-	0.05	Calculated as Ni in total dust[3]
Otherwise	-	0.5	" " "
Vinyl chloride			
Existing VC and PVC production plant	5	13	-
Otherwise	2	5	-

1) There are MAK values for this material.

2) The TRK values for fine asbestos dust and fine asbestos-containing dust were worked out by the "Kommission zur Prüfung gesundheitsgefährlicher Arbeitsstoffe" der Deutschen Forschungsgemeinschaft (the "Committee for Testing Materials Hazardous to Health" of the German Research Association).

3) By total dust is here meant the fraction of the dust which can be inhaled. It is determined with sampling apparatus at a suction rate 1.25 m/S ± 10%.

4) By fine dust is meant the dust passing into the alveoli. This comprises a body of dust passing a separator system whose action corresponds to the theoretical separation function of a sedimentation separator which separates up to 50% of particles of aerodynamic diameter 5 µm.

EXPLANATIONS

The TRK values are to be understood as yearly average values for a daily exposure generally not exceeding 8 hours and not longer than 40 hours weekly - or in four-shift working 42 hours per week as an average of four successive shifts.

The concentration may not on average exceed three times the TRK value for a period of 1 hour.

Thus a limit is also placed on peak levels; the amplitudes of fluctuation of the concentration of injurious material are taken into account at the same time.

The decisive factors for fixing the TRK value are:-

- the ability to determine the concentration of the injurious material in the region of the TRK value

- the current technical state of the process and ventilation precautions having regard to what is within technical reach in the near future.

- that present knowledge of industrial hygiene is not inconsistent with it.

While the general definition of the term Technische Richtkonzentration (Technical Reference Concentration) in this TRgA has been taken over unchanged from TRgA101 "Definitions", a list of TRK values has been newly incorporated. The explanations of the TRK values have also been newly devised.

Circulation

Dr J Stafford, DSO-107

Dr J H Wilson, DSO-320

Dr P P Manning, DSO-320

Mr V Morris, DED, Runcorn (3 copies)

Mr G Norcross, ICI Europa Limited (3 copies)

Mr C G Jones, B-1 (3 copies)

Library, Plastics Division, LIBR.

Languages Unit, R-J/G.5