CHEMICAL MANUFACTURERS ASSOCIATION

January 22, 1980

Dr. Leo W. Ziemlak
American Hoechst Corporation
Route 202-206 North
Somerville, New Jersey 08876

Dear Leo:

Thank you for your letter of January 14. A copy of the study conducted by the prestigious Institute of Occupational Medicine and entitled, "An Epidemiological Study of Respiratory Disease in Workers Exposed to PVC Dust" is enclosed. Also enclosed is a copy of Dr. Stafford's letter to Dr. Anthony Robbins, NIOSH, Cincinnati. Dr. Stafford's letter presents a perceptive historical perspective as well as a thorough-going recapitulation of ICI's investigative work on PVC dusts to date.

During one of your visits to CMA offices, please stop by and we'll have a moment or two of Mellon Institute Old Home Week. It was good to hear from you.

Kindest personal regards.

Sincerely,

J. T. Seawell

JTS:das

Enclosures

CMA 004119

JAN 10 1980

AMERICAN HOECHST CORPORATION

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MY DIRECT DIAL NUMBER IS 685- 2021

January 14, 1980

Mr. J. T. Seawell
Chemical Manufacturers Association
1825 Connecticut Avenue, N.W.
Washington, D.C. 20009

Re: VCM/PVC - Letter December 13, 1979

Dear Joe:

In your referenced letter, you refer to a study conducted by the Institute of Occupational Medicine (IOM) on "An Epidemiological Study of Respiratory Disease in Workers Exposed to PVC Dust." Would it be possible for you to send me a copy of the report and Dr. Stafford's letter to Dr. A. Robbins of NIOSH?

American Hoechst is a member of CMA and we have plants in Delaware and Illinois engaged in the manufacture of PVC products.

Each time I visit CMA I intend to stop by to say hello, but somehow there never seems to be time.

Best wishes for the New Year.

Very truly yours,

Dr. L. W. Ziemlak

LWZ:ecl

State of California
Air Resources Board

March 27, 1978

Public Hearing to Consider a Limitation on Ambient Concentrations of Vinyl Chloride

Research Division
P. O. Box 2815
Sacramento, Calif.
95812

CONTENTS

I. Introduction

The adverse effects of vinyl chloride (VC) upon human health -- its role as a carcinogen, mutagen and suspected teratogen -- have been discussed in detail in Air Resources Board Staff Report 78-1-1 (available for review upon request) and by several medical experts at the January 25, 1978, meeting of the Board.

After reviewing a substantial body of medical, epidemiological and scientific literature dealing with the toxicity and carcinogenicity of vinyl chloride, the staff was unable to specify any level of exposure other than zero that could be considered safe. However, the staff reasoned that a regulation requiring an ambient level of zero would be, in effect, unenforceable, since violations in the range between zero and the limit of detection inherent in the measurement method selected for monitoring VC could not be detected.

The lowest enforceable ambient standard that could be adopted will depend, then, on the monitoring method specified in the standard. The staff concluded that, if methodologies requiring elaborate, extremely expensive instrumentation are excluded from consideration, standard at the level of about 0.010 ppm with an averaging time of several hours could be enforced using instrumentation that is readily available at a reasonable cost and can be operated by paraprofessional staff.

On the basis of these considerations, the staff recommended that the Board establish, on an interim basis, a maximum allowable level for ambient concentrations of vinyl chloride within the range of 0.01 to 0.05 parts per million, twenty-four hour average.

The State Health Department and its Air Ouality Advisory Committee (AQAC) were generally in concurrence with the staff's position. The AQAC, following discussions at a meetinq on January 18, 1978, advised the Board:

> "In light of the evidence of emissions of vinyl chloride, and the knowledge about the seriousness of its effects, it is desirable to establish an air quality standard, even though the basis would be substantially different than other standards recommended by the Department...."
>
> "The Committee concurs in the Staff Report's position that no exposure level above zero can be considered safe or acceptable. The level for an enforceable standard should reflect the lowest concentration measurable by available and practical methods, and in any event, is not a matter which needs to reflect medical judgement."

Dr. John Goldsmith, in presenting the Health Department's recommendation to the Board, expressed the view that, while a standard within the ranqe recommended in the staff report was appropriate, a standard at the lower end of that range, namely, 0.01 ppm, twenty-four hour average, was preferable. He expressed the general view that, in the case of airborne carcinogens, the only acceptable exposure is the absolute minimum achievable through the application of the best possible controls, accompanied by care and good practice in the operation of facilities.

Other testimony given at the January meeting urged the Board to delay the setting of an ambient air quality standard until the federal NESHAP program is fully implemented in October 1978. Other concerns were expressed relating to the monitoring method proposed by the ARB staff. The Board requested the staff to evaluate the adequacy of the NESHAP program, to obtain additional air monitoring data in the South Coast Air Basin near facilities that emit vinyl chloride, and to notice a public hearing for March or April to consider the regulation of vinyl chloride.

II. Summary and Conclusions

In response to requests made by the Board at the January meeting, the staff has carried out an analysis of the EPA's NESHAP regulations and prepared estimates of the maximum ambient levels of VC that can be expected when the largest VC facilities in California come into full compliance with these regulations. This report presents the results of this analysis along with the results of additional air monitoring work requested by the Board. In addition, an updated discussion of the measurement method proposed for adoption by the Board is presented.

The staff, following a careful review of the federal NESHAP Standard, has reached the following conclusions:

- NESHAP does not, in all cases, require the application of best available control technology. Indeed, some California VC processors are currently installing equipment that provides far more effective control of VC emissions than is called for under NESHAP.

- Enforcement of NESHAP, because of the complexity of its requirements, is extremely difficult and would appear to place inordinate demands upon the regulatory agency charged with ensuring compliance.

- Fugitive emissions from miscellaneous sources such as tank cars and associated unloading facilities, pipe and hose joints, flanges, seals and packing glands are not adequately controlled under NESHAP.

- NESHAP places no upper limit on the total emissions from the stacks of a VC facility; only a concentration limit is specified.

- Although the regulations were developed under a general policy calling for a goal of zero emissions (and, presumably, zero ambient concentration), NESHAP does not assure that community exposure to VC will be maintained below any specified level.

- Finally, NESHAP does not deal adequately with the critical upset/breakdown question. There is no adequate mechanism to minimize such occurrences; there is no specification of measures to be taken to prevent community exposure to high levels of VC when breakdowns occur.

The staff has used air quality simulation modeling techniques to provide the Board with estimates of ambient levels of VC that may result from application of the federal NESHAP regulations. The following conclusions have come from this analysis:

- Point source (stack) emissions from a facility just in compliance with the federal 10 ppm limitation (assuming mass flows scaled to plant throughput) produce maximum 1-hour levels of VC of about 0.01 ppm. Ground level maxima generally occur within 100m of the plant, because of the low bouyancy of the plumes. Twenty-four hour average values at a single monitoring site would be expected to be somewhat lower because of variations in wind direction and mass flow.

- Fugitive emissions of VC play a dominant role in determining ambient VC levels in the vicinity of the plants studied. Using current EPA estimates for fugitive emission rates, our calculations predict that worst case 24-hour average VC levels in excess of 1 ppm could occur immediately downwind of the combined Stauffer - B. F. Goodrich facilities.

- Comparison of these estimates with the results of recent air measurements in the vicinity of VC facilities suggests that the EPA emission factor for fugitive emissions is too high. A more refined inventory of fugitive emissions is clearly desirable.

- Our calculations show that if total emissions (fugitive and stack) from the combined Stauffer - Goodrich facility, potentially California's most critical location, can be reduced to about 0.5 kg/hr, ambient levels of VC outside the facility are not likely to exceed 0.01 ppm, 24-hour average (absent accidental releases of VC under upset/breakdown conditions).

In response to the Board's request in late January, the staff resumed air monitoring activities in the vicinity of VC facilities in the Los Angeles area. In addition, data from monitoring programs conducted by B. F. Goodrich Chemical Company and Stauffer Chemical Company in Long Beach and Keysor-Century Corporation in Saugus have been made available to the staff. These data are discussed in Section IV-C of this report.

Although the unusual weather conditions that occurred during this period were not, on the average, conducive to the buildup of high concentrations of pollutants, a review of the monitoring data by the staff suggests several tentative conclusions:

- Ambient levels of vinyl chloride in the Saugus community have dropped dramatically, relative to those observed in October and November 1977. Although meteorological factors may have accounted for some of the observed change, there appears to have been a substantial decrease in VC emissions from the Keysor-Century facility.

- Air monitoring data from the Long Beach area continue to show VC levels comparable to those reported to the Board in January, with levels less than 0.10 ppm VC.

- Ambient levels of VC in Saugus and Long Beach appear to be averaging well below the worst-case levels predicted by air quality models. This may indicate that fugitive emissions from VC facilities are lower than EPA estimates or, alternatively, that weather conditions have not been conducive to maximum buildup of VC emissions.

In Staff Report 78-1-1, we discussed several candidate methods that are available for sampling and analyzing ambient air to determine the concentration of VC. All of the acceptable methods rely ultimately on the use of a gas chromatograph to analyze the sample. They differed principally in the method of sample collection and in the amount of preparation required prior to analysis.

The method developed by the staff of ARB's Atmospheric Studies Branch uses a bag sampler, followed by direct-injection gas chromatographic analysis. The method found to provide a minimum measurable VC level of about 0.010 ppm with a standard deviation of about ± 0.005 ppm over the range between zero and 1.0 ppm with good linearity.

The staff has done further work on the development of an accurate, reliable and precise measurement method that can be adopted for general use. The results of this work are summarized in Section V of this report. The staff has concluded that:

- The ARB method using direct injection is sufficiently sensitive to provide reliable measurements at the 0.010 ppm level with a precision of ± 0.002 ppm.

- The ARB method can be made less sensitive to hydrocarbon interference by using a different gas chromatographic column than originally proposed. This will increase the ability of

analysts to quantify low concentrations of VC in the presence of relatively high ambient concentrations of hydrocarbons.

- The staff, following discussions with analysts employed by the VC industry, has concluded that other sampling and analysis techniques may also be suitable for monitoring ambient VC. The industry has not yet demonstrated equivalency of it's methods to the ARB method.

III. RECOMMENDATION

Following our original recommendation to adopt an interim air quality standard for vinyl chloride, the staff has explored other options that might be proposed to the Board to achieve essentially the same objectives.

All of those with whom the Board and the staff have discussed the issue -- the State Health Department, the Air Quality Advisory Committee, the Board's ad hoc Panel on Atmospheric Carcinogens and other medical and public health experts -- agree that no exposure to vinyl chloride for any period of time at any level, other than zero, can be said with certainty to be safe. There is no known threshold level for its proven carcinogenic and mutagenic (bacterial effects and so little is known about dose-response relationships for materials such as vinyl chloride that the magnitude of risks associated with low level exposures simply cannot be quantified. There is unanimous agreement, however, among those mentioned that ambient levels of vinyl chloride should be reduced to the absolute minimum -- ideally to zero -- as quickly as possible.

Reliance on the federal NESHAP regulation for vinyl chloride, for which enforcement authority as now been delegated to the South Coast Air Quality Management District (SCAQMD), is one of the

options available to the Bcard. The staff cannot say with certainty how much full compliance with NESHAP will do to reduce community exposure, although it seems likely that some additional control of fugitive emissions will be required to meet an ambient standard in the range of 0.01 to 0.05 ppm, twenty-four hour average.

Of more concern to the staff in making a recommendation on NESHAP are questions of enforceability, apparent loopholes that could permit total VC emissions to increase even while a facility remains in compliance, and inadequate incentive for facility operators to adopt operating and maintenance procedures that will prevent fugitive emissions.

On balance, NESHAP's shortcomings and uncertainties about achieving any specified ambient level under its provisions cause us to recommend against California's relying solely on NESHAP to protect the public health from the adverse health effects of vinyl chloride.

Adoption of an air quality standard for vinyl chloride or other known carcinogens presents other problems. An ambient air quality standard is generally taken to represent a safe or "no effect" level of exposure to the pollutant in question, at least for the vast majority of the population; this generalization

does not apply to vinyl chloride and most other chemical carcinogens. There is a risk, probably extra ordinarily small, but not precisely quantifiable, of grave consequences to ordinary individuals at any level the Board might adopt for a standard. Moreover, since emission rates consistent with attaining an ambient standard vary substantially with prevailing meteorological conditions, a standard for a site-specific pollutant could represent, in industry's eyes, a "license" to pollute up to the level of the standard, absent carefully designed and vigorously enforced emission control regulations.

On the other hand, adoption of a standard or other limits on maximum ambient concentrations of vinyl chloride will ensure that exposure to VC will not exceed a specified level at any location outside the facilities themselves, assuming the SCAQMD and/or the Board use a standard as a basis for developing, adopting and enforcing the appropriate emission regulations to augment, as necessary, the provisions of NESHAP.

On balance, the staff's view is that an ambient standard provides a more effective way of ensuring thatlow levels of vinyl chloride will be maintained in the community.

Therefore, the staff recommends that the Board adopt an ambient standard, to be designated as a significant harm level (a level never to be exceeded) in the range of 0.01 to 0.05 parts per million, twenty-four hour average. The staff further recommends that this standard be adopted pursuant to the Board's authority to establish ambient air quality standards for the protection of the public health Section 39606 (b) of

the Health and Safety Code and to implement and interpret Section 41700, of the Health and Safety Code, which prohibits any person from discharging quantities of air contaminants which endanger the health of a considerable number of persons or the public. By including this latter authority, the Board will distinguish the significant harm level established in February, 1976 for sulfates, which are not associated with the more serious carcinogenic, mutagenic and possible teratogenic effects if vinyl chloride. By referencing 41700, the Board will be establishing a basis for immediate enforcement (e.g., through legal action in a court or abatement proceedings before a district hearing board) which, in the staff's view is appropriate for pollutants with carcinogenic or other special health consequences.

The staff recommends further that the Board require that suitable vinyl chloride air monitoring instrumentation be installed on or near the property lines of facilities using and/or producing vinyl chloride monomer to ascertain whether or not the significant harm level is being violated at locations to which the general public has access. It would seem fair that such instrumentation be installed and maintained by the operators of those facilities, as a part of their existing emission control programs.

The staff recommends further that the Board specify the measurement method developed by the ARB staff and described in detail in Appendix 5 of this report as the one to be used in determining violations of the significant harm level. Although other methods may also be acceptable, equivalency with the ARB method with respect to accuracy, precision and specificity will need to be demonstrated before such methods can be approved.

Finally, the staff recommends that the Board urge the SCAQMD to act expeditiously to formulate and adopt rules and regulations that will ensure that ambient vinyl chloride levels are reduced to and maintained at or, preferably, well below the level designated as a significant harm level.

IV. Evaluation of the NESHAP Program

At its January 25 meeting, the Board requested that the staff assess the adequacy of the NESHAP emission standard as a means of achieving acceptably low levels of vinyl chloride in the community. In addition, the staff was asked to resume its monitoring efforts in the Los Angeles area to gather additional data on current vinyl chloride levels.

Section IV-A, below, provides a discussion of the NESHAP regulation and its enforceability. Section IV-B summarizes the results of air quality modeling calculations of projected ambient levels of VC in the vicinity of facilities in compliance with the NESHAP regulation. Section IV-C provides updated information on ambient levels of VC now being observed in the Los Angeles area, along with a short discussion of the implications of these results with respect to the magnitude of the fugitive emissions problem.

A. NESHAP as an Enforcement Program

The NESHAP Standard for control of VC emissions was adopted by the EPA and became effective on October 21, 1976. A copy of the Standard is attached as Appendix 2. Subsequently, on September 14, 1977, the South Coast Air Quality Management District (SCAQMD) adopted an equivalent regulation, Rule 1005 (Appendix 3 of this report). The authority to enforce NESHAP was delegated to the District on November 23, 1977. Prior to this delegation, in order to meet certain requirements of NESHAP, the EPA issued individual waivers of compliance to each of the four affected facilities in California. The scheduled date for full compliance with NESHAP is October 21, 1978.

1. Existing NESHAP Program

The following is a brief summary of NESHAP for control of VC emissions from ethylene dichloride (EDC), VC monomer and PVC plants. For EDC-VC plants, VC concentrations in gaseous effluents from control devices are limited to 10 ppm. In addition, emissions from the oxychlorination process in EDC plants are limited to 0.2 g/kg of EDC produced. For PVC plants, VC gas concentrations in the effluent from control devices are also limited to 10 ppm for sources preceding the stripper and for the stripper

itself. PVC companies that choose not to strip the residual VC below 400 ppm are required to achieve an emission limitation of 0.4 g/kg of PVC produced for the processes immediately following the stripping operations, namely the blending, centrifuging, drying and packaging. All four facilities in California have chosen the option of reducing residual VC in the resin to 400 ppm. Another requirement for PVC plants is to control VC emissions from reactor openings to 0.02 g/kg of PVC produced.

In EDC-VC and PVC plants, the regulations require that fugitive emissions be captured and controlled. Discharges from relief valves and manual venting of gases are prohibited, except under emergency conditions. As part of the requirement to control fugitive emissions, it is required that a leak detection and elimination program be implemented. In addition, the regulations require extensive monitoring, sampling, analyses, record keeping, and reporting.

The orginal intent of NESHAP for VC was to compel industries to utilize best available control technology (BACT) on emission sources, because VC is a carcinogenic pollutant and is therefore to be controlled to the maximum extent possible. Our analysis of the regulation indicates that in many cases NESHAP does <u>not</u> require BACT and further

control measures could be used. This is supported by the fact that some companies have voluntarily achieved emission rates well below current limitations. For example, one of the PVC plants located in Long Beach has achieved greater than an order of magnitude reduction of residual VC content below limitation levels for some of its resin formulations with the VC stripping process. Moreover, some of the waivers of compliance issued by EPA require installation of control equipment above and beyond the basic requirements of NESHAP, which provides further indication that NESHAP does not represent BACT in all cases.

Table IV-1 summarizes the emission sources in facilities that emit VC, their respective emission limitations and the potential for further emission reductions:

TABLE IV-1

COMPARISON OF EXISTING NESHAP REQUIREMENTS AND AVAILABLE ADDITIONAL CONTROL FOR VINYL CHLORIDE EMISSIONS

Emission Source	Current Limit	Potential Limit
Oxychlorination reactors	.2 g/kg product	By incineration, approach non-detectable (ND) level.
Railroad tank cars	No regulation	No leaks.
Opening of mixing, weighing and holding containers	10 ppm	Vent to incinerator, approach ND.
Polyvinyl chloride reactor opening	.02 g/kg product	By cleaning reactor while closed or ducting losses to incinerator, approach ND.
Reactor exhaust gases	10 ppm	By incineration, approach ND.
Monomer recovery exhaust system	10 ppm	By incineration, approach ND.
Stripper Exhaust Gases	10 ppm	By incineration, approach ND.
Sources following stripper*	400 ppm residual in slurry	Variable depending on type resin being stripped (10-400 ppm).
a) blend tanks	Controlled by stripping requirement	Vent head space emissions to incinerator, approach ND.
b) centrifuge	Controlled by stripping requirement	Enclose system and vent to incinerator, approach ND.
c) dryer	Controlled by stripping requirement	Enclose system and vent to incinerator, approach ND.

TABLE IV-1 (continued)

d) packager	Controlled by stripping requirement	Enclose system and vent to incinerator, approach ND.
Relief, and manual vent valve discharges	0 (except emergency)	Hood and vent to incinerator, approach ND.
Fugitive sources	Capture and control	Maintain to prevent leaks; on control systems approach ND.
a) unloading line	.13 cubic feet VC at std. temp. and pressure during opening	Vent VC to incinerator, approach ND; or install valves to decrease volume of VC released.
b) rotating pumps	Double mechanical seals; or control to 10 ppm	No leaks.
c) reciprocating pumps	Double outboard seals; or control to 10 ppm	No leaks.
d) rotating compressors	Double mechanical seals; or control to 10 ppm	No leaks.
e) reciprocating compressors	Double outboard seals; or control to 10 ppm	No leaks.
f) agitators	Double mechanical seals; or control to 10 ppm	No leaks.
g) equipment opening	$\leq$ 20 percent volume VC or 25 gallons at standard temperature and pressure (whichever is larger)	Vent to incinerator, approach ND; strip waste water used to backfill and clean, approach ND.

TABLE IV-1 (continued)

h) inprocess waste water	10 ppm	Strip, approach ND.
i) leaks (i.e. all valves, flanges, fittings, etc.)	Detect and eliminate	Weld threaded fittings; no leaks.

*If any residual VC remains in resin after stripping then steps a-d should be implemented.

The potential reductions shown in Table IV-1 are based on a limited amount of source test information and a limited number of plant inspections. Further engineering evaluation must be performed to determine the precise method and extent of implementing these or further reductions.

Another area of the regulation that needs to be considered concerns emergency or accidental releases of VC. Appropriate procedures should be adopted whereby during such a release of VC the air pollution control officer of the District is immediately notified in order to have an opportunity to take appropriate action.

2. Proposed Changes to NESHAP for VC

As a result of a lawsuit filed by the Environmental Defense Fund, EPA proposed changes to the NESHAP regulation on June 2, 1977 (See Appendix 4). These proposed changes include:

a. A reduction of VC in exhaust gases from control equipment from 10 ppm to 5 ppm for EDC-VC and PVC plants. The purpose of this requirement is to optimize existing control equipment; however, if a company were not able to meet the requirement without additional control equipment, an interim emission limit would be set and reviewed every three years.

b. A reduction in residual VC from the slurry in PVC plants to one quarter of the current limitation. This would apply only to those grades of resin which had not been produced by the plant on or before June 2, 1977.

c. A reduction of VC emissions from oxychlorination reactors to 5 ppm from the present limit of 0.2 g/kg of EDC produced. This would apply only to reactors which were constructed after June 2, 1977.

d. Outright prohibition of increases in emissions within a 5 mile radius of an existing source due to new construction. This would include plant expansions and new facilities.

The offset provision, d. above, of the proposed regulation will have the effect of allowing no plant expansion without emission trade-offs.

Industry's opposition to this provision of the proposed regulation and EPA's consideration of changes in its general carcinogen policy are apparently the major stumbling blocks delaying adoption of the proposed augmented regulation. The staff's view is that the trade-off provision is important and should be adopted immediately by the SCAQMD so that ambient levels of VC do not increase around present facilities.

3. Enforceability

The NESHAP regulations for facilities using or producing VC requires them to sample for, analyze, record, and report VC emissions and concentrations in the facility. In accomplishing this general objective, firms are required to do the following:

a. Implement a VC leak detection and elimination program through means of stationary and portable in-plant monitoring. The levels are recorded and reported when levels of VC are found to be above the level defined as a leak. Programs for detection vary from plant to plant.

b. Determine and report reactor opening losses from oxychlorination and PVC reactors.

c. Determine residual VC levels in each batch of PVC slurry after it has been stripped.

d. Monitor all exhaust gases that must meet the 10 ppm VC limit and report VC levels over the limit.

e. Record emergency releases from manual vent valves on PVC reactors and from relief valves. This information is required to be reported within 10 days after the occurrence.

The SCAQMD receives and reviews semi-annual reports with the above information included and has access to other records that are maintained for two years by the companies. The District can perform, when it deems necessary, plant inspections and/or source testing.

The requirements of the regulation are very detailed and complex; they necessitate constant surveillance by a regulatory agency to ensure they are being complied with. More importantly, the federal regulation places no upper limit on the total mass emissions of VC from these facilities or the total amount of VC exhausted through stacks.

These two shortcomings, along with what many view as too heavy a reliance on self-monitoring of compliance, combine to provide little assurance that community levels of VC can be maintained at acceptably low levels under the federal regulations as they are now written.

B. Estimates of Community Concentrations of Vinyl Chloride with the NESHAP Program.

Introduction

In response to the Board's request, a preliminary study has been undertaken by the ARB Modeling Section to assess the air quality impacts from polyvinyl chloride (PVC) and vinyl chloride monomer (VC) plants in Los Angeles County on receptor areas in their vicinity, and to determine the probable degree of compliance of these facilities with the proposed ARB air quality standard for vinyl chloride when they come into full compliance with NESHAP emission standards.

At the present time, four PVC or VC facilities are operating in the Los Angeles area. These are the Keysor-Century PVC plant at Saugus, the B.F. Goodrich PVC and Stauffer Chemical Company PVC and VC plants at Long Beach, and the Union Carbide PVC plant in Torrance. The B.F. Goodrich and Stauffer Chemical facilities are located adjacent to one another on a north-south axis with the B.F. Goodrich plant to the south and Stauffer Chemical to the north.

Emission estimates for these facilities were compiled by the ARB Enforcement Branch based on data supplied by B.F. Goodrich, Keysor-Century and EPA, and the following analyses were performed:

- An evaluation of the effects of typical PVC and VC point sources on downwind receptors (point source releases are limited to 10 ppm in stack concentration by EPA NESHAP regulation).

o An evaluation of the effects on adjacent receptors of the three of the four facilities described above using both point and area source emission estimates.[1)]

1. Study Methodology and Data Description

Due to time constraints and the preliminary nature of the data gathered to date, it was decided that a Gaussian dispersion model was best suited for this study. Gaussian models incorporate the following assumptions:

a. Steady state emission sources and wind fields
b. Bimodal Gaussian distribution of pollutants vertically and horizontally
c. No vertical wind shear
d. Uniform vertical temperature stratification
e. Flat or gently rolling terrain
f. No aerodynamic downwash effects attributable to buildings
g. Chemically inert pollutants
h. Effective stack height based on Briggs' buoyant plume rise formula (1).

The impacts from the PVC and VC facilities investigated here involve short range transport of a relatively inert pollutant from sources with little or no plume rise. Pollutant dispersion under these conditions should be well characterized by Gaussian type models. The only assumptions which might be questionable

1) No analysis was made of receptor sites near the Union Carbide facility.

are numbers e, f, and h. Assumption e, that the terrain is relatively flat, is satisfied at the Long Beach sites, but not at Saugus. This will increase the uncertainty of the results obtained for the Keysor-Century plant. The assumption that no aerodynamic downwash or building effects occur may also be incorrect for these facilities since the pollutants are emitted close to ground level. Downwash and building effects can be important at high wind speeds, but it is expected that the increased dilution of the pollutants under these conditions will offset whatever increases the aerodynamic effects might cause.

Assumption h was tested by comparing both momentum and buoyant plume rise formulas using the point source parameters provided for the B.F. Goodrich and Keysor-Century plants. The two different formulations were found to coincide for almost all conditions tested to within a meter or two. In those cases where the two calculations differed significantly, the buoyant plume rise formulation was found to be the correct method of describing the height of pollutant release (2).

The data used in this study were compiled by the ARB Enforcement Branch and consisted of a point source inventory for the B.F. Goodrich and Keysor-Century plants, and estimated fugitive emissions for all three facilities based on EPA factors for

typical PVC and VC facilities (3). These values were scaled according to plant production capacity. The staff was unable to obtain point source emission estimates for the Stauffer Chemical plant. Since the estimated point source emissions from the B.F. Goodrich plant were found to comprise approximately 0.5 percent of the total plant emissions, it was decided that a reliable estimate of the Stauffer plant impact could be made using only the value for the fugitive emissions. Point source emissions were also neglected for the B.F. Goodrich facility, except that one simulation using a point source having the maximum allowable vinyl chloride concentration of 10 ppm was run to assess the type of impacts expected from such controlled point sources. The data used in this study are listed in Tables IV-2 and IV-3.

Preliminary runs to determine meteorology for cases corresponding to maximum one hour levels were made using the EPA Gaussian model PTMAX. This program computes the maximum downwind concentrations from point source emissions for a variety of wind speeds and atmospheric stabilities. The worst case meteorological conditions for each stability class were determined from these calculations and are shown in Table IV-4.

The ARB program, HRSTAB, was then used to determine the typical stability distribution in the Los Angeles area for a winter (January) and a summer (July) day with clear skies and low wind speeds. The stability distributions are also listed in Table IV-4.

Worst case meteorological scenarios were then formulated by combining the worst case meteorological conditions for each stability class and weighting them by their expected frequency of occurrence in each 24-hour scenario.

These meteorological conditions, combined with the point and fugitive source emissions, were also run using the EPA orogram PTDIS. PTDIS computes downwind concentrations from point source emissions at distances specified by the user. The fugitive emissions for each facility were treated as a uniformly distributed area source with a release height of 3m. The area of the Keysor-Century plant was assumed to be 100m x 100m, while the B.F. Goodrich and Stauffer plants were each assumed to be 120m x 120m.

Area sources are treated by the use of virtual point sources in PTDIS. A virtual source of release for the area source emissions upwind from the actual location of the area source is specified such that the horizontal spread of the virtual plume, characterized by the parameter σ_y, obeys the relation

$$\sigma_y = L/4.3$$

where L is the length of one side of the area source at the center of the area source. As described by Turner (4), this value of σ_y represents treatment of the area source as a crosswind line source with a normal distribution of pollutant about the center line of the plume.

Values for the worst case meteorological conditions in Table IV-4 were run using PTDIS for each stability class represented in the 24-hour stability distributions for both winter and summer days. Seperate runs were made for the point and area source emissions. These results were combined, using each stability type, to produce worst case 24-hour averages. Twenty-four hour average values were also computed for meterological conditions typical of the Los Angeles area. These conditions represent sea breeze meteorology during the day and drainage flow conditions (toward the ocean) at night. All these results are given in Table IV-5.

In the case of the Keysor-Century plant, maximum 24-hour values representing worst case meteorological conditions for both the point source and the area source (fugitive) emissions were calculated. (The values calculated for the vicinity of the B.F. Goodrich and Stauffer plants represent worst case conditions for fugitive sources alone, because point source contributions were assumed to be negligible, on the basis of the data currently available).

2. Results and Conclusions

The results give in Tables IV-5 show that, under current conditions, the air quality impacts of controlled point sources (stack) are insignificant in relation to the impacts from fugitive sources, if EPA emission rates are assumed. The worst case 24-hour average vinyl chloride concentrations

predicted at the plant boundaries range from 0.316 ppm at Saugus to 1.18 ppm in the vicinity of the Stauffer and B.F. Goodrich facilities. For the more typical meteorological scenarios, which include sea breeze and drainage flow conditions, these worst case values are reduced to 0.247 ppm at Saugus and 0.709 ppm at the Long Beach facilities.

These values represent the best estimate that can be made at the present time, considering the uncertainty involved in estimating fugitive emissions from PVC and VC plants. There are several reasons to believe that these results represent upper limits on the concentrations actually to be expected. These reasons are:

a. The EPA fugitive emissions estimate is conservative, since it is based on a mass balance calculation which does not specify loss mechanisms for vinyl chloride other than emission into the atmosphere.

b. Gaussian models tend to over-predict ground level concentrations.

c. Wind directions were held constant over multi-hour averaging periods.

d. The release height assumed for the fugitive emissions is probably a lower limit for the actual release height.

The following facts should also be considered when attempting to relate these predicted values to actual air quality measurements.

a. Downwind concentrations fall off substantially with distance from the plant. For example, at 0.5 km downwind, the worst case concentration values calculated for the Long Beach facilities are approximately 0.1 to 0.2 ppm.

b. Atmospheric concentration values depend linearly on the emission source strength.

c. Emission rates for fugitive emissions are probably of order of magnitude accuracy and are conservative, i.e., likely to be higher than actual, rather than lower.

d. The assumed spatial and temporal uniformity of fugitive emissions is probably not correct. In addition, the release height of these emissions will vary from source to source.

These results should, therefore, be considered order of magnitude estimates of the air quality impacts involved largely because of uncertainties in the emissions data available to the staff at the time the calculations were performed. Before any final results can be obtained, a more refined emissions inventory of these facilities should be conducted.

The results of these preliminary calculations demonstrate that ambient levels of vinyl chloride in the vicinity of VC and PVC facilities are largely determined by fugitive emission rates. Stack emissions, even at the 10 ppm upper concentration limit allowed under NESHAP, contribute very little to the totals.

Additional calculations corresponding to fugitive emission rates of 50% and 10% of the EPA estimates were carried out. These results are summarized in Table IV-6. These results lead to the conclusion that concentrations of vinyl chloride in the range suggested by the proposed significant harm level can be achieved at all of the facilities studied even under the most unfavorable meteorological conditions, if fugitive emission rates can be reduced to about 0.5 kg/hr (1.1 lb/hr) and the proposed 5 ppm upper limit on VC concentrations in stack effluent is promulgated. (These estimates apply to the combined plants at the Long Beach location.)

Table IV-2

Keysor-Century Source and Emission Data

Point Source

Height	9.75m (32 ft.)
Temperature	310 ^{o}K (100^{o}F)
Source Strength	0.289 g/sec (10ppm in stack)
Vol. Flow Rate	11.81 m^3/sec

Area Source (fugitive)*

Height	3m (9 ft.)
Temperature	ambient
Source Strength	0.797 g/sec
Dimensions	100m x 100m
PVC Production Capacity	15 MM kg/year

*These emission strengths are based on EPA fugitive emission estimates of 3.61 g/sec (29 lb/hr) for a plant with production capacity of 68MM kg/year (3).

Table IV-3

B. F. Goodrich and Stauffer Chemical Source and Emission Data

Point Source (BFG typical source)

Height	24.4m (~80 ft.)
Temperature	ambient
Source Strength	0.16 g/sec
Vol. Flow Rate	6.6m^3/sec

Area Sources (fugitive)*

Height	3m
Temperature	ambient
Source Strength	2.68 g/sec (BFG) 4.06 g/sec (Stauffer)
Dimensions	120m x 120m
PVC Production Capacity	50MM kg/year (BFG) 70MM kg/year (Stauffer)
VCM Production Capacity	75MM kg/year (Stauffer)

*These source strengths are based on EPA emission estimates of 3.6 g/sec for a PVC plant with 68MM kg/year capacity and 1.2 g/sec (9.7 lb/hr) for a VC plant with 316MM kg/year capacity (3).

Table IV-4

Worst Case Meteorology

and Stability Distributions

Worst-Case Conditions For Point Source (Stack) Impact (summer)

No. of Hours	Stability	Windspeed (m/sec)
5	A	1
4	B	4
2	C	4
1	D	4
12	F*	1

Worst-Case Conditions For Area Source (Fugitive) Impact

	No. of Hours	Stability	Windspeed (m/sec)
winter	7	C	2
	1	D	2
	16	F*	1
summer	5	A	1
	4	B	1
	2	C	2
	1	D	2
	12	F*	1

*For Long Beach F stabilities have been increased to E to account for the urban heat island effect

Table IV-5

Maximum 24-Hour Ambient Concentrations of Vinyl Chloride Under Various Weather Conditions (ppm)

Results for B.F. Goodrich and Stauffer Chemical

1 Hour Worst Cases for Area Source (Fugitive) Impact

		STAUFFER			B. F. GOODRICH		
Stability	Wind Speed(m/sec)	Plant Boundary	0.1 km	0.5 km	Plant Boundary	0.1 km	0.5 km
A	1	1.24	0.34	0.050	0.817	0.224	0.033
B	1	1.10	0.50	0.070	0.724	0.329	0.046
C	2	0.412	0.29	0.060	0.271	0.191	0.040
D	2	0.341	0.22	0.090	0.225	0.145	0.059
E	1	0.674	0.62	0.220	0.444	0.408	0.145

24 Hour Worst Case Conditions For Area Source (Fugitive) Impact (at the boundaries of the combined BFG and Stauffer facilities)

	winter	summer
24 hour northerly flow typical meteorology*	0.917	1.18
daytime receptors	0.196 (8 hours)	0.642 (12 hours)
nighttime receptors	0.709 (16 hours)	0.532 (12 hours)

Table IV-5 (Cont.)

Results for Keysor-Century
(all values for distance ≥.1 km from source)

Worst-Case Conditions For Point Source (Stack) Impact

Summer:	0.8g/s source+ (ppm)
constant winds for 24 hours	0.265
typical meteorology	0.080
daytime receptor site (8 hours)	0.080
nightime receptor site (16 hours)	0.185

Worst Case Conditions For Area Source (Fugitive) Impact

Summer:	0.8g/s source+ (ppm)
constant winds for 24 hours	0.316
typical meteorology	
daytime receptor site (12 hours)*	0.131
nightime receptor site (12 hours)*	0.185
Winter:	
constant winds for 24 hours	0.295
typical meteorology	
daytime receptor site (8 hours)*	0.049
nightime receptor site (16 hours)*	0.247

+The 0.8g/s source results are for fugitive emission estimates scaled by plant production capacity (see Table IV-2)

*These values are based on onshore flow during the day and drainage flow at night. The number of hours each receptor is exposed under these conditions is given in parenthesis. Daytime wind direction is from the south, and nightime wind direction is from the north.

Table IV-6

Twenty - Four Hour Worst Case Concentrations (ppm)
for Reduced Fugitive Emissions at Long Beach
(results at the combined plant boundaries)

Meteorological Conditions	Season	50% emission** reduction	90% emission** reduction
24 hour northerly flow	winter	0.459	0.092
	summer	0.590	0.118
Typical Meteorology (daytime receptors)*	winter	0.098 (8 hours)	0.020 (8 hours)
	summer	0.32 (12 hours)	0.064 (12 hours)
Typical Meteorology (nighttime receptors)*	winter	0.355 (16 hours)	0.071 (16 hours)
	summer	0.266 (12 hours)	0.053 (12 hours)

*These values are based on sea breeze meteorology during the day and drainage flow meteorology at night. The night of hours each receptor is exposed under these conditions is given in parenthesis. Daytime wind direction is from the south, and nighttime wind direction is from the north.

**Percentage reductions are scaled down from the EPA estimate of fugitive emissions from the combined facilities. If actual fugitive emissions are lower than the EPA estimate, maximum ambient levels of VC would decrease to correspondingly lower values.

References

1. G.A. Briggs, Plume Rise
U.S. Atomic Energy Comission, 1969

2. R.A. Schultze, Notes on Diffusion Modeling
Trinity Consultants, Dallas Texas, 1976, p.61

3. Point source emission estimates were supplied to ARB from B.F. Goodrich and Keysor-Century. Fugitive emission estimates were obtained from :
EPA Supplement Document #28155, and plant production capacities were obtained from "Standard Support and Environmental Impact Statement: Emission Standard for Vinyl Chloride," EPA-450/2-75-009, October 1975, Table 3-3

4. D.B. Turner, Workbook of Atmospheric Dispersion Estimates
EPA, Research Triangle Park, 1970, p. 38.

C. Recent Ambient Vinyl Chloride Data

The ARB monitored the vinyl chloride concentration in the ambient air at the Saugus School, located near the Keysor-Century plant, on 38 days from January 30 through March 22, 1978. The sampling period was 24 hours on 35 days, and 12, 16 and 20 hours on 3 days. On the three partial days, none of the sampled concentrations exceeded the minimum measurable concentration of 0.01 ppm. Four of the 35 days had 24 hour average values that reached or exceeded 0.01 ppm. (On those days 24-hour averages were computed by substituting one-half the detectable limit for those samples whose concentration was below the detectable limit*). On those four days the 24-hour average concentrations were 0.01, 0.01, 0.012, and 0.064 ppm.

The maximum concentration observed was 0.18 ppm in an 8-hour sample on February 6, 1978 (1600-2400). Other sample concentrations above 0.01 ppm include: 0.05 for four hours, two 8-hour samples of 0.02, and a 4-hour sample of 0.012. All other samples were 0.01 ppm or less.

In addition to the continuous monitoring several instantaneous "grab" samples were obtained in the vicinity of the three other plants emitting vinyl chloride in southern California.

On February 8, 1978, at approximately 1930 hours, two syringe samples were taken on 223rd Street, Long Beach immediately adjacent to the northern boundary of the Stauffer Chemical facility

*This procedure follows "Guidelines for the Evaluation of Air Quality Data", OAQPS No. 1.2 - 015, EPA, February 1974. However, in these cases more than 25% of the observations are less than the minimum detectable, and the Guidelines advise that no statistics should be computed.

and about 200 meters north of the B.F. Goodrich plant. The concentration of vinyl chloride in the samples was 0.375 ppm and 0.058 ppm. Weather conditions included rain with a southeast wind estimated at 5 to 10 knots.

Three samples were obtained at approximately 1030 hours on the same day in the vicinity of the Union Carbide Company in Torrance. The concentration of vinyl chloride from a sample taken on Prairie Avenue, west of the plant was less than 0.001 ppm. A sample from 190th Street, north of the plant contained 0.004 ppm. A sample taken at the Torrance Children's Center, approximately one-half mile north of the plant had a concentration of 0.002 ppm. The wind was southwest at 1 to 2 mph.

B.F. Goodrich - Stauffer Monitoring Results

B.F. Goodrich and Stauffer Chemical are conducting a cooperative air monitoring effort in the vicinity of their facilities, in the Long Beach - Carson community and at several remote locations. These data were made available to the staff and are presented as received in the accompanying table (Table IV -7).

Compared with the staff's modeling estimates, these levels are somewhat lower than might have been expected. A single notable exception to this is the value of 0.098 ppm (24-hour average) reported for the Long Beach site 3 miles southeast of the plants. A simultaneous measurement at the southeast corner of the Stauffer facility shows a much lower reading, so this result is all the more surprising. The companies have not been able to account for this discrepancy.

TABLE IV-7
B F GOODRICH CHEMICAL DIVISION

STAUFFER CHEMICAL DIVISION

VINYL CHLORIDE
COMMUNITY MONITORING PROJECT
3/13/78

DATE	LOCATION	VC(ppb)
2/2/78	100 yds. NW of Source (Fire Station)	6.2
2/7/78	" "	13.0
2/16/78	" " BFG	8.9
2/22/78	" " Samples	10.3
2/23/78	" "	10.4
3/7/78	" "	8.9
2/2/78	SE Corner of Stauffer Property	28.1
2/7/78	" "	N.D.
2/9/78	" " Stauffer	10.5
2/14/78	" " Samples	1.0
2/16/78	" "	94.0
2/22/78	" "	52.4
2/23/78	" "	2.0
2/28/78	" "	0.7
3/2/78	" "	0.2
2/2/78	One Mile East in Carson Community	2.8
2/7/78	" "	N.D.
2/22/78	" " BFG	0.6
2/23/78	" " Samples	0.2
3/7/78	" "	5.9
2/2/78	Three Miles SE in Long Beach Community	3.9
2/7/78	" "	N.D.
2/9/78	" " Stauffer	5.9
2/14/78	" " Samples	< 1.0
2/16/78	" "	< 1.0
2/22/78	" "	1.0
2/23/78	" "	< 1.0
2/28/78	" "	98.0
3/2/78	" "	1.0
2/2/78	Eighteen Miles SE in Huntington Beach Community	7.9
2/7/78	" "	N.D.
2/14/78	" " Stauffer	0.6
2/16/78	" " Samples	< 1.0
2/2/78	Thirty-eight Miles SE in Mission Veijo	0.5
2/7/78	" "	N.D.
2/16/78	" " BFG	1.9
2/22/78	" " Samples	0.2
2/3/78	Colorado River Near Blyth, Calif. (BFG)	< 0.1
2/7/78	Snowmass, Colorado (BFG)	0.2
2/10/78	" " (3 hr. sample, BFG)	< 0.1

All samples collected continuously for 24 hours beginning at 6 A.M. on the date indicated.

Keysor - Century Monitoring Results

The Keysor - Century Company monitored vinyl chloride concentrations in the ambient air at three sites in the vicinity; the Saugus School, the Mohawk Gas Station and the railroad station (see Figure 1).

Sampling was performed daily on three 8-hour shifts from January 27 through March 22, 1978 except for approximately a dozen samples lost at various sites on various shifts because of malfunctions. Concentrations at or below 0.05 ppm are not detectable with the measurement system employed. Concentration values above 0.05 ppm were observed on twelve days during this time period. On each of those twelve days the concentration exceeded 0.05 ppm only on one shift at one of the three sites. Each of the three shifts had four of the excesses. Three of the values were at the Saugus School, four at the railroad station and five at the Mohawk Gas Station.

Comparison of ARB and Keysor - Century Measurements at Saugus School

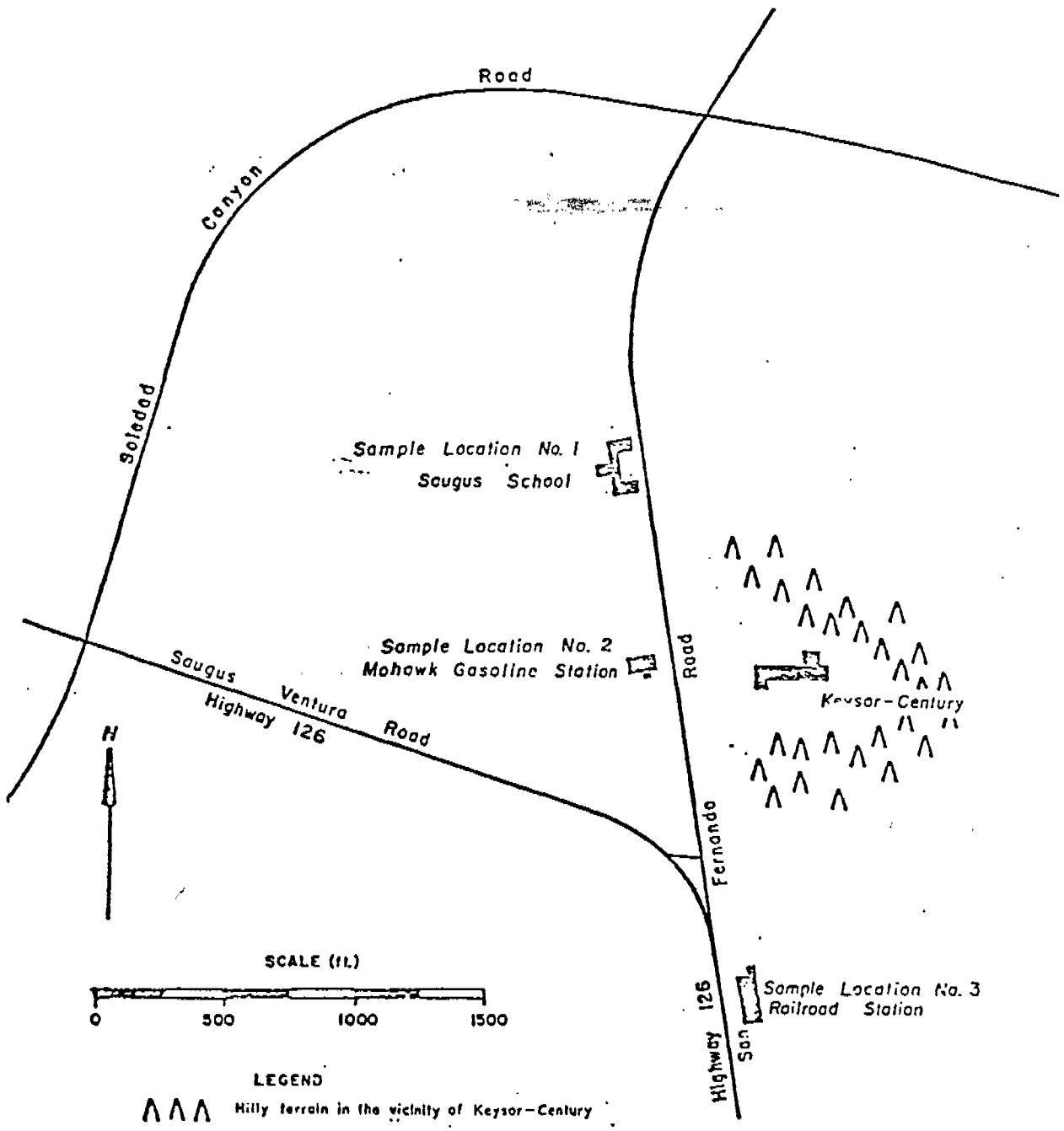
The Saugus School was the only sampling site used by both the ARB and Keysor - Century.

Keysor - Century reported values above the detectable limit of 0.05 ppm at the site on February 3 (0.09 ppm), February 19 (0.06 ppm) and March 5, 1978 (0.08 ppm).

ARB reported no detectable values on February 3, or on March 5. The ARB did not monitor on February 19.

FIGURE 1

Keysor-Century and Air Resources Board Ambient Air Sampling Locations



Source: ARB Enforcement Branch

CMA 004168

On February 6, ARB recorded a concentration of 0.18 ppm for the time interval 1600 - 2400 hours, at the Saugus School. Keysor-Century reported a non-detectable level for that same time interval at Saugus School, but reported a simultaneous reading of 0.07 ppm at the Mohawk Gas Station.

The staff has prepared a number of standard samples for analysis in the ARB's Haagen-Smit Laboratory, the Keysor-Century Laboratory and an independent referee laboratory. A comparison of results obtained by the three laboratories shows good agreement. This suggests that the discrepancy may be traced to the calibration standard currently in use at Keysor-Century. The staff is continuing to explore the reasons for this apparent lack of agreement.

These recent data suggest that, even prior to full compliance with NESHAP, ambient levels of VC in the vicinity of these facilities are averaging well below the calculated levels based on the EPA's emission factor for fugitive emissions. The staff finds this result encouraging, in that it suggests that fugitive emissions of VC may be reduced to a level that approaches that required under the proposed ambient standard when these facilities are in full compliance with NESHAP. Further reductions, if any, needed to meet the proposed ambient standard should be relatively easy to achieve.

V. Measurement Method

A. Background

Another major factor for the Board to consider in setting an air quality standard or a significant harm level for VC is the selection of a measurement method that is precise, accurate, and specific to VC. In Staff Report 78-1-1 presented to the Board at the January 25, 1978 public meeting, the staff recommended that the "ARB Method-Vinyl Chloride in Air" be adopted as the official method for quantifying ambient levels of VC. This method had been developed by the ARB Research staff specifically for purposes of detecting VC in the vicinity of facilities that emit VC.

Several issues were raised with regard to the method, specifically:

1. The method's ability to measure VC accurately at 0.010 ppm, the lower level under consideration.
2. The specificity of the method because of possible interference from other organic compounds.
3. Other possible methods in use by some of the manufacturers, especially those utilizing charcoal sampling tubes.

In response to these issues the staff included further refinements to the description of the method in response to the specificity and accuracy concerns. Additionally, the staff held a meeting, at the request of B.F. Goodrich with representatives of B. F. Goodrich, Dow Chemical, Keysor-Century and Stauffer Chemical, to discuss the method.

2. Modifications to the ARB Method

In response to the several concerns raised about the method, the staff made several changes to the method. The revised method, attached hereto as Appendix 5 and dated March 13, 1978, includes the following changes:

Page 1, Line 7 - Range is redefined in terms of ppm by volume in order to eliminate any ambiguity and to conform with the concentration units used for other standards and methods.

Page 1, Paragraph 2 - The limits of analysis capability are expressed in terms of "minimum measurable" rather than "minimum detectable" concentrations in response to a manufacturer's concern that the "minimum measurable" level can be accurately and precisely quantified whereas "the mimimum detectable"level cannot. This eliminates any possible ambiguity in the meaning of the terms "detection" and "quantification".

Page 4, Paragraph 6.4 - A different gas chromatographic column is specified. This column is preferred over that originally specified because, under the prescribed operating conditions, there are no known interferences with the quantification of VC.

The above modifications are based on new calibration data (Table V-I) that the staff has acquired, using the new column, for the two variations of the method (i.e., direct injection and preconcentration by freeze-out).

Table I-1

Loop (1 ml.) method

calibration#	# samples	nominal conc. (ppm)	response (ppm)
1	8	0.08	0.0818 ± 0.0047
2	3	0.08	0.0780 ± 0.0004
1	6	0.008	0.0064 ± 0.0016
1	10	0.123	0.1234 ± 0.0070
2	3	0.008	0.0079 ± 0.0027
2	3	0.400	0.4092 ± 0.0023
2	4	.024	0.0270 ± 0.009

(response) = 1.0234 * (conc) -0.009

Sy = 2.23 (PPb)
r = 0.999896

Table 2.

Freeze-out (100ml.) Method

calibration#	# samples	nonimal conc. (ppm)	response
1	4	0.008	0.0078 ± 0.00006
2	3	0.008	0.0077 ± 0.0003
1	4	0.080	0.0768 ± 0.0017
2	5	0.080	0.0750 ± 0.0020
3	1	0.080	0.0826
1	3	0.123	0.1214 ± 0.0042
2	3	0.0008	0.0009 ± 0.0001
2	3	0.024	0.0225 ± 0.00006

(response) = 0.984616 * (conc) - 0.00036

Sy = 2.35 PPB
r = 0.998836

Sy = standard error of estimate

r = correlation coefficient

This section of the report describes the originally proposed method, modifications to the proposed ARB method, the basis for these modifications and the resolution of the issues and comments raised by the manufacturers at the January 25, 1978 Board meeting and the March 16, 1978 staff meeting.

B. The ARB Measurement Method

1. Originally Proposed Method

The ARB method involves constant-flow sample collection into a Tedlar bag. The sample is then injected directly into the sampling loop of a gas-liquid chromatograph which separates the VC from other compounds. Finally, the VC concentration is quantified using flame ionization detection. The sampling loop is adequate for samples down to approximately 0.010 ppm VC. For lower levels of VC, a freeze-out concentrating technique is used prior to analysis.

In the January 25, 1978 report, the detection limit was defined as 0.02 nanograms per cubic meter (approximately 0.010 ppm) for direct injection, and precision was defined as "Using ten calibration points between 0.025 and 1.0 ppm VC, the 95 percent confidence interval is $\pm$ 0.010 ppm, which is essentially equivalent to a standard deviation of 0.005 ppm VC. With a freeze-out trap, a lower limit of detection of 0.001 ppm can be achieved, with a standard deviation of about 0.0005."

Each calibration sample was prepared independently in a Tedlar bag. Repeated analyses of the samples demonstrate the accuracy and precision of the methods. The direct injection (loop) method is accurate and precise at 0.010 ppm, and the preconcentration freeze-out method is accurate and precise to 0.001 ppm, as noted in Table V-1. A simple linear regression illustrates the linearity of the instruments.

C. Meeting of March 16, 1978 with the Manufacturers

B.F. Goodrich requested a meeting with the staff in order to clarify and resolve concerns that it had with the proposed ARB method. The staff met with representatives of B.F. Goodrich on March 16, 1978 in Berkeley. Representatives of Stauffer Chemical, Dow Chemical, and Keysor-Century also attended the meeting.

The staff provided detailed analytical data demonstrating the specificity, precision, and accuracy of the proposed method. Based on the staff's data and our field experience, the representatives of B.F. Goodrich appeared to acknowledge that the quantitative measurement of VC could be accurately performed at the level of one part per billion by volume in air using the ARB method. The representatives of Stauffer Chemical and Dow Chemical did not object to the staff's conclusions.

At the same meeting, representatives of B.F. Goodrich presented their own analytical method for review and acceptance by the ARB. The B.F. Goodrich method involves sample collection with charcoal tubes rather than the Tedlar bags as proposed by the ARB staff. The VC is then thermally desorbed from the charcoal and directly injected into the chromatograph for analysis. However, since Goodrich did not submit any analytical data to establish the specificity, precision, and accuracy of the proposed method, the staff was unable to determine whether it is equivalent to the ARB method. B.F. Goodrich agreed to exchange further information with the ARB analytical staff regarding experimental techniques employed in its analysis of VC.

D. Staff Response to Comments on Methodology

The Air Resources Board staff has received a number of comments from B.F. Goodrich and Stauffer Chemical Company regarding the analytical method employed by the staff in measuring ambient levels of VC. This subsection summarizes the manufacturers' comments and the staff responses thereto.

1. January 25 comments of B.F. Goodrich Company (BFG)

   a. BFG questions whether or not vinyl chloride can be measured accurately at concentrations of 0.01 - 0.05 parts per million by direct injection (page 7, No. 1).

The staff has included calibration data in Section V-B which demonstrates the accuracy of the ARB direct injection method at and below these concentrations.

   b. BFG suggests that the National Institute of Occupational Safety and Health method employing carbon adsorption coupled with thermal desorption and total injection may be as effective and easier to implement than the ARB's freeze-out method (page 8, No. 2).

The staff will entertain acceptance of other analytical procedures by any other laboratory group, provided there is ample evidence as to the specificity, precision, and accuracy of these procedures.

   c. BFG seeks to clarify the distinction between detection and measurement.

The ARB staff has modified its analytical method (see Section V-B) so that the minimum measurable amount is clearly defined.

d. BFG recommends a minimum measurable concentration of 500 parts per billion by volume of VC because the detection limit of many BFG analytical instruments is 100 parts per billion (Appendix E).

The staff notes that this request was not discussed at the meeting of March 16 in Berkeley. During the meeting the BFG staff expressed confidence that VC can and should be quantified accurately at and below 10 parts per billion by volume. The ARB staff can detect VC at 2 parts per billion by direct injection and accurately quantify VC at 10 parts per billion. The use of a freeze-out preconcentration technique, routinely employed at the ARB laboratory, lowers the detection limit to less than 0.1 part per billion by volume. One part per billion can be accurately quantified by this technique (see Section V-B).

2. January 25 Comments of Stauffer Chemical Company.

a. Stauffer requests experimental data from the ARB demonstrating that vinyl chloride can be accurately quantitated at 10 parts per billion.

The ARB staff presents calibration data in Section V-B to demonstrate the accuracy and precision of the method at the 1 part per billion level.

b. Stauffer suggests that the presence of VC in the samples be verified by mass spectrometry or other means because of the possibility of interferences.

The ARB staff routinely verifies the presence of VC by mass spectrometry. Also, the staff has recently developed new analytical methods that eliminate possible interferences with the quantification of VC (see Section V-B).

c. Stauffer requests information about the standard reference materials and calibration standards.

The ARB staff purchased standards of vinyl chloride at approximately 0.8 parts per million in nitrogen. A 1-liter precision gas sampling syringe is used to prepare calibration standards at 0.4, 0.124, 0.08, 0.024, 0.008, 0.0008, and 0.00008 ppm VC by volume in zero air.

d. Stauffer requests detailed information regarding the use of nitric oxide as an ozone quencher.

Ozone levels in the South Coast Air Basin no longer are expected to exceed 0.5 ppm. Therefore, the highest concentration of nitric oxide that is required is 0.5 ppm. A 10-liter air sample, therefore, requires 50 milliliters of 100 ppm nitric oxide in nitrogen. This small amount does not measurably affect the concentration of VC in the sample. None of the VC/PVC plants to be monitored is in a high ozone area. Therefore, the required quantity of nitric oxide could be substantially reduced.

More importantly, the NIOSH, EPA, B.F. Goodrich and Stauffer methods relying on VC adsorption on charcoal may be unacceptable because ozone in the sample stream may destroy some of the VC adsorbed on the charcoal.

e. Stauffer points out the importance of obtaining a representative composite sample.

The ARB staff utilizes a constant flow sampler to partially fill a Tedlar bag. Thus, a truly representative composite sample is obtained.

f. Stauffer seeks a definition of parts per million.

The ARB bases its standards on and reports measurements as parts per million volume/volume.

g. Stauffer questions the use of a Rotameter to to measure sample air flow.

The ARB method requires a Rotameter only at the beginning and end of the sampling period to assure constant flow. Therefore, contamination of the Rotameter is not a problem. Since the bags are not filled completely, back pressure is not a problem.

h. Stauffer points out that the analyses should be performed within 24-hours of taking the samples.

This is standard practice at the ARB and is discussed in the proposed method.

i. Stauffer questions the sensitivity and accuracy claimed for a 1 ml direct injection.

The staff presents calibration data to substantiate its claims in Section V-B.

j. Stauffer points out that sampling valves may adsorb and desorb VC leading to spurious results.

The ARB staff has performed repeated experiments in which air zero is analyzed immediately following a sample of 800 parts per billion VC in air. No outgasing was ever observed.

k. Stauffer suggests that the column employed by the ARB may have a memory effect that could lead to errors in analysis.

Repeated ARB experiments involving blanks following samples reveal no memory effects due to the column.

E. Conclusion

In summary, some of the concerns of the manufacturers with regard to the proposed ARB method appear warranted, such as defining the minimum "measurable" level rather than the minimum "detectable" level for the direct injection and preconcentration freeze-out techniques, and the type of column used for separation. The staff has modified the method, thus, defining the lower measurable levels as 0.010 ppm VC for the direct injection and 0.001 ppm VC for the freeze-out techniques, and changing the column specifications, thereby improving the proposed method.

Based on discussions between the staff and the manufacturers at a meeting of March 16, 1978 in Berkeley, there appears to be agreement that the proposed method can measure VC accurately and precisely at 0.001 ppm. The only remaining concern is that some manufacturers would prefer to use their own methods, which should pose no problem provided they demonstrate method equivalency.

APPENDICES

APPENDIX I

Basic VC Monomer Production and Polymerization Processes

Figures 1 and 2, taken from the reference below*, illustrate the basic elements and the flow of materials in the production of VC monomer and the production of VC polymers. Each step in the process may have associated with it pumps, compressors, agitators, columns, and similar apparatus common to the chemical industry, and these pieces of equipment must be considered as possible sources of VC emissions. The types, numbers and arrangement of such equipment will vary from plant to plant and are not shown on the simplified diagrams.

Vinyl Chloride Monomer Production

Nearly all vinyl chloride manufacture begins by either oxychlorination of ethylene or direct chlorination of ethylene to produce ethylene dichloride. In the oxychlorination process, ethylene dichloride is made by the reaction of air and hydrogen chloride (HCl) with ethylene in a catalytic process. In the direct chlorination process, ethylene dichloride is made by the reaction of ethylene and chlorine. The crude ethylene dichloride produced by these processes is then purified by scrubbing, drying and fractionating as indicated in Figure 1. The purified ethylene dichloride then enters a cracking furnace, where vinyl chloride and HCl are produced. The HCl is then removed from the furnace and recycled to the oxychlorinator.

*SRI International, Cancer Control Monograph: Vinyl Chloride, Prepared for National Cancer Institute (in press).

The fractionating column following the cracking furnace separates the residual ethylene dichloride from the vinyl chloride monomer. The ethylene dichloride is recycled into the purifying system and the monomer is transferred to storage.

Polymerization Process

As indicated in Figure 2, vinyl chloride monomer for the polymerization process is obtained from a storage tank. The storage tank is supplied from tank cars or from a monomer production facility at the same site. Although different types of polymerization processes are used, most PVC resin is produced by loading VCM, water, and other materials, such as emulsifying agents into polymerization vessels commonly called "reactors". The reaction proceeds under controlled conditions of temperature and pressure.

After polymerization the mixture of resin and liquid, called "slurry", is transferred to the stripping device. (In some plants stripping is carried out in the reactor.) The stripping process, by the use of heat and reduced pressure, drives most of the unreacted monomer out of the slurry. The extracted monomer is introduced into the VCM recovery system where it is processed for recycling into the polymerization process. The stripped slurry is sent to a blending tank to be combined with slurry from other reactors, in order to obtain the desired product composition. From the blend tank the slurry enters a centrifuge where most of the water is removed. From the centrifuge the polymer enters a flash dryer which removes the remaining water. The dry polymer resin is screened and shipped, either in bulk or packed in bags.

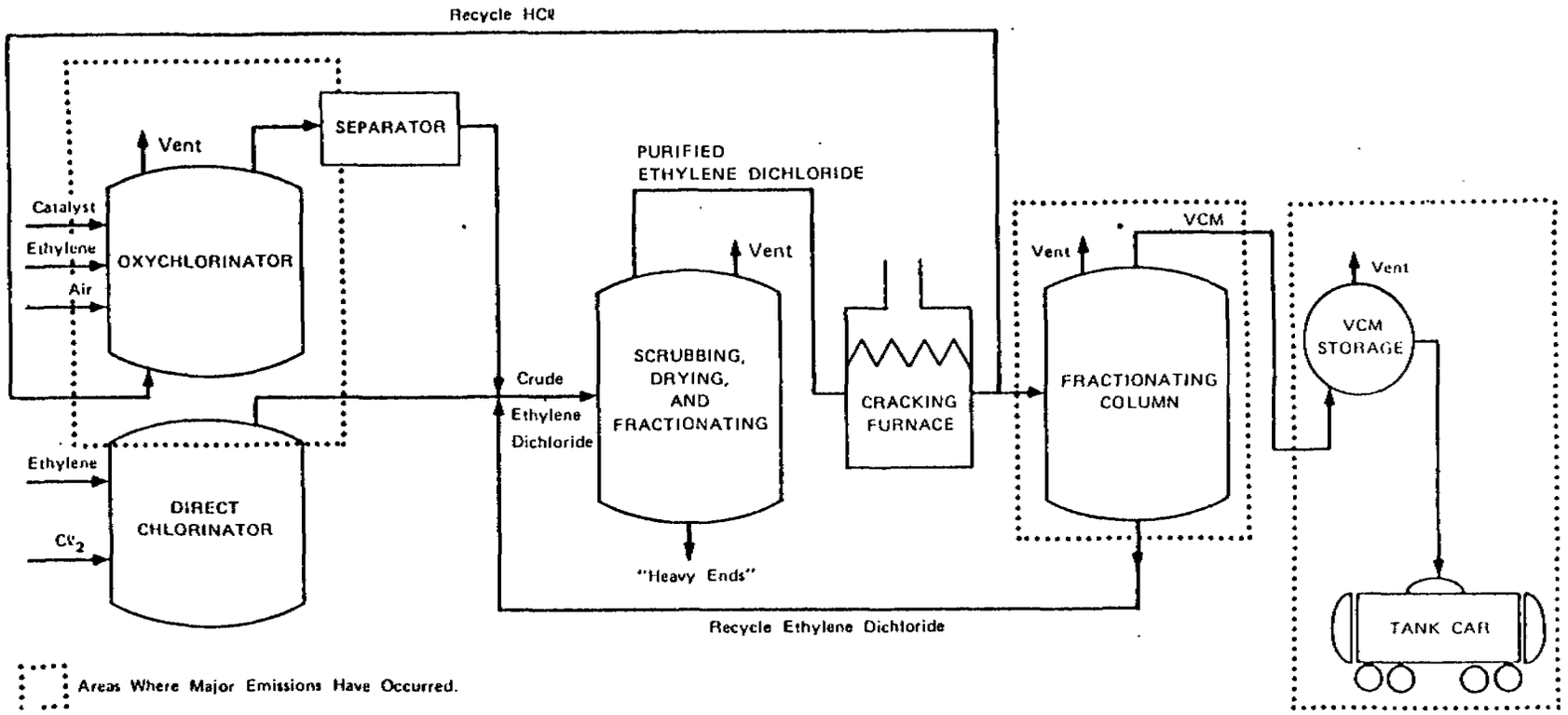


FIGURE 1 SIMPLIFIED "TYPICAL" PROCESS FOR PRODUCTION OF VINYL CHLORIDE MONOMER (VCM)

Source: SRI International, Cancer Control Monograph: Vinyl Chloride. Prepared for National Cancer Institute (in press).

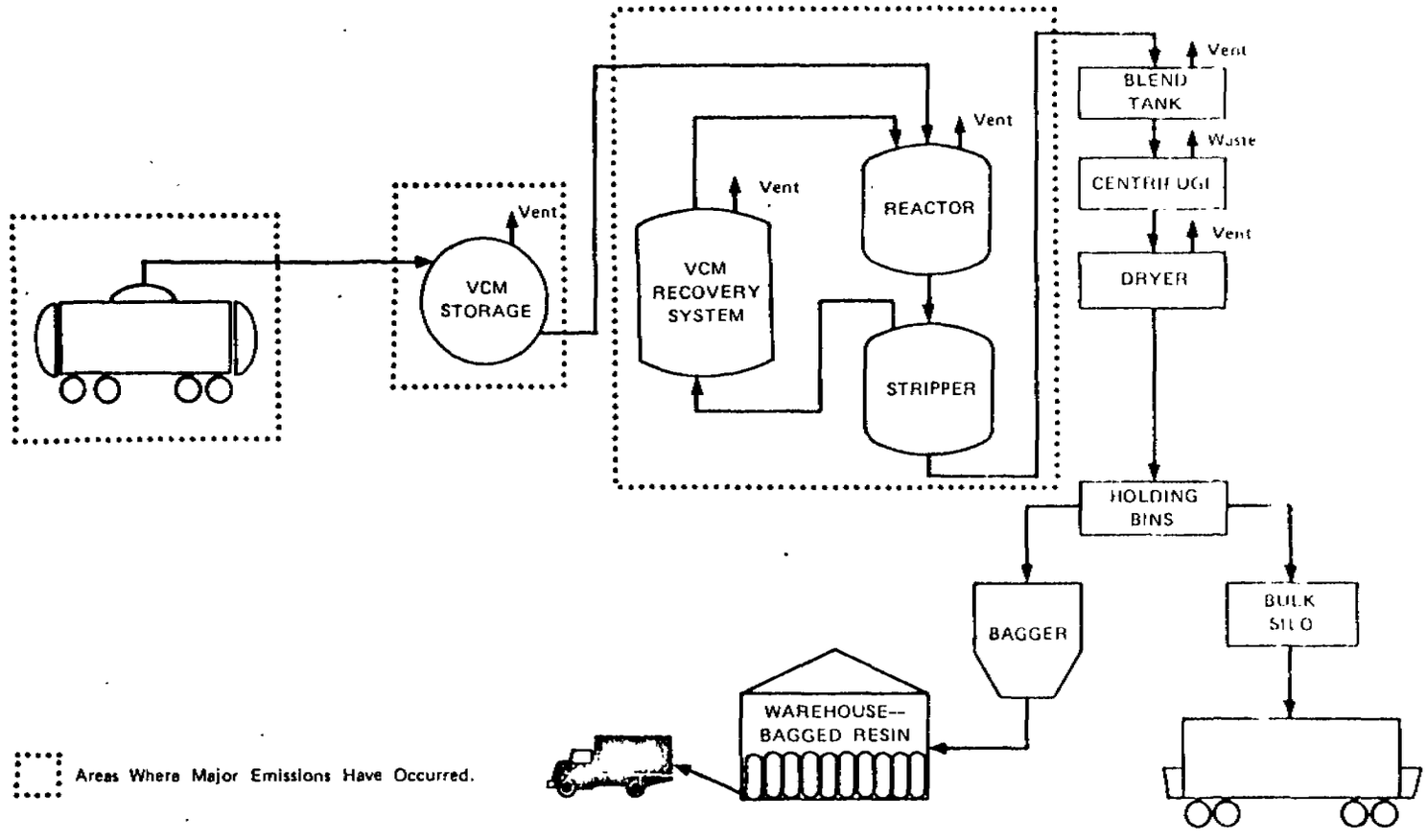


FIGURE 2 SIMPLIFIED "TYPICAL" POLYMERIZATION PROCESS

Source: SRI International, Cancer Control Monograph: Vinyl Chloride. Prepared for National Cancer Institute (in press).

APPENDIX 2

federal register

THURSDAY, OCTOBER 21, 1976

PART II:

ENVIRONMENTAL PROTECTION AGENCY

NATIONAL EMISSION STANDARDS FOR HAZARDOUS AIR POLLUTANTS

Standard For Vinyl Chloride

Title 40—Protection of Environment

CHAPTER I—ENVIRONMENTAL PROTECTION AGENCY

SUBCHAPTER C—AIR PROGRAMS

[FRL 613-1]

PART 61—NATIONAL EMISSION STANDARDS FOR HAZARDOUS AIR POLLUTANTS

Standard for Vinyl Chloride

On December 24, 1975, under section 112 of the Clean Air Act, as amended (42 U.S.C. 1857), the Environmental Protection Agency (EPA) added vinyl chloride to the list of hazardous air pollutants (40 FR 59477) and proposed a national emission standard for it (40 FR 59532). The standard covers plants which manufacture ethylene dichloride, vinyl chloride, and/or polyvinyl chloride.

EPA decided to regulate vinyl chloride because it has been implicated as the causal agent of angiosarcoma and other serious disorders, both carcinogenic and noncarcinogenic, in people with occupational exposure and in animals with experimental exposure to vinyl chloride. Reasonable extrapolations from these findings cause concern that vinyl chloride may cause or contribute to the same or similar disorders at present ambient air levels. The purpose of the standard is to minimize vinyl chloride emissions from all known process and fugitive emission sources in ethylene dichloride-vinyl chloride and polyvinyl chloride plants to the level attainable with best available control technology. This will have the effect of furthering the protection of public health by minimizing the health risks to the people living in the vicinity of these plants and to any additional people who are exposed as a result of new construction.

Interested parties participated in the rulemaking by sending comments to EPA. The comments have been carefully considered, and where determined by the Administrator to be appropriate, changes have been made to the regulation as promulgated.

SUMMARY OF THE STANDARD

In ethylene dichloride-vinyl chloride plants, the standard limits vinyl chloride emissions from the ethylene dichloride and vinyl chloride formation and purification processes to 10 ppm. For the oxychlorination process, vinyl chloride emissions are limited to 0.2 g/kg of ethylene dichloride product.

In polyvinyl chloride plants, the standard limits vinyl chloride emissions from equipment preceding and including the stripper in the plant process flow to 10 ppm. Emissions from equipment following the stripper are to be controlled by stripping dispersion resins to 2000 ppm and other resins to 400 ppm, or by using equivalent controls. Vinyl chloride emissions from reactor opening are to be reduced to 0.02 g/kg polyvinyl chloride product.

In both ethylene dichloride-vinyl chloride and polyvinyl chloride plants, relief valve discharges and manual venting of gases are prohibited except under emergency conditions. Fugitive emissions are required to be captured and controlled.

HEALTH AND ENVIRONMENTAL IMPACTS

EPA prepared a document entitled the *Quantitative Risk Assessment for Community Exposure to Vinyl Chloride* which estimates the risk from vinyl chloride exposure to populations living in the vicinity of vinyl chloride-emitting plants before and after implementation of controls to meet the standard. There are no dose-response data for the concentrations of vinyl chloride found in the ambient air. Therefore, assessments of risk at ambient levels of exposure were extrapolated from dose-response data from higher levels of exposure using both a linear model and a log-probit model. Extrapolations made with each of these models entailed using different sets of assumptions. Because different assumptions can be made in extrapolating to low doses, the health risks are reported in ranges.

It was estimated that 4.6 million people live within 5 miles of ethylene dichloride-vinyl chloride and polyvinyl chloride plants and that the average exposure around these plants before installation of controls to meet the standard is 17 parts per billion. The exposure levels for uncontrolled plants were calculated based on estimated 1974 emission levels. Using the linear dose-response model, EPA found that the rate of initiation of liver angiosarcoma among people living around uncontrolled plants is expected to range from less than one to ten cases of liver angiosarcoma per year of exposure to vinyl chloride. The log-probit model gave predictions that are 0.1 to 0.01 times this rate. This wide range is an indication of the uncertainties in extrapolation to low doses. Due to the long latency time observed in cancer cases resulting from vinyl chloride exposure, increases initiated by exposure this year will not be diagnosed until the 1990's or later. Vinyl chloride is also estimated to produce an equal number of primary cancers at other sites, for a total of somewhere between less than one and twenty cases of cancer per year of exposure among residents around plants. The number of these effects is expected to be reduced at least in proportion to the reduction in the ambient annual average vinyl chloride concentration, which is expected to be 5 percent of the uncontrolled levels after the standard is implemented.

Changes in the standard since proposal do not affect the level of control required. Thus, the environmental impact of the promulgated standard is, with one exception, the same as that described in Chapter 6 of Volume I of the *Standard Support and Environmental Impact Statement*. According to data submitted by the Society of Plastics Industry, Inc. (SPI), the impact on water consumption in the draft environmental impact statement was overstated. In estimating the impact on water consumption, EPA based its estimates on worst case conditions. That is, EPA assumed that those control systems with the greatest water usage would be employed and that there would be no recycling of water. There is no regulation which would require water recycling. According to SPI, the control system utilizing the most water will not be used generally by the industry and economic factors will cause plants to recycle much of the water. Therefore, according to SPI the impact of the standard on water consumption will be negligible.

The environmental impacts of the promulgated standard may be summarized as follows: The primary environmental impacts of the standard are beneficial and will consist of vinyl chloride emission reductions of approximately 94 percent at ethylene dichloride-vinyl chloride plants and 95 percent at polyvinyl chloride plants. Percentage numbers for both source categories are based on an estimated 90 percent reduction in fugitive emissions and 1974 emission levels.

The potential secondary environmental impacts of the standard are either insignificant or will be minimized without additional action, except for one adverse impact. Hydrogen chloride is already emitted by process equipment at ethylene dichloride-vinyl chloride plants and by other petrochemical plants in the complexes where ethylene dichloride-vinyl chloride plants are typically located. An incinerator used to attain the standard at an ethylene dichloride-vinyl chloride plant could increase hydrogen chloride emissions by several fold. Typically, however, due to the corrosion problems which would otherwise occur both on plant property and in the community, plants use scrubbers to control already existing hydrogen chloride emissions. Hydrogen chloride emissions resulting from control of vinyl chloride emissions are expected to be controlled for the same reason. If even a moderately efficient scrubber (98 percent control) were used to control the hydrogen chloride emissions resulting from incineration of vinyl chloride emissions, the increase in hydrogen chloride emissions from a typical ethylene dichloride-vinyl chloride plant due to the standard would be reduced to 35 percent. However, EPA plans to further evaluate the need to control hydrogen chloride emissions, since diffusion model results indicate that under "worst-case" meteorological conditions, the hydrogen chloride emissions from the process equipment and the incinerator combined would cause maximum ambient concentrations of hydrogen chloride in the vicinity of ethylene dichloride-vinyl chloride plants to be in the same range or somewhat higher than existing foreign standards and National Academy of Sciences (NAS) guidelines for public exposure.

ECONOMIC IMPACT

In accordance with Executive Order 11821 and OMB circular A-107, EPA carefully evaluated the economic and inflationary impact of the proposed standard and alternative control levels and certified this in the preamble to the proposed standard. These impacts are

discussed in Chapter 7 of Volume I of the *Standard Support and Environmental Impact Statement*. Comments on the proposed standard have resulted in only one major change in the economic impact analysis. EPA estimated that there would be four plant closures as a result of the promulgated standard. Of the four plants identified as possible closure candidates, one has given notice that it no longer produces polyvinyl chloride and the other three have indicated that they do not intend to close as a result of the standard.

The economic impacts of the promulgated standard may be summarized as follows: The total capital cost for existing plants to meet the standard is estimated to be $198 million, of which $15 million is for ethylene dichloride-vinyl chloride plants and $183 million is for polyvinyl chloride plants. EPA estimates that these plants will have to spend $70 million per year to maintain the required emission levels. In addition, the total capital cost for existing plants to meet the EPA's 1983 water effluent guideline limitations is expected to be $83 million and the total annualized operation cost is $17 million. The costs to the industry of meeting the OSHA standard cannot be quantified at this time, but they are expected to overlap to some degree with the costs to meet EPA's fugitive emission regulations. The costs of meeting the fugitive emission regulations are included in the total costs cited above for meeting the promulgated regulation. Broken out separately, the capital cost of meeting the fugitive emission regulations is $37 million and the annualized cost is $25 million.

The standard is not expected to deter construction of new ethylene dichloride-vinyl chloride plants or most types of new polyvinyl chloride plants. For one type of polyvinyl chloride plant (dispersion process) that represents 13 percent of the industry production, the standard would significantly deter the construction of smaller plants.

It is estimated that the price of polyvinyl chloride resins will rise by approximately 7.3 percent in order to maintain precontrol profitability and also to recover the total annualized control costs necessitated by the standard at ethylene dichloride-vinyl chloride plants and polyvinyl chloride plants. This increase is estimated to translate into a maximum consumer price increase in goods fabricated from polyvinyl chloride resins of approximately 3.5 percent. Recovery of effluent annualized costs plus maintenance of precontrol profitability is estimated to add approximately 2 percent to polyvinyl chloride resin prices and result in an additional maximum consumer price increase of 1 percent.

Public Participation

During the public comment period, 50 comment letters on the proposed standard were received. There were 24 from industry; 3 from environmental groups; 15 from Federal, State, and local agencies; and 8 from individual citizens. As required by section 112(b)(1)(B) of the Act, a public hearing was held on the proposed standard on February 3, 1976, in Washington, D.C. Presentations were made by the Environmental Defense Fund, the Society of the Plastics Industry, Inc., Dow Chemical Company, Diamond Shamrock Corporation, and Air Products and Chemicals, Inc. Copies of the comment letters received, the public hearing record, and a summary of the comments with EPA's responses are available for public inspection and copying at the EPA Public Information Reference Unit, Room 2922 (EPA Library), 401 M Street, SW., Washington, D.C. In addition, copies of the comment summary and Agency responses may be obtained upon written request from the Public Information Center (PM-215), Environmental Protection Agency, 401 M Street, SW., Washington, D.C. 20460 (specify *Standard Support and Environmental Impact Statement, Emission Standard for Vinyl Chloride, Volume II*).

Significant Comments and Changes to the Proposed Regulation

(1) *Decision to list vinyl chloride as a hazardous air pollutant.* In general, the commenters did not contest EPA's decision to list vinyl chloride as a hazardous air pollutant. However, three commenters (two companies and one Federal agency) argued that EPA placed undue emphasis on factors suggesting that vinyl chloride presented a health risk and ignored factors suggesting that no significant risk was involved. Under section 112, however, EPA could remove vinyl chloride from the list of hazardous air pollutants only if information were presented to EPA that shows that vinyl chloride is clearly not a hazardous air pollutant. As discussed more fully in the comment summary, the commenters did not provide conclusive evidence that vinyl chloride is not a hazardous air pollutant which causes or contributes to death or serious illness, nor did they conclusively prove that the health risk factors emphasized by EPA were insignificant.

Several other commenters agreed with EPA's decision to list vinyl chloride as a hazardous air pollutant, but argued that EPA had overstated the health problem, the emission levels, and the projected ambient air concentrations around uncontrolled plants. With regard to the alleged overstated health problem, the commenters stated, for example, that the U.S. worker EPA discussed as having been exposed to vinyl chloride levels lower than those usually encountered in polyvinyl chloride production has been dropped from the National Institute of Occupational Safety and Health's listing of workers with angiosarcoma. EPA agrees that there are questions concerning the level of exposure and in some cases the pathology of these cases not involved directly in polyvinyl chloride and vinyl chloride production. These uncertainties are stated in the appropriate footnotes of the *Scientific and Technical Assessment Report on Vinyl Chloride and Polyvinyl Chloride* (STAR) where the angiosarcoma cases are listed. However, in spite of these uncertainties, in view of the possible exposure patterns, these cases cannot be ignored in the evaluation of the potential public health problems.

With regard to the alleged overstated emission levels, the uncontrolled emission levels reported by EPA were based on 1974 data. This qualification was stated wherever emission data were presented. EPA recognizes that emissions have been reduced since that time, and stated this in the preamble to the proposed standard. EPA decided not to gather more recent data on emission levels, because these emission levels are expected to change, and gathering the data would take considerable time both on the part of EPA and on the part of industry. Since the purpose of the standard is to minimize emissions, these more current data would not affect the standard itself. The 1974 emission levels were also used in diffusion modeling to project maximum ambient air concentrations around uncontrolled plants. These maximum air concentrations would probably be lower if 1976 emission levels were used. This would reduce the relative impact of the standard below that described in the *Standard Support and Environmental Impact Statement*, but would not affect the basis of the standard itself.

(2) *Approach for Regulating Vinyl Chloride Under Section 112.* Two approaches other than using best available control technology were suggested by the commenters for regulating vinyl chloride under section 112. The first was to ban polyvinyl chloride products for which substitutes are currently available and to gradually phase out other polyvinyl chloride products as substitutes are developed.

In the preamble to the proposed standard EPA specified its reasons for not setting a zero emission limit for vinyl chloride, as follows: (1) There are beneficial uses of vinyl chloride products for which desirable substitutes are not readily available; (2) there are potentially adverse health and environmental impacts from substitutes which have not been thoroughly studied; (3) there are a number of employees, particularly in the fabrication industries, who would become at least temporarily unemployed; and (4) control technology is available which is capable of substantially reducing emissions of vinyl chloride into the atmosphere.

EPA agrees that substitutes do exist or could be manufactured for most polyvinyl chloride uses. However, in general, these substitutes do not have some of the more desirable characteristics of polyvinyl chloride, such as nonflammability. If vinyl chloride and polyvinyl chloride were banned, other substitutes with these more desirable characteristics would likely be developed. There is a risk that these substitutes would also have adverse health or environmental effects. Since control measures are available which can reduce vinyl chloride emissions by 90 percent or more, it does not seem prudent to reduce emissions by the remaining percentage and take the risk of introducing new untested chemicals into the environment.

Another approach suggested by the commenters was to base the standard for each individual emission point on cost versus benefit. Several of the fugitive emission points cited were specifically as cited for which the costs of control were extremely high in comparison with the benefits. Although EPA did determine a cost-benefit ratio for the controls required for a number of emission points, EPA does not believe such a ratio is an appropriate basis on which to set a standard. Section 111 of the Clean Air Act provides for the development of standards based on best control technology (considering costs). Even under section 111, however, standards are not based on a fine balancing of costs versus benefits. Instead, costs are considered in terms of the affordability of the control technology required to achieve a given emission level and the economic impact of possible standards on the industry in question. Unlike section 111, section 112 does not explicitly provide for consideration of costs, so it would clearly be inappropriate to consider costs to a greater extent under section 112 than would be done under section 111. As discussed in the preamble to the proposed standard for vinyl chloride, EPA believes costs may be considered under section 112, but only to a very limited extent; i.e., to assure that the costs of control technology are not grossly disproportionate to the amount of emission reduction achieved. In comparison with other emission points, the costs of controlling the fugitive emission sources mentioned by the commenters are relatively small compared with the amount of emission reduction achieved.

Several commenters recommended adding to the regulation a provision for excess emissions during startup, shutdown, and malfunction. EPA considered this comment, and decided that this addition is not necessary for the vinyl chloride standard. Startup and shutdown of the process has essentially no effect on emissions to the atmosphere for polyvinyl chloride production, and technology exists to avoid excess emissions during startup and shutdown at ethylene dichloride/vinyl chloride plants. We do not believe plants should be allowed to emit excess emissions during malfunctions, and therefore are requiring them to shut down immediately.

(3) *Selection of source categories.* In the preamble to the proposed standard EPA recognized that some small research and development facilities may exist where the emissions of vinyl chloride are insignificant and covering these facilities under the standard would be unnecessary and inappropriate. However, EPA did not have sufficient information available to clearly define which facilities should be excluded from the standard, and encouraged interested parties to submit such information during the comment period. Based on the information submitted, EPA decided to exempt polyvinyl chloride reactors and associated equipment from applicability of all parts of the standard if the reactors are used in research and development and have a capacity of no more than 0.10 m^3 (50 gal). Reactors in this size range can generally be found in a laboratory, whereas the larger reactors are typically pilot scale facilities. Emissions from laboratory scale equipment are relatively small, and application of the controls required by the standard would be expensive and impractical. EPA also decided to exempt research and development facilities containing reactors greater than 0.10 m^3 (50 gal) and no more than 4.07 m^3 (1100 gal) in capacity from all parts of the standard except the 10 ppm limit for reactors, strippers, monomer recovery systems, and mixing, weighing and holding containers. EPA decided not to require these facilities to meet other parts of the standard because of the technical problems involved in doing so. For example, the standard for reactor opening is based in part on reducing the frequency of opening the reactor. Research and development reactors have to be opened after every batch for thorough cleaning. Also, stripping technology is developed individually for each resin in research and development equipment. Therefore, attainment of the stripping limitations in the research and development equipment would not always be possible. The 4.07 m^3 (1100 gal) figure was selected as an upper cut-off point because there are no commercial reactors smaller than this.

(4) *Emission limits.* The only major change in the emission limits between proposal and promulgation is the addition of a provision for emergency manual venting of vinyl chloride from reactors to the atmosphere. The proposed standard prohibited all manual venting to the atmosphere. In the preamble to the proposed standard, EPA invited interested persons to comment on whether permitting manual venting to the atmosphere could result in overall lower emissions. There are several methods available for preventing relief discharges from reactors, one of which is manual venting of part of the reactor contents for purposes of cooling and reduction in pressure within the reactor. The higher the temperature and pressure within the reactor, the greater the amount of vinyl chloride which has to be removed to bring the reactor under control. Manual venting can be done at a lower pressure than the pressure required to open the relief valve. For this reason manual venting can result in lower emissions than would occur by allowing the reactor to discharge through the relief valve. Furthermore, a manual vent valve is under the control of an operator and can be closed. A relief valve may become clogged with resin and not close. The result would be loss of all the reactor contents.

The contents of a reactor can be manually vented to a gasholder or other holding vessel. However, in some cases, such as during severe weather conditions, several reactors may be out of control at one time. There would be insufficient holding capacity under these conditions to manually vent the contents of all the reactors to a gasholder. Therefore, when all other measures to prevent relief valve discharges have been exhausted, manual venting will be permitted as a last resort before the relief valve opens. The same notification procedures are required for manual venting to the atmosphere as are required for relief discharges.

There are several changes in the numerical emission limits in the promulgated standard. Except for the standard for reactor opening loss, these changes simply involve conversion to the International System of Units (SI). There was an error involved in the original calculation used to derive the standard for reactor opening. Correcting this error doubles the allowable emissions. It is emphasized that the change in this standard is a correction, and not a change in the intent for the degree of control required.

The proposed standard required the installation of a rupture disc beneath each relief valve to prevent leakage from the relief valve. A provision has been added to the promulgated standard so that a rupture disc is not required if the relief valve is tied into a process line or recovery system. In this case, any leakage from the relief valve would be contained.

The regulation for obtaining vinyl chloride samples has been changed to an operating procedure. The proposed standard stated that there were to be no emissions from taking the samples. Several commenters pointed out that the use of the word "no" would make this regulation impractical to enforce. Therefore, the promulgated standard specifies the operating procedure which EPA originally intended to be used to control this source. This revision is only a change in wording and does not represent a change in the level of the standard.

The regulation for taking samples has also been revised to apply only to samples containing at least 10 percent by weight vinyl chloride. This is consistent with the other parts of the standard which apply to equipment "in vinyl chloride service." "In vinyl chloride service" distinguishes between situations where vinyl chloride is clearly involved and situations where vinyl chloride is a minor component or contaminant, and as defined in promulgated § 61.61(1) means that a piece of equipment contains or contacts either a liquid that is at least 10 percent by weight vinyl chloride or a gas that is at least 10 percent by volume vinyl chloride.

The proposed standard required a vinyl chloride monitoring system for continuously measuring vinyl chloride levels both within the plant (for leak detection) and within stacks. The proposed standard did not outline required specifications for the monitoring system, except that it was to analyze the samples with gas chromatography, or if all hydrocarbons were assumed to be vinyl chloride, with infrared spectrophotometry, flame ion detection, or equivalent. It required that each plant submit a description of its monitoring system to EPA, so that EPA could determine whether it was acceptable or not. Comments were received indicating a need for EPA to specify some criteria for judging the acceptability of monitoring systems. The accuracy of the monitor-

ing system would be related to the frequency of calibration. Therefore, EPA has included in the promulgated standard requirements for the frequency of calibration and procedures to be carried out in the calibration of the monitoring instruments.

The portable hydrocarbon detector required by the proposed standard was required to have a sensitivity of 5 ppm. Comments were received indicating that instruments in this sensitivity range are delicate and require continuing maintenance. The portable hydrocarbon detector is required for leak detection and for measuring vinyl chloride concentrations inside the equipment before opening it. A 5 ppm sensitivity is not needed in either case, and the required sensitivity has been changed to 10 ppm in the promulgated standard.

The proposed standard contained a single regulation for compressors. The promulgated standard has separate regulations for rotating and reciprocating compressors. This is consistent with having separate regulations for rotating and reciprocating pumps in both the proposed and promulgated standards.

Section 61.66 of the proposed standard provided for the use of equivalent methods of control which have been approved by EPA. The promulgated standard requires that the plant owner or operator submit a request for determination of equivalency within 30 days of the promulgation date if the alternative control method is intended as the initial means of control. The purpose of this is to provide time for EPA to evaluate the method before the plant has to be in compliance (for existing sources, 90 days after the promulgation date). EPA also suggests that this request for determination of equivalency be accompanied by a request for waiver of compliance pursuant to section 112(c)(1)(B)(ii) of the Act. The request for a waiver for compliance should provide for the case where EPA determines that a method is not equivalent and the plant needs to purchase other equipment. In no case will the waiver of compliance be extended beyond two years from the date of promulgation.

There are several wording clarifications which have been made in the promulgated standard. The definition for "in vinyl chloride service" (§ 60.61(l)) has been clarified by stating that it means equipment that contacts vinyl chloride as well as equipment that contains vinyl chloride. This would include such equipment as agitators.

Words have been added in §§ 61.62, 61.63, and 61.64 to clarify that the 10 ppm emission limits do not have to be met when equipment has already been opened in compliance with the regulation for opening of equipment. Equipment that has met the opening of equipment regulation can contain more than 10 ppm vinyl chloride and would be in violation of the standard if this statement were not included.

The requirements for stripping polyvinyl chloride resins to specified levels have been revised in §§ 61.64(c), 61.67 (g)(3)(ii), and 61.70(c)(2)(i) so that measurement of the vinyl chloride levels in the resins is to be made immediately after stripping is completed rather than as the resin is being transferred out of the stripper. This allows a plant to carry out operations in a stripper after stripping has been completed but before it is transferred out of the stripper. This is consistent with the original intent of the standard.

The regulation for loading and unloading lines in § 61.65(b)(1) has been revised to clarify that it applies only to lines that are disconnected after each loading or unloading operation. Permanently installed pipelines that are opened infrequently for inspection or maintenance, for example, are covered by the opening of equipment regulation rather than the loading and unloading line regulation.

The regulation for inprocess wastewater in the proposed standard could have been misinterpreted to require individual treatment of wastewater streams. Section 61.65(b)(9)(i) of the promulgated standard clarifies that wastewater streams that are required to be treated (i.e., those containing greater than 10 ppm vinyl chloride) can be combined to be treated. However, wastewater streams that contain greater than 10 ppm vinyl chloride cannot be combined with wastewater streams that contain less than 10 ppm vinyl chloride before treatment; i.e., dilution cannot be used to meet the standard.

The commenters recommended several changes in the emission limits which have not been incorporated into the promulgated standard. These are discussed in the following paragraphs.

It was recommended that the requirement for double mechanical seals on pumps, compressors, and agitators be removed because the single seals currently used on this equipment have small emissions and are more reliable than double mechanical seals. EPA is aware that each fugitive emission source, such as one pump, taken by itself causes relatively small emissions. Fugitive emissions considered as a whole are a significant source of emissions, however, and the intent of the standard is to reduce these. Double mechanical seal pumps are commonly used in the industry for emission reduction. Sealless pumps or equivalent systems are available as options to double mechanical seals.

The commenters recommended increasing the averaging time for the 10 ppm limits and the emission limits for reactor opening and stripping to 30 days. Some of the commenters apparently thought that the 10 ppm limits had to be met on an instantaneous basis. However, since the performance test for determining compliance consists of three runs for a minimum of an hour each, the averaging time for the 10 ppm limit is at least three hours. Increasing the averaging time to 30 days for any of the emission limits would permit higher peak emission levels. EPA has determined that this is neither desirable nor necessary.

Some commenters requested that the stripping levels for dispersion resins be made the same as for other resins and others requested that they be made less stringent. EPA decided not to make the standard for stripping dispersion resins the same as for other resins because there is sufficient evidence to indicate that these resins are more difficult to strip than other resins. With regard to making the stripping levels for dispersion resins less stringent, only one of the eight manufacturers of dispersion resins specifically commented that the dispersion resin standard should be made less stringent. Only two of several grades of dispersion resins made by this company cannot meet the 2,000 ppm limit. The proposed standard takes into consideration that some resins are more difficult to strip than others by providing for averaging among different resins.

(5) *Testing, reporting, and recordkeeping.* There are several relatively minor changes in the testing, reporting, and recordkeeping requirements. A provision has been added to § 61.67 which requires that stack gas samples taken with Test Method 106 are to be analyzed within 24 hours. This is consistent with the requirements in the proposed Test Method 106. The promulgated standard also specifies that in averaging the results of the three runs required by Test Method 106, a time-weighted average is to be used.

One commenter requested that the oxygen content and moisture content be specified for the 10 ppm concentration standards. The proposed standard specified that the vinyl chloride concentration is to be corrected to 10 percent oxygen (wet basis) if combustion is used as the control measure. In the promulgated standard, this requirement has been expanded to all control measures.

A provision has been added to the promulgated standard which states that if a reactor is also used as a stripper, the reactor opening emissions may be determined immediately following the stripping operation. If a reactor is also used as a stripper, the resin is in the reactor when it is opened. This means that vinyl chloride in the resin which has already been stripped to acceptable levels can escape from the resin and become part of the reactor opening loss. It is EPA's intent that once a resin has been stripped to the required levels, that additional controls are not required. Under the new provision, vinyl chloride escaping from the resin after it has been stripped to acceptable levels is not counted as part of the reactor opening loss.

A section requiring continuous monitoring of stack emissions has been added to the promulgated standard. The continuous monitoring of stack emissions was required in the proposed standard. The addition of a specific paragraph for emission monitoring serves only to clarify the requirement.

The standard has been revised so that the initial report requires a "description" rather than a "detailed description" of the equipment used to control fugitive emissions. Several commenters pointed out that a detailed description would contain proprietary information. EPA agrees that a detailed description in the

initial report is unnecessary. If additional information is needed, EPA can obtain it under section 114 of the Act and the plant can request confidential treatment in accordance with 40 CFR Part 2 for information it believes to be proprietary.

The proposed standard required that a semiannual report be submitted every 180 days. The promulgated standard specifies dates for the submittal of the reports. It also specifies that the first semiannual report does not have to be submitted until at least six months after the initial report is submitted.

The standard has been revised to eliminate the requirement to record the cause of any leak detected by the vinyl chloride detector, the action taken to repair the leak, and the amount of time required to repair the leak. EPA is concerned only that leaks are detected and repaired. That this has been done can be established by looking at the strip chart record of measurements made by the vinyl chloride detector. These records are still required for the portable hydrocarbon detector however.

Several commentators recommended that the companies be allowed an extra two weeks to submit to EPA data from the initial performance test. They also recommended that they submit the data by regular mail rather than registered mail. EPA has not adopted either of these recommendations. A source is supposed to be in compliance with the standard within 90 days of the promulgation of the standard. The standard requires that the emission tests be done within the 90 day period, and permits an extra 30 days for determination of results. The purpose of using registered mail is to document the fact that emission data have been sent and received. This way if the results are lost in the mail, there will be no question that they were sent.

(6) *Test method.* Test Method 106 has been changed to recognize that on a gas chromatograph equipped with a Chromosorb 102 column, acetaldehyde may interfere with the vinyl chloride peak. When a sample is expected to contain acetaldehyde, a secondary column as described in section 4.3.2 must be employed. Mass spectroscopy or another absolute analytical technique is required to confirm the vinyl chloride peak obtained with the gas chromatograph, only if peak resolution with the secondary column is not successful.

In section 4.1.4, aluminized Mylar bags can be substituted for Tedlar bags. EPA now has data to allow this substitution, provided that the samples are analyzed within 24 hours of collection.

In section 5.1.3 of Test Method 106 the requirement to use "oxygen gas" has been replaced with "oxygen gas or air, as required by the detector." Several commentors stated that most gas chromatographs are designed to use hydrogen and air for their flame detectors. When used in this way, they are capable of detecting 0.5 ppm vinyl chloride in air. This is sensitive enough for monitoring the 10 ppm emission limits stipulated in the standard.

In section 6.4 of Test Method 106 the requirement for an automatic integrator has been replaced with a requirement for a disc integrator or planimeter for measuring peak area. This change is in response to a comment which states that automatic integrators are unnecessarily elaborate and expensive.

A new section 6.5 has been added to Test Method 106 which requires determination of the water vapor content of the sampling bag by measuring the ambient temperature and pressure near the bag. The vinyl chloride concentration of the bag can then be reported on a dry basis. A provision for checking the rigid container for leaks has been added to section 7.4 of Test Method 106.

The only change in Test Method 107 is the provision in Section 5.3.2 for use of Carbopak C as well as Carbopak A.

AUTHORITY: Section 112 of the Clean Air Act as added by sec. 4(a) of Pub. L. 91-604, 84 Stat. 1685 (42 U.S.C. 1857c-7; Section 114 of the Clean Air Act, as added by sec. 4(a) of Pub. L. 91-604, 84 Stat. 1687, and amended by Pub. L. 93-319, sec. 6(a)(4), 88 Stat. 259 (42 U.S.C. 1857c-9); Section 301(a) of the Clean Air Act, as amended by sec. 15(c)(2) of Pub. L. 91-604, 84 Stat. 1713 (42 U.S.C. 1857g(a)).

Dated: October 12, 1976.

JOHN QUARLES,
Acting Administrator.

Part 61 of Chapter I, Title 40 of the Code of Federal Regulations is amended as follows: The table of sections for Part 61 is amended by adding a list of sections for new Subpart F and Part 61 is amended by adding a new Subpart F reading as follows:

Subpart F—National Emission Standard for Vinyl Chloride

Sec.
61.60 Applicability.
61.61 Definitions.
61.62 Emission standard for ethylene dichloride plants.
61.63 Emission standard for vinyl chloride plants.
61.64 Emission standard for polyvinyl chloride plants.
61.65 Emission standard for ethylene dichloride, vinyl chloride and polyvinyl chloride plants.
61.66 Equivalent equipment and procedures.
61.67 Emission tests.
61.68 Emission monitoring.
61.69 Initial report.
61.70 Semiannual report.
61.71 Recordkeeping.

AUTHORITY: Section 112 of the Clean Air Act as added by sec. 4(a) of Pub. L. 91-604, 84 Stat. 1685 (42 U.S.C. 1857c-7); section 114 of the Clean Air Act, as added by sec. 4(a) of Pub. L. 91-604, 84 Stat. 1687, and amended by Pub. L. 93-319, sec. 6(a)(4), 88 Stat. 259 (42 U.S.C. 1857c-9); section 301(a) of the Clean Air Act, as amended by sec. 15(c)(2) of Pub. L. 91-604, 84 Stat. 1713 (42 U.S.C. 1857g(a)).

Subpart F—National Emission Standard for Vinyl Chloride

§ 61.60 Applicability.

(a) This subpart applies to plants which produce:

(1) Ethylene dichloride by reaction of oxygen and hydrogen chloride with ethylene,

(2) Vinyl chloride by any process, and/or

(3) One or more polymers containing any fraction of polymerized vinyl chloride.

(b) This subpart does not apply to equipment used in research and development if the reactor used to polymerize the vinyl chloride processed in the equipment has a capacity of no more than 0.19 m³ (50 gal).

(c) Sections of this subpart other than § 61.64(a)(1), (b), (c), and (d) do not apply to equipment used in research and development if the reactor used to polymerize the vinyl chloride processed in the equipment has a capacity of greater than 0.19 m³ (50 gal) and no more than 4.07 m³ (1100 gal).

§ 61.61 Definitions.

Terms used in this subpart are defined in the Act, in subpart A of this part, or in this section as follows:

(a) "Ethylene dichloride plant" includes any plant which produces ethylene dichloride by reaction of oxygen and hydrogen chloride with ethylene.

(b) "Vinyl chloride plant" includes any plant which produces vinyl chloride by any process.

(c) "Polyvinyl chloride plant" includes any plant where vinyl chloride alone or in combination with other materials is polymerized.

(d) "Slip gauge" means a gauge which has a probe that moves through the gas/liquid interface in a storage or transfer vessel and indicates the level of vinyl chloride in the vessel by the physical state of the material the gauge discharges.

(e) "Type of resin" means the broad classification of resin referring to the basic manufacturing process for producing that resin, including, but not limited to, the suspension, dispersion, latex, bulk, and solution processes.

(f) "Grade of resin" means the subdivision of resin classification which describes it as a unique resin, i.e., the most exact description of a resin with no further subdivision.

(g) "Dispersion resin" means a resin manufactured in such away as to form fluid dispersions when dispersed in a plasticizer or plasticizer/diluent mixtures.

(h) "Latex resin" means a resin which is produced by a polymerization process which initiates from free radical catalyst sites and is sold undried.

(i) "Bulk resin' 'means a resin which is produced by a polymerization process in which no water is used.

(j) "Inprocess wastewater" means any water which, during manufacturing or processing, comes into direct contact with vinyl chloride or polyvinyl chloride or results from the production or use of any raw material, intermediate product, finished product, by-product, or waste product containing vinyl chloride or polyvinyl chloride but which has not been discharged to a wastewater treatment process or discharged untreated as wastewater.

(k) "Wastewater treatment process" includes any process which modifies

characteristics such as BOD, COD, TSS, and pH, usually for the purpose of meeting effluent guidelines and standards; it does not include any process the purpose of which is to remove vinyl chloride from water to meet requirements of this subpart.

(l) "In vinyl chloride service" means that a piece of equipment contains or contacts either a liquid that is at least 10 percent by weight vinyl chloride or a gas that is at least 10 percent by volume vinyl chloride.

(m) "Standard operating procedure" means a formal written procedure officially adopted by the plant owner or operator and available on a routine basis to those persons responsible for carrying out the procedure.

(n) "Run" means the net period of time during which an emission sample is collected.

(o) "Ethylene dichloride purification" includes any part of the process of ethylene dichloride production which follows ethylene dichloride formation and in which finished ethylene dichloride is produced.

(p) "Vinyl chloride purification" includes any part of the process of vinyl chloride production which follows vinyl chloride formation and in which finished vinyl chloride is produced.

(q) "Reactor" includes any vessel in which vinyl chloride is partially or totally polymerized into polyvinyl chloride.

(r) "Reactor opening loss" means the emissions of vinyl chloride occurring when a reactor is vented to the atmosphere for any purpose other than an emergency relief discharge as defined in § 61.65(a).

(s) "Stripper" includes any vessel in which residual vinyl chloride is removed from polyvinyl chloride resin, except bulk resin, in the slurry form by the use of heat and/or vacuum. In the case of bulk resin, stripper includes any vessel which is used to remove residual vinyl chloride from polyvinyl chloride resin immediately following the polymerization step in the plant process flow.

§ 61.62 Emission standard for ethylene dichloride plants.

An owner or operator of an ethylene dichloride plant shall comply with the requirements of this section and § 61.65.

(a) Ethylene dichloride purification: The concentration of vinyl chloride in all exhaust gases discharged to the atmosphere from any equipment used in ethylene dichloride purification is not to exceed 10 ppm, except as provided in § 61.65(a). This requirement does not apply to equipment that has been opened, is out of operation, and met the requirement in § 61.65(b) before being opened.

(b) Oxychlorination reactor: Except as provided in § 61.65(a), emissions of vinyl chloride to the atmosphere from each oxychlorination reactor are not to exceed 0.2 g/kg the 100 percent ethylene dichloride product from the oxychlorination process.

§ 61.63 Emission standard for vinyl chloride plants.

An owner or operator of a vinyl chloride plant shall comply with the requirements of this section and § 61.65.

(a) Vinyl chloride formation and purification: The concentration of vinyl chloride in all exhaust gases discharged to the atmosphere from any equipment used in vinyl chloride formation and/or purification is not to exceed 10 ppm, except as provided in § 61.65(a). This requirement does not apply to equipment that has been opened, is out of operation, and met the requirement in § 61.65(b)(6)(i) before being opened.

§ 61.64 Emission standard for polyvinyl chloride plants.

An owner or operator of a polyvinyl chloride plant shall comply with the requirements of this section and § 61.65.

(a) Reactor: The following requirements apply to reactors:

(1) The concentration of vinyl chloride in all exhaust gases discharged to the atmosphere from each reactor is not to exceed 10 ppm, except as provided in paragraph (a)(2) of this section and § 61.65(a).

(2) The reactor opening loss from each reactor is not to exceed 0.02 g vinyl chloride/Kg (0.00002 lb vinyl chloride/lb) of polyvinyl chloride product, with the product determined on a dry solids basis. This requirement applies to any vessel which is used as a reactor or as both a reactor and a stripper. In the bulk process, the product means the gross product of prepolymerization and postpolymerization.

(3) Manual vent valve discharge: Except for an emergency manual vent valve discharge, there is to be no discharge to the atmosphere from any manual vent valve on a polyvinyl chloride reactor in vinyl chloride service. An emergency manual vent valve discharge means a discharge to the atmosphere which could not have been avoided by taking measures to prevent the discharge. Within 10 days of any discharge to the atmosphere from any manual vent valve, the owner or operator of the source from which the discharge occurs shall submit to the Administrator a report in writing containing information on the source, nature and cause of the discharge, the date and time of the discharge, the approximate total vinyl chloride loss during the discharge, the method used for determining the vinyl chloride loss, the action that was taken to prevent the discharge, and measures adopted to prevent future discharges.

(b) Stripper: The concentration of vinyl chloride in all exhaust gases discharged to the atmosphere from each stripper is not to exceed 10 ppm, except as provided in § 61.65(a). This requirement does not apply to equipment that has been opened, is out of operation, and met the requirement in § 61.65(b)(6)(i) before being opened.

(c) Mixing, weighing, and holding containers: The concentration of vinyl chloride in all exhaust gases discharged to the atmosphere from each mixing, weighing, or holding container in vinyl chloride service which precedes the stripper (or the reactor if the plant has no stripper) in the plant process flow is not to exceed 10 ppm, except as provided in § 61.65(a). This requirement does not apply to equipment that has been opened, is out of operation, and met the requirement in § 61.65(b)(6)(i) before being opened.

(d) Monomer recovery system. The concentration of vinyl chloride in all exhaust gases discharged to the atmosphere from each monomer recovery system is not to exceed 10 ppm, except as provided in § 61.65(a). This requirement does not apply to equipment that has been opened, is out of operation, and met the requirement in § 61.65(b)(6)(i) before being opened.

(e) Sources following the stripper(s): The following requirements apply to emissions of vinyl chloride to the atmosphere from the combination of all sources following the stripper(s) (or the reactor(s) if the plant has no stripper(s)) in the plant process flow including but not limited to, centrifuges, concentrators, blend tanks, filters, dryers, conveyor air discharges, baggers, storage containers, and inprocess wastewater:

(1) In polyvinyl chloride plants using stripping technology to control vinyl chloride emissions, the weighted average residual vinyl chloride concentration in all grades of polyvinyl chloride resin processed through the stripping operation on each calendar day, measured immediately after the stripping operation is completed, may not exceed:

(i) 2000 ppm for polyvinyl chloride dispersion resins, excluding latex resins;

(ii) 400 ppm for all other polyvinyl chloride resins, including latex resins, averaged separately for each type of resin; or

(2) In polyvinyl chloride plants controlling vinyl chloride emissions with technology other than stripping or in addition to stripping, emissions of vinyl chloride to the atmosphere may not exceed:

(i) 2 g/kg (0.002 lb/lb) product from the stripper(s) (or reactor(s) if the plant has no stripper(s)) for dispersion polyvinyl chloride resins, excluding latex resins, with the product determined on a dry solids basis;

(ii) 0.4 g/kg (0.0004 lb/lb) product from the strippers (or reactor(s) if the plant has no stripper(s)) for all other polyvinyl chloride resins, including latex resins, with the product determined on a dry solids basis.

§ 61.65 Emission standard for ethylene dichloride, vinyl chloride and polyvinyl chloride plants.

An owner or operator of an ethylene dichloride, vinyl chloride, and/or polyvinyl chloride plant shall comply with the requirements of this section.

(a) Relief valve discharge: Except for an emergency relief discharge, there is to be no discharge to the atmosphere from any relief valve on any equipment in vinyl chloride service. An emergency relief discharge means a discharge which could not have been avoided by taking measures to prevent the discharge. Within 10 days of any relief valve discharge,

the owner or operator of the source from which the relief valve discharge occurs shall submit to the Administrator a report in writing containing information on the source, nature and cause of the discharge, the date and time of the discharge, an estimate of the total vinyl chloride lost during the discharge, the method used for determining the vinyl chloride lost, the action that was taken to prevent the discharge, and measures adopted to prevent future discharges.

(b) Fugitive emission sources:

(1) Loading and unloading lines: Vinyl chloride emissions from loading and unloading lines which are opened to the atmosphere after each loading or unloading operation are to be minimized as follows:

(i) After each loading or unloading operation and before opening a loading or unloading line to the atmosphere, the quantity of vinyl chloride in all parts of each loading or unloading line that are to be opened to the atmosphere is to be reduced so that the parts combined contain no greater than 0.0038 m^3 (0.13 ft^3) of vinyl chloride, at standard temperature and pressure; and

(ii) Any vinyl chloride removed from a loading or unloading line in accordance with paragraph (b)(1)(i) of this section is to be ducted through a control system from which the concentration of vinyl chloride in the exhaust gases does not exceed 10 ppm, or equivalent as provided in § 61.66.

(2) Slip gauges: During loading or unloading operations, the vinyl chloride emissions from each slip gauge in vinyl chloride service are to be minimized by ducting any vinyl chloride discharged from the slip gauge through a control system from which the concentration of vinyl chloride in the exhaust gases does not exceed 10 ppm, or equivalent as provided in § 61.66.

(3) Leakage from pump, compressor, and agitator seals:

(i) Rotating pumps: Vinyl chloride emissions from seals on all rotating pumps in vinyl chloride service are to be minimized by installing sealless pumps, pumps with double mechanical seals, or equivalent as provided in § 61.66. If double mechanical seals are used, vinyl chloride emission from the seals are to be minimized by maintaining the pressure between the two seals so that any leak that occurs is into the pump; by ducting any vinyl chloride between the two seals through a control system from which the concentration of vinyl chloride in the exhaust gases does not exceed 10 ppm; or equivalent as provided in § 61.66.

(ii) Reciprocating pumps: Vinyl chloride emissions from seals on all reciprocating pumps in vinyl chloride service are to be minimized by installing double outboard seals, or equivalent as provided in § 61.66. If double outboard seals are used, vinyl chloride emissions from the seals are to be minimized by maintaining the pressure between the two seals so that any leak that occurs is into the pump; by ducting any vinyl chloride between the two seals through a control system from which the concentration of vinyl chloride in the exhaust gases does not exceed 10 ppm; or equivalent as provided in § 61.66.

(iii) Rotating compressors: Vinyl chloride emissions from seals on all rotating compressors in vinyl chloride service are to be minimized by installing compressors with double mechanical seals, or equivalent as provided in § 61.66. If double mechanical seals are used, vinyl chloride emissions from the seals are to be minimized by maintaining the pressure between the two seals so that any leak that occurs is into the compressor; by ducting any vinyl chloride between the two seals through a control system from which the concentration of vinyl chloride in the exhaust gases does not exceed 10 ppm; or equivalent as provided in § 61.66.

(iv) Reciprocating compressors: Vinyl chloride emissions from seals on all reciprocating compressors in vinyl chloride service are to be minimized by installing double outboard seals, or equivalent as provided in § 61.66. If double outboard seals are used, vinyl chloride emissions from the seals are to be minimized by maintaining the pressure between the two seals so that any leak that occurs is into the compressor; by ducting any vinyl chloride between the two seals through a control system from which the concentration of vinyl chloride in the exhaust gases does not exceed 10 ppm; or equivalent as provided in § 61.66.

(v) Agitator: Vinyl chloride emissions from seals on all agitators in vinyl chloride service are to be minimized by installing agitators with double mechanical seals, or equivalent as provided in § 61.66. If double mechanical seals are used, vinyl chloride emissions from the seals are to be minimized by maintaining the pressure between the two seals so that any leak that occurs is into the agitated vessel; by ducting any vinyl chloride between the two seals through a control system from which the concentration of vinyl chloride in the exhaust gases does not exceed 10 ppm; or equivalent as provided in § 61.66.

(4) Leakage from relief valves: Vinyl chloride emissions due to leakage from each relief valve on equipment in vinyl chloride service are to be minimized by installing a rupture disk between the equipment and the relief valve, by connecting the relief valve discharge to a process line or recovery system, or equivalent as provided in § 61.66.

(5) Manual venting of gases: Except as provided in § 61.64(a)(3), all gases which are manually vented from equipment in vinyl chloride service are to be ducted through a control system from which the concentration of vinyl chloride in the exhaust gases does not exceed 10 ppm; or equivalent as provided in § 61.66.

(6) Opening of equipment: Vinyl chloride emissions from opening of equipment (including loading or unloading lines that are not opened to the atmosphere after each loading or unloading operation) are to be minimized as follows:

(i) Before opening any equipment for any reason, the quantity of vinyl chloride is to be reduced so that the equipment contains no more than 2.0 percent by volume vinyl chloride or 0.0950 m^3 (25 gal) of vinyl chloride, whichever is larger, at standard temperature and pressure; and

(ii) Any vinyl chloride removed from the equipment in accordance with paragraph (b)(6)(i) of this section is to be ducted through a control system from which the concentration of vinyl chloride in the exhaust gases does not exceed 10 ppm, or equivalent as provided in § 61.66.

(7) Samples: Unused portions of samples containing at least 10 percent by weight vinyl chloride are to be returned to the process, and sampling techniques are to be such that sample containers in vinyl chloride service are purged into a closed process system.

(8) Leak detection and elimination: Vinyl chloride emissions due to leaks from equipment in vinyl chloride service are to be minimized by instituting and implementing a formal leak detection and elimination program. The owner or operator shall submit a description of the program to the Administrator for approval. The program is to be submitted within 45 days of the effective date of these regulations, unless a waiver of compliance is granted under § 61.11. If a waiver of compliance is granted, the program is to be submitted on a date scheduled by the Administrator. Approval of a program will be granted by the Administrator provided he finds:

(i) It includes a reliable and accurate vinyl chloride monitoring system for detection of major leaks and identification of the general area of the plant where a leak is located. A vinyl chloride monitoring system means a device which obtains air samples from one or more points on a continuous sequential basis and analyzes the samples with gas chromatography or, if the owner or operator assumes that all hydrocarbons measured are vinyl chloride, with infrared spectrophotometry flame ion detection, or an equivalent or alternative method.

(ii) It includes a reliable and accurate portable hydrocarbon detector to be used routinely to find small leaks and to pinpoint the major leaks indicated by the vinyl chloride monitoring system. A portable hydrocarbon detector means a device which measures hydrocarbons with a sensitivity of at least 10 ppm and is of such design and size that it can be used to measure emissions from localized points.

(iii) It provides for an acceptable calibration and maintenance schedule for the vinyl chloride monitoring system and portable hydrocarbon detector. For the vinyl chloride monitoring system, a daily span check is to be conducted with a concentration of vinyl chloride equal to the concentration defined as a leak according to paragraph (b)(8)(vi) of this section. The calibration is to be done with either:

(A) A calibration gas mixture prepared from the gases specified in sections 5.2.1 and 5.2.3 of Test Method 106, or

(B) A calibration gas cylinder containing the appropriate concentration of vinyl chloride. If a calibration gas cylinder is used, the analysis must be traceable to the National Bureau of Standards or to a gravimetrically calibrated vinyl chloride permeation tube.

(iv) The location and number of points to be monitored and the frequency of monitoring provided for in the program are acceptable when they are compared with the number of pieces of equipment in vinyl chloride service and the size and physical layout of the plant.

(v) It contains an acceptable plan of action to be taken when a leak is detected.

(vi) It contains a definition of leak which is acceptable when compared with the background concentrations of vinyl chloride in the areas of the plant to be monitored by the vinyl chloride monitoring system. Measurements of background concentrations of vinyl chloride in the areas of the plant to be monitored by the vinyl chloride monitoring system are to be included with the description of the program. The definition of leak for a given plant may vary among the different areas within the plant and is also to change over time as background concentrations in the plant are reduced.

(9) Inprocess wastewater: Vinyl chloride emissions to the atmosphere from inprocess wastewater are to be reduced as follows:

(i) The concentration of vinyl chloride in each inprocess wastewater stream containing greater than 10 ppm vinyl chloride measured immediately as it leaves a piece of equipment and before being mixed with any other inprocess wastewater stream is to be reduced to no more than 10 ppm by weight before being mixed with any other inprocess wastewater stream which contains less than 10 ppm vinyl chloride; before being exposed to the atmosphere, before being discharged to a wastewater treatment process; or before being discharged untreated as a wastewater. The paragraph does apply to water which is used to displace vinyl chloride from equipment before it is opened to the atmosphere in accordance with § 61.64(a)(2) or paragraph (b)(6) of this section, but does not apply to water which is used to wash out equipment after the equipment has already been opened to the atmosphere in accordance with § 61.64(a)(2) or paragraph (b)(6) of this section.

(ii) Any vinyl chloride removed from the inprocess wastewater in accordance with paragraph (b)(9)(i) of this section is to be ducted through a control system from which the concentration of vinyl chloride in the exhaust gases does not exceed 10 ppm, or equivalent as provided in § 61.66.

(c) The requirements in paragraphs (b)(1), (b)(2), (b)(5), (b)(6), (b)(7) and (b)(8) of this section are to be incorporated into a standard operating procedure, and made available upon request for inspection by the Administrator. The standard operating procedure is to include provisions for measuring the vinyl chloride in equipment 3.175 m³ (1250 gal) in volume for which an emission limit is prescribed in § 61.65(b)(6)(i) prior to opening the equipment and using Test Method 106, a portable hydrocarbon detector, or an equivalent or alternative method. The method of measurement is to meet the requirements in § 61.67(g)(5)(i)(A) or (g)(5)(i)(B).

§ 61.66 Equivalent equipment and procedures.

Upon written application from an owner or operator, the Administrator may approve use of equipment or procedures which have been demonstrated to his satisfaction to be equivalent in terms of reducing vinyl chloride emissions to the atmosphere to those prescribed for compliance with a specific paragraph of this subpart. For an existing source, any request for using an equivalent method as the initial measure of control is to be submitted to the Administrator within 30 days of the effective date. For a new source, any request for using an equivalent method is to be submitted to the Administrator with the application for approval of construction or modification required by § 61.07.

§ 61.67 Emission tests.

(a) Unless a waiver of emission testing is obtained under § 61.13, the owner or operator of a source to which this subpart applies shall test emissions from the source,

(1) Within 90 days of the effective date in the case of an existing source or a new source which has an initial startup date preceding the effective date, or

(2) Within 90 days of startup in the case of a new source, initial startup of which occurs after the effective date.

(b) The owner or operator shall provide the Administrator at least 30 days prior notice of an emission test to afford the Administrator the opportunity to have an observer present during the test.

(c) Any emission test is to be conducted while the equipment being tested is operating at the maximum production rate at which the equipment will be operated and under other relevant conditions as may be specified by the Administrator based on representative performance of the source.

(d) Each emission test is to consist of three runs. For the purpose of determining emissions, the average of results of all runs is to apply. The average is to be computed on a time weighted basis.

(e) All samples are to be analyzed within 24 hours, and vinyl chloride emissions are to be determined within 30 days after the emission test. The owner or operator shall report the determinations to the Administrator by a registered letter dispatched before the close of the next business day following the determination.

(f) The owner or operator shall retain at the plant and make available, upon request, for inspection by the Administrator, for a minimum of 2 years records of emission test results and other data needed to determine emissions.

(g) Unless otherwise specified, the owner or operator shall use test Test Methods in Appendix B to this part for each test as required by paragraphs (g)(1), (g)(2), (g)(3), (g)(4), or (g)(5) of this section, unless an equivalent method or an alternative method has been approved by the Administrator. If the Administrator finds reasonable grounds to dispute the results obtained by an equivalent or alternative method he may require the use of a reference method. If the results of the reference and equivalent or alternative methods do not agree, the results obtained by the reference method prevail, and the Administrator may notify the owner or operator that approval of the method previously considered to be equivalent or alternative is withdrawn.

(1) Test Method 106 is to be used to determine the vinyl chloride emissions from any source for which an emission limit is prescribed in §§ 61.62(a) or (b), § 61.63(a), or §§ 61.64(a)(1), (b), (c), or (d), or from any control system to which reactor emissions are required to be ducted in § 61.64(a)(2) or to which fugitive emissions are required to be ducted in §§ 61.65(b)(1)(ii), (b)(2), (b)(5), (b)(6)(ii), or (b)(9)(ii).

(i) For each run, one sample is to be collected. The sampling site is to be at least two stack or duct diameters downstream and one half diameter upstream from any flow disturbance such as a bend, expansion, contraction, or visible flame. For a rectangular cross section an equivalent diameter is to be determined from the following equation:

$$\text{equivalent diameter} = 2\,\frac{(\text{length})(\text{width})}{\text{length} + \text{width}}$$

The sampling point in the duct is to be at the centroid of the cross section. The sample is to be extracted at a rate proportional to the gas velocity at the sampling point. The sample is to be taken over a minimum of one hour, and is to contain a minimum volume of 50 liters corrected to standard conditions.

(ii) For gas streams containing more than 10 percent oxygen, the concentration of vinyle chloride as determined by Test Method 106 is to be corrected to 10 percent oxygen for determination of emissions by using the following equation:

$$C_{e\,(\text{corrected})} = C_e \frac{10.9}{20.9 - \text{percent } O_2}$$

where:

$C_{e\,(\text{corrected})}$ = The concentration of vinyl chloride in the exhaust gases, corrected to 10 percent oxygen.

C_e = The concentration of vinyl chloride as measured by Test Method 106.

20.9 = Percent oxygen in the ambient air at standard conditions.

10.9 = Percent oxygen in the ambient air at standard conditions, minus the 10 percent oxygen to which the correction is being made.

Percent O_2 = Percent oxygen in the exhaust gas as measured by Reference Method 3 in Appendix A of Part 60 of this chapter.

(iii) For those emission sources where the emission limit is prescribed in terms of mass rather than concentration, mass

emissions in kg/100 kg product are to be determined by using the following equation:

$$C_{BX} = \frac{[C_A\ (2.60)\ Q\ 10^{-4}]\ [100]}{Z}$$

where:

C_{BX} = kg vinyl chloride/100 kg product.
C_A = [illegible] of vinyl chloride as measured by Test Method 107.
2.60 = Density of vinyl chloride at one atmosphere and 20° C in kg/m³.
Q = Volumetric flow rate in m³/hr as determined by Reference Method 2 of Appendix A to part 60 of this chapter.
10^{-4} = Conversion factor for ppm.
Z = Production rate in kg/hr.

(2) Test Method 107 is to be used to determine the concentration of vinyl chloride in each inprocess wastewater stream for which an emission limit is prescribed in § 61.65(b)(9)(i).

(3) Where a stripping operation is used to attain the emission limit in § 61.64(e), emissions are to be determined using Test Method 107 as follows:

(i) The number of strippers and samples and the types and grades of resin to be sampled are to be determined by the Administrator for each individual plant at the time of the test based on the plant's operation.

(ii) Each sample is to be taken immediately following the stripping operation.

(iii) The corresponding quantity of material processed by each stripper is to be determined on a dry solids basis and by a method submitted to and approved by the Administrator.

(iv) At the prior request of the Administrator, the owner or operator shall provide duplicates of the samples required in paragraph (g)(3)(i) of this section.

(4) Where control technology other than or in addition to a stripping operation is used to attain the emission limit in § 61.64(e), emissions are to be determined as follows:

(i) Test Method 106 is to be used to determine atmospheric emissions from all of the process equipment simultaneously. The requirements of paragraph (g)(1) of this section are to be met.

(ii) Test Method 107 is to be used to determine the concentration of vinyl chloride in each inprocess wastewater stream subject to the emission limit prescribed in § 61.64(e). The mass of vinyl chloride in kg/100 kg product in each in process wastewater stream is to be determined by using the following equation:

$$C_{BX} = \frac{[C_A\ R\ 10^{-4}]\ [100]}{Z}$$

where:

C_{BX} = kg vinyl chloride/100 kg product.
C_A = the concentration of vinyl chloride as measured by Test Method 107.
R = water flow rate in l/hr, determined in accordance with a method which has been submitted to and approved by the Administrator.
10^{-4} = Conversion factor for ppm.
Z = Production rate (kg/hr), determined in accordance with a method which has been submitted and approved by the Administrator.

(5) The reactor opening loss for which an emission limit is prescribed in § 61.64(a)(2) is to be determined. The number of reactors for which the determination is to be made is to be specified by the Administrator for each individual plant at the time of the determination based on the plant's operation. For a reactor that is also used as a stripper, the determination may be made immediately following the stripping operation.

(i) Except as provided in paragraph (g)(5)(ii) of this section, the reactor opening loss is to be determined using the following equation:

$$C = \frac{W\ (2.60)\ (10^{-4})\ (Cb)}{Y\ Z}$$

where:

C = kg vinyl chloride/kg emissions/kg product.
W = Capacity of the reactor in m³.
2.60 = Density of vinyl chloride at one atmosphere and 20° C in kg/m³.
10^{-4} = Conversion factor for ppm.
Cb = ppm by volume vinyl chloride as determined by Test Method 106 or a portable hydrocarbon detector which measures hydrocarbons with a sensitivity of at least 10 ppm.
Y = Number of batches since the reactor was last opened to the atmosphere.
Z = Average kg of polyvinyl chloride produced per batch in the number of batches since the reactor was last opened to the atmosphere.

(A) If Method 106 is used to determine the concentration of vinyl chloride (Cb), the sample is to be withdrawn at a constant rate with a probe of sufficient length to reach the vessel bottom from the manhole. Samples are to be taken for 5 minutes within 6 inches of the vessel bottom, 5 minutes near the vessel center, and 5 minutes near the vessel top.

(B) If a portable hydrocarbon detector is used to determine the concentration of vinyl chloride (Cb), a probe of sufficient length to reach the vessel bottom from the manhole is to be used to make the measurements. One measurement will be made within 6 inches of the vessel bottom, one near the vessel center and one near the vessel top. Measurements are to be made at each location until the reading is stabilized. All hydrocarbons measured are to be assumed to be vinyl chloride.

(C) The production rate of polyvinyl chloride (Z) is to be determined by a method submitted to and approved by the Administrator.

(ii) A calculation based on the number of evacuations, the vacuum involved, and the volume of gas in the reactor is hereby approved by the Administrator as an alternative method for determining reactor opening loss for postpolymerization reactors in the manufacture of bulk resins.

§ 61.68 Emission monitoring.

(a) A vinyl chloride monitoring system is to be used to monitor on a continuous basis the emissions from the sources for which emission limits are prescribed in § 61.62(a) and (b), § 61.63(a), and § 61.64(a)(1), (b), (c), and (d), and for any control system to which reactor emission are required to be ducted in § 61.65(b)(1)(ii), and (b)(2), (b)(5), (b)(6)(ii), and (b)(9)(ii).

(b) The vinyl chloride monitoring system(s) used to meet the requirement in paragraph (a) of this section is to be a device which obtains air samples from one or more points on a continuous sequential basis and analyzes the samples with gas chromotography or, if the owner or operator assumes that all hydrocarbons measured are vinyl chloride, with infrared spectrophotometry, flame ion detection, or an equivalent or alternative method. The vinyl chloride monitoring system used to meet the requirements in § 61.65(b)(6)(i) may be used to meet the requirements of this section.

(c) A daily span check is to be conducted for each vinyle chloride monitoring system used. For all of the emission sources listed in paragraph (a) of this section, except the one for which an emission limit is prescribed in § 61.62(b), the daily span check is to be conducted with a concentration of vinyl chloride equal to 10 ppm. For the emission source for which an emission limit is prescribed in § 61.62(b), the daily span check is to be conducted with a concentration of vinyl chloride which is determined to be equivalent to the emission limit for that source based on the emission test required by § 67.67. The calibration is to be done with either:

(1) A calibration gas mixture prepared from the gases specified in sections 5.2.1 and 5.2.3 of Test Method 106, or

(2) A calibration gas cylinder containing the appropriate concentration of vinyl chloride. If a calibration gas cylinder is used, the analysis must be traceable to the National Bureau of Standards or to a gravimetrically calibrated vinyl chloride permeation tube.

§ 61.69 Initial report.

(a) An owner or operator of any source to which this subpart applies shall submit a statement in writing notifying the Administrator that the equipment and procedural specifications in §§ 61.65 (b)(1), (b)(2), (b)(3), (b)(4), (b)(5), (b)(6), (b)(7), and (b)(8) are being implemented.

(b)(1) In the case of an existing source or a new source which has an initial startup date preceding the effective date, the statement is to be submitted within 90 days of the effective date, unless a waiver of compliance is granted under § 61.11, along with the information required under § 61.10. If a waiver of compliance is granted, the statement is to be submitted on a date scheduled by the Administrator.

(2) In the case of a new source which did not have an initial startup date preceding the effective date, the statement is to be submitted within 90 days of the initial startup date.

(c) The statement is to contain the following information:

(1) A list of the equipment installed for compliance.

(2) A description of the physical and functional characteristics of each piece of equipment.

(3) A description of the methods which have been incorporated into the standard operating procedures for measuring or calculating the emissions for which emission limits are prescribed in §§ 61.65 (b)(1)(i) and (b)(6)(i),

(4) A statement that each piece of equipment is installed and that each piece of equipment and each procedure is being used.

§ 61.70 Semiannual report.

(a)(2) is to be determined. The number source to which this subpart applies shall submit to the Administrator on Septem-

ber 15 and March 15 of each year a report in writing containing the information required by this section. The first semiannual report is to be submitted following the first full 6 month reporting period after the initial report is submitted.

(b) (1) In the case of an existing source or a new source which has an initial startup date preceding the effective date, the first report is to be submitted within 180 days of the effective date, unless a waiver of compliance is granted under § 61.11. If a waiver of compliance is granted, the first report is to be submitted on a date scheduled by the Administrator.

(2) In the case of a new source which did not have an initial startup date preceding the effective date, the first report is to be submitted within 180 days of the initial startup date.

(c) Unless otherwise specified, the owner or operator shall use the Test Methods in Appendix B to this part to conduct emission tests as required by paragraphs (c)(2) and (c)(3) of this section, unless an equivalent or an alternative method has been approved by the Administrator. If the Administrator finds reasonable grounds to dispute the results obtained by an equivalent or alternative method, he may require the use of a reference method. If the results of the reference and equivalent or alternative methods do not agree, the results obtained by the reference method prevail, and the Administrator may notify the owner or operator that approval of the method previously considered to be equivalent or alternative is withdrawn.

(1) The owner or operator shall include in the report a record of any emissions which averaged over any hour period (commencing on the hour) are in excess of the emission limits prescribed in §§ 61.62(a) or (b), § 61.63(a), or §§ 61.64(a)(1), (b), (c), or (d), or for any control system to which reactor emissions are required to be ducted in § 61.64(a)(2) or to which fugitive emissions are required to be ducted in § 61.65 (b)(1)(ii), (b)(2), (b)(5), (b)(6)(ii), or (b)(9)(ii). The emissions are to be measured in accordance with § 61.68.

(2) In polyvinyl chloride plants for which a stripping operation is used to attain the emisison level prescribed in § 61.64(e), the owner or operator shall include in the report a record of the vinyl chloride content in the polyvinyl chloride resin. Test Method 107 is to be used to determine vinyl chloride content as follows:

(i) If batch stripping is used, one representative sample of polyvinyl chloride resin is to be taken from each batch of each grade of resin immediately following the completion of the stripping, and grade and the date and time the batch is completed. The corresponding quantity of material processed in each stripper batch is to be recorded and identified by resin type and grade and the date and time the batch is completed.

(ii) If continuous stripping is used, one representative sample of polyvinyl chloride resin is to be taken for each grade of resin processed or at intervals of 8 hours for each grade of resin which is being processed, whichever is more frequent. The sample is to be taken as the resin flows out of the stripper and identified by resin type and grade and the date and time the sample was taken. The corresponding quantity of material processed by each stripper over the time period represented by the sample during the eight hour period, is to be recorded and identified by resin type and grade and the date and time it represents.

(iii) The quantity of material processed by the stripper is to be determined on a dry solids basis and by a method submitted to and approved by the Administrator.

(iv) At the prior request of the Administrator, the owner or operator shall provide duplicates of the samples required in paragraphs (c)(2)(i) and (c)(2)(ii) of this section.

(v) The report to the Administrator by the owner or operator is to include the vinyl chloride content found in all the samples required in paragraphs (c)(2)(i) and (c)(2)(ii) of this section, averaged separately for each type of resin, over each calendar day and weighted according to the quantity of each grade of resin processed by the stripper(s) that calendar day, according to the following equation:

$$A_{T_j} = \frac{\sum_{i=1}^{n} P_{a_i} M_{a_i}}{Q_{T_j}} = \frac{P_{a_1} M_{a_1} + P_{a_2} M_{a_2} + \ldots + P_{a_n} M_{a_n}}{Q_{T_j}}$$

A = 24-hour average concentration of type T_j resin in ppm.
Q = Total production of type T_j resin over the 24-hour period, in kg.
T_j = Type of resin; $j = 1, 2, \ldots m$ where m is total number of resin types produced during the 24-hour period.
M = Concentration of vinyl chloride in one sample of grade G_i resin, in ppm.
P = Production of grade G_i resin represented by the sample, in kg.
G_i = Grade of resin, e.g., G_1, G_2, and G_n.
n = Total number of grades of resin produced during the 24-hour period.

(vi) The owner or operator shall retain at the source and make available for inspection by the Administrator for a minimum of 2 years records of all data needed to furnish the information required by paragraph (c)(2)(v) of this section: The records are to contain the following information:

(A) The vinyl chloride content found in all the samples required in paragraphs (c)(2)(i) and (c)(2)(ii) of this section, identified by the resin type and grade and the time and date of the sample, and

(B) The corresponding quantity of polyvinyl chloride resin processed by the stripper(s), identified by the resin type and grade and the time and date it represents.

(3) The owner or operator shall include in the report a record of the emissions from each reactor opening for which an emission limit is prescribed in § 61.64(a)(2). Emissions are to be determined in accordance with § 61.67(g)(5), except that emissions for each reactor are to be determined. For a reactor that is also used as a stripper, the determination may be made immediately following the stripping operation.

§ 61.71 Recordkeeping.

(a) The owner or operator of any source to which this subpart applies shall retain the following information at the source and make it available for inspection by the Administrator for a minimum of two years:

(1) A record of the leaks detected by the vinyl chloride monitoring system, as required by § 61.65(b)(8), including the concentrations of vinyl chloride as measured, analyzed, and recorded by the vinyl chloride detector, the location of each measurement and the date and approximate time of each measurement.

(2) A record of the leaks detected during routine monitoring with the portable hydrocarbon detector and the action taken to repair the leaks, as required by § 61.65(b)(8), including a brief statement explaining the location and cause of each leak detected with the portable hydrocarbon detector, the date and time of the leak and any action taken to eliminate that leak measured in accordance with § 61.68.

(3) For the relief discharges from reactors subject to the provisions of § 61.65(a), a daily operating record for each reactor, including pressures and temperatures.

2. Appendix B is amended by adding Test Methods 106 and 107 as follows:

METHOD 106—DETERMINATION OF VINYL CHLORIDE FROM STATIONARY SOURCES

INTRODUCTION

Performance of this method should not be attempted by persons unfamiliar with the operation of a gas chromatograph, nor by those who are unfamiliar with source sampling, as there are many details that are beyond the scope of this presentation. Care must be exercised to prevent exposure of sampling personnel to vinyl chloride, a carcinogen.

1. Principle and Applicability.

1.1 An integrated bag sample of stack gas containing vinyl chloride (chloroethylene) is subjected to chromatographic analysis using a flame ionization detector.

1.2 The method is applicable to the measurement of vinyl chloride in stack gases from ethylene dichloride, vinyl chloride and polyvinyl chloride manufacturing processes, except where the vinyl chloride is contained in particulate matter.

2. Range and Sensitivity.

The lower limit of detection will vary according to the chromatograph used. Values reported include 1×10^{-7} mg and 4×10^{-7} mg.

3. Interferences.

Acetaldehyde, which can occur in some vinyl chloride sources, will interfere with the vinyl chloride peak from the Chromosorb 1 column. See sections 4.3.2 and 6.4. If resolution of the vinyl chloride peak is still unsatisfactory for a particular sample, the chromatograph parameters can be further altered with prior approval of the Administrator. If alteration of the chromatograph parameters fails to resolve the vinyl chloride peak, then supplemental confirmation of the vinyl chloride peak through an absolute analytical technique, such as mass spectroscopy, must be performed.

4. Apparatus.

4.1 Sampling (Figure 1).

4.1.1 Probe—Stainless steel, Pyrex glass, or Teflon tubing according to stack temp

ature, each equipped with a glass wool plug to remove particulate matter.

4.1.2 Sample line—Teflon, 6.4 mm outside diameter, of sufficient length to connect probe to bag. A new unused piece is employed for each series of bag samples that constitutes an emission test.

4.1.3 Male (1) and female (2) stainless steel quick-connects, with ball checks (one pair without) located as shown in Figure 1.

4.1.4 Tedlar bags, 100 liter capacity—To contain sample. Teflon bags are not acceptable. Aluminized Mylar bags may be used, provided that the samples are analyzed within 24 hours of collection.

4.1.5 Rigid leakproof containers for 4.1.4, with covering to protect contents from sunlight.

4.1.6 Needle valve—To adjust sample flow rate.

4.1.7 Pump—Leak-free. Minimum capacity 2 liters per minute.

4.1.8 Charcoal tube—To prevent admission of vinyl chloride to atmosphere in vicinity of samplers.

4.1.9 Flow meter—For observing sample flow rate; capable of measuring a flow range from 0.10 to 1.00 liter per minute.

4.1.10 Connecting tubing—Teflon, 6.4 mm outside diameter, to assemble sample train (Figure 1).

4.1.11 Pitot tube—Type S (or equivalent), attached to the probe so that the sampling flow rate can be regulated proportional to the stack gas velocity.

4.2 Sample recovery.

4.2.1 Tubing—Teflon, 6.4 mm outside diameter, to connect bag to gas chromatograph sample loop. A new unused piece is employed for each series of bag samples that constitutes an emission test, and is to be discarded upon conclusion of analysis of those bags.

4.3 Analysis.

4.3.1 Gas chromatograph—With flame ionization detector, potentiometric strip chart recorder and 1.0 to 5.0 ml heated sampling loop in automatic sample valve.

4.3.2 Chromatographic column—Stainless steel, 2.0 × 3.2 mm, containing 80/100 mesh Chromosorb 102. A secondary colum of GE SF-96, 20% on 60/80 mesh AW Chromosorb P, stainless steel, 2.0 m × 3.2 mm, will be required if acetaldehyde is present. If used, the SF-96 column is placed after the Chromosorb 102 column. The combined columns should then be operated at 110°C.

4.3.3 Flow meters (2)—Rotameter type, 0 to 100 ml/min capacity, with flow control valves.

4.3.4 Gas regulators—For required gas cylinders.

4.3.5 Thermometer—Accurate to one degree centigrade, to measure temperature of heated sample loop at time of sample injection.

4.3.6 Barometer—Accurate to 5 mm Hg, to measure atmospheric pressure around gas chromatograph during sample analysis.

4.3.7 Pump—Leak-free. Minimum capacity 100 ml/min.

4.4 Calibration.

4.4.1 Tubing—Teflon, 6.4 mm outside diameter, separate pieces marked for each calibration concentration.

4.4.2 Tedlar bags—Sixteen-inch square size, separate bag marked for each calibration concentration.

4.4.3 Syringe—0.5 ml, gas tight.

4.4.4 Syringe—50 µl, gas tight.

4.4.5 Flow meter—Rotameter type, 0 to 1000 ml/min range accurate to ±1%, to meter nitrogen in preparation of standard gas mixtures.

4.4.6 Stop watch—Of known accuracy, to time gas flow in preparation of standard gas mixtures.

5. Reagents. It is necessary that all reagents be of chromatographic grade.

5.1 Analysis.

5.1.1 Helium gas or nitrogen gas—Zero grade, for chromatographic carrier gas.

5.1.2 Hydrogen gas—Zero grade.

5.1.3 Oxygen gas, or Air, as required by the detector—Zero grade.

5.2 Calibration.

5.2.1 Vinyl chloride, 99.9—%—For preparation of standard gas mixtures.

5.2.2 Calibration cylinders (3), optional—One each of 50, 10 and 5 ppm vinyl chloride in nitrogen with certified analysis. Analysis must be traceable to NBS (National Bureau of Standards) or to a gravimetrically calibrated vinyl chloride permeation tube.

5.2.3 Nitrogen gas—Zero grade, for preparation of standard gas mixtures.

6. Procedure.

6.1 Sampling. Assemble the sample train as in Figure 106-1. Perform a bag leak check according to Section 7.4. Observe that all connections between the bag and the probe are tight. Place the end of the probe at the centroid of the stack and start the pump with the needle valve adjusted to yield a flow of 0.5 lpm. After a period of time sufficient to purge the line several times has elapsed, connect the vacuum line to the bag and evacuate the bag until the rotameter indicates no flow. Then reposition the sample and vacuum lines and begin the actual sampling, keeping the rate proportional to the stack velocity. Direct the gas exiting the rotameter away from sampling personnel. At the end of the sample period, shut off the pump, disconnect the sample line from the bag, and disconnect the vacuum line from the bag container. Protect the bag container from sunlight.

6.2 Sample storage. Sample bags must be kept out of direct sunlight. When at all possible, analysis is to be performed within 24 hours of sample collection.

6.3 Sample recovery. With a piece of Teflon tubing identified for that bag, connect a bag inlet valve to the gas chromatograph sample valve. Switch the valve to withdraw gas from the bag through the sample loop. Plumb the equipment so the sample gas passes from the sample valve to the leak-free pump, and then to a charcoal tube, followed by a 0–100 ml/min rotameter with flow control valve.

6.4 Analysis. Set the column temperature to 100° C the detector temperature to 150° C, and the sample loop temperature to 70° C. When optimum hydrogen and oxygen flow rates have been determined verify and maintain these flow rates during all chromatograph operations. Using zero helium or nitrogen as the carrier gas, establish a flow rate in the range consistent with the manufacturer's requirements for satisfactory detector operation. A flow rate of approximately 40 ml/min should produce adequate separations. Observe the base line periodically and determine that the noise level has stabilized and that base line drift has ceased. Purge the sample loop for thirty seconds at the rate of 100 ml/min, then activate the sample valve. Record the injection time (the position of the pen on the chart at the time of sample injection), the sample number, the sample loop temperature, the column temperature, carrier gas flow rate, chart speed and the attenuator setting. Record the laboratory pressure. From the chart, select the peak having the retention time corresponding to vinyl chloride, as determined in Section 7.2. Measure the peak area, A_m, by use of H_m and a disc integrator or a planimeter. Measure the peak height, H_m. Record A_m and the retention time. Repeat the injection at least two times or until two consecutive vinyl chloride peaks do not vary in area more than 5%. The average value for these two areas will be used to compute the bag concentration.

Compare the ratio of H_m to A_m for the vinyl chloride sample with the same ratio for the standard peak which is closest in height. As a guideline, if these ratios differ by more than 10%, the vinyl chloride peak may not be pure (possibly acetaldehyde is present) and the secondary column should be employed (see Section 4.3.2).

6.5 Measure the ambient temperature and barometric pressure near the bag. (Assume the relative humidity to be 100 percent.) From a water saturation vapor pressure table, determine the record and water vapor content of the bag.

7. Calibration and Standards.

7.1 Preparation of vinyl chloride standard gas mixtures. Evacuate a sixteen-inch square Tedlar bag that has passed a leak check (described in Section 7.4) and meter in 5.0 liters of nitrogen. While the bag is filling, use the 0.5 ml syringe to inject 250 µl of 99.9 + % vinyl chloride through the wall of the bag. Upon withdrawing the syringe needle, immediately cover the resulting hole with a piece of adhesive tape. This gives a concentration of 50 ppm of vinyl chloride. In a like manner use the other syringe to prepare dilutions having 10 and 5 ppm vinyl chloride concentrations. Place each bag on a smooth surface and alternately depress opposite sides of the bag 50 times to further mix the gases.

7.2 Determination of vinyl chloride retention time. This section can be performed simultaneously with Section 7.3. Establish chromatograph conditions identical with those in Section 6.3, above. Set attenuator to X 1 position. Flush the sampling loop with zero helium or nitrogen and activate the sample valve. Record the injection time, the sample loop temperature, the column temperature, the carrier gas flow rate, the chart speed and the attenuator setting. Record peaks and detector responses that occur in the absence of vinyl chloride. Maintain conditions. With the equipment plumbing arranged identically to Section 6.3, flush the sample loop for 30 seconds at the rate of 100 ml/min with one of the vinyl chloride calibration mixtures and activate the sample valve. Record the injection time. Select the peak that corresponds to vinyl chloride. Measure the distance on the chart from the injection time to the time at which the peak maximum occurs. This quantity, divided by the chart speed, is defined as the retention time. Record.

7.3 Preparation of chromatograph calibration curve. Make a gas chromatographic measurement of each standard gas mixture (described in Section 7.1) using conditions identical with those listed in Section 6.3 above. Flush the sampling loop for 30 seconds at the rate of 100 ml/min with each standard gas mixture and activate the sample valve. Record C_s, the concentrations of vinyl chloride injected, the attenuator setting, chart speed, peak area, sample loop temperature, column temperature, carrier gas flow rate, and retention time. Record the laboratory pressure. Calculate A_s, the peak area multi-

[1] Mention of trade names on specific products does not constitute endorsement by the Environmental Protection Agency.

piled by the attenuator setting. Repeat until two injection areas are within 5%, then plot these points vs C_s. When the other concentrations have been plotted, draw a smooth curve through the points. Perform calibration daily, or before and after each set of bag samples, whichever is more frequent.

7.4 Bag leak checks. While performance of this section is required subsequent to bag use, it is also advised that it be performed prior to bag use. After each use, make sure a bag did not develop leaks as follows. To leak check, connect a water manometer and pressurize the bag to 5–10 cm H_2O (2–4 in H_2O). Allow to stand for 10 minutes. Any displacement in the water manometer indicates a leak. Also check the rigid container for leaks in this manner.

(NOTE: An alternative leak check method is to pressurize the bag to 5–10 cm H_2O or 2–4 in. H_2O and allow to stand overnight. A deflated bag indicates a leak.) For each sample bag in its rigid container, place a rotameter in-line between the bag and the pump inlet. Evacuate the bag. Failure of the rotameter to register zero flow when the bag appears to be empty indicates a leak.

8. Calculations.

8.1 Determine the sample peak area as follows:

$$A_s = A_m A_f$$

Equation 106–1

where:
A_s = The sample peak area.
A_m = The measured peak area.
A_f = The attenuation factor.

8.2 Vinyl chloride concentrations. From the calibration curve described in Section 7.3, above, select the value of C_s that corresponds to A_s, the sample peak area. Calculate C_b as follows:

$$C_b = \frac{C_s P_r T_s}{P_s T_r (1 - B_{ws})}$$

Equation 106–2

Where:

B_{ws} = The water vapor content of the bag sample, as analyzed.
C_b = The concentration of vinyl chloride in the bag sample in ppm.
C_s = The concentration of vinyl chloride indicated by the gas chromatograph, in ppm.
P_r = The reference pressure, the laboratory pressure recorded during calibration, mm Hg.
T_s = The sample loop temperature on the absolute scale at the time of analysis, °K.
P_s = The laboratory pressure at time of analysis, mm Hg.
T_r = The reference temperature, the sample loop temperature recorded during calibration, °K.

9. References.

1. Brown, D. W., Loy, E. W. and Stephenson, M. H. "Vinyl Chloride Monitoring Near the B. F. Goodrich Chemical Company in Louisville, Kentucky." Region IV, U.S. Environmental Protection Agency, Surveillance and Analysis Division, Athens, Georgia, June 24, 1974.

2. "Evaluation of A Collection and Analytical Procedure for Vinyl Chloride in Air," by G. D. Clayton and Associates, December 13, 1974. EPA Contract No. 68–02–1408, Task Order No. 2, EPA Report oN. 75–VCL–1.

3. "Standardization of Stationary Source Emission Method for Vinyl Chloride," by Midwest Research Institute, 1976. EPA Contract No. 68–02–1098, Task Order No. 7.

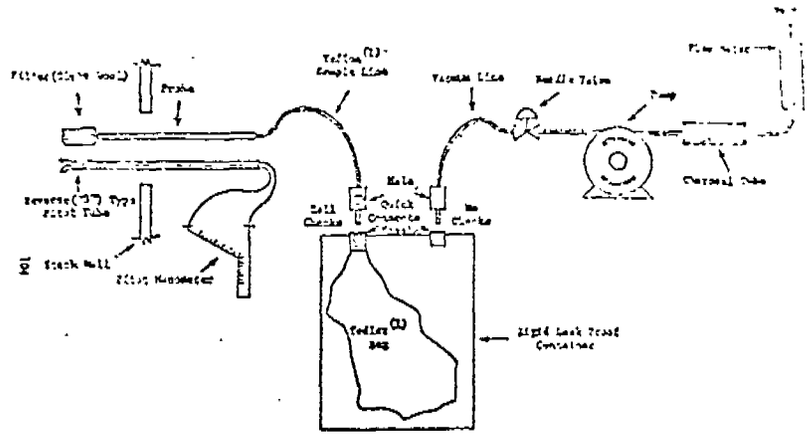


Figure 106-1. Integrated bag sampling train.

(1) Mention of trade name on specific products does not constitute endorsement by the Environmental Protection Agency.

METHOD 107—DETERMINATION OF VINYL CHLORIDE CONTENT OF INPROCESS WASTEWATER SAMPLES, AND VINYL CHLORIDE CONTENT OF POLYVINYL CHLORIDE RESIN, SLURRY, WET CAKE, AND LATEX SAMPLES

INTRODUCTION

Performance of this method should not be attempted by persons unfamiliar with the operation of a gas chromatograph, nor by those who are unfamiliar with sampling, as there are many details that are beyond the scope of this presentation. Care must be exercised to prevent exposure of sampling personnel to vinyl chloride, a carcinogen.

1. Principle and Applicability.

1.1 The basis for this method relates to the vapor equilibrium which is established between RVCM, PVC, resin, water, and air in a closed system. It has been demonstrated that the RVCM in a PVC resin will equilibrate in a closed vessel quite rapidly, provided that the temperature of the PVC resin is maintained above the glass transition temperature of that specific resin.

1.2 This procedure is suitable for determining the vinyl chloride monomer (VCM) content of inprocess wastewater samples, and the residual vinyl chloride monomer (RVCM) content of polyvinyl chloride (PVC) resins, wet cake, slurry, and latex samples. It cannot be used for polymer in fused form, such as sheet or cubes. If a resolution of the vinyl chloride peak is not satisfactory for a particular sample, then chromatograph parameters may be altered with prior approval of the Administrator. If there is reason to believe that some other hydrocarbon with an identical retention time is present in the sample, then supplemental confirmation of the vinyl chloride peak through an absolute analytical technique, such as mass spectroscopy, should be performed.

2. Range and Sensitivity.

The lower limit of detection of vinyl chloride will vary according to the chromatograph used. Values reported include 1×10^{-7} mg and 4×10^{-7} mg. With proper calibration, the upper limit may be extended as needed.

3. Precision and Reproducibility.

An interlaboratory comparison between seven laboratories of three resin samples, each split into three parts, yielded a standard deviation of 2.63% for a sample with a mean of 2.09 ppm, 4.16% for a sample with a mean of 1.66 ppm, and 5.29% for a sample with a mean of 62.66 ppm.

4. Safety.

Do not release vinyl chloride to the laboratory atmosphere during preparation of standards. Venting or purging with VCM/air mixtures must be held to a minimum. When they are required, the vapor must be routed to outside air. Vinyl chloride, even at low ppm levels, must never be vented inside the laboratory. After vials have been analyzed, the pressure within the vial must be vented prior to removal from the instrument turntable. Vials must be vented into an activated charcoal tube using a hypodermic needle to prevent release of vinyl chloride into the laboratory atmosphere. The charcoal must be replaced prior to vinyl chloride breakthrough.

5. Apparatus.

5.1 Sampling.

5.1.1 Bottles—60 ml (2 oz), with waxed lined screw on tops, for PVC samples.

5.1.2 Vials—50 ml Hypo-vials,[1] sealed with Teflon faced Tuf-Bond discs for water samples.

5.1.3 Electrical tape—or equivalent, to prevent loosening of bottle tops.

5.2 Sample/recovery.

5.2.1 Vials—With seals and caps, Perkin-Elmer Corporation No. 109–0118, or equivalent.

5.2.2 Analytical balance—Capable of weighing to ±0.001 gram.

5.2.3. Syringe, 100 ml—Precision Series "A" No. 010025, or equivalent.

[1] Mention of trade names on specific products does not constitute endorsement by the Environmental Protection Agency.

5.2.4 Vial sealer, Perkin-Elmer No. 105-0105 or equivalent.

5.3 Analysis.

5.3.1 Gas chromatograph—Perkin-Elmer Corporation Model F-40 head-space analyzer, No. 105-0101, or equivalent.

5.3.2 Chromatographic column—Stainless steel, 2 m x 3.2 mm, containing 0.4% Carbowax 1500 on Carbopak A, Perkin-Elmer Corporation No. 105-0130, or equivalent. Carbopak C can be used in place of Carbopak A.

5.3.3 Thermometer—0 to 100° C, accurate to ±0.1° C, Perkin-Elmer No. 105-0109 or equivalent.

5.3.4 Sample tray thermostat system—Perkin-Elmer No. 105-0105, or equivalent.

5.3.5 Septa—Sandwich type, for automatic dosing, 13 mm, Perkin-Elmer No. 105-1008, or equivalent.

5.3.6 Integrator - recorder — Hewlett - Packard Model 3330A, or equivalent.

5.3.7 Filter drier assembly (3)—Perkin-Elmer No. 220117, or equivalent.

5.3.8 Soap film flowmeter—Hewlett Packard No. 0101-0113, or equivalent.

5.4 Calibration.

5.4.1 Regulators—for required gas cylinders.

6. Reagents.

6.1 Analysis.

6.1.1 Hydrogen gas—zero grade.

6.1.2 Nitrogen gas—zero grade.

6.1.3 Air—zero grade.

6.2 Calibration.

6.2.1 Standard cylinders (4)—one each of 50, 500, 2000, and 4000 ppm vinyl chloride in nitrogen, with certified analysis.

7. Procedure.

7.1 Sampling.

7.1.1 PVC sampling—Allow the resin or slurry to flow from a tap on the tank or silo until the tap line has been well purged. Extend a 60 ml sample bottle under the tap, fill, and immediately tightly cap the bottle. Wrap electrical tape around the cap and bottle to prevent the top from loosening. Place an identifying label on each bottle, and record the date, time, and sample location both on the bottles and in a log book.

7.1.2 Water sampling—Prior to use, the 60 ml vials (without the discs) must be capped with aluminum foil and muffled at 400°C for at least one hour to destroy or remove any organic matter that could interfere with analysis. At the sampling location fill the vials bubble-free, to overflowing so that a convex meniscus forms at the top. The excess water is displaced as the sealing disc is carefully placed, Teflon side down, on the opening of the vial. Place the aluminum seal over the disc and the neck of the vial and crimp into place. Affix an identifying label on the bottle, and record the date, time, and sample location both on the vials and in a log book. All samples must be kept refrigerated until analyzed.

7.2 Sample recovery. Samples must be run within 24 hours.

7.2.1 Resin samples—The weight of the resin used must be between 0.1 and 4.5 grams. An exact weight must be obtained (±0.001 gram) for each sample. In the case of suspension resins a volumetric cup can be prepared which will hold the required amount of sample. The sample bottle is opened, and the cup volume of resin is added to the tared sample vial (including septum and aluminum cap). The vial is immediately sealed and the exact sample weight is then obtained. Report this value on the data sheet as it is required for calculation of RVCM. In the case of relatively dry resin samples (water content <0.3 weight %), 100 µl of distilled water must be injected into the vial, after sealing and weighing, using a 100 µl syringe. In the case of dispersion resins, the cup cannot be used. The sample is instead weighed approximately in an aluminum dish, transferred to the tared vial and weighed accurately in the vial. The sample is then placed in the Perkin-Elmer head space analyzer (or equivalent) and conditioned for one hour at 90°C.

NOTE: Some aluminum vial caps have a center section which must be removed prior to placing into sample tray. If not removed, serious damage to the injection needle will occur.

7.2.2 Suspension resin slurry and wet cake samples—Slurry must be filtered using a small Buchner funnel with vacuum to yield wet cake. The filtering process must be continued only as long as a steady stream of water is exiting from the funnel. Excessive filtration time could result in some loss of VCM. The wet cake sample (0.10 to 4.5 grams) is added to a tared vial (including septum and aluminum cap) and immediately sealed. Sample weight is then determined to 3 decimal places. The sample is then placed in the Perkin-Elmer head space analyzer (or equivalent) and conditioned for one hour at 90°C. A sample of wet cake is used to determine TS (total solids). This is required for calculating the RVCM.

7.2.3 Dispersion resin slurry samples.—This material should not be filtered. Sample must be thoroughly mixed. Using a tared vial (including septum and aluminum cap) add approximately 8 drops (0.25 to 0.35 grams) of slurry or latex using a medicine dropper. This should be done immediately after mixing. Seal the vial as soon as possible. Determine sample weight accurate to 0.001 grams. Total sample weight must not exceed 0.50 grams. Condition the vial for one hour at 90°C in the analyzer. Determine the TS on the slurry sample (Section 7.3.5).

7.2.4 Inprocess wastewater samples—Using a tared vial (including septum and aluminum cap) quickly add approximately 1 cc of water using a medicine dropper. Seal the vial as soon as possible. Determine sample weight accurate to 0.001 gram. Condition the vial for two hours at 90°C in the analyzer.

7.3 Analysis.

7.3.1 Preparation of gas chromatograph—Install the chromatographic column and condition overnight at 150°C. Do not connect the exit end of the column to the detector while conditioning.

7.3.1.1 Flow rate adjustments—Adjust flow rates as follows:

a. Nitrogen carrier gas—Set regulator on cylinder to read 50 psig. Set regulator on chromatograph to 1.3 kg/cm². Normal flows at this pressure should be 25 to 40 cc/minute. Check with bubble flow meter.

b. Burner air supply—Set regulator on cylinder to read 50 psig. Set regulator on chromatograph to supply air to burner at a rate between 250 and 300 cc/minute. Check with bubble flowmeter.

3. Hydrogen supply—Set regulator on cylinder to read 30 psig. Set regulator on chromatograph to supply approximately 35±5 cc/minute. Optimize hydrogen flow to yield the most sensitive detector response without extinguishing the flame. Check flow with bubble meter and record this flow

7.3.1.2 Temperature adjustments—Set temperatures as follows:

a. Oven (chromatographic column), 60° C.

b. Dosing line, 140° C.

c. Injection block, 140° C.

d. Sample chamber, water temperature, 90° C±1.0° C.

7.3.1.3 Ignition of flame ionization detector—Ignite the detector according to the manufacturer's instructions.

7.3.1.4 Amplifier balance—Balance the amplifier according to the manufacturer's instructions.

7.3.2 Programming the chromatograph—Program the chromatograph as follows:

a. I—Dosing time—The normal setting is 2 seconds.

b. A—Analysis time—The normal setting is 8 minutes. Certain types of samples contain high boiling materials which can cause interference with the vinyl chloride peak on subsequent analyses. In these cases the analysis time must be adjusted to eliminate the interference. An automated backflush system can also be used to solve this problem.

c. B—Flushing—The normal setting is 0.2 minutes.

d. W—Stabilization time—The nomal setting is 0.2 minutes.

e. X—Number of analyses per sample—The normal setting is 1.

7.3.3 Preparation of sample turntable—Before placing any sample into turntable, be certain that the center section of the aluminum cap has been removed. The numbered sample bottles should be placed in the corresponding numbered positions in the turntable. Insert samples in the following order:

Positions 1 & 2—Old 2000 ppm standards for conditioning. These are necessary only after the analyzer has not been used for 24 hours or longer.

Position 3—50 ppm standard, freshly prepared.

Position 4—500 ppm standard, freshly prepared.

Position 5—2000 ppm standard, freshly prepared.

Position 6—4000 ppm standard, freshly prepared.

Position 7—Sample No. 7 (This is the first sample of the day, but is given as 7 to be consistent with the turntable and the integrator printout.)

After all samples have been positioned, insert the second set of 50, 500, 2000, and 4000 ppm standards. Samples, including standards must be conditioned in the bath of 90° C for 1 hour (not to exceed 5 hours).

7.3.4 Start chromatograph program—When all samples, including standards, have been conditioned at 90° C for 1 hour, start the analysis program according to the manufacturers' instructions. These instructions must be carefully followed when starting and stopping program to prevent damage to the dosing assembly.

7.3.5 Determination of total solids (TS). For wet cake, slurry, resin solution, and PVC latex samples, determine TS for each sample by accurately weighing approximately 3 to 4 grams of sample in an aluminum pan before and after placing in a draft oven (105 to 110° C). Samples must be dried to constant weight. After first weighing return the pan to the oven for a short period of time and then reweigh to verify complete dryness. TS is then calculated as the final sample weight divided by initial sample weight.

8. Calibration.

Calibration is to be performed each eight-hour period when the instrument is used. Each day, prior to running samples, the column should be conditioned by running two of the previous days 2000 ppm standards.

8.1 Preparation of Standards.

Calibration standards are prepared by filling the vials with the vinyl chloride/nitrogen standards, rapidly seating the septum and sealing with the aluminum cap. Use a stainless steel line from the cylinder to the vial. Do not use rubber or tygon tubing. The sample line from the cylinder must be

purged (into hood) for several minutes prior to filling vials. After purging, reduce the flow rate to approximately 500–1000 cc/min. Place end of tubing into vial (near bottom) and after one minute slowly remove tubing. Place septum in vial as soon as possible to minimize mixing air with sample. After the standard vials are sealed, inject 100 μl of distilled water.

8.2 Preparation of chromatograph calibration curve.

Prepare two 50 ppm, two 500 ppm, two 2000 ppm, and two 4000 ppm standard samples. Run the calibration samples in exactly the same manner as regular samples. Plot A_s, the integrator area counts for each standard sample vs C_s, the concentration of vinyl chloride in each standard sample. Draw a line of best fit through the points.

9. Calculations.

9.1 Response factor.

From the calibration curve described in Section 8.2, above, select the value of C_s that corresponds to A_s for each sample. Compute the response factor, R_f, for each sample, as follows:

$$R_f = \frac{A_s}{C_s} \quad \text{Equation 107-1}$$

9.2 Residual vinyl chloride monomer concentration, or vinyl chloride monomer concentration.

Calculate C_{vm} as follows:

$$C_{vm} = \frac{A_s P_a}{R_f T_1}\left(\frac{M_v V_g}{m_s R} + K T_3\right)$$

Equation 107-2

where:

C_{vm} = Concentration of vinyl chloride in the sample, in ppm.
P_a = Laboratory atmosphere pressure, mm Hg.
T_1 = Room temperature, °K.
M_v = Molecular weight of VCM (62.5).
V_g = Volume of vapor phase (vial volume less sample volume).
m_s = Weight of sample, grams.
R = Gas constant (62,360).
K = Henry's Law constant for VCM in PVC at 90°C, $K = 6.52 \times 10^{-4} = K_p$ for VCM in 1 cc (approximate) wastewater sample at 90°C, $K = 5.0 \times 10^{-4} = K_w$.
T_3 = Equilibration temperature, °K.

If the following conditions are met, Equation 107-2 can be simplified as follows:

1. T_1 = 22° C (295° K);
2. T_3 = 90° C (363° K).
3. P_a = 750 mm. Hg.
4. $V_g = V_v - \frac{m_s}{1.4} = 23.5 - \frac{m_s}{1.4}$

where

V_v = Vial volume, cc (73.5).

5. Sample contains less than 0.5% water.

$$C_{vm} = \frac{A_s}{R_f}\left(4.197 \times 10^{-1} + \frac{5.038 \times 10^{-1}}{m_s}\right)$$

Equation 107-3

The following general equation can be used for any sample which contains VCM, PVC and/or water.

$$C_{vm} = \frac{A_s P_a}{R_f T_1} \times \left[\frac{M_v V_g}{R m_s} + K_p (TS)\, T_3 + K_w (1 - TS) T_3\right]$$

Equation 107-4

where:

T_1 = Total solids.

Note: K_w must be determined.

Results calculated using Equation 107-4 represent concentration based on the total sample. To obtain results based on dry PVC content, divide by TS.

For a 1 cc (approximate) wastewater sample, Equation 107-4 can be simplified to the following:

$$C_{vm} = \frac{A_s}{R_f}\left[\frac{5.038 \times 10^{-1}}{m_s} + (2.066 \times 10^{-1})\right]$$

Equation 107-5

10. References.

1. Residual Vinyl Chloride Monomer Content of Polyvinyl Chloride Resins and Wet Cake Samples, B. F. Goodrich Chemical Co. Standard Test Procedure No. 1005–T. B. F. Goodrich Technical Center, Avon Lake, Ohio. January 30, 1975.

2. Berens, A. R., "The Solubility of Vinyl Chloride in Polyvinyl Chloride," ACS-Division of Polymer Chemistry, Polymer Preprints *15* (2): 197, 1974.

3. Berens, A. R., "The Diffusion of Vinyl Chloride in Polyvinyl Chloride," ACS-Division of Polymer Chemistry, Polymer Preprints *15* (2): 203, 1974.

4. Berens, A. R., L. B. Crider, C. J. Tomanek and J. M. Whitney, Analysis for Vinyl Chloride in PVC Powders by Head-Space Gas Chromatography," to be published.

[FR Doc.76–30849 Filed 10–20–76;8:45 am]

APPENDIX 3

RESOLUTION NO. 77-40

A Resolution of the South Coast Air Quality Management District Board enacting Rule 1005, Emission Standard for Vinyl Chloride.

BE IT RESOLVED that the South Coast Air Quality Management Board in regular session assembled on September 14, 1977, hereby adopts Rule 1005 as attached hereto. That rule to become effective upon the date that the United States Environmental Protection Agency delegates authority to implement and enforce this rule to the South Coast Air Quality Management District.

DATED: SEPTEMBER 14, 1977

Nancy Long, Deputy
CLERK OF THE BOARD

Ayes: Beam, Geoghegan, Hansberger, Harwood, Heinsheimer, Raver, McCar
Noes: None
Absent: Braude, Haley, Meade

SOUTH COAST AIR QUALITY MANAGEMENT DISTRICT

Proposed Rule 1005
Emission Standard for Vinyl Chloride

For Hearing on September 2, 1977

ADOPTED
by the
South Coast Air Quality
Management District Board
Date: 9-14-77
Jackie Dix
Clerk of the Board

CMA 004203

Resolution No. 77-40

Rule 1005 Emission Standard for Vinyl Chloride

(a) Applicability

(1) This rule applies to plants which produce:

(A) Ethylene dichloride by reaction of oxygen and hydrogen chloride with ethylene,

(B) Vinyl chloride by any process, and/or

(C) One or more polymers containing any fraction of polymerized vinyl chloride.

(2) This rule does not apply to equipment used in research and development if the reactor used to polymerize the vinyl chloride processed in the equipment has a capacity of no more than 0.19 m^3 (50 gal).

(3) Sections of this rule other than (e)(1)(A), (2), (3) and (4) do not apply to equipment used in research and development if the reactor used to polymerize the vinyl chloride processed in the equipment has a capacity of greater than 0.19 m^3 (50 gal) and no more than 4.07 m^3 (1100 gal).

(b) Definitions

(1) ETHYLENE DICHLORIDE PLANT includes any plant which produces ethylene dichloride by reaction of oxygen and hydrogen chloride with ethylene.

(2) VINYL CHLORIDE PLANT includes any plant which produces vinyl chloride by any process.

(3) POLYVINYL CHLORIDE PLANT includes any plant where vinyl chloride alone or in combination with other materials is polymerized.

(4) SLIP GAUGE means a gauge which has a probe that moves through the gas/liquid interface in a storage or transfer vessel and indicates the level of vinyl chloride in the vessel by the physical state of the material the gauge discharges.

(5) TYPE OF RESIN means the broad classification of resin referring to the basic manufacturing process for producing that resin, including, but not limited to, the suspension, dispersion, latex, bulk and solution processes.

(6) GRADE OF RESIN means the subdivision of resin classification which describes it as a unique resin, i.e., the most exact description of a resin with no further subdivision.

(7) DISPERSION RESIN means a resin manufactured in such a way as to form fluid dispersions when dispersed in a plasticizer or plasticizer/diluent mixtures.

(8) LATEX RESIN means a resin which is produced by a polymerization process which initiates from free radical catalyst sites and is sold undried.

(9) BULK RESIN means a resin which is produced by a polymerization process in which no water is used.

(10) INPROCESS WASTEWATER means any water which, during manufacturing or processing, comes into direct contact with vinyl chloride or polyvinyl chloride or results from the production or use of any raw material, intermediate product, finished product, by-product, or waste product containing vinyl chloride or polyvinyl chloride but which has not been discharged to a wastewater treatment process or discharged untreated as wastewater.

(11) WASTEWATER TREATMENT PROCESS includes any process which modifies characteristics such as BOD, COD, TSS and pH, usually for

the purpose of meeting effluent guidelines and standards; it does not include any process the purpose of which is to remove vinyl chloride from water to meet requirements of this subpart.

(12) IN VINYL CHLORIDE SERVICE means that a piece of equipment contains or contacts either a liquid that is at least 10 percent by weight vinyl chloride or a gas that is at least 10 percent by volume vinyl chloride.

(13) STANDARD OPERATING PROCEDURE means a formal written procedure officially adopted by the plant owner or operator and available on a routine basis to those persons responsible for carrying out the procedure.

(14) RUN means the net period of time during which an emission sample is collected.

(15) ETHYLENE DICHLORIDE PURIFICATION includes any part of the process of ethylene dichloride production which follows ethylene dichloride formation and in which finished ethylene dichloride is produced.

(16) VINYL CHLORIDE PURIFICATION includes any part of the process of vinyl chloride production which follows vinyl chloride formation and in which finished vinyl chloride is produced.

(17) REACTOR includes any vessel in which vinyl chloride is partially or totally polymerized into polyvinyl chloride.

(18) REACTOR OPENING LOSS means the emissions of vinyl chloride occurring when a reactor is vented to the atmosphere for any purpose other than an emergency relief discharge as defined in (f)(1).

(19) STRIPPER includes any vessel in which residual vinyl chloride is removed from polyvinyl chloride resin, except bulk resin, in the slurry form by the use of heat and/or vacuum. In the case of

bulk resin, stripper includes any vessel which is used to remove residual vinyl chloride from polyvinyl chloride resin immediately following the polymerization step in the plant process flow.

(c) Emission standard for ethylene dichloride plants.
An owner or operator of an ethylene dichloride plant shall comply with the requirements of this section and section (f).

(1) Ethylene dichloride purification: The concentration of vinyl chloride in all exhaust gases discharged to the atmosphere from any equipment used in ethylene dichloride purification is not to exceed 10 ppm, except as provided in (f)(1). This requirement does not apply to equipment that has been opened, is out of operation, and met the requirement in (f)(2) before being opened.

(2) Oxychlorination reactor: Except as provided in (f)(1), emissions of vinyl chloride to the atmosphere from each oxychlorinatio reactor are not to exceed 0.2 g/kg (0.0002 lb/lb) of the 100 percent ethylene dichloride product from the oxychlorination process.

(d) Emission standard for vinyl chloride plants.
An owner or operator of a vinyl chloride plant shall comply with the requirements of this section and section (f).

Vinyl chloride formation and purification: The concentration of vinyl chloride in all exhaust gases discharged to the atmosphere from any equipment used in vinyl chloride formation and/or purification is not to exceed 10 ppm, except as provided in (f)(1) This requirement does not apply to equipment that has been opened, is out of operation, and met the requirement in (f)(2)(F)(i) before being opened.

(e) Emission standard for polyvinyl chloride plants. An owner or operator of a polyvinyl chloride plant shall comply with the requirements of this section and section (f).

(1) The following requirements apply to reactors:

(A) The concentration of vinyl chloride in all exhaust gases discharged to the atmosphere from each reactor is not to exceed 10 ppm, except as provided in paragraph (1)(B) of this section and section (f)(1).

(B) The reactor opening loss from each reactor is not to exceed 0.02 g vinyl chloride/Kg (0.00002 lb vinyl chloride/lb) of polyvinyl chloride product, with the product determined on a dry solids basis. This requirement applies to any vessel which is used as a reactor or as both a reactor and a stripper. In the bulk process, the product means the gross product of prepolymerization and postpolymerization.

(C) Manual vent valve discharge: Except for an emergency manual vent valve discharge, there is to be no discharge to the atmosphere from any manual vent valve on a polyvinyl chloride reactor in vinyl chloride service. An emergency manual vent valve discharge means a discharge to the atmosphere which could not have been avoided by taking measures to prevent the discharge. Within 10 days of any discharge to the atmosphere from any manual vent valve, the owner or operator of the source from which the discharge occurs shall submit to the Air Pollution Control Officer a report in writing containing information on the source, nature and cause of the discharge, the date and time of the discharge, the approximate total vinyl chloride loss during the discharge, the method used for determining the vinyl chloride loss, the action

that was taken to prevent the discharge, and measures adopted to prevent future discharges.

(2) Stripper: The concentration of vinyl chloride in all exhaust gases discharged to the atmosphere from each stripper is not to exceed 10 ppm, except as provided in (f)(1). This requirement does not apply to equipment that has been opened, is out of operation, and met the requirement in (f)(2)(F)(i) before being opened.

(3) Mixing, weighing, and holding containers: The concentration of vinyl chloride in all exhaust gases discharged to the atmosphere from each mixing, weighing, or holding container in vinyl chloride service which precedes the stripper (or the reactor if the plant has no stripper) in the plant process flow is not to exceed 10 ppm, except as provided in (f)(1). This requirement does not apply to equipment that has been opened, is out of operation, and met the requirement in (f)(2)(F)(i) before being opened.

(4) Monomer recovery system: The concentration of vinyl chloride in all exhaust gases discharged to the atmosphere from each monomer recovery system is not to exceed 10 ppm, except as provided in (f)(1). This requirement does not apply to equipment that has been opened, is out of operation, and met the requirement in (f)(2)(F)(i) before being opened.

(5) Sources following the stripper: The following requirements apply to emissions of vinyl chloride to the atmosphere from the combination of all sources following the stripper (or the reactor if the plant has no stripper) in the plant process flow including but not limited to, centrifuges, concentrators, blend tanks, filters, dryers, conveyor air discharges, baggers, storage

containers, and inprocess wastewater:

(A) In polyvinyl chloride plants using stripping technolo to control vinyl chloride emissions, the weighted average residual vinyl chloride concentration in all grades of polyvinyl chloride resin processed through the stripping operation on each calendar day, measured immediately after the stripping operation is completed, may not exceed:

(i) 2000 ppm for polyvinyl chloride dispersion resins, excluding latex resins;

(ii) 400 ppm for all other polyvinyl chloride resins, including latex resins, averaged separately for each type of resin; or

(B) In polyvinyl chloride plants controlling vinyl chloride emissions with technology other than stripping or in addition to stripping, emissions of vinyl chloride to the atmosphere may not exceed:

(i) 2 g/kg (0.002 lb/lb) product from the stripper (or reactor if the plant has no stripper) for dispersion polyvinyl chloride resins, excluding latex resins, with the product determined on a dry solids basis;

(ii) 0.4 g/kg (0.004 lb/lb) product from the stripper (or reactor if the plant has no stripper) for all other polyvinyl chloride resins, including latex resins, with the product determined on a dry solids basis.

(f) Additional standards for ethylene dichloride, vinyl chloride and polyvinyl chloride plants.

In addition to other requirements in this rule, an owner or operator of an ethylene dichloride, vinyl chloride, and/or polyvinyl chloride plant shall comply with the requirements of this section.

(1) Relief valve discharge: Except for an emergency relief discharge, there is to be no discharge to the atmosphere from any relief valve on any equipment in vinyl chloride service. An emergency relief discharge means a discharge which could not have been avoided by taking measures to prevent the discharge. Within 10 days of any relief valve discharge, the owner or operator of the source from which the relief valve discharge occurs shall submit to the Air Pollution Control Officer a report in writing containing information on the source, nature and cause of the discharge, the date and time of the discharge, the approximate total vinyl chloride loss during the discharge, the method used for determining the vinyl chloride loss, the action that was taken to prevent the discharge, and measures adopted to prevent future discharges.

(2) Fugitive emission sources:

(A) Loading and unloading lines: Vinyl chloride emissions from loading and unloading lines which are opened to the atmosphere after each loading or unloading operation are to be minimized as follows:

(i) After each loading or unloading operation and before opening a loading or unloading line to the atmosphere, the quantity of vinyl chloride in all parts of each loading or unloading line that are to be opened to the atmosphere is to be reduced so that the parts combined contain no greater than 0.0038 m^3 (0.13 ft^3) of vinyl chloride, at standard temperature and pressure; and

(ii) Any vinyl chloride removed from a loading or unloading line in accordance with paragraph (2)(B)(i) of this section is to be ducted through a control system from which the concentration

of vinyl chloride in the exhaust gases does not exceed 10 ppm, or equivalent as provided in (g).

(B) Slip gauges: During loading or unloading operations, the vinyl chloride emissions from each slip gauge in vinyl chloride service are to be minimized by ducting any vinyl chloride discharged from the slip gauge through a control system from which the concentration of vinyl chloride in the exhaust gases does not exceed 10 ppm, or equivalent as provided in (g).

(C) Leakage from pump, compressor, and agitator seals:

(i) Rotating pumps: Vinyl chloride emissions from seals on all rotating pumps in vinyl chloride service are to be minimized by installing sealless pumps, pumps with double mechanical seals, or equivalent as provided in (g). If double mechanical seals are used, vinyl chloride emission from the seals are to be minimized by maintaining the pressure between the two seals so that any leak that occurs is into the pump; by ducting any vinyl chloride between the two seals through a control system from which the concentration of vinyl chloride in the exhaust gases does not exceed 10 ppm; or equivalent as provided in (g).

(ii) Reciprocating pumps: Vinyl chloride emissions from seals on all reciprocating pumps in vinyl chloride service are to be minimized by installing double outboard seals, or equivalent as provided in (g). If double outboard seals are used, vinyl chloride emissions from the seals are to be minimized by maintaining the pressure between the two seals so that any leak that occurs is into the pump; by ducting any vinyl chloride between the two seals through a control system from which the concentration of vinyl chloride in the exhaust gases does not exceed 10 ppm; or equivalent as provided in (g).

(iii) Rotating compressor: Vinyl chloride emissions from seals on all rotating compressors in vinyl chloride service are to be minimized by installing compressors with double mechanical seals, or equivalent as provided in (g). If double mechanical seals are used, vinyl chloride emissions from the seals are to be minimized by maintaining the pressure between the two seals so that any leak that occurs is into the compressor; by ducting any vinyl chloride between the two seals through a control system from which the concentration of vinyl chloride in the exhaust gases does not exceed 10 ppm; or equivalent as provided in (g).

(iv) Reciprocating compressors: Vinyl chloride emissions from seals on all reciprocating compressors in vinyl chloride service are to be minimized by installing double outboard seals, or equivalent as provided in (g). If double outboard seals are used, vinyl chloride emissions from the seals are to be minimized by maintaining the pressure between the two seals so that any leak that occurs is into the compressor; by ducting any vinyl chloride between the two seals through a control system from which the concentration of vinyl chloride in the exhaust gases does not exceed 10 ppm; or equivalent as provided in (g).

(v) Agitator: Vinyl chloride emissions from seals on all agitators in vinyl chloride service are to be minimized by installing agitators with double mechanical seals, or equivalent as provided in (g). If double mechanical seals, are used, vinyl chloride emissions from the seals are to be minimized by maintaining the pressure between the two seals so that any leak [illegible] by ducting any vinyl chloride between the two seals through a control system from which the

concentration of vinyl chloride in the exhaust gases does not exceed 10 ppm; or equivalent as provided in (g).

(D) Leakage from relief valves: Vinyl chloride emissions due to leakage from each relief valve on equipment in vinyl chloride service are to be minimized by installing a rupture disk between the equipment and the relief valve, by connecting the relief valve discharge to a process line or recovery system, or equivalent as provided in (g).

(E) Manual venting of gases: Except as provided in (e)(1)(C), all gases which are manually vented from equipment in vinyl chloride service are to be ducted through a control system from which the concentration of vinyl chloride in the exhaust gases does not exceed 10 ppm; or equivalent as provided in (g).

(F) Opening of equipment: Vinyl chloride emissions from opening of equipment (including loading or unloading lines that are not opened to the atmosphere after each loading or unloading operation) are to be minimized as follows:

(i) Before opening any equipment for any reason, the quantity of vinyl chloride is to be reduced so that the equipment contains no more than 2.0 percent by volume vinyl chloride or 0.0950 m^3 (25 gal) of vinyl chloride, whichever is larger, at standard temperature and pressure; and

(ii) Any vinyl chloride removed from the equipment in accordance with paragraph (2)(F)(i) of this section is to be ducted through a control system from which the concentration of vinyl chloride in the exhaust gases does not exceed 10 ppm, or equivalent as provided in (g).

(G) Samples: Unused portions of samples containing at least 10 percent by weight vinyl chloride are to be returned to

the process, and sampling techniques are to be such that sample containers in vinyl chloride service are purged into a closed process system.

(H) Leak detection and elimination: Vinyl chloride emissions due to leaks from equipment in vinyl chloride service are to be minimized by instituting and implementing a formal leak detection and elimination program. The owner or operator shall submit a description of the program to the Air Pollution Control Officer for approval. The program is to be submitted within 45 days of the effective date of these regulations. Approval of a program will be granted by the Air Pollution Control Officer provided he finds:

(i) It includes a reliable and accurate vinyl chloride monitoring system for detection of major leaks and identification of the general area of the plant where a leak is located. A vinyl chloride monitoring system means a device which obtains air samples from one or more points on a continuous sequential basis and analyzes the samples with gas chromatography or, if the owner or operator assumes that all hydrocarbons measured are vinyl chloride, with infrared spectrophotometry flame ion detection, or an equivalent or alternative method.

(ii) It includes a reliable and accurate portable hydrocarbon detector to be used routinely to find small leaks and to pinpoint the major leaks indicated by the vinyl chloride monitoring system. A portable hydrocarbon detector means a device which measures hydrocarbons with a sensitivity of at least 10 ppm and is of such design and size that it can be used to measure emissions from localized points.

(iii) It provides for an acceptable calibration and maintenance schedule for the vinyl chloride monitoring system and portable hydrocarbon detector. For the vinyl chloride monitoring system, a daily span check is to be conducted with a concentration of vinyl chloride equal to the concentration defined as a leak according to paragraph (2)(H)(vi) of this section. The calibration is to be done with either a calibration gas mixture prepared from the gases specified by the Air Pollution Control Officer, or a calibration gas cylinder containing the appropriate concentration of vinyl chloride. If a calibration gas cylinder is used, the analysis must be traceable to the National Bureau of Standards or to a gravimetrically calibrated vinyl chloride permeation tube.

(iv) The location and number of points to be monitored and the frequency of monitoring provided for in the program are acceptable when they are compared with the number of pieces of equipment in vinyl chloride service and the size and physical layout of the plant.

(v) It contains an acceptable plan of action to be taken when a leak is detected.

(vi) It contains a definition of leak which is acceptable when compared with the background concentrations of vinyl chloride in the areas of the plant to be monitored by the vinyl chloride monitoring system. Measurements of background concentrations of vinyl chloride in the areas of the plant to be monitored by the vinyl chloride monitoring system are to be included with the description of the program. The definition of leak for a given plant may vary among the different areas within the plant and is also to change over time as background concentrations in the plant are reduced.

(I) Inprocess Wastewater: Vinyl chloride emissions to the atmosphere from inprocess wastewater are to be reduced as follows:

(i) The concentration of vinyl chloride in each inprocess wastewater stream containing greater than 10 ppm vinyl chloride measured immediately as it leaves a piece of equipment and before being mixed with any other inprocess wastewater stream is to be reduced to no more than 10 ppm by weight before being mixed with any other inprocess wastewater stream which contains less than 10 ppm vinyl chloride, before being discharged to a wastewater treatment process, or before being discharged untreated as a wastewater. This paragraph does apply to water which is used to displace vinyl chloride from equipment before it is opened to the atmosphere in accordance with (e)(1)(B) or paragrpah (2)(F) of this section, but does not apply to water which is used to wash out equipment after the equipment has already been opened to the atmosphere in accordance with (e)(1) B) or paragraph (2)(F) of this section.

(ii) Any vinyl chloride removed from the inprocess wastewater in accordance with paragrpah (2)(I)(i) of this section is to be ducted through a control system from which the concentration of vinyl chloride in the exhaust gases does not exceed 10 ppm, or equivalent as provided in (g).

(3) The requirements in paragraphs (2)(A), (2)(B), (2)(D), (2)(F), (2)(G) and (2)(H) of this section are to be incorporated into a standard operating procedure, and made available upon request for inspection by the Air Pollution Control Officer. The standard operating procedure is to include provisions for measuring

the vinyl chloride in equipment which is 4.75 m^3 (1250 gal) in volume or greater for which an emission limit is prescribed in (f)(2)(F)(i) prior to opening the equipment and using a portable hydrocarbon dector, or an equivalent or alternative method. The method of measurement is to meet the requirements specified by the Air Pollution Control Officer.

(g) Equivalent equipment and procedures.

The Air Pollution Control Officer may approve use of equipment or procedures which have been demonstrated to his satisfaction to be equivalent in terms of reducing vinyl chloride emissions to the atmosphere to those prescribed for compliance with a specific paragraph of this rule. For a new or modified source, any request for using an equivalent method is to be submitted to the Air Pollution Control Officer with the application for authority to construct and permit to operate.

(h) Testing procedures.

(1) Unless a waiver of emission testing is obtained under Rule 1001 (b) each owner or operator of a source subject to the standard in Rule 1005 shall test emissions from that source. Such tests shall be conducted in accordance with the procedures set forth below.

(2) Emissions shall be tested according to methods specified by the Air Pollution Control Officer:

(A) The test shall be performed within 90 days of the effective date of these regulations in the case of an existing source or a new source which has an initial startup date preceding the effective date.

(B) The test shall be performed within 90 days of start-up in the case of a new source which did not have an initial startup date preceding the effective date.

(3) The Air Pollution Control Officer shall be notified at least 30 days prior to an emission test, so that he may, at his option, observe the test.

(4) All samples shall be analyzed within 24 hours, and vinyl chloride emissions shall be determined within 30 days after the stack test. Each determination shall be reported to the Air Pollution Control Officer by a registered letter dispatched before the close of the next business day following such determination.

(5) Records of emission test results and other data needed to determine total emissions shall be retained at the source and shall be made available for inspection by the Air Pollution Control Officer for at least two years.

(i) Emission monitoring.

(1) A vinyl chloride monitoring system is to be used to monitor on a continuous basis the emissions from the sources for which emission limits are prescribed in (c)(1) and (2); (d)(1); (e)(1)(A), (2), (3) and (4) and for any control system to which reactor emission are required to be ducted in (f)(2)(A)(ii) and (2)(B), (2)(E), (2)(F)(ii) and (2)(I)(ii).

(2) The vinyl chloride monitoring system(s) used to meet the requirement in paragraph (1) of this section is to be a device which obtains air samples from one or more points on a continuous sequential basis and analyzes the samples with gas chromotography, or, if the chief or operator assumes that all pollutants emitted are vinyl chloride, with infrared spectrophotometry, flame ion detection,

or an equivalent or alternative method. The vinyl chloride monitoring system used to meet the requirements in (f)(2)(K)(i) may be used to meet the requirements of this section.

(3) A daily span check is to be conducted for each vinyl chloride monitoring system used. For all of the emission sources listed in paragraph (1) of this section, except the one for which an emission limit is prescribed in (c)(2), the daily span check is to be conducted with a concentration of vinyl chloride equal to 10 ppm. For the emission source for which an emission limit is prescribed in (c)(2), the daily span check is to be conducted with a concentration of vinyl chloride which is determined to be equivalent to the emission limit for that source based on the emission test required by (h). The calibration is to be done with either:

(A) A calibration gas mixture prepared from the gases specified by the Air Pollution Control Officer; or

(B) A calibration gas cylinder containing the appropriate concentration of vinyl chloride. If a calibration gas cylinder is used, the analysis must be traceable to the National Bureau of Standards or to a gravimetrically calibrated vinyl chloride permeation tube.

(j) Initial report.

(1) An owner or operator of any source to which this rule applies shall submit a statement in writing notifying the Air Pollution Control Officer that the equipment and procedural specifications in (f)(2)(A), (2)(B), (2)(C), (2)(D), (2)(E), (2)(F), (2)(G) and (2)(H) are being implemented.

(2) (A) In the case of an existing source or a new source which has an initial startup date preceding the effective date, the statement is to be submitted within 90 days of the effective date.

(B) In the case of a new source which did not have an initial startup date preceding the effective date, the statement is to be submitted within 90 days of the initial startup date.

(3) The statement is to contain the following information:

(A) A list of the equipment installed for compliance.

(B) A description of the physical and functional characteristics of each piece of equipment.

(C) A description of the methods which have been incorporated into the standard operating procedures for measuring or calculating the emissions for which emission limits are prescribed in (f)(2)(A)(i) and (2)(F)(i).

(4) A statement that each piece of equipment is installed and that each piece of equipment and each procedure is being used.

(k) Semiannual report.

(1) The owner or operator of any source to which this rule applies shall submit to the Air Pollution Control Officer on September 15 and March 15 of each year a report in writing containing the information required by this section. The first semiannual report is to be submitted following the first full 6 month reporting period after the initial report is submitted.

(2) (A) In the case of an existing source or a new source which has an initial startup date preceding the effective date, the first report is to be submitted within 100 days of the effective date.

(B) In the case of a new source which did not have an initial startup date preceding the effective date, the first report is to be submitted within 180 days of the initial startup date.

(3) Unless otherwise specified, the owner or operator shall use the test methods specified by the Air Pollution Control Officer to conduct emission tests as required by paragraphs (3)(B) and (3)(C) of this section, unless an equivalent or an alternative method has been approved by the Air Pollution Control Officer. If the Air Pollution Control Officer finds reasonable grounds to dispute the results obtained by an equivalent or alternative method, he may require the use of a reference method. If the results of the reference and equivalent or alternative methods do not agree, the results obtained by the reference method prevail, and the Air Pollution Control Officer may notify the owner or operator that approval of the method previously considered to be equivalent or alternative is withdrawn.

(A) The owner or operator shall include in the report a record of any emissions which averaged over any hour period (commencing on the hour) are in excess of the emission limits prescribed in (c)(1) or (2), (d)(1) or (e)(1)(A), (2), (3), or (4) or for any control system to which reactor emissions are required to be ducted in (e)(1)(B) or to which fugitive emissions are required to be ducted in (f)(2)(A)(ii), (2)(B), (2)(E), (2)(F)(ii) or (2)(I)(ii). The emissions are to be measured in accordance with (i).

(B) In polyvinyl chloride plants for which a stripping operation is used to attain the emission level prescribed in (e)(5) the owner or operator shall include in the report a record of the vinyl chloride content in the polyvinyl chloride resin. Test methods

specified by the Air Pollution Control Officer are to be used to determine vinyl chloride content as follows:

(i) If batch stripping is used, one representative sample of polyvinyl chloride resin is to be taken from each batch of each grade of resin immediately following the completion of the stripping, and grade and the date and time the batch is completed. The corresponding qualtity of material processed in each stripper batch is to be recorded and identified by resin type and grade and the date and time the batch is completed.

(ii) If continuous stripping is used, one representative sample of polyvinyl chloride resin is to be taken for each grade of resin processed or at intervals of 8 hours for each grade of resin which is being processed, whichever is more frequent. The sample is to be taken as the resin flows out of the stripper and identified by resin type and grade and the date and time the sample was taken. The corresponding quantity of material processed by each stripper over the time period represented by the sample during the eight hour period, is to be recorded and identified by resin type and grade and the date and time it represents.

(iii) The quantity of material processed by the stripper is to be determined on a dry solids basis and by a method submitted to and approved by the Air Pollution Control Officer.

(iv) At the prior request of the Air Pollution Control Officer, the owner or operator shall provide duplicates of the samples required in paragraphs (3)(B)(i) and (3)(B)(ii) of this section.

(v) The report to the Air Pollution Control Officer by the owner or operator is to include the vinyl chloride content found in all the samples required in paragrpahs (3)(B)(i)

and (3)(B)(ii) of this section, averaged separately for each type of resin, over each calendar day and weighted according to the quantity of each grade of resin processed by the stripper(s) that calendar day, according to the following equation:

$$A_{T_i} = \frac{\sum_{i=1}^{n} P_{G_i} M_{G_i}}{Q_{T_i}}$$

$$= \frac{P_{G_1} M_{G_1} + P_{G_2} M_{G_2} + \ldots + P_{G_n} M_{G_n}}{Q_{T_i}}$$

A = 24-hour average concentration of type T_i resin in ppm.

Q = Total production of type T_i resin over the 24-hour period, in kg.

T_i = Type of resin i=1,2,...m where m is total number of resin types produced during the 24-hour period.

M = Concentration of vinyl chloride in one sample of grade G_i resin, in ppm

P = Production of grade G_i resin represented by the sample, in kg.

G_i = Grade of resin, e.g., G_1, G_2, and G_3.

n = Total number of grades of resin produced during the 24-hour period.

(vi) The owner or operator shall retain at the source and make available for inspection by the Air Pollution Control Officer for a minimum of 2 years records of all data needed to furnish the information required by paragraph (3)(B)(v) of this section. The records are to contain the following information:

(I) The vinyl chloride content found in all the samples required in paragraphs (3)(B)(i) and (3)(B)(ii) of this

section, identified by the resin type and grade and the time and date of the sample, and

(II) The corresponding quantity of polyvinyl chloride resin processed by the stripper(s), identified by the resin type and grade and the time and date it represents.

(C) The owner or operator shall include in the report a record of the emissions from each reactor opening for which an emission limit is prescribed in (e)(1)(B). Emissions are to be determined in accordance with (h), except that emissions for each reactor are to be determined. For a reactor that is also used as a stripper, the determination may be made immediately following the stripping operation.

(l) Recordkeeping

(1) The owner or operator of any source to which this rule applies shall retain the following information at the source and make it available for inspection by the Air Pollution Control Officer for a minimum of two years:

(A) A record of the leaks detected by the vinyl chloride monitoring system, as required by (f)(2)(H), including the concentrations of vinyl chloride as measured, analyzed, and recorded by the vinyl chloride detector, the location of each measurement and the date and approximate time of each measurement.

(B) A record of the leaks detected during routine monitoring with the portable hydrocarbon detector and the action taken to repair the leaks, as required by (f)(2(H), including a brief statement explaining the location and cause of each leak detected with the portable hydrocarbon detector, the date and time of the leak and any action taken to eliminate that leak measured

(C) For the relief discharges from reactors subject to the provisions of (f)(1), a daily operating record for each reactor, including pressures and temperatures.

(m) Effective Date

This rule is effective upon the date that the United States Environmental Protection Agency delegates authority to implement and enforce this rule to the South Coast Air Quality Management District.

ENVIRONMENTAL PROTECTION AGENCY

[40 CFR Part 61]

[FRL 728-5]

VINYL CHLORIDE

National Emission Standards for Hazardous Air Pollutants

AGENCY: Environmental Protection Agency.

ACTION: Proposed rule.

SUMMARY: The proposed amendments are being made to the vinyl chloride standard which has promulgated October 21, 1976, and would apply to new and existing ethylene dichloride, vinyl chloride, and polyvinyl chloride plants. The standard and the proposed amendments implement the Clean Air Act and are based on the Administrator's determination that vinyl chloride is a hazardous air pollutant. The intended effect of the proposed amendments is to require improved effectiveness of control technology at existing plants, impose more stringent emission limits on new sources, and prohibit an emission increase within the vicinity of an existing source due to the construction of a new source.

DATES: Comments must be received on or before August 1, 1977.

ADDRESSES: Comments should be submitted (preferably in triplicate) to the Emission Standards and Engineering Division, Environmental Protection Agency, Research Triangle Park, North Carolina. Attention: Mr. Don R. Goodwin.

All public comments received may be inspected and copied at the Public Information Reference Unit (EPA Library), Room 2922, 401 M Street, SW., Washington, D.C.

FOR FURTHER INFORMATION CONTACT:

Don R. Goodwin, Emission Standards and Engineering Division, Environmental Protection Agency, Research Triangle Park, North Carolina 27711, Telephone No. 919-688-8146, ext. 271.

SUPPLEMENTARY INFORMATION:

BACKGROUND

On October 21, 1976, EPA promulgated a standard for vinyl chloride under the authority of section 112(b)(1)(B) of the Clean Air Act, as amended (41 FR 46561). The standard applies to ethylene dichloride, vinyl chloride, and polyvinyl chloride plants.

On November 19, 1976, the Environmental Defense Fund (EDF) petitioned the United States Court of Appeals for the District of Columbia Circuit to review the standard. Motions to intervene were subsequently filed on behalf of the Society of the Plastics Industry, Inc., the Goodyear Tire and Rubber Company and Air Products and Chemicals, Inc., and were granted by order of the Court on January 18, 1977. On March 24, 1977, EDF and EPA moved to dismiss the proceedings in view of a settlement agreement requiring EPA to take certain additional actions. These include a restatement of EPA's policy for regulating carcinogens under section 112 of the Clean Air Act; the proposal of amendments which would require increased efficiency of existing control equipment, require more stringent control at new sources, and prohibit increases in emissions within the vicinity of an existing source due to new construction; and the initiation of a review of the vinyl chloride standard three years after the promulgation of the amendments.

ZERO EMISSION GOAL

The vinyl chloride standard has been criticized for allegedly placing unwarranted emphasis on technological rather than health considerations. Although EPA disagrees with this criticism, it seems appropriate to restate EPA's approach to the regulation of carcinogens in general and under Section 112 of the Clean Air Act, and to explain how the vinyl chloride standard and the proposed amendments are consistent with this approach and with the protection of public health.

On May 25, 1976, EPA published interim procedures and guidelines for health risk and economic impact assessments of suspected carcinogens (41 FR 21402), which define EPA's approach to regulatory action for suspect carcinogens. As indicated in that publication, there are two steps involved in the decision-making process with regard to the regulation of a potential carcinogen. Although different EPA statutory authorities impose different requirements, in general two decisions must be made with regard to each potential carcinogen. The first decision is whether a particular substance constitutes a cancer risk. The second decision is what regulatory action, if any, should be taken to reduce that risk.

In deciding whether a cancer risk exists, EPA will consider a substance a presumptive cancer risk when it causes a statistically significant excess incidence of benign or malignant tumors in humans or animals. In the case of vinyl chloride, EPA evaluated all available data and concluded that a cancer risk exists. In deciding how and whether to regulate, EPA examined section 112 of the Clean Air Act. Section 112 of the Act requires that emission standards be set "at the level which in the judgment of the Administrator provides an ample margin of safety to protect the public health from such hazardous air pollutants." This requirement appears to assume that each pollutant regulated will have a threshold level of effects below which no health effects will occur. As explained in the documentation for the current standard (40 FR 59532, December 24, 1975; 41 FR 46560, October 21, 1976), it has not been possible to determine if there is a threshold level of effects for vinyl chloride and it is not certain that such a threshold may be determined in the near future. In the absence of strong evidence to the contrary, then, the only level of vinyl chloride which would appear to be absolutely protective of health is zero, which may be achievable only by banning vinyl chloride emissions completely. That, in turn, would require closing the entire industry. As explained in the earlier rulemaking it is not clear that Congress would have intended this result, so instead EPA required the lowest level achievable using technological means. (See 40 FR 59534 and 41 FR 46562).

In order to insure that the standard continues to approach the only level of emissions which is known to be absolutely protective of health, namely zero emissions, EPA is proposing amendments which require more efficient use of existing control technology at existing plants and more effective controls at new plants, and which encourage technology to reach this goal without banning vinyl chloride.

MORE STRINGENT STANDARDS FOR EXISTING SOURCES

EPA is proposing amendments which would require sources presently subject to a 10 ppm emission limit to reduce emissions to 5 ppm within three years of promulgation of the amendments. The affected sources include ethylene dichloride purification; vinyl chloride formation and purification; reactors, strippers; mixing, weighing, and holding containers; monomer recovery systems; and fugitive emissions which have been captured in accordance with the existing regulation.* If the owner or operator of a source believed that a control system would not be capable of meeting the 5 ppm limit, he would be able to request that the Administrator approve an interim emission limit for that source. Such requests would have to be made one year before the compliance date. In requesting an interim emission limit, the owner or operator would have to submit supportive data and meet with EPA to discuss his particular problems in attaining compliance. The meeting would be announced in the FEDERAL REGISTER and any interested party would be allowed to attend and submit written or oral comments. If an interim emission limit were granted to the source, the required emission level would be specified in a written notification from EPA and in the FEDERAL REGISTER. Each source granted an interim emission limit would be reviewed every three years to determine whether emissions could be reduced to 5 ppm, or at least to a lower interim emission limit.

In proposing the reduction from 10 to 5 ppm, it is not EPA's intent that a control system which has been installed to

*As an explanatory note, paragraph (b) of § 61.65 contains nine fugitive emission regulations. For several of these, the fugitive emissions are required to be captured and ducted to a control device meeting 19 ppm. According to the proposed amendments, the emissions from this control device would have to be reduced to 5 ppm in the same way any other source currently required to meet 10 ppm would have to do. Rather than incorporating both the 5 and 10 ppm emission limits in each paragraph in § 61.65(b), a separate paragraph (c) containing these emission limits is being added to § 61.65. All the other paragraphs in (b) are cross-referenced in paragraph (c)

meet the 10 ppm emission limit be removed and replaced with another more efficient control system or that a second control system be added behind the first control system. The purpose of the proposed amendment is to force owners and operators to maximize the effectiveness of existing control systems.

More Stringent Standards for New Sources

The proposed amendments would also require more stringent controls for new sources; i.e., sources for which construction is commenced after the date of proposal of these amendments. According to § 61.02 of the General Provisions, "commenced" means that an owner or operator has undertaken a continuous program of construction or modification or that an owner or operator has entered into a contractual obligation to undertake and complete, within a reasonable time, a continuous program of construction or modification.

New sources of types which would be subject to the 10 ppm emission limit under the current standard would be required under the amendments to meet a 5 ppm emission limit at the time of startup. With new sources there would be no provision allowing requests for EPA approval of an interim emission limit. New sources would be required to meet the more stringent emission limit at the time of startup, because they have an opportunity to design their equipment to meet the 5 ppm emission limit at the time construction is commenced. Existing sources, on the other hand, require time to maximize the effectiveness of their control systems.

The proposed amendment would also require ethylene dichloride-vinyl chloride plants to control emissions from new oxychlorination reactors to 5 ppm. This requirement is based on installation of a recycling and oxygen feed system with an incinerator or equivalent control device. The current standard limits emissions from the oxychlorination reactor to 0.2 g/kg (0.0002 lb/lb) of the 100 percent ethylene dichloride product from the oxychlorination reactor. This emission limit can be met by changing process parameters, rather than installing a control device. During the development of the current standard EPA considered requiring existing sources to control emissions with an incinerator or equivalent technology, but rejected this approach because a large quantity of fuel would be required to reduce emissions from a relatively small source. An existing oxychlorination reactor typically has a large volume, low hydrocarbon effluent gas stream, and large quantities of supplemental fuels would be required for combustion of its emissions.

A new plant can reduce the volume of its effluent gas stream and make it more concentrated by recycling the gas stream and using oxygen instead of air to feed into the process. (3, 4) the current standard was not based on this technology because it was not considered feasible to retrofit existing plants so that they could use oxygen instead of air. The recycling and oxygen feed methodology is considered feasible for new oxychlorination reactors because it can be incorporated at the time of construction. Since the use of this technology would eliminate the supplemental fuel problem referred to above, it is EPA's judgment that new oxychlorination reactors should be controlled to the same extent that is proposed for other emission sources.

The proposed amendment also includes a more stringent emission limit for new polyvinyl chloride resins being processed in equipment following the stripping operation. That is, the amendment would apply to resins for which production for the purpose of marketing was commenced after the proposal of the amendment. The amendment would require all new resins except new dispersion resins to be stripped to 100 ppm and new dispersion resins to be stripped to 500 ppm. These limits for new products would be one-fourth of the limits contained in the standard for existing products. Consistent with the current standard, the amendment would permit the use of control devices rather than stripping technology to meet the emission limit. In this case equipment being used to process all new resins except new dispersion resins would have to be controlled to 0.01 kg/kg product and the equipment used for new dispersion resins would have to be controlled to 0.05 kg/kg product.

A "new source" is defined in 40 CFR 61.02 as a stationary source, the construction or modification of which is commenced after proposal of a standard. There was some question based on this definition as to whether the amendment to the stripping standard for new sources should apply to new polyvinyl chloride resins or the installation of new equipment following the stripper. If the applicability of the amendment for new sources were based on the installation of new equipment following the stripper, it would be difficult to determine what constitutes a new source at an existing plant. This is based on the reasoning that the stripping standard requires that all equipment following the stripper in the process be controlled as a unit. The series of equipment following the stripper includes pumps and conveying equipment which might be expected to be replaced on a frequent and routine basis. Replacing one of these pieces of equipment would in effect cause the whole series of equipment following the stripper to have to meet the standard for new sources. In other words, all resins processed in the series of the equipment would have to meet the lower standard even though only a minor part of the equipment had been replaced.

EPA decided that a more reasonable and direct approach was to make the proposed amendment apply to the production of new polyvinyl chloride resins. This is based on the reasoning that emissions from the equipment following the stripper are a function of the amount of vinyl chloride left in the resin after the stripping operation is completed; i.e., the resin is the source of the emissions rather than the equipment. The same equipment can be used to process different resin grades. Variations in the emissions from the equipment are a function of the resin being processed rather than the characteristics of the equipment. The control technology which is used for the equipment following the stripper is likewise more directly linked to the resin than the equipment. Stripping is used to control the emissions due to the vinyl chloride in the resin before the resin is processed in the equipment.

Before the hazards of vinyl chloride became known, stripping technology was employed by polyvinyl chloride manufacturers to recover raw materials for economic purposes. As a result of a standard promulgated by the Occupational Safety and Health Administration (39 FR 35890), some companies investigated improvements in stripping methodology for emission control purposes. (1)

Optimum stripping consists of a set of operating conditions which must be developed experimentally on an individual basis for the many resins. In developing the current standard, EPA recognized that stripping technology for dispersion resins had not been refined to the same extent as it had been for other resins and that there was more difficulty in stripping dispersion resins than other resins. For this reason a less stringent emission limit was established for dispersion resins. Dispersion resins are permitted a higher emission limit under the proposed amendment for the same reason.

EPA believes that for some resins, companies have already developed stripping technology which would meet the proposed amendment. (2) For other resins, the proposed standard would require additional improvement in stripping technology. If stripping technology has not been developed to the extent necessary to meet the proposed amendment for a particular resin, the manufacturer would have the option of developing the technology or not producing the resin.

The current standard, unlike the proposed amendment, was not based on the premise that an owner or operator would have the option of not producing a particular resin. It is EPA's judgment that the owner or operator making a new product has more freedom of choice than the owner or operator already making a particular product in selecting those resins which are to be produced. EPA's standard would be included in the variables under consideration when decisions are being made as to which resins are to be produced.

The proposed amendment would apply to any new source, whether it constituted replacement of an existing source in an existing plant, the expansion of an existing plant, or part of an entirely new plant. That is, if a new oxychlorination reactor or a new polyvinyl chloride reactor were installed at an existing plant, it would be subject to the emission limits for new sources. This means that as existing sources are gradually replaced with new sources in an existing plant,

the overall emission level from that existing plant would be reduced.

Emission Offset

Because the present vinyl chloride standard focuses on reducing emissions rather than attaining a particular ambient air quality concentration, there is no provision for limiting the size of plants or the clustering of plants in a geographical area. The doubling of the size of an existing plant or the construction of a new plant beside an existing plant would considerably increase the ambient air concentrations of vinyl chloride in the vicinity of the plant(s) even if the vinyl chloride standard was met. EPA determined at the time of promulgation of the current standard that the costs of prohibiting the production of vinyl chloride and polyvinyl chloride were too high and the continued operation of existing plants should be allowed. EPA believes, however, that the standard should include a mechanism for prohibiting an increase in ambient concentrations of vinyl chloride due to new construction in areas where existing sources are already located.

Accordingly, EPA is proposing an amendment which would prohibit an increase in emissions within 8 kilometers (km) (approximately five miles) of an existing source due to the construction of a new emission source. This means that if a new source were added to an existing plant, the increase in emissions due to that new source would have to be offset by a reduction in emissions from other existing sources within that plant or at other plants within 8 km of the construction site of the new source. Similarly, a new plant could not be constructed within 8 km of an existing plant(s) unless the emission increase due to the new plant were offset by an emission reduction at the existing plant or plants. This provision may result in few existing plants being expanded and few new plants being constructed in the vicinity of existing plants. However, the proposed amendment does not preclude this possibility.

The offset provision would apply only to new construction which results in an increase in production rate. Replacing or adding equipment such as pumps, compressors, agitators, sampling equipment and unloading hoses is a routine practice at existing plants. Additions of equipment of this nature would, in and of itself, be expected to result in little, if any, increase in emissions. In EPA's judgment, a plant should not be required to prove this fact each time one of these pieces of equipment is added. The addition of this type of equipment in conjunction with major process equipment, however, is likely to result in both an increase in emissions as well as an increase in production rate, and is therefore covered by the offset provision.

If the offset provision were adopted, the reduction in emissions could be achieved in the production rate of an existing source or sources. The baseline emission rate would be determined based on the maximum production rate which had been attained by each existing source. The allowable emission rate for each source would be based on the maximum production rate at which that source would be operated in the future.

Also, if the emissions from an existing source were already below the emission limit applicable to it, the proposed amendment would give the source credit for the difference between the emission limit and the actual emission level. That is the baseline emission rate would be based on the standard rather than on an emission test. It is EPA's judgment that this is a more equitable approach than penalizing a source which has already taken measures to reduce emissions below the standard. Such a source would have less room for further reducing emissions.

The emission limits applicable to both the existing and new sources involved in the offset arrangement would be contained in the approval of new construction granted by the Administrator under 40 CFR 61.08.

EPA believes that a policy of no net increase in emissions due to new construction is justified because of the hazardous nature of vinyl chloride. However, EPA recognizes the potential difficulties in implementing such a policy and interested persons are urged to submit comments and factual information relating to this policy.

Review of Standard

EPA plans to undertake a full-scale review of Subpart F of 40 CFR Part 61 beginning three years from the promulgation of any amendments. In the study EPA will review information concerning technological advances in the control of vinyl chloride emissions to determine what further changes might then be appropriate to move toward the goal of zero vinyl chloride emissions. EPA will also consider recent health data to determine whether the approach for regulating vinyl chloride should be altered.

Environmental Impact

The proposed amendment, in contrast to the current standard, would encourage the development of new technology and improvements in existing technology and would have the following three positive environmental impacts: (1) further reduction of emissions at existing plants, (2) no increase in emissions within 8 km of an existing source, and (3) lower emissions from new sources than would be accomplished through the current standard regardless of the construction site. These environmental impacts would provide progress toward the ultimate goal of zero emissions without banning vinyl chloride, and in the process would provide additional protection of public health by further minimizing the health risks to the people living in the vicinity of existing plants and to any additional people who are exposed as a result of new construction.

Specifically, for those existing sources which are currently subject to a 10 ppm emission limit, emissions would be reduced by half within three years after the promulgation date of these amendments. At both an existing average-sized ethylene dichloride-vinyl chloride plant and an existing average-sized polyvinyl chloride plant, which contain other sources than the ones required to meet a 5 ppm emission limit, it is estimated this will have the effect of reducing total emissions by less than one percent. Emissions at existing plants would be further reduced as existing oxychlorination reactors are replaced with new oxychlorination reactors and as new polyvinyl chloride resins are preduced to replace existing ones.

Under the proposed amendment, emissions from new plants would be considerably lower than they would be under the current standard. For a typical new average-sized ethylene dichloride-vinyl chloride plant (318×10^6 kg/yr or 700×10^6 lb/yr produced), the hourly emissions would be 5.1 kg (11.5 lb) instead of 10.3 kg (23.1 lb). For a typical new average-sized dispersion polyvinyl chloride plant (46×10^6 kg/yr or 100×10^6 lb/yr production), the emissions would be about 9 kg/hr (20 lb/hr) instead of 17.5 kg/hr (39 lb/hr) and for a typical new average-sized suspension polyvinyl chloride (68×10^6 kg/yr or 150×10^6 lb/yr production) the emissions would be 13 5 kg/hr) (30 lb/hr) instead of 16 kg/hr (36 lb/hr). These emissions are calculated based on the emission factors published in the documentation for the existing standard. (1) Ambient air concentrations are expected to be reduced proportionately.

The only negative environmental impact would be an increase in hydrogen chloride emissions at ethylene dichloride-vinyl chloride plants if incineration were used to control emissions from new oxychlorination reactors. However, due to the corrosion problems which would otherwise occur on plant property and in the community, plants are expected to use scrubbers to control the hydrogen chloride emissions. The proposed amendment is not expected to have a significant impact on energy consumption.

Economic Impact

The potential economic impacts of the proposed standard are:

(1) Costs for research and development of improved methodology for operation of existing control technology so that it can be used to meet the 5 ppm emission limit.

(2) Costs for research and development of improved stripping techniques to meet the standard for new polyvinyl chloride resins.

(3) Cost of research and development or licensing for converting over to the oxygen system for a new oxychlorination reactor.

(4) Possibly increased transportation costs of raw materials in the case that the offset policy results in the construction of a new plant farther from an existing plant than it otherwise would have been.

(5) Costs of building a new plant more than 8 km from an existing plant in the event that the offset requirement precluded the expansion of an existing plant.

(6) Delay in the production of a particular resin due to time spent developing stripping technology for that resin.

(7) No growth in the production of a particular resin due to the inability to strip that resin to required levels.

The types of costs which have been named would be difficult to quantify. The costs would be expected to vary considerably from one plant to another depending on the amount of research and development than had already been done, the extent to which technology could be transferred from other plants and processes, and the plans for new construction.

One area in which cost estimates can be generated is the use of an oxygen-recycle oxychlorination process as opposed to an air-based system. The proposed amendment does not require the use of the oxygen-recycle system, but many plants would be expected to employ this system to avoid the high costs of incinerating the high volume gas stream from a typical air-based system. The primary cost of using the oxygen-recycle system is the cost of the oxygen itself. The cost of the oxygen for a particular plant would depend on whether the plant was located where there is a considerable demand for both the oxygen and nitrogen products of air separation. According to one recent article, if it is assumed that such a demand exists, the cost of the oxygen ($14.34/ton) would be approximately equivalent to the cost of compressing air for use in the air-based system. (1) Another report in which this assumption was not made and the economics of the air and oxygen systems were being compared, it was concluded that overall production economics "favor the oxygen process even if vent gas incineration would not be required for an air-based plant since the sum of all remaining advantages offered by oxygen-based plant operation more than outweighs the incremental cost for the oxygen feed." (2)

Miscellaneous: The Administrator invites comments on all aspects of the proposed amendments.

(Section 112 of the Clean Air Act, sec. 4(a) of Pub. L. 91-604, 84 Stat. 1685 (42 U.S.C. 1857c-7) and section 301(a) of the Clean Air Act, sec. 2 of Pub. L. No. 90-148, 84 Stat. 504 as amended by sec. (15)(c)(2) of Pub. L. 91-604, 84 Stat. 1713 (42 U.S.C. 1857 g(a)). Secs. 61.67 and 61.68 also proposed under the authority of section 114 of the Clean Air Act, as added by sec. 4(a) of Pub. L. 91-604, 84 Stat. 1687 and amended by Pub. L. 93-319, sec. 6(a)(4), 88 Stat. 259 (42 U.S.C. 1857c-9).)

NOTE.—The Environmental Protection Agency has determined that this document does not contain a major proposal requiring preparation of an Economic Impact Analysis under Executive Orders 11821 and 11949 and OMB Circular A-107.

Dated: May 27, 1977.

DOUGLAS M. COSTLE,
Administrator.

REFERENCES

(1) *Standard Support and Environmental Impact Statement; Emission Standard for Vinyl Chloride*, EPA-450 12-75-009, October, 1975.

(2) "Goodrich Reports Impressive Progress in Solving Vinyl Chloride Problem," *American Paint and Coatings Journal*, Vol. 60, No. 31, January 12, 1976, p. 24.

(3) E. W. Wimer and R. E. Feathers, "Oxygen Gives Low Cost VCM," *Hydrocarbon Processing*, March 1976, pp. 81-84.

(4) Peter Reich, "Air or Oxygen For VCM?," *Hydrocarbon Processing*, March, 1976, pp. 85-89.

It is proposed that Subpart F of 40 CFR Part 61 be amended as follows:

1. In § 61.08, paragraph (b) is revised to read as follows:

§ 61.08 Approval by the Administrator.

* * * * *

(b) If the Administrator determines that a stationary source for which an application pursuant to § 61.07 was submitted will not, if properly operated, cause emissions in violation of the standard or violation of § 61.73, he will approve the construction or modification of such source.

* * * * * *

2. Section 61.62 is revised to read as follows:

§ 61.62 Emission standard for ethylene dichloride plants.

An owner or operator of an ethylene dichloride plant shall comply with the requirements of this section and § 61.65.

(a) Ethylene dichloride purification: Except as provided in § 61.65(a), the concentration of vinyl chloride in all exhaust gases discharged to the atmosphere from any equipment used in ethylene dichloride purification is not to exceed the appropriate emission limit as follows:

(1) Each source for which construction had commenced on or before (date of proposal of these amendments), 10 ppm until (date three years after promulgation of these amendments) and 5 ppm after (date three years after the promulgation of these amendments).

(2) Each source for which construction commenced after June 2, 1977, 5 ppm.

(b) Oxychlorination reactor: Except as provided in § 61.65(a), emissions of vinyl chloride to the atmosphere are not to exceed the appropriate emission limit as follows:

(1) Each source for which construction had commenced on or before (date of proposal of these amendments), 0.2 g/kg (0.0002 lb/lb of the 100 percent ethylene dichloride product from the oxychlorination reactor.

(2) Each source for which construction commenced after June 2, 1977, 5 ppm.

(c) The requirements of this section do not apply to equipment that has been opened, is out of operation and met the requirement in § 61.65(b)(6)(i) before being opened.

3. Section 61.63 is revised to read as follows:

§ 61.63 Emission standard for vinyl chloride plants.

An owner or operator of a vinyl chloride plant shall comply with the requirements of this section and § 61.65.

(a) Vinyl chloride formation and purification: Except as provided in § 61.65(a), the concentration of vinyl chloride in all exhaust gases discharged to the atmosphere from any equipment used in vinyl chloride formation and/or purification is not to exceed the appropriate emission limit as follows:

(1) Each source, for which construction had commenced on or before June 2, 1977, 10 ppm until (date three years after promulgation of these amendments) and 5 ppm after (date three years after promulgation of these amendments).

(2) Each source for which construction commenced after June 2, 1977, 5 ppm.

(b) The requirements of this section do not apply to equipment that has been opened, is out of operation, and met the requirement in § 61.65(b)(6)(i) before being opened.

4. Section 61.64 is amended by revising paragraphs (a)(1), (b), (c), (d) and (e) and by adding paragraph (f) as follows:

§ 61.64 Emission standard for polyvinyl chloride plants.

An owner or operator of a polyvinyl chloride plant shall comply with the requirements of this section and § 61.65.

(a) Reactor: The following requirements apply to reactors:

(1) Except as provided in paragraph (a)(2) of this section and § 61.65(a), the concentration of vinyl chloride in all exhaust gases discharged to the atmosphere from each reactor is not to exceed the appropriate emission limit as follows:

(i) Each source for which construction had commenced on or before June 2, 1977 10 ppm until (date three years after promulgation of these amendments) and 5 ppm after (date three years after promulgation of these amendments).

(ii) Each source for which construction commenced after June 2, 1977, 5 ppm.

* * * * *

(b) Stripper: Except as provided in § 61.65(a), the concentration of vinyl chloride in all exhaust gases discharged to the atmosphere from each stripper is not to exceed the appropriate emission limit as follows:

(1) Each source for which construction had commenced on or before June 2, 1977 10 ppm until (date three years after promulgation of these amendments) and 5 ppm after (date three years after final promulgation of these amendments).

(2) Each source for which construction commenced after June 2, 1977, 5 ppm.

(c) Mixing, weighting, and holding containers: Except as provided in § 61.65(a), the concentration of vinyl chloride in all exhaust gases discharged to the atmosphere from each mixing, weighing, or holding container in vinyl chloride service which precedes the stripper (or the reactor if the plant has no stripper) in the plant process flow is not to exceed the appropriate emission limit as follows:

(1) Each source, for which construction had commenced on or before (date

of proposal of these amendments), 10 ppm until (date three years after promulgation of these amendments) and 5 ppm after (date three years after promulgation of these amendments).

(2) Each source for which construction commenced after June 2, 1977, 5 ppm.

(d) Monomer recovery system. Except as provided in § 61.65(a), the concentration of vinyl chloride in all exhaust gases discharged to the atmosphere from each monomer recovery system is not to exceed the appropriate concentration as follows:

(1) Each source for which construction had commenced on or before (date of proposal of these amendments), 10 ppm until (date three years after promulgation of these amendments) and 5 ppm after (date three years after promulgation of these amendments).

(2) Each source for which construction commenced after June 2, 1977, 5 ppm.

(e) Sources following the stripper(s): The following requirements apply to emissions of vinyl chloride to the atmosphere from the combination of all sources following the stripper(s) [or the reactor(s) if the plant has no stripper] in the plant process flow including, but not limited, to centrifuges, concentrators, blend tanks, filters, dryers, conveyor air discharges, baggers, storage containers, and inprocess wastewater.

(1) In polyvinyl chloride plants using stripping technology to control vinyl chloride emissions:

(i) For a grade or grades of polyvinyl chloride resin which have been produced by the plant on or before June 2, 1977, the weighted average residual vinyl chloride concentration in all the grades processed through the stripping operation on each calendar day, measured immediately after the stripping operation is completed, may not exceed the appropriate emission limit as follows:

(A) 2,000 ppm for polyvinyl chloride dispersion resins, excluding latex resins;

(B) 400 ppm for all other polyvinyl chloride resins, including latex resins, averaged separately for each type of resin;

(ii) For a grade or grades of polyvinyl chloride resin which have not been produced by the plant on or before June 2, 1977, the weighted average residual vinyl chloride concentration in all the grades processed through the stripping operation on each calendar day, measured immediately after the stripping operation is completed, may not exceed the appropriate emission limit as follows:

(A) 500 ppm for polyvinyl chloride dispersion resins, excluding latex resins;

(B) 100 ppm for all other polyvinyl chloride resins, including latex resins, averaged separately for each type of resin; or

(2) In polyvinyl chloride plants controlling vinyl chloride emissions with technology other than stripping or in addition to stripping:

(i) For sources being used to process a grade or grades of polyvinyl chloride resin all of which had been produced by the plant on or before June 2, 1977:

(A) 2 g/kg (0.003 lb/lb) product from the stripper(s) [or reactor(s) if the plant has no stripper(s)] for dispersion polyvinyl chloride resins, excluding latex resins, with the product determined on a dry solids basis;

(B) 0.4 g/kg (0.004 lb/lb) product from the stripper(s) (or reactor(s) if the plant has no stripper(s)) for all other polyvinyl chloride resins, including latex resins, with the product determined on a dry solids basis.

(ii) For sources being used to process any grade of polyvinyl chloride resin not produced by the plant on or before June 2, 1977:

(A) 0.5 g/kg (0.0005 lb/lb) product from the stripper(s) (or reactor(s) if the plant has no stripper(s)) for dispersion polyvinyl chloride resins, excluding latex resins, with the product determined on a dry solids basis;

(B) 0.1 g/kg. (0.0001 lb/lb) product from the strippers (or reactor(s) if the plant has no stripper(s)) for all other polyvinyl chloride resins, including latex resins, with the product determined on a dry solids basis.

(f) The requirements of paragraphs (b), (c), and (d) of this section do not apply to equipment that has been opened, is out of operation, and met the requirement in § 61.65(b)(6)(i) before being opened.

5. Section 61.65 is amended as follows:

A. By replacing the phrase "10 ppm" with the phrase "the appropriate emission limit specified in § 61.65(c)" in paragraphs (b)(1)(ii), (b)(2), (b)(3)(i), (b)(3)(ii), (b)(3)(iii), (b)(3)(iv), (b)(3)(v), (b)(5), (b)(6)(ii), and (b)(9)(ii);

B. By revising paragraph (c) and adding paragraph (d) as set forth below.

§ 61.65 Emission standard for ethylene dichloride, vinyl chloride, and polyvinyl chloride plants.

* * * * *

(c) The emission limit which is not to be exceeded is as follows: (1) Each source, for which construction had commenced on or before June 2, 1977, 10 ppm until (date three years after promulgation of these amendments) and 5 ppm after (date three years after promulgation of these amendments).

(2) Each source for which construction commenced after June 2, 1977, 5 ppm.

(d) The requirements in paragraphs (b)(1), (b)(2), (b)(5), (b)(6), (b)(7) and (b)(8) of this section are to be incorporated into a standard operating procedure, and made available upon request for inspection by the Administrator. The standard operating procedure is to include provisions for measuring the vinyl chloride in equipment ≥4.75 m^3 (1250 gal) in volume for which an emission limit is prescribed in § 61.65(b)(6)(i) prior to opening the equipment and using Test Method 106, a portable hydrocarbon detector, or an equivalent or alternative method. The method of measurement is to meet the requirements in § 61.67(g)(5)(i)(A) or (g)(5)(i)(B).

6. In § 61.67, paragraph (a) is revised to read as follows:

§ 61.67 Emission tests.

(a) Unless a waiver of emission testing is obtained under § 61.13, the owner or operator of a source to which this subpart applies shall test emissions from the source as follows:

(1) For an existing source or a new source which has an initial startup date preceding October 21, 1976:

(i) Within 90 days following October 21, 1976, and

(ii) For those sources subject to §§ 61.62(a); 61.63(a); 61.64 (a)(1), (b), (c), and (d); and/or 61.65(b)(1), (b)(2), (b)(3), (b)(5), (b)(6), and/or (b)(9), within 90 days following (date three years after the promulgation date of these amendments).

(2) For a new source for which initial startup occurs after October 21, 1976, within 90 days of startup.

* * * * *

7. In § 61.68, paragraph (c) is revised to read as follows:

§ 61.68 Emission monitoring.

* * * * *

(c) A daily span check is to be conducted for each vinyl chloride monitoring system used. For all of the sources listed in paragraph (a) of this section, except for the one for which an emission limit is prescribed in § 61.62(b)(1), the daily span check is to be conducted with a concentration of vinyl chloride equal to the concentration emission limit applicable to it. For a source subject to the emission limit prescribed in § 61.62(b)(1), the daily span check is to be conducted with a concentration of vinyl chloride which is determined to be equivalent to the emission limit for that source based on the emission test required by § 61.67. The calibration is to be done with either:

* * * * *

8. A new § 61.72 is added to read as follows:

§ 61.72 Request for interim emission limit.

(a) If in the opinion of the owner or operator of an existing source, that source will be unable to comply with the 5 ppm emission limit in §§ 61.62(a)(1); 61.63(a)(1); 61.64 (a)(1)(i), (b)(1), (c)(1), (d)(1); and/or 61.65(c)(1) on or before (date three years after promulgation of these amendments), the owner or operator of that source may request that the Administrator approve an interim emission limit for that source. The request is to be in writing and is to be submitted to the Administrator within six months prior to (date two years after promulgation of these amendments). The request is to include:

(1) The reasons the source is incapable of being in compliance with the 5 ppm emission limit and data to support those reasons, and

(2) A suggested interim emission limit and description of the methodology for attaining that limit.

(b) Any owner or operator of a source who has submitted to the Administrator a written request for an interim emission limit in accordance with § 61.72(a), shall within 60 days of the date of the written request meet with the Administrator concerning the information contained in the request. The meeting is to be open to interested persons, who are to be allowed to submit oral or written testimony relevant to compliance of the source.

(c) The Administrator will within 120 days of receipt of the written request required by paragraph (a) of this section, notify the owner or operator in writing of approval or denial of approval of an interim emission limit.

(d) If an interim emission limit is approved the notification is to include the level of the interim emission limit, which may be the level requested or a more stringent one.

(e) A determination to deny approval of an interim emission limit is to set forth the specific grounds on which such denial is based.

(f) Approval for any interim emission limit granted for any source under § 61.72(c) shall expire three years from the date of issuance. The owner or operator may request an extension of approval for an interim emission limit or a lower interim emission limit. The request is to be in writing, is to be submitted within six months prior to a year before the expiration date and is to include the information listed in § 61.72 (b), (c), (d), and (e) are to apply.

9. A new § 61.73 is added to read as follows:

§ 61.73 Offset of emissions due to new construction.

(a) No owner or operator is to construct a new source which alone or in combination with other sources being constructed at the same time results in an increased production rate unless he demonstrates to the Administrator's satisfaction that such construction will not cause an increase in vinyl chloride emissions within 8 km of any other source which is subject to this subpart.

(b) Reduction in production rate is an allowable mechanism for attaining an offset in emissions.

(c) The baseline emission rate is to be determined based on the level of emissions allowable by the standard.

(d) Reducing emissions from an interim emission limit to the standard for a source is not an acceptable means of achieving an emission offset.

(e) In the application for approval of construction required by § 61.07, owners or operators of sources subject to this subpart shall include, in addition to the information required by § 61.07, the following information:

(1) The name, address, and location of any plant subject to this subpart which is located within 8 km of the proposed location of the source to be constructed.

(f) The emission limits applicable to both the new source(s) and the source(s) at which emissions are being reduced to balance the increase in emissions due to the new construction are to be established by the Administrator in the approval for construction required by § 61.08.

(Secs. 112 and 301(a) of the Clean Air Act, sec. 4(a) of Pub. L. No. 91-604, 84 Stat. 1683; sec. 2 of Pub. L. No. 90-148, 81 Stat. 504 (42 U.S.C. 1855c-7, 1857g(a)). Secs. 61.67 and 61.68 also issued under sec. 114 of the Clean Air Act, sec 4(a) of Pub. L. No. 91-604, 84 Stat. 1687 (42 U.S.C. 1857c-9).)

[FR Doc.77-15572 Filed 6-1-77;8:45 am]

DEPARTMENT OF HEALTH, EDUCATION, AND WELFARE

Office of Education

[45 CFR Parts 163 and 163a]

CAREER EDUCATION AND CAREER DEVELOPMENT

Addition of Programs

AGENCY: Office of Education, HEW.

ACTION: Proposed rule.

SUMMARY: The Commissioner of Education, with the approval of the Secretary of Health, Education, and Welfare, proposes to add two new career education programs as enacted by the Education Amendments of 1976. Part 163 contains provisions for a new one-year program of financial assistance to States and other allottees for Fiscal Year 1978 to plan for the improvement and development of career education and career development programs and activities for individuals of all ages. Part 163a contains provisions for the Commissioner of Education to conduct a number of career information activities during Fiscal Year 1978, including the collection, analysis, and dissemination of information pertaining to career trends and options in the United States as well as exemplary materials from the career education field. Both these programs are new authorizations for which no funding has been requested by the Administration.

DATES: Comments must be received on or before July 5, 1977.

ADDRESSES: Comments should be addressed to Sidney High, U.S. Office of Education, 7th and D Streets, S.W., Room 3108-A, Washington, D.C. 20202.

FOR FURTHER INFORMATION CONTACT:

Sidney High, 202-245-2331.

SUPPLEMENTARY INFORMATION: (a) *Organization.* Part 163 (sections 331-334 of Pub. L. 94-482), as set forth in this proposed rule, contains those provisions which are applicable to the program of Federal assistance to States and other allottees to enable them to plan for the development of career education and career development programs. The assistance provided under this Part is also subject to the applicable provisions contained in the Office of Education General Provisions Regulations published in 45 CFR Parts 100 and 100b (38 FR 30654, November 6, 1973). Part 163a (section 335 of Pub. L. 94-482) contains those provisions applicable to the program of collection, analysis, and dissemination by the Commissioner of career information and exemplary materials. To the extent the Commissioner proceeds by contract, as authorized by section 335 of Pub. L. 94-482, the program will also be governed by the applicable provisions of the Federal Procurement Regulations. 41 CFR Chapters 1 and 3. To the extent the Commissioner proceeds by grant, the applicable provisions of 45 CFR Part 100a (38 FR 30662, November 6, 1973) will apply.

(b) *Comments and responses.* In the Notice of Intent to Issue Regulations (published in 41 FR 51550 on November 22, 1976) the Commissioner requested public comment on a number of specific issues in addition to inviting expressions of public sentiment on any issue considered worthy of comment. In the thirty days afforded interested persons in which to make their views known, 64 State and national organizations, associations, and agencies and 3 individuals submitted comments. The comments on the specific issues listed in the Notice of Intent are summarized below:

(1) Given the apparent overlap between the planning authorities contained in section 406(f)(2) of Pub. L. 93-380 and sections 331-34 of Pub. L. 94-482, how can the latter program be designed to avoid duplication of the former program? (a) Should planning under sections 331-34 focus on career education for individuals beyond the secondary school level? (b) Should States be required to explain the relationship between activities carried out and proposed under the two authorities?

The commenters were overwhelmingly supportive of the view that duplication of activities conducted under both authorities (Pub. L. 93-380 and Pub. L. 94-482) should be as limited as possible. They clearly thought the regulation should require a careful explanation of the relationship between these two planning efforts. It was suggested that planning activities conducted pursuant to Pub. L. 94-482 might properly extend and augment the planning already begun under Pub. L. 93-380. It was also noted by several commenters that State planning already being conducted under Title I and Title X of the Higher Education Act of 1965 (20 U.S.C. 1001 et seq.) should also be coordinated with planning efforts conducted pursuant to Pub. L. 94-482 because those titles deal with the continuing education of adults and, therefore, are closely related to the concept of career education for individuals of all ages. The proposed § 163.6(b) attempts to avoid duplication by requiring the allottee to explain the relationship between planning activities carried out under Pub. L. 93-380 and proposed under Pub. L. 94-482 in the event that the planning is addressed to the same age groups.

On the related question of priorities between K-12 and postsecondary planning, while the majority of commenters identified the need for cooperation be-

APPENDIX 5

ARB Method

VINYL CHLORIDE IN AIR

Organics Evaluation Section

Analytical Method

Analyte:	Vinyl Chloride (VCM, Chloroethene)	Date:	3/13/78
Matrix:	Air	Range:	0.001 to 100 ppm by volume, per injection
Procedure:	Collection in Tedlar bag, Gas Chromatography		

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1. Principle of the Method

   1.1 Air is sampled into a Tedlar bag at a constant rate during selected time intervals by means of an automatic sampler.

   1.2 A portion of the air sample is transferred via syringe to the heated volumetric sample loop of the gas chromatograph.

   1.3 The sample is introduced into the chromatograph by means of a gas sampling valve.

   1.4 The GC data system quantitates the VCM by integrating the peak area and calculating concentration from a factor determined during calibration with a VCM standard.

2. Range and Sensitivity

2.1 The minimum measurable concentration of vinyl chloride monomer was determined to be 0.010 ppm $\cong$ 0.02 ng./cm^3 using the prescribed instrument conditions and a 1 cm^3 sampling loop.

2.2 The minimum measurable concentration of vinyl chloride monomer was determined to be less than 0.001 ppm $\cong$ 0.002 ng/cm^3 using the prescribed instrument conditions and pre-concentrating by freezing a 100 ml. sample.

2.3 The minimum detectable amount of VCM was determined to be less than one fifth the concentrations indicated in sections 2.1 and 2.2.

3. Interferences

   3.1 Any organic compound present in the sample having a retention time very similar to that of VCM under the operating conditions described in this method is an interference. Therefore, proof of chemical identity requires confirmation by other means.

3.2 If a particular interfering compound is thought likely to be present, new chromatographic parameters must be chosen so as to resolve the VCM peak from the interfering peak.

3.3 Water vapor in the sample does not interfere with the separation and and quantification of VCM.

4. Calibration, precision and accuracy.

4.1 The calibration procedure employed follows closely the concepts and principles set forth in the "Quality Assurance Handbook for Air Pollution Measurement Systems" (U.S. Environmental Protection Agency, 1976). It includes periodic multicomponent calibrations, linearity checks, and frequent zero-span checks, it also includes a calculation of the confidence interval as a measure of precision for any given sample concentration.

4.2 Multicomponent Calibration: Several authors have described the linearity of flame ionization detectors (see Purnell, 1962, and references cited). This linearity extends over seven orders of magnitude at the milligram level. Therefore, we use standard reference materials and standard reference samples which bracket the anticipated range of pollutant concentrations. Four independent determinations of the instrument response are made at both a high and a low reference concentration. An additional two independent determinations are made at two midrange reference concentrations to check the linearity of the instrument.

4.3 Linearity Check: The calibration data are fitted to a straight line, $Y = a + bX$, by the method of least squares (see Bennett and Franklin, 1954). The response, Y, is expressed as a function of the concentration, X. An analysis of variance table is constructed from the regression data (see Draper and Smith, 1966). The mean-square error due to lack of fit about the regression line is compared to the total mean-square error of the independent replicates about their individual means. The calibration is accepted if the F-ratio is less than the 95% rejection limit.

4.4 Confidence Intervals: The variance of the concentration corresponding to a given instrument reponse (or average response of N repeated measures) is estimated by the method of Bennett and Franklin (1954). The 95% confidence intervals are obtained by multiplying the square root of this variance by the appropriate value of 't' from the 't' table.

4.5 Sample Calibration: A sample multipoint calibration including linearity check and confidence intervals is given in the appendix.

4.6 Zero-Span Checks

The laboratory data system monitors the detector zero continuously after the instrument baseline has been established. A span check is made each day at the high reference concentration to verify that the instrument is responding accurately.

4.7 References:

Bennett, C. A. and Franklin, N. L. (1954), "Statistical Analysis in Chemistry and the Chemical Industry," John Wiley & Sons, Inc., New York, pp. 222-232.

Draper, N. R. and Smith, H. (1966), "Applied Regression Analysis," John Wiley & Sons, Inc., New York, p. 30.

Purnell, H. (1962), "Gas Chromatography," John Wiley & Sons, Inc., New York, pp. 301-302.

U. S. Environmental Protection Agency (1976), "Quality Assurance Handbook for Air Pollution Measurement Systems, Volume I - Principles," EPA-600/9-76-005 Environmental Monitoring and Support Laboratory, Research Triangle Park, North Carolina 27711.

5. Advantages and Disadvantage of the Method

5.1 The air sampling equipment is easily set-up and involves no liquids. The concentration of vinyl chloride monomer in the range of interest is stable for at least one week in the Tedlar sampling bags, provided that no ozone is present. Ozone removal is assured by adding small amounts of nitric oxide to the bag prior to sampling.

5.2 The sample is easily and repeatably introduced into the instrument by means of a volumetric gas sampling valve.

5.3 A representative composite sample is readily obtained for any selected time interval, because the equipment samples at a constant rate.

5.4 The lower concentration limit of the analysis may be extended by concentrating the sample further by freezing out a larger volume. The precision of the analysis at low concentrations is considerably enahanced by this technique.

5.5 Chromatographic conditions can be readily selected so that interferences are eliminated and so that the analysis time is minimized.

6. Apparatus

6.1 A sampler consisting of a diaphragm pump, a flow metering valve, fittings and tubing to convey air samples to sample bags, timers, solenoid valves and associated electrical circuitry to control filling of the sample bags, all compactly mounted on a metal chassis operating on 110 VAC.

6.2 Tedlar bags, nominally of 30 to 100 liter capacity, equipped with quick-connect fittings.

6.3 A gas chromatograph equipped with a gas sampling valve or freeze-out inlet system and flame ionization detector.

6.4 A stainless steel column (2 meters x 1/8 in.) packed with 0.19% Picric Acid on 80/100 mesh Carbopak C, or other column capable of resolving VCM from other organics with similar physical/retention properties.

6.5 An analog recorder and means to quantitate peak areas.

6.6 100 ml ground glass syringes or other suitable devices to transfer air samples from Tedlar bags to sample inlet of the G.C.

7. Reagents

7.1 Vinyl chloride reference standard, 0.70 ppm in N2 (Matheson, or equivalent)

7.2 Helium, 99.995%

7.3 Hydrogen, 99.995%

7.4 Oxygen, 99.6%

8. Procedure

8.1 Preparation of bags: All bags are filled with nitrogen and inspected for leaks. Bags are pumped empty prior to use, refilled with pure N_2 and tested for absence of vinyl chloride.

8.2 Preparation of sampling device: Metering valves are adjusted to secure appropriate air sampling rates, as determined by rotometer. Timers are set so that air will be sampled for desired time intervals. The sampler is set up in sampling location and empty sample bags are labeled and connected to the sampler.

8.3 Transport of bags to laboratory: Filled bags are protected from exposure to direct sunlight while being transported to the laboratory. Care is exercised not to puncture the plastic.

8.4 Samples received at the laboratory are logged in and placed on storage racks.

8.5 Analysis of Samples (loop method).

8.5.1 Introduction of sample into gas chromatograph:

Air is transferred from the air sample bag to the sample loop of the gas chromatograph by means of a clean 100 ml syringe fitted with Luer-lok to quick-connect adapter.

8.5.2 The gas sampling valve (rotary type) is equipped with 1 ml. loop. Other loop sizes may be used.

8.5.3 G. C. conditions: With the suggested n-octane/Porasil C column typical operating conditions for the gas chromatograph are:

1. 25 ml./min helium carrier gas flow.
2. 30 ml./min hydrogen gas flow to detector
3. 300 ml./min oxygen flow to detector
4. 83°C sample valve temperature
5. 125°C detector temperature
6. 60°C isothermal column temperature

8.5.4 Measurement of concentration:

Concentrations of VCM may be calculated by a Varian CDS 111 chromatographic data system or by any other suitable integration device.

8.6 Analysis of Samples (Freeze-out method)

8.6.1 Freeze-out/Injection:

1. Immerse the sample loop in liquid nitrogen and allow the temperature to stabilize.
2. After discarding about 50 ml of the sample, withdraw exactly 100 cc from the sample bag with a 100 ml. syringe.
3. Add about 5-10 ml. Helium to the syringe and transfer the sample into the loop.
4. Back fill the syringe with another 20 cc of Helium and flush the 20 cc through the loop; then flush Helium through the loop for 3 minutes.
5. Isolate the trap by using an "isolation valve."
6. Replace the LN_2 Dewar with a Dewar containing hot water at about 80°C.
7. Allow all the ice to melt from the trap.

8. Inject the sample into the carrier gas stream.

8.6.2 Measurement of area: The area of the sample peak is measured by any suitable integration device.

8.6.3 The instrument operating conditions are similar to those described in section 8.5.3 above.

9. Calibration and Standards

CAUTION: Laboratory operations involving carcinogens

Because vinyl chloride has been identified as a human carcinogen, observe appropriate precautions when handling this gas. The OSHA regulations pertaining to the use and handling of vinyl chloride may be found in 29 CFR 1910.93q (Section 1910.93q in Title 29 of the Code of Federal Regulations available in the Federal Register, Vol. 39, No. 194, Friday, October 4, 1974, pp

9.1 A commercially prepared and certified reference standard containing approximately 1 ppm vinyl chloride in nitrogen is used to calibrate the instrument.

9.2 The concentration of vinyl chloride in nitrogen referred to in 2.1 above is certified (or corrected) by the National Bureau of Standards, Washington, D.C.

9.3 Additional standards of lower concentrations of VCM in nitrogen are prepared at one half, one tenth, one hundredth and one thousandth the label value. At least two sets of standards with not less than three independent analyses are performed on each instrument to create multipoint calibrations and to perform zero-span checks.

10. Calculations.

10.1 The Vinyl Chloride Monomer (VCM) concentration, in ppm, is calculated by the CDS 111 data system using the external standard method

$$\text{Concentration}_i = \text{Area}_i \times \text{Calibration Factor}$$

10.2 The calibration factor (CF) is calculated during calibration by the equation

$$CF = \frac{Conc}{Area}$$

Replicate calibrations are averaged and the arithmetic mean is stored as the CF to be used in subsequent analyses.

10.3 Concentrations may be converted from ppm to mg/m^3 by means of the following formula

$$mg/m^3 = ng/cm^3 = \frac{P \cdot (62.5) \cdot (ppm) \cdot (10^3)}{(82.07) \cdot T}$$

where P = pressure in atmospheres

62.5 = molecular weight of vinyl chloride

82.07 = gas constant in $cm^3 \cdot$ atm./deg. mole

T = absolute temperature (^oK)

The concentration unit of mg/m^3 is equivalent to ng/cm^3.

11. Additional references

Hill, R. H., C. S. McCammon, A. T. Saalwaechter, A. W. Teass, and W. J. Woodfin, "Determination of Vinyl Chloride in Air," in preparation.

White, L. D., D. G. Taylor, P. A. Mauer, and R. E. Kupel, "A Convenient Optimized Method for the Analysis of Selected Solvent Vapors in the Industrial Atmosphere," Am. Ind. Hyg. Assn. J., 31, 225 (1970).

APPENDIX 6

GLOSSARY

Terms used in the NESHAP regulation for vinyl chloride are defind as follows.*

(a) "Ethylene dichloride plant" includes any plant which produces ethylene dichloride by reaction of oxygen and hydrogen chloride with ethylene.

(b) "Vinyl chloride plant" includes any plant which produces vinyl chloride by any process.

(c) "Polyvinyl chloride plant" includes any plant where vinyl chloride alone or in combination with other materials is polymerized.

(d) "Slip gauge" means a gauge which has a probe that moves through the gas/liquid interface in a storage or transfer vessel and indicates the level of vinyl chloride in the vessel by the physical state of the material the gauge discharges.

(e) "Type of resin" means the broad classification of resin referring to the basic manufacturing process for producing that resin, including, but not limited to, the suspension, dispersion, latex, bulk, and solution processes.

(f) "Grade of resin" means the subdivision of resin classification which describes it as a unique resin, i.e., the most exact description of a resin with no further subdivision.

(g) "Dispersion resin" means a resin manufactured in such a way as to form fluid dispersions when dispersed in a plasticizer or plasticizer/ diluent mixtures.

(h) "Latex resin" means a resin which is produced by a polymerization process which initiates from free radical catalyst sites and is sold undried.

(i) "Bulk resin" means a resin which is produced by a polymerization process in which no water is used.

(j) "Inprocess wastewater" means any water which, during manufacturing or processing, comes into direct contact with vinyl chloride or polyvinyl chloride or results from the production or use of any raw material, intermediate, product finished product, by-product, or waste product containing vinyl chloride or polyvinyl chloride but which has not been discharged to a wastewater treatment process or discharged untreated as wastewater.

*Federal Register, Volume 42, page 29006, and Volume 40, page 59544 and 59545.

(k) "Wastewater treatment process" includes any process which modifies characteristics such as BOD, COD, TSS, and pH, usually for the purpose of meeting effluent guidelines and standards; it does not include any process the purpose of which is to remove vinyl chloride from water to meet requirements of this subpart.

(l) "In vinyl chloride service" means that a piece of equipment contains either a liquid that is at least 10 percent by weight vinyl chloride or a gas that is at least 10 percent by volume vinyl chloride.

(m) "Vinyl chloride detector" means a device which obtains air samples from one or more points on a continuous sequential basis and analyzes the samples with gas chromatography or, if the owner or operator assumes that all hydrocarbons measured are vinyl chloride, with infrared spectrophotometry, flame ion detection, or an equivalent or alternative method.

(n) "Portable hydrocarbon detector" means a device which measures hydrocarbons with a sensitivity of at least 5 ppm and is of such design and size that it can be used to measure emissions from localized points.

(o) "Standard operating procedure" means a formal written procedure officially adopted by the plant owner or operator and available on a routine basis to those persons responsible for carrying out the procedure.

(p) "Run" means the net period of time during which an emission sample is collected.

(q) "Ethylene dichloride purification" includes any part of the process of ethylene dichloride production which follows ethylene dichloride formation and in which finished ethylene dichloride is produced.

(r) "Vinyl chloride purification" includes any part of the process of vinyl chloride production which follows vinyl chloride formation and in which finished vinyl chloride is produced.

(s) "Reactor" includes any vessel in which vinyl chloride is partially or totally polymerized into polyvinyl chloride.

(t) "Reactor opening loss" means the emissions of vinyl chloride occurring when a reactor is vented to the atmosphere for any purpose other than an emergency relief discharge as defined in § 61.65(a).

(u) "Stripper" includes any vessel in which residual vinyl cloride is removed from polyvinyl chloride resin, except bulk resin, in the slurry form by the use of heat and/or vacuum. In the case of bulk resin, stripper includes any vessel which is used to remove residual vinyl chloride from polyvinyl chloride resin immediately following the polymerization step in the plant process flow.

(v) "Standard temperature" means a temperature of 20^{o} C (69^{o} F).

(w) "Standard pressure" means a pressure of 760 mm of Hg (29.92 in. of Hg).

(x) "Oxychlorination" is a process for the production of ethylene dichloride which is made by the reaction of air and hydrogen chloride with ethylene in a catalytic process.**

** Defined by ARB staff.

APPENDIX 7

EFFECTS OF AIRBORNE VINYL CHLORIDE

Air Resources Board
Staff Report 78-1-1

Available upon request from
the Air Resources Board

APPENDIX 8

State of California
AIR RESOURCES BOARD

NOTICE OF PUBLIC HEARING TO CONSIDER
ESTABLISHMENT OF STATE AMBIENT AIR QUALITY
STANDARDS AND/OR SIGNIFICANT HARM LEVELS
FOR VINYL CHLORIDE

NOTICE IS HEREBY GIVEN that the Air Resources Board, pursuant to the authority vested by Section 39601 of the Health and Safety Code, and to implement, interpret or make specific Sections 39606(b) and 41700 of the Health and Safety Code, will conduct a public hearing, at the time and place specified below, to consider the establishment of one or more state ambient air quality standards or significant harm levels (levels never to be exceeded) for vinyl chloride.

On January 25, 1978, the Board received a status report from its staff and comments from interested persons on this item. As a result of information received on January 25 and subsequent thereto, the Board is proposing to take one or more of the following actions with respect to vinyl chloride air pollution:

-- Pursue enforcement of the emission regulations for vinly chloride monomer and related substances promulgated by the Environmental Protection Agency (EPA) on October 21, 1976 pursuant to Section 112 of the Clean Air Act [National Emission Standards for Hazardous Air Pollutants (NESHAPS)], and defer further state regulatory action until the NESHAPS emission regulations are fully implemented in October 1978.

-- Pursue enforcement of the NESHAPS emission regulations for vinyl chloride and related substances and adopt a state ambient air quality standard or standards for vinyl chloride or designate a Significant Harm Level or Levels for vinyl chloride on the basis of existing scientific evidence. The ambient air quality standard would be attained or exceedances of the Significant Harm Level(s) would be prevented by means of rules to be adopted subsequently by the South Coast Air Quality Management District (SCAQMD). These rules could be enforced, for example, by an air measurement program that includes continuous or frequent intermittent monitoring of vinyl chloride levels at the boundary line of vinyl chloride facilities to be conducted by the operators of such facilities, and/or by specific emission limitations. If the action taken is to set a Significant Harm Level, enforcement under Health and Safety Code Section 41700 could also be taken, through district permit requirements and/or legal action before a court of competent jurisdiction.

The Board requests evidence and testimony relating to the effects of vinyl chloride exposures on health, illness, and irritation to the senses. The Board also seeks information relating to the appropriateness of a 24-hour or other averaging period, and appropriate test methods. Staff analysis of comments received during and subsequent to the January 25, 1978 Board meeting will be presented.

If one or more new state ambient air quality standards and/or Significant Harm Levels for vinyl chloride are established, the Board will make appropriate amendments to its regulations in Section 70200, Title 17, California Administrative Code, relating to ambient air quality standards.

The time and place for public hearing on this matter are as follows:

DATE: April 27, 1978

TIME: 10:00 a.m.

PLACE: Crystal Ballroom
Hotel San Franciscan
1231 Market Street
San Francisco, CA

Copies of the staff report on this matter will be available for inspection at, or may be obtained from, the headquarters office of the Air Resources Board, 1102 Q Street (P.O. Box 2815), Sacramento, California 95812, Attention: Public Information Office, at least 30 days prior to the scheduled hearing date. All documents reviewed by the staff in connection with its consideration of the issues in the staff report, together with written comments received from interested persons, if any, will also be available for inspection and copying.

NOTICE IS FURTHER GIVEN that any interested person may present oral or written statements at the public hearing referred to above. The Board requests that interested persons who have written statements on this matter submit 10 copies of the same at least seven days prior to the scheduled hearing date in order to provide adequate time for staff analysis and comment, and to allow early review by the Board. Interested persons are further advised that the Chairman may require oral testimony to be limited in scope or duration; however, all persons will be allowed at least five minutes for presentation of oral testimony. Following completion of the public hearing, the Air Resources Board, on its own motion or at the instance of any interested person, may establish one or more ambient air quality standards and/or Significant Harm Levels for vinyl chloride.

The Air Resources Board has determined that this action creates no additional cost to local government pursuant to Section 2231 of the Revenue and Taxation Code.

CALIFORNIA AIR RESOURCES BOARD

William H. Lewis, Jr.
Executive Officer

March 22, 1978