Inter-organization Correspondence

B.F.Goodrich

TO	FIELD POINT OR AKRON DEPARTMENT & BLDG. NO.	DATE YOUR LETTER
W. E. McCormick	Akron	
FROM	**FIELD POINT OR AKRON DEPARTMENT & BLDG. NO.**	**DATE THIS LETTER**
D. L. Dowell	Cleveland	2-28-73

SUBJECT

TLV of Vinyl Chloride

Mr. E. F. Barker, Director of Purchasing, has asked for my recommendations on the attached information.

It is my recommendation that we supply our major vinyl chloride customers with a revised copy of MCA's Data Sheet SD-56, "Vinyl Chloride", and attach a label similar to the one Dow Chemical is using. The context of the label should be the same as Dow's with the exception of the last sentence. I am sure we could, and are, maintaining a 50 ppm exposure of vinyl chloride to our employees at Calvert City. However, I doubt if we are maintaining a 50 ppm level in our PVC polymerization buildings. This subject has been discussed with Dr. B. M. G. Zwicker and he is in agreement with my recommendation.

Dr. Zwicker recommended, and I agree, we should revise our MSDS (Department of Labor form--LSB-OOS-4, May 1969) TLV to read 200 ppm and forward a copy to our vinyl chloride customers.

By copy of this letter, I am requesting Mr. Barker to hold status quo on the subject until you have reviewed the information and inform me of your opinion on Dr. Zwicker's and my recommendations.

Dennie L. Dowell

Dennie L. Dowell

DLD:kjm
Attachments

cc: E. F. Barker - J. S. Wolff
B. M. G. Zwicker
J. L. Nelson

2510135

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The present OSHA level is 500 ppm (ceiling) Regardless of what ACGIH does, we should go with the OSHA level. W.E.M.

D. Dowell: I cannot argue Bill's point pro or con. I suspect that W C Becker might have a different viewpoint, especially if we have really been asked to comment by Air Products or Hooker. But both of them have been aware of the potential reasons for Dan's action. Let's get with Eli on the subject.

MAR 7 1973 3/8/73

BFG-4056-B REV. 11/70 LITHO. IN U.S.A.

D R A F T

ACTIONS ON VINYL CHLORIDE EXPOSURE LEVELS

ACGIH ¥ American Conference of Government Industrial Hygienists ¥
[TLV is ACGIH's copyright similar to Time Weighted Average]

Recommendations

VCl included in first list	1948	TLV 500 ppm
Proposed change to make TLV the ceiling value	(1962)?	TLV 500c "
Adopted proposed change	1963	TLV 500c "
Proposed change of VCl TLV	Oct. 1970	TLV 200 ppm
Adopted proposed change	Oct. 1972	TLV 200 ppm

OSHA

Law enacted	Dec. 29, 1970	(implemented Apr.28, 1971)
Law adopted ACGIH standards	May 29, 1971	500c ppm
Priority list for standard review (VCM 11th group on priority list)	Spring , 1972	
Call for standard rulemaking on VCM	Jan., 1973	
Meeting of Committee on VCM	June , 1973	
Hearing on standard	Feb. 15, 1974	
Emergency temporary standard	April 5, 1974	50c ppm
Proposed permanent standard	May 6, 1974	no detectable
Public comments by	June 10, 1974	
Hearings	June25-28, 1974	
Drafting of permanent standard	~ July 9, 1974	

NIOSH

Recommendations to OSHA	March 11, 1974	no detectable

BMGZ:ksc
cc: H. Waltemate
J. L. Nelson
A. Vittone, Jr.

BFG37722

B. F. Goodrich Chemical Company
A DIVISION OF THE B. F. GOODRICH COMPANY
DEVELOPMENT CENTER

An Instrumental System for the Monitoring of Vinyl Chloride Monomer in Plant and Laboratory Work Environments

by
L. B. Crider

Date Completed: January 30, 1974 Date Issued: February 8, 1974

Summary:

A number of instrumental systems have been evaluated for the monitoring of vinyl chloride monomer in ambient air. Methods for both survey detection and fixed monitoring have been subjected to in-plant testing for a sufficient period of time to provide final design recommendations for a total system including the analyzer, sampling system and data processing hardware requirements.

Note: This report was prepared for the Manufacturing Chemist Association for wide distribution outside the B.F.Goodrich Chemical Company. All inquiries relating to this subject matter should be referred to Dr. B. M. G. Zwicker.

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List of Tables, Figures and Appendices

Introduction

Within the past several years there has developed a growing awareness of the need to do continuous or sequential sample monitoring of air quality in both laboratory and production work areas. Significant factors contributing to our increased knowledge relating to air quality in polymerization buildings in the PVC industry include the development of suitable instrumentation for the analysis of contaminants and the implementation of these methods, initially on a batch sampling basis. The development of much improved monitoring systems has lead to the ability to do continuous or sequential monitoring (as opposed to batch sampling) by interfacing an analytical instrument with an automatic sampling system. Additionally, the response signal from the analytical instrument now can be feed to a programmable calculator or minicomputer to provide new reporting capabilities such as hourly and shift average concentration levels as well as an instantaneous display and recording of concentration levels at multiple locations.

These much improved sample handling, analytical and data processing capabilities have revealed that the analysis of air quality based on infrequent, batch samples is grossly inadequate. It is also now apparent that even the most advanced instrumental system is not totally adequate because of its limitations in monitoring only from specific, fixed locations, whereas the monitoring needs may frequently be shifted from one location to another. The use of a fixed monitoring system, supplemented by the frequent use of easily portable analyzers having equivalent capabilities, is now recognized as the minimum requirements for both monitoring and maintaining good air quality in polymerization work areas.

As a result of this improved ability to make air quality measurements there has also developed an increased awareness of the many complexities involved in the maintenance of good air quality in an enclosed working area. Good ventilation, the rigid exclusion of leaks and the institution of improved manufacturing procedures are only a part of the practices that must be adhered to. Equally important is the ability to provide early detection and to take immediate corrective action when contaminant levels exceed the criteria established for employee exposure.

Obviously, a monitoring system must therefore be designed to meet the requirements of specific work areas. Preliminary studies must be made to determine excursion limits (maximum and minimum concentrations) of air contaminants and a number of analytical methods must be considered or tested to provide the required measurements. Another important factor is the frequency of sampling and analysis required to provide early warning of high concentration levels and a suitable history of employee exposure. Equally important in the planning stage is proper consideration of data handling since continuous or rapid sequential monitoring from multiple sample locations can produce such a large quantity of data that some means of automated data acquisition, summation, averaging and report writing must be included as a part of the total system.

Instrumental and System Requirements

An instrumental system for the monitoring of vinyl chloride monomer (VCM) in a process or laboratory work area should have the following capabilities or characteristics;

* One ppm detection capabilities (or better),
* Rapid response to changes in concentration levels,
* Linear and reproducible response over a wide concentration range (0 - 1000 ppm),
* Require a minimum of operator attention and maintenance,
* Have the capability of sampling at multiple, remote locations.
* Be compatible with a variety of sampling requirements and data handling methods, such as interfacing to a multi-point recorder, programmable calculator or minicomputer.

Other desirable characteristics of this system should include low or moderate cost, the employment of simple, well accepted concepts and that the hardware and associated electronic equipment be compatible with existing operating and maintenance capabilities in our production plants. It also would be desirable that the instrumentation be of a type currently available from several instrument manufacturers.

Instrument Selection and Evaluation

Data obtained through the analysis of batch samples (using gas chromatography) and survey analyses (using a portable organic vapor analyzer) are sufficient to suggest that two different types of instrumental capabilities are required to meet all of the criteria for effective monitoring and rapid identification of emission sources. The utility of the portable organic vapor analyzer is already apparent in its ability to rapidly and very specifically identify small leaks in processing equipment. It was an early conclusion that an effective total system must include the capability to monitor with both fixed and portable analyzers. The fixed analyzer should monitor a

sufficient number of sample locations in a building so as to provide a continuous record of concentration levels and equally important provide early detection of concentrations exceeding desired levels. When high VCM levels occurred, the portable analyzer would then be employed to more rapidly identify the source and provide the supplemental capabilities needed for immediate corrective action.

The screening of methods having potential for meeting all of the required performance criteria resulted in a select list of instruments for further testing in a production plant environment:

Table 1

Survey Instruments (Portable)	Monitoring Instruments (Fixed)
1. Gas Chromatograph	1. Gas Chromatograph
2. Infrared w/20m gas cell	2. Combustion-Conductivity
3. Catalytic oxidation	3. Infrared w/20m cell
4. Flame Ionization*	4. Flame Ionization*

*Organic Vapor Analyzer (OVA)

Obviously, the above list includes a number of instruments that are now widely used for the monitoring of air quality. Some of these methods (infrared and gas chromatography) have specific component identifying capabilities and some (catalytic oxidation, flame ionization and combustion-conductivity) give a total response to hydrocarbons or halogens. In the early stages of in-plant testing of these methods it soon became apparent that in a majority of PVC polymerization work areas, specific component identification was not required because the presence of atmospheric contaminants, other than VCM, was of little or no concern. Even in those areas where two or more components are present the

requirement for specific component identification is not required except in those cases where there is a gross difference in the relative toxicity of the individual components.

Comparison of Fixed Monitoring Instruments

The following discussion relating to the evaluation of various types of fixed analyzers for monitoring VCM, will be limited to a general comparison of the relative merits of the methods. Additional detail becomes unnecessary because of obvious, unreconcilable problems involved in use of several of the methods. A more concise summary of the advantages and disadvantages of the various methods investigated is given in Table 2.

Total Hydrocarbon Analyzer

The use of a total hydrocarbon analyzer having a flame ionization detector is the preferred method for the monitoring of VCM with a fixed analyzer for several reasons;

1. Outstanding sensitivity (as low as 0 - 1 ppm full scale; 0.01 ppm minimum detection)
2. Linear response (±2% full scale)
3. Good reproducibility (±2% full scale)
4. Rapid response time (almost instantaneous)

Additionally, the total hydrocarbon analyzer also fills the requirements for unattended operation, minimum maintenance requirements and moderate cost (under $2,000 w/o recorder).

Infrared and Gas Chromatograph Analyzers

Although the infrared and gas chromatographic methods are acceptable

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COMPARISON OF FIXED MONITORING INSTRUMENTS

Method	Advantages of Method	Disadvantages of Method[1]
Total Hydrocarbon Analyzer with Flame Ionization Detector	1. Outstanding sensitivity (0-1 ppm full scale) 2. Linear response (±2% full scale) 3. Good reproducibility (±2% full scale) 4. Rapid response time (almost instantaneous) and cycle time 5. Easy to operate, low maintenance requirements 6. Moderate cost ($2000 w/o recorder)	1. Not specific for VCM
Gas Chromatograph	1. Good sensitivity (low ppm) 2. Acceptable response; good reproducibility 3. Specific for VCM	1. Longer cycle time (5-10 min.) 2. More complex equipment 3. More difficult to operate and maintain 4. More expensive
Infrared Spectrometer w/20m Gas Cell	1. Excellent sensitivity [0.7 ppm MDL[2]] 2. Acceptable response; good reproducibility 3. Specific for VCM	1. Longer cycle time (5-10 min.) 2. More complex equipment 3. More difficult to operate and maintain 4. More expensive
Combustion-Conductivity Method	1. Good sensitivity (low ppm) 2. Specific for halogens	1. Not specific for VCM 2. Longer cycle time 3. Requires excessive operator attention and maintenance 4. Not commercially available

(1) as compared with the Total Hydrocarbon Analyzer

(2) Minimum Detection Limit

in terms of many of the desired performance features, they have the following disadvantages when compared to the total hydrocarbon analyzer;

1. Longer cycle time (2 - 10 minutes)
2. More complex equipment
3. More difficult to calibrate, operate and maintain
4. More expensive (2 to 3 times)

The obvious advantage of infrared and gas chromatography is the ability to measure several components in batch or sequential air samples.

Combustion-Conductivity Analyzer

Although the use of combustion-conductivity was considered as a candidate in the screening of possible acceptable methods, no direct investigation was made to obtain comparative performance data for several reasons. No commercial instruments employing this concept are now available. Also, this method has been extensively explored and used by the Dow Chemical Company for the past ten years. Based on Dow's evaluation[1], this method is a highly acceptable and usable procedure and fills many of the criteria for the monitoring of VCM or other halogenated hydrocarbons in plant work areas. In comparing the combustion-conductivity method with the total hydrocarbon analyzer there are, however, a number of disadvantages;

1. It is a more complex system,
2. More difficult to operate and maintain,
3. More expensive; not commercially available.

(1) Raymond M. Donahue, "Dow Halogenated Hydrocarbon Analyzer", Instruments Systems Research Laboratory Report, The Dow Chemical Company, Midland, Michigan.

In summary, it can be said that the evaluation of candidate methods was limited to the types of hardware currently available from a number of instrument manufacturers. A suitable method was readily identified. No preference can be stated for one instrument supplier over another.

A primary objective in the screening evaluations was to identify a suitable instrumental method and to then expedite in-plant testing to finalize the design of a total system. The Bendix 8401 Total Hydrocarbon Analyzer was the particular instrument selected for the in-plant testing phase, although similar instrumentation from another supplier could also be considered.

Comparison of Portable, Survey Instruments

The screening of candidate methods (summarized in Table 3) for use as a portable analyzer for VCM was largely influenced by prior, successful use of the flame ionization method as a portable monitor. It also soon became apparent that the comparisons relating to methods for fixed monitoring were, in most cases, translatable to the portable monitoring evaluations.

It should be emphasized that the most important features required in a portable VCM monitoring instrument are rapid response (almost instantaneous), outstanding sensitivity (1 ppm or better detection capabilities) and the equipment should be light weight and easy to handle and operate. Good linearity over a wide range of concentrations and reproducibility are desirable features, although not as critical as with the fixed monitor. Keep in mind that the major function of this instrument is to find leaks and emission sources as opposed to the continuous, quantitative requirements of the fixed analyzer. It also is desirable that the instrument be explosion proof or suitable for use in a Class I, Group D area.

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COMPARISON OF PORTABLE SURVEY INSTRUMENTS

Method	Advantages of Method	Disadvantages of Method[1]
Organic Vapor Analyzer (OVA) with flame ionization detector	1. Good sensitivity (low ppm) 2. linear response (1-1000 ppm) 3. Good reproducibility 4. Rapid response (almost instantaneous) 5. Light weight; easily portable 6. Easy to operate and maintain 7. Moderate cost (<$3,000)	1. Not specific for VCM 2. Not approved for use in a Class I, Group D work area[2]
Gas Chromatography	1. Good sensitivity (low ppm) 2. Acceptable response; good reproducibility 3. Specific for VCM 4. Excellent for multi-component mixtures	1. Lacks instantaneous response for leak detection 2. Not as easily portable as OVA
Infrared Spectrometer w/20m Gas Cell	1. Excellent sensitivity [0.7 MDL[3]] 2. Linear response; good reproducibility 3. Specific for VCM 4. Good for multi-component mixtures	1. Lacks instantaneous response for leak detection 2. Not easily portable 3. Not explosion proof; requires exclosure with N_2 or air purge
Catalytic Oxidation	1. Easily portable 2. Explosion proof 3. Good response at high concentrations	1. Lacks sensitivity (not reliable below 50 ppm) 2. Bad zero level drift

(1) as compared with the Organic Vapor Analyzer

(2) Requires Hot Work Permit

(3) Minimum Detection Limit

DCB8722

Table 3

Portable Organic Vapor Analyzer

The portable flame ionization instrument (Century Organic Vapor Analyzer) gives an almost instantaneous response to changes in VCM concentrations. It has excellent sensitivity (<1.0 ppm minimum detection limits) and gives a linear readout over a wide range of concentrations. The instrument is light weight, compact and easily transportable. It provides an excellent method for the detection and location of small leaks in processing equipment. Although the Century OVA is rated as being intrinsically safe for use in most PVC processing areas it has not yet been approved by Factory Mutual, or other rating agencies, for use in a Class I, Group D area. Such approval is expected however by mid-1974. Standard work practices involving the use of non-rate equipment in such areas need to be rigidly adhered to (such as air testing and the issuing of a Hot Work Permit).

Portable Gas Chromatograph

The use of a portable gas chromatograph having a flame ionization detector has a number of distinct advantages including the ability to specifically separate and measure VCM in the presence of other organic vapors. This advantage, however, is responsible for several undesirable features of the method, namely increased analysis time and additional requirements for operation and calibration of the instrument. The inability to provide an almost instantaneous response is sufficient to preclude the gas chromatograph as an effective method for VCM leak detection. Its primary utility is in providing analysis of batch samples in work areas where multicomponent mixtures are present.

Portable Infrared Analyzer

The infrared instrument (Wilkes Scientific Corp. Miran Gas Analyzer)

evaluated as a portable VCM analyzer had excellent sensitivity (0.7 ppm minimum detection). The major disadvantages of this method is the lag in response time (several minutes) due to the 5 liter volume of the variable path length gas cell and the time required for flushing between samples. This limitation makes this method insensitive in rapidly detecting changes in VCM concentrations when the sample probe is moved from one location to another. The instrument is too bulky to conveniently use as a portable analyzer. It also is not explosion proof. In the in-plant evaluation the instrument was mounted in an air tight box and kept under a positive pressure using a N_2 purge. This seriously limits the mobility of the instrument. It was also found that the housing for the detector is not light proof and that there is a change in zero level when the instrument was exposed to direct sunlight.

Portable Catalytic-Oxidation Analyzer

The Catalytic Oxidation method (Bacharach Instrument Company's J-W Analyzer) did not meet our performance criteria for several reasons, the most important being lack of sensitivity (minimum detection limit of 10 ppm) and baseline (zero level) drift. The instrument is apparently responsive to temperature changes or other exposure conditions and over a relatively short period of time the zero level can change in amounts equivalent to 100 ppm of VCM.

In summary, it was concluded, based on the evaluation of these several methods, that the Organic Vapor Analyzer equipped with a flame ionization detector is the preferred type of instrumentation for use as a portable analyzer for VCM in ambient air.

The Total Instrumental Monitoring System

A total instrumental system for the monitoring of VCM in ambient air includes, in addition to the flame ionization instrument, an automatic, multi-point gas sampling system, a multi-point recorder, and other means of data collection such as a programmable calculator or mini-computer and the necessary hardware for interfacing these components. A basic diagram of the instrument and sampling system is shown in Figure 1.

The Flame Ionization Instrument in a Fixed Monitoring System

This unit is designed for unattended operation over long periods of time without the necessity for adjustment or any type of manual operation. The instrument is housed in a metal case suitable for either bench or rack mounting ($16\frac{1}{2}$" X $8\frac{1}{2}$" X 18") and weighs approximately 40 pounds. The analyzer utilizes all solid state electronic components mounted on plug-in type printed circuit boards.

The utility requirements include a 115 volt power supply (150 watts) and a cyclinder of hydrogen for the operation of the burner in the analyzer. The hydrogen consumption rate is about 45cc/min.

The analyzer package (see Analytical Flow Description, Figure 2) includes an internal sample pump and sample pressure regulator as well as the necessary capillary flow controls and indicating pressure gauges to provide a very stable flow of hydrogen, air and sample gas. The analytical components in contact with the sample should be either glass or stainless steel to minimize corrosion. Some of the components in the flame ionization cell (bonnet and guiderods) should be Teflon coated to prevent corrosion from the HCl roduced from the combustion of VCM.

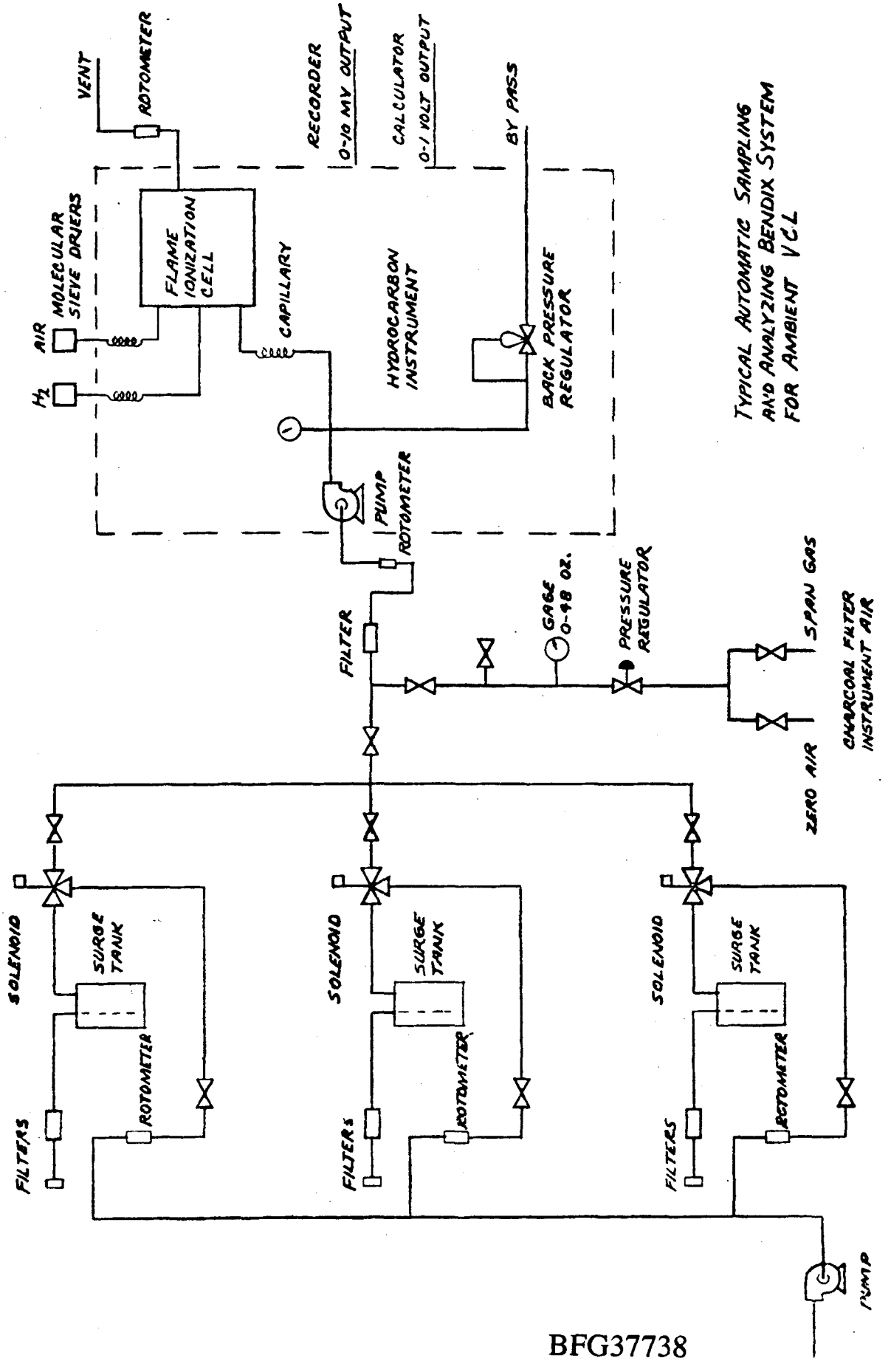

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Figure 1

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Analytical Flow Description

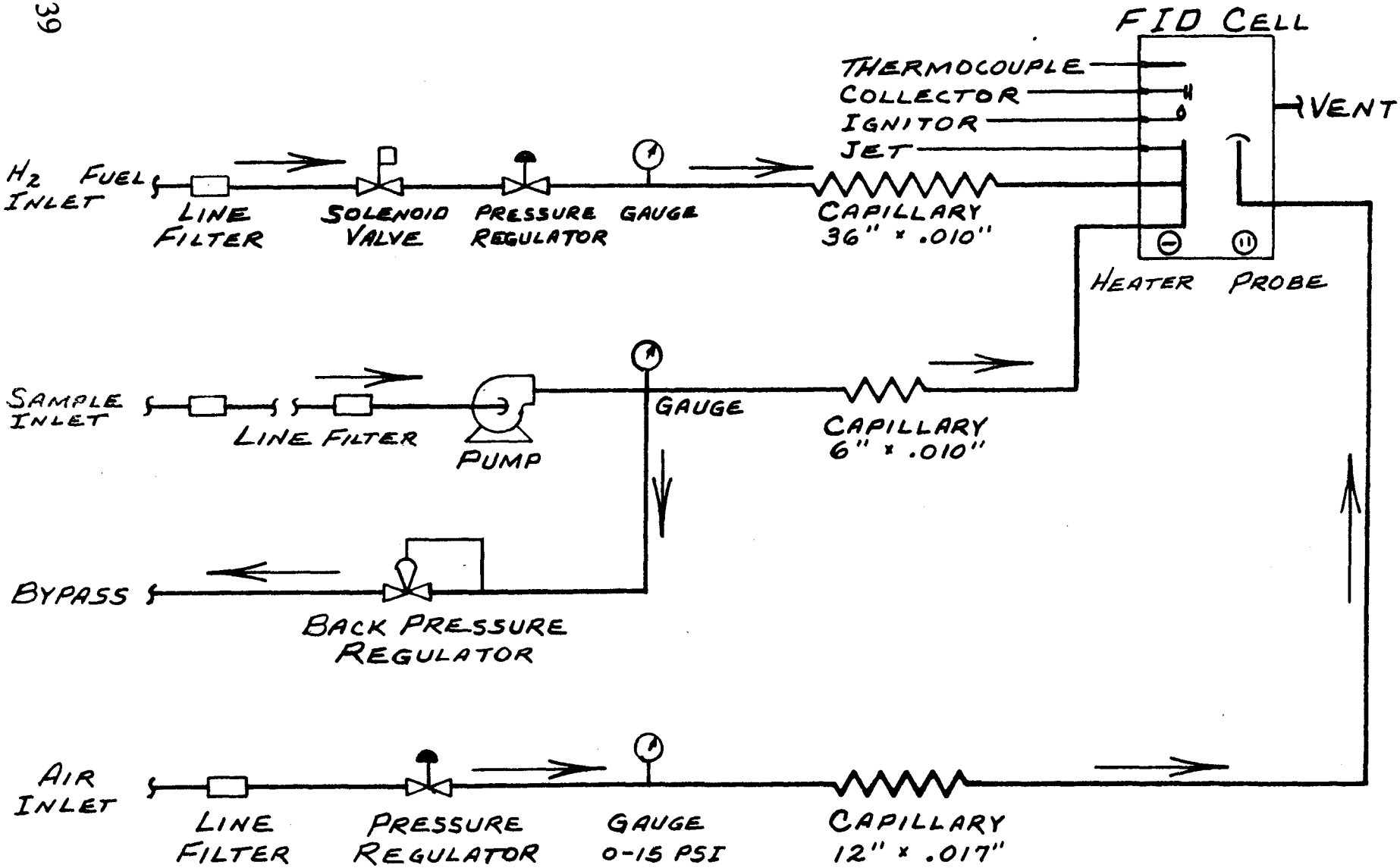

Figure 2

This type of analyzer can operate over a wide range of temperature and humidity conditions without adverse effect on measurement accuracy. The sample is introduced at a controlled rate into the flame ionization cell where a hydrogen flame is burning in an atmosphere of air. As the sample enters the flame a percentage of the molecules are ionized, forming positive and negative ions. The extent of ionization depends on the compounds present (composition and structure) and the temperature of the flame. As a general rule, compounds must have carbon-carbon or carbon-hydrogen bonds to be detectable. The degree of ionization is roughly proportional to the number of carbon atoms per molecule. Inorganic materials such as hydrogen, oxygen, nitrogen and water are not ionized. The positive ions formed in the flame are collected on a negative electrode producing a signal that can be measured using the output of an electrometer preamplifier.

The Automatic Sampling System

The interfacing of the automatic sampling sytem to the flame ionization instrument is shown schematically in Figure 1, including the manifold for the zero and span gas cylinders necessary for calibration of the instrument. It should be noted that sample pumps are included in both the analyzer and sampling system. The sampling system pump continuously pulls samples from six remote locations to the instrument inlet manifold. This reduces lag time to a few seconds. The sample valves are operated by a mechanical switching device in the multi-point recorder on a 2 minute cycle. The concentration level (ion current calibrated for VCM) is recorded on the strip chart recorder and a suitable signal is provided for a continuous digital read-out.

Sample points can be located up to 150 ft. from the instrument. The location and number of sample points required should be determined by an

analysis of building ventilation patterns and many other factors including process equipment locations that can result in VCM emissions and employee work area definitions. Sample points in employee work areas should be located at about breathing level (approximately 5 feet above the floor). The lines from the sample point to the sampling system manifold are 3/8" OD polypropylene tubing and contain two filters to prevent the introduction of polymer or dust into the sampling system or analyzer. The balance of the components in the sampling system are constructed of stainless steel. A one liter surge tank is included in each sample line. This addition was made to prevent the recording of rapid changes in concentration levels that apparently occur as a result of rapid vertical movement of thin VCM layers in the atmosphere. The surge tank provides sufficient mixing and compositing action (30 seconds) to smooth out the instrument and recorder response to these types of spikes.(2)

Recorder and Data Collection

A variety of options are available for the collection and recording of data from the VCM analyzer system. The system shown schematically in Figure 3 is capable of handling a single analyzer with 6 sample points. This system consists of a six-point recorder, a digital readout meter, digital clock and a 110 volt AC to 5 volt DC converter and other required hardware for interfacing to a programmable calculator (Wang Model 720C).

Concentration levels are recorded by the 6-point recorder during each sampling cycle. Additionally, a signal is provided to the digital read-out meter and the programmable calculator. The calculator stores and averages data from each sample point to provide hourly and shift reports that are typed

(2) This phenomenon is not completely understood. It suggests that transport of VCM in air may be much like the waving action of a heavy smoke.

Data Collection System
Flame Ionization Instrument

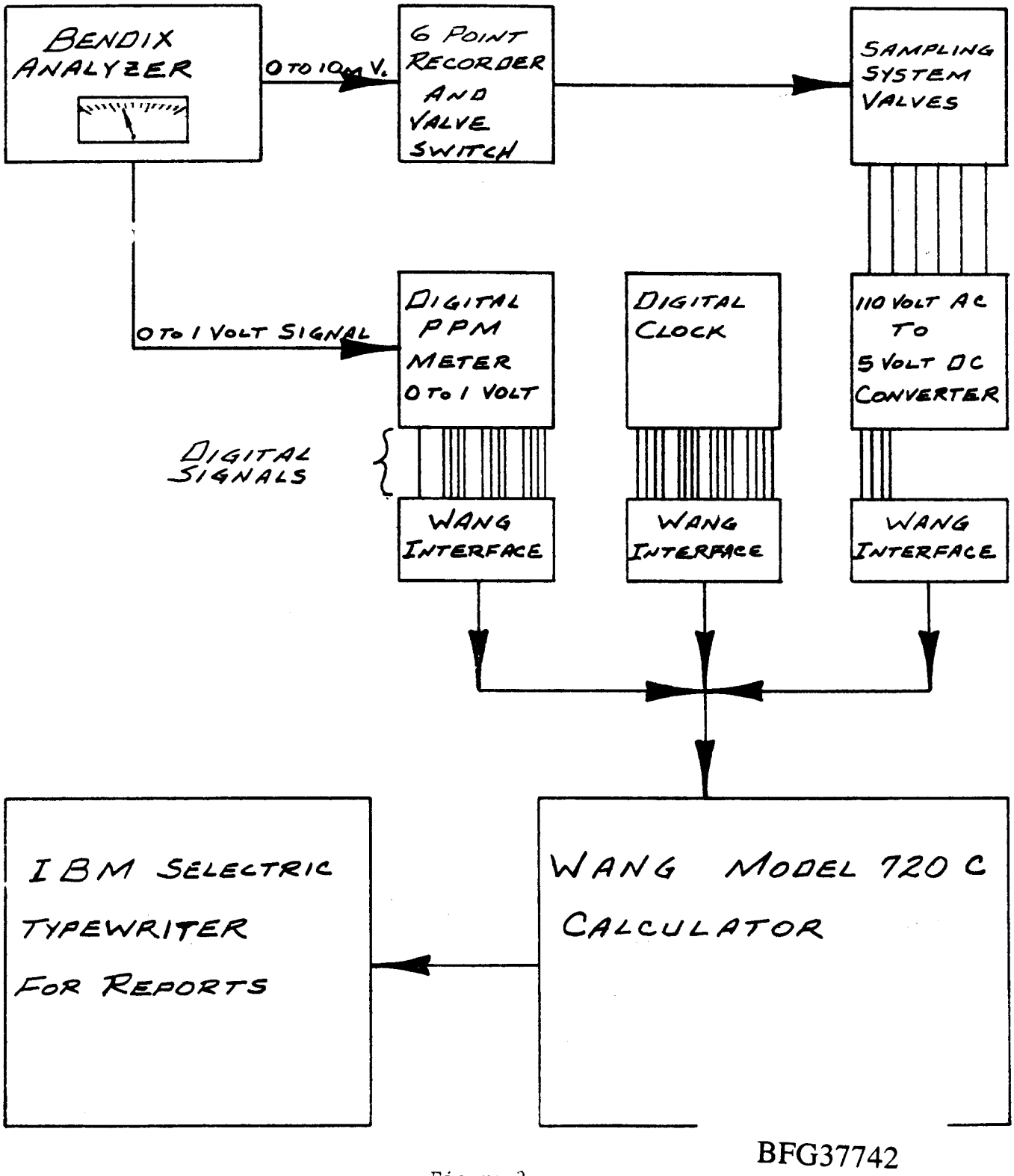

Figure 3

out on an IBM typewriter. The hourly report is an average of concentration levels at each sample point in ppm. The shift report includes an 8 hour average of concentration level at each sample point plus a summary of maximum peak levels and time of occurrence for each hour during the shift period. The shift report also includes a summary of percent of time that VCM concentration level exceeded the maximum allowable concentration of 50 ppm.

Fixed Station Monitoring vs. Personal Monitoring

The use of fixed station monitors for the sampling and analysis of ambient air in a production plant is only one approach that can be used in determining an employee's exposure index. The obvious disadvantage of fixed station monitoring is its fixed nature as opposed to mobile personnel. Multiple station sampling capabilities are, therefore, essential to cover all of the areas of employee exposure. Additionally, the determination of a Time Weighted Average for an employee must include a calculation of concentration vs. time to obtain a total exposure index. This accuracy of this method is obviously dependent on the ability to measure the concentration levels in all areas of exposure and also to accurately estimate the amount of time the employee spends in each work area.

In comparing the use of a fixed station monitor with a personal monitor (a portable device worn by each individual) there are also some obvious advantages in using the fixed station concept. Firstly, it provides an instantaneous display of concentration level and obviously provides the best signal (alarm) for instituting corrective action. On the other hand, the personal monitor provides only a history of events that are averaged out over a period of hours. Most types of personal monitoring devices will only reveal an overexposure to

a toxic substance after it has occurred. The fixed station monitor can warn you before overexposure occurs. The other obvious disadvantage of the personal monitor is that it must be worn by the individual which can create problems due to bulk, weight, vibration or just because it's a continuous reminder of the problem. A comparison of the costs of the two methods will, in general, show that a fixed station monitoring system will have an initially higher hardware cost while the personal monitor will have a higher sustaining analytical cost, particularly when measurements are required for large numbers of employees.

Although the evaluation of personal monitoring equipment was not a specific objective relating to the previously described instrumental evaluations, the need for this capability is now most obvious. The ultimate evaluation of a fixed station monitoring system in measuring an employee's exposure index must include some means of personal monitoring. The acceptance of a fixed station system is dependent on obtaining reasonable agreement with data obtained from a personal monitoring program. Several methods of personal monitoring are detailed in the literature[3][4][5]. Each of these methods, however, may require some further refinement or need to be modified to meet specific monitoring requirements in PVC production work areas.

Summary

An analysis of the problems relating to the monitoring of vinyl chloride

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(3) A. A. Allemang and R. A. Goudeau, "Monitoring Personnel Exposure to Chlorinated Hydrocarbons in an Industrial Work Environment", Personal Communication, Dow Chemical Co., March 30, 1973.

(4) E. .. Palmes and A. F. Gunnison, "Personal Monitoring Device for Gaseous Contaminants", J. of Amer. Ind. Hyg. Assoc., pp. 78-81, Feb. 1973.

(5) Edward D. Baretta, et.al., "Monitoring Exposures to Vinyl Chloride Vapor: Breath Analysis and Continuous Air Sampling", J. of Amer. Ind. Hyg. Assoc., Vol. 30, p. 537-544, Nov.-Dec., 1969.

monomer (VCM) in laboratory and production work areas has shown that two different types of monitoring capabilities are required; a fixed analyzer with multi-point remote sampling capabilities and a portable analyzer for rapid area survey analyses and leak detection.

An evaluation of commercially available instrumental methods has revealed that the flame ionization method for monitoring low concentrations of VCM in ambient air has distinct advantages over other procedures investigated. These advantages include outstanding sensitivity (0.01 ppm minimum detection), and good linearity and response (±2%) over a wide range of concentrations (0 - 1000 ppm). Additionally, the analyzer is moderate in cost (approximately $2,000) and can be easily interfaced to a multi-point sampling system and continuously operated on a two minute per-sample-point cycle for long periods of time with a minimum of operator attention or maintenance.

A fixed monitoring system utilizing a flame ionization instrument (Bendix 8401 Total Hydrocarbon Analyzer) has been in continuous operation in a PVC poly building, at the B.F.Goodrich Chemical Company plant in Avon Lake, Ohio, for approximately six months. This system which includes, in addition to the analyzer and a six point sampling system, a multi-point recorder, interfacing hardware and a programmable calculator for data reporting on a hourly and shift basis. The operation of this system has been essentially trouble free during this period and has provided the types of measurements required to determine VCM concentrations in a multi-story building and to minimize employee exposure levels.

An important adjunct to this system is the portable survey instrument that has outstanding utility in rapidly determining the source of VCM leaks

in processing equipment. This instrument (Century Organic Vapor Analyzer[6]) also uses the flame ionization principle. It is light weight, easily portable and has sensitivity and linear response roughly equivalent to the fixed analyzer. Equally important, and highly essential in leak detection, is this instrument's instant response to VCM.

Recommendations

The previously described evaluation of various instrumental methods and the subsequent testing of a total system in a plant working environment has been sufficient to conclude that these procedures can be easily applied to a variety of work areas where the monitoring of VCM in ambient air is a criteria for employee health and safety. It, therefore, can be recommended that the identified methods, or their equivalent, be adopted as standard industry practices. Standard operating procedures detailing the start-up, operation, calibration and instrument maintenance are included in Appendix I (Fixed Analyzer) and Appendix II (Portable Analyzer).

Acknowledgments

The author would like to recognize the contributions of the large number of people who participated in this work. A particular debt of gratitude is owed to L. W. Salzer for his wisdom in selecting specific instrumental methods for testing; to M. D. Rider for his invaluable contributions to the in-plant testing; and to M. E. Forsythe for his assistance in interfacing the analytical and data collection systems.

---

(6) Century Systems Corporation; Arkansas City, Kansas.

B.F.Goodrich Chemical Company
Avon Lake General Chemical Plant
Avon Lake, Ohio

STANDARD OPERATING PROCEDURE

Bendix Total Hydrocarbon Analyzer

I. Scope

This procedure is a method for the determination of vinyl chloride in air by the hydrogen flame ionization method.

II. Discussion

The vinyl chloride content of the building air shall be determined to comply with the company criteria for maximum allowable exposure of 50 ppm. The sample is introduced into the Flame Ionization Detector (FID) cell under pressure where a hydrogen flame is burning in an atmosphere of air. The resulting burning of the sample produces an electrical output signal which is proportional to the amount of hydrocarbon (vinyl chloride) in the sample. The output voltage is then indicated on the output meter, recorder and calculator.

III. Safety

1. The Bendix THA and recorder are non-explosion proof, therefore, requiring installation in a control room or warehouse area.

2. Hydrogen gas, when mixed with air, is highly flammable. Avoid any sparking conditions during cylinder changes. Do not disconnect hydrogen lines with open fires in the area.

3. Do not attempt to remove the FID cell until certain that it has cooled sufficiently to prevent burns to personnel.

4. Do not remove or replace electronic cards with power on. Use care to avoid personal contact with electrical contacts while the instrument or recorder is operating.

Date issued: January 28, 1974 By: M. D. Rider

Appendix I

5. Installations of sample probes five feet from the floor level should be placed in non-critical path areas avoiding personnel contact.

IV. Startup Procedure

Prior to performing the startup procedure, ensure that the POWER switch, and SUPPRESSION switch are in the OFF positions and the ATTENUATION switch is set to X10.

To perform system startup, complete the following tasks in the sequence indicated:

1. Adjust charcoal filtered instrument air to a nominal 25 psig setting.
2. Adjust the hydrogen cylinder output pressure to a nominal 25 psig setting.
3. Adjust the hydrogen pressure on the Bendix front panel to a nominal 5 psig setting.
4. Adjust the air pressure on the Bendix front panel to a nominal 6 psig setting.
5. Turn POWER switch ON.
6. Place the ignitor switch in the IGNITE position. Hold the switch in this position until the flame out light goes off. If the flame out light comes on again, place the switch in the IGNITE position again and hold for a long period of time.

V. Setting Instrument Zero

At initial startup, or following extended periods of non-operation, the instrument zero must be set prior to calibration and operation. In these cases, perform the startup procedure and allow the instrument to operate for a minimum of 60 minutes to allow the system to stabilize. After instrument stabilization, or if the unit has been in operation and a routine zero check is being made, proceed as follows:

NOTE: First take Wang calculator off line by pressing PRIME.

1. Open the activated carbon filtered instrument air by-pass line and assure a maximum pressure of 28 oz. pressure using the Watts pressure regulator. CAUTION: Excessive pressure to the analyzer pump will rupture the pump bellows.
2. Open the AIR valve & close MAIN SAMPLE SHUT OFF valve simultaneously on the Bendix automatic sampling system.

3. When the output meter on the Bendix front panel has stabilized, unlock the SUPPRESSION control knob and adjust to zero. The ATTENUATION switch is set to X1 for zeroing. An acceptable zero is in the 0 to 0.05 ppm range on the output meter.
4. Set the ATTENUATOR knob to ~~X300~~ X1000 and assure a zero reading on the 6 point recorder.
5. Shut off the filtered instrument air bypass line.
6. Close the AIR valve and open the MAIN SAMPLE SHUTOFF valve simultaneously on the Bendix automatic sampling system.

VI. Calibration

1. Open the vinyl chloride in air (110 ppm) compressed gas cylinder valve.
2. Adjust the 2 stage gas regulator to a nominal 25 psig setting.
3. Open the VCl gas shutoff valve and assure a maximum pressure of 28 oz. pressure using the Watts pressure regulator.
4. Open the VCl valve and close the MAIN SAMPLE SHUTOFF valve simultaneously on the Bendix automatic sampling system.
5. When the output meter has stabilized, unlock the RANGE knob and adjust the output meter to read a nominal ~~35~~ 110. The recorder reading should be set exactly to read ~~35~~ 110. The ATTENUATOR has been previously set at ~~X300~~ X1000 for a 110 ppm standard.
6. Shut off the vinyl chloride compressed gas cylinder valve.
7. Close the VCl valve and open the MAIN SAMPLE SHUTOFF valve simultaneously on the Bendix automatic sampling system.

VII. On Stream Analysis

1. Set ATTENUATION knob to X1000.
2. Assure the 6 rotameters are equally balanced at 4 LPM.
3. Press GO on the Wang calculator.
4. Note calibration on Wang typewriter printout, L & N recorder, and log sheet. Also note hydrogen gas cylinder pressure, suppression setting, range setting, and the Bendix pump bypass flowmeter reading on the log sheet. Weekly zero and calibration checks are required.
5. Presently 0-300 ppm data is displayed on the L & N recorder and 0-1000 ppm data is displayed on the Wang calculator typewriter.

VIII. Complete Shutdown Procedure

1. Push PRIME on the Wang calculator.
2. Move Bendix THA POWER switch to the OFF position.
3. Close the AIR SUPPLY shutoff valve.
4. Move Bendix sampling system pump switch to the OFF position.
5. Move the recorder power switch to the OFF position.
6. Remove top fuse inside recorder to deactivate solenoid mechanism.

IX. Routine Maintenance

1. Clean in-line Hoke filters and the $\frac{1}{4}$" Swagelok filter in the sample line if the bypass flow meter reads less than 1.5 LPM.
2. Replace the MSA sample inlet filter cartridge once every six months.
3. Replace the activated carbon filter on the instrument air supply once every 6 months or if the suppression setting approaches 800.
4. Replace the hydrogen gas cylinder supply when cylinder pressure declines to 100 psig. A full cylinder has an approximate $4\frac{1}{2}$ month service life.
5. Molecular sieve driers on the hydrogen and air lines should be dried in an oven at 105°C. for 4 hours every six months to drive off the moisture.
6. Replace the chart paper on the recorder once every $2\frac{1}{2}$ weeks.
7. Replace the ink pad wheel on the recorder when the readout becomes faint. Depressing the ink pad with a sharp point may bring additional ink to the pad surface.

X. Hydrogen Cylinder Replacement

1. Push the PRIME button on the Wang calculator.
2. Move the Bendix POWER switch to the OFF position.
3. Close the hydrogen cylinder valve.
4. Turn the two-stage regulator fully counter clockwise and remove the regulator from the cylinder.

5. Slightly open and close the new hydrogen gas cylinder valve to blow out foreign particles.

6. Connect the new cylinder to the regulator (left hand threads).

7. Open the cylinder valve and adjust the two-stage regulator for a pressure of 25 psig.

8. Turn instrument power ON.

9. Assure hydrogen pressure gauge on the Bendix front panel reads a nominal 5 psig.

10. Allow a minimum of 10 minutes for air to purge from the system and ignite the flame.

11. Perform the zero and calibration procedure 10 minutes after the instrument has come to equilibrium. Refer to Sections V, VI, and VII.

XI. Trouble Shooting

Refer to the attached Trouble Analysis Chart.

If a malfunction is suspected and all controls appear to be operating properly, refer to the Service Manual for the trouble shooting and repair procedures. The procedures contained in the Service Manual are designed for use of technically qualified personnel only.

The use of the manual by unqualified or inexperienced personnel is not recommended. The Total Hydrocarbon Analyzer is a precision instrument and can be damaged by improper handling and maintenance.

This above statement also applies to the L & N Speedomax "H" recorder.

XII Reference

Bendix Series 8400 Total Hydrocarbon Analyzer Installation and Operation Manual.

Bendix Series 8400 Total Hydrocarbon Analyzer Service and Maintenance Manual.

L & N Speedomax H & W Multipoint Recorder Manual, Directions 177304, Issue 7, and
Addendum to Directions 177304, Issue 7.

XIII. For Service & Technical Information Contact

Clay Cook Ext. 277
Electrical & Instrument Foreman

Doug Rider Ext. 554 or 553
Environmental Engineer

Lou Salzer Ext. 297
Process Instrument Consultant

Mark Forsythe Ext. 485
Electrical and Electronics Engineer

bp

Table 2-1. Trouble Analysis Chart

Symptom	Probable Cause	Corrective Action
Panel meter fails to indicate.	Power cord disconnected.	Connect power cord.
	Blown fuse.	Replace fuse.
	Power switch is OFF.	Turn power ON.
	Electrometer card inoperative.	Replace electrometer card.
	Power supply card inoperative.	Replace supply card.
	Defective meter.	Replace meter.
Excessive meter noise.	Contaminated hydrogen.	Replace H_2 cylinder.
	Contaminated air.	Replace air cylinder.
	Moisture in FID cell.	Ensure that temperature is at least 80°C.
	Defective power supply card.	Replace supply card.
	Leak in H_2 or air system.	Repair leak.
	Defective coaxial cable.	Replace cable.
	Excessive variation in ac supply.	Obtain correct supply source.
	Weld joint on collector is broken.	Replace collector.
Flame out light illuminated.	H_2 or air supply depleted.	Replace as necessary.
	Defective H_2 shutoff solenoid.	Replace solenoid coil or solenoid as required.
	Excessive sample flow.	Correct to flow rate specified in Operational Data Sheet.
	Plugged capillary.	Replace capillary. Check filters and replace all that are dirty or clogged.
Sample pressure gauge indicates zero pressure.	Inoperative pump.	Replace pump.
	Plugged filter.	Replace or clean filter.

1 Sample Inlet
2 Pump, High Temperature
3 Cell Vent
4 Bypass
5 H_2 Inlet
6 Air Inlet
7 Fan
8 Filter Card
9 15 VDC Power Supply Card
10 Converter Card
11 Auto Ignitor Card
12 110 VDC Power Supply Card
13 Resistor Card
14 Resistor, 1×10^{12} (1,000,000 Meg)
15 Capacitor, 22 PF
16 Resistor, 1×10^{10} (10,000 Meg)
17 Microdot Connector (to card)
18 Air Valve & Indicator
19 Fuel (H_2) Valve & Indicator
20 Meter
21 Sample Valve
22 Sample Pressure Indicator
23 Heat Shield
24 Pump Motor
25 Cell

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Figure 2-1. Total Hydrocarbon Analyzer Asser

Symptom	Probable Cause	Corrective Action
	Incorrect pressure.	Set pressure to conform to setting specified in Operational Data Sheet.
H_2 pressure gauge indicates zero pressure.	Hydrogen Generator is off or cylinder is depleted.	Turn on generator or replace cylinder.
	Defective pressure regulator.	Replace regulator.
	Line plugged.	Clean or replace line. Check filters and drier and clean or replace as necessary.
Air pressure gauge indicates zero pressure.	Air supply is depleted.	Replace air cylinder.
	Defective pressure regulator.	Replace regulator.
	Line plugged.	Clean or replace line. Check filters and drier and clean or replace as necessary.
	Flame is off.	Reignite and check pressure.
Total hydrocarbon measurements are abnormally low.	Incorrect H_2 or air flow.	Correct as necessary.
	Incorrect sample pressure.	Check pump, filter, and lines. Clean and replace as necessary.
	Incorrect position of ignitor coil.	Check position for proper location. (See Figure 2-3).
	Defective electrometer or power supply card.	Replace as necessary.
	Zero improperly adjusted.	Readjust correctly.
	Calibration improperly adjusted.	Readjust correctly.

If the trouble is traced to the fuse, a printed circuit card, a pressure regulator, the sample pump or the FID cell, refer to Removal and Replacement Procedures.

ELECTRONIC SYSTEM

The electronic system consists of a 110 vdc power supply, an electrometer amplifier, and an auto ignitor containing a relay for H_2 shutoff control. The system also includes a detector cell temperature control and attenuator and range adjustments for calibration of the electrometer output. Optional electronics for creating a current output include a 15 vdc power supply regulator, a filter and a voltage to current converter. The functional relationship of these components is shown in the block diagram, Figure 2-2. Schematic diagrams are provided in Section 4.

PRINCIPLE OF ELECTRICAL/ELECTRONIC OPERATION

When the power switch is turned on, 115 vac is fed simultaneously to the rectifier circuit, the pump motor, the

fan motor, the ignitor switch, the H_2 shutoff relay, and the detector cell temperature control.

The 110 vdc power supply card operates from a rectified source of approximately 140 vdc which is obtained by changing the 115 vac to dc. The output of the 110 vdc power supply card is a regulated 110 vdc which is fed to the suppression adjustment control and the electrometer amplifier.

The electrometer amplifier receives an additional input signal from the FID cell which determines the electrometer output voltage. The electrometer output is 0 to −100 vdc which is then simultaneously fed to the range adjustment control (which in turn feeds the attenuator switch providing attenuation adjustment to the flame cell collector), the output meter, the voltage outputs and, when installed, the voltage to current converter. The electrometer output is reduced at the output circuits for the 0 to 1 vdc and 0 to 10 mv outputs to the recorder. The 0 to −100 vdc input is transformed to 0 to −10 vdc for conversion to the current output.

When the converter is installed, the source power of 115 vac is transformed to 25 vac by transformer F-90X for the auto ignitor/H_2 shutoff card and the filter card. The 25 vac is a nominal voltage and the instrument operates satisfactorily when the voltage is anywhere between 16 and 30 volts. The input voltage is rectified as it enters the filter card and the auto ignitor card. The filtered output of the filter card is then fed to the input of the 15 vdc power supply card and the converter card. Regulated 15 vdc from the power supply card is fed to the converter card for Q1, Q2, Q3 and Q4. Q5 receives power from the 16 to 30 vdc provided from the filter card.

ELECTRONIC TROUBLESHOOTING

Electronic troubleshooting should be performed only by qualified technical personnel. The high voltages contained within the instrument may be hazardous to anyone unfamiliar with testing electronic equipment.

When troubleshooting the electronics, a strip chart recorder with a range of 0 to 10 mvdc and a chart speed of 0.5 or 1 inch per minute and a multimeter of suitable range is required. Unless otherwise specified, all dc voltages are referenced to ground.

CAUTION

When measuring voltages on pins at bottom of cards, use caution to prevent shorting pins together or to ground. Do *not* remove or replace cards or components with power on.

A card extender is available from Bendix to aid in measuring voltages on cards. The card extender, Part Number 5512457, raises the card to a position where test points are more accessible, thus reducing the danger of shorting contacts.

Sensitive electronic components can be destroyed by shorting of contacts. The use of alligator type clips on card pins is *not* recommended.

When a card is indicated to be defective, replace with a new card and recheck.

NOTE

Before replacing a card, it is recommended that the card be rechecked to verify original findings.

TESTING THE 110 VDC POWER SUPPLY CARD, Part No. 5511109

This card (located in socket J2) supplies + and −110 vdc for jet potential and suppression current. To determine if this card is functioning properly, refer to the master schematic and perform the following checks in the sequence indicated.

1. Check from pin 1 to ground for +140 vdc ±10 v. If voltage is not present, remove the card and retest at the card socket. If voltage is still not present, a defective transformer or rectifier is indicated. If voltage is present, a defective 110 vdc card is indicated.

2. Check from pin 2 to ground for −140 vdc ±10 v. If voltage is not present, remove the card and retest at the card socket. If voltage is still not present, a defective transformer or rectifier is indicated. If voltage is present, a defective 110 vdc card is indicated.

B.F.Goodrich Chemical Company
Avon Lake General Chemical Plant
Avon Lake, Ohio

STANDARD OPERATION PROCEDURE

Century Organic Vapor Analyzer

I. Scope

This procedure is a method for the determination of vinyl chloride in air by the hydrogen flame ionization method.

II. Discussion

The vinyl chloride content of the building air shall be determined to comply with the company criteria for maximum concentrations and T.W.A. and to identify source leaks greater than the maximum allowable exposure of 50 ppm. The vinyl chloride content of poly evacuation blower exhausts, blend tank exhausts, dryer exhausts, and recovery vents shall be determined to comply with EPA regulations and plant efficiency standards.

III. Safety

1. The Century OVA is rated intrinsically safe but does not have Factory Mutual approval to date, therefore, the following precautions shall be taken in a Class I, Group D area.

   A. A Hot Work Permit will be required.

   B. The instrument shall be On prior to entering the area. If a flameout occurs, the instrument shall be restarted outside the area.

   C. Only authorized personnel who have been fully trained and approved by both the general foreman and plant safety engineer shall operate the instrument.

2. Open flames and no smoking shall be observed during the hydrogen fill operation. Hydrogen gas, when mixed with air, is highly flammable.

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3. Do not fill the hydrogen tank beyond the maximum rated pressure of 2300 psi. The hydrogen tanks used in the instrument are made from stainless steel, proof-tested to 6000 psi and 100% production tested to 4600 psi.

4. Maintain the sample flow above 1.5 LPM to prevent a hydrogen rich atmosphere causing an explosion in the combustion chamber. The teflon chamber will not rupture.

5. Use only the fuses supplied with the instrument. Do not depress igniter button longer than 5 seconds. Wait 15 seconds between depressions to prevent fuse overload. The battery pack has two (2) power circuits, one for the pump motor and igniter and the other for the electronic circuits. Both circuits have resistive current limiting to restrict the short circuit current to an intrinsically safe level. In addition to the current limiting, there is a fuse (1 amp. slo-blow and $\frac{1}{4}$ amp.) in each line to protect against overload conditions.

6. Do not operate the instrument without the hydrogen flow restricter, inlet and outlet scintered stainless steel flame arrestors.

IV. Battery Check

Move Instr/Batt test switch to the Batt Test position and insure battery is charged by reading the indication on the readout meter.

V. Turn On Procedure

1. The gas selector adjust should be preset to the desired dial indication prior to turn-on. ALGC Unit No. 1 has a vinyl chloride set point of 460 for the 1-1000 ppm range.

2. Move the INSTR switch to ON and allow one minute for warm-up.

3. Move CALIB switch to LOW and verify the meter reads 10 ppm. If not, adjust meter reading to 10 ppm with the CALIB ADJ knob. Do not change the GAS SELECTOR ADJUST KNOB.

4. Move the pump switch to ON and observe SAMPLE FLOW RATE indicator in a vertical position. A minimum flow of 1.5 LPM is required. Clean sample line filters (pickup probe filter and elbow filter) if less than 1.5 LPM. If necessary, clean sample-hydrogen mixer. Filters may be blown out with air or cleaned with alcohol and oven dried at 120°F. Sonic cleaned is an acceptable method.

   NOTE: A millipore Aerosol Filter, MAWP 037A0 ,on the probe inlet will cut filter maintenance by 90%. A 3/16" tube to 1/8" Tx(nail) reducer, SS-300-R-2, is required to attach filter.

5. Open H_2 tank valve ½ turn and observe the reading on the H_2 tank pressure indicator. Approximately 200 psi of pressure is needed for each hour of operation. Refill H_2 tank prior to using if tank pressure is less than 200 psi.

6. Open H_2 supply valve ½ turn and observe that the reading on the H_2 SUPPLY PRESSURE is 8 psi (or H_2 factory set conditions).

7. Wait two minutes to obtain a hydrogen rich mixture and press IGNITER button. Do not depress for time periods longer than 5 seconds and wait 15 seconds between depressions. There will be a slight "pop" as the hydrogen ignites and meter pointer will move upscale and return to a position upscale of zero. Immediately after ignition, release the IGNITER button.

8. After flame ignition, allow approximately one minute for the chamber to reach operating temperature.

9. Place cover on the instrument and check shoulder strap to make sure if properly snapped in position.

10. The instrument is now ready for use.

VI. Operating Procedure

1. Obtain a Hot Work Permit from the building foreman.

2. Enter the survey area with the instrument ON and flame burning.

3. The probe may be used to measure VCl concentrations inside a poly but do not enter the poly with the entire instrument. A 3/16" I.D. X 10 ft. polypropylene or teflon tubing may be used as an extension hose. The instrument does not have Class I, Group D approval.

4. Take employee exposure readings two feet from equipment hardware and five feet from floor level. The instrument may also be used as a leak detector by placing the probe flush to the equipment.

5. Readings taken on the Probe/Readout Assembly are linear from 1 to 1000 ppm (0.1%) on the ALGC unit when calibrated at 25 ppm. For approximate concentrations in the 0.3 to 10% range when calibrated at 25 ppm, divide all readings by two. A calibration chart is required for each instrument in use. Each new unit placed into service should always have a full calibration over the entire range to determine the linearity of the Probe/Readout Assembly. See the section on calibration.

6. A portable battery powered Rustrak recorder (0-5 V. input) with shoulder straps may be used with the instrument in non-explosion proof areas. The Style "J" chart makes excellent copy for EPA records on blend tank exhaust at a chart speed of 0.5 inch/minute. Align the instrument readout with the recorder reading by adjusting the recorder potentiometer behind the recorder face plate.

7. If a flameout occurs, return to a non hazardous area, ensure that the pump is running at an air flow rate greater than 1.5 LPM, then press the IGNITER button.

VII. Shutdown Procedure

1. Close H_2 TANK valve. Allow H_2 pressure to go to zero.

2. Close H_2 SUPPLY valve.

3. Move INSTR switch to OFF.

4. Wait 5 seconds and move PUMP switch to OFF.

5. Plug AC battery charger into connector on battery cover.

6. Move the battery charger switch to the ON position. When fully charged, the pointer will be in line with "charged" marker above the scale.

7. When battery is fully charged, move the battery charger switch to OFF and disconnect from the battery connector. Approximately one hour of charging time is required for each hour of operation. However, an overnight charge is recommended since the charger can be left ON indefinitely without damaging the batteries.

8. To install a new battery pack, the instrument panel is removed from the case by unlocking the four (4) $\frac{1}{4}$ turn fasteners on the panel face and also removing the refill cap and elbow connector. The battery pack is removed by taking out the four (4) screws on the panel and disconnecting the power connector at the battery pack.

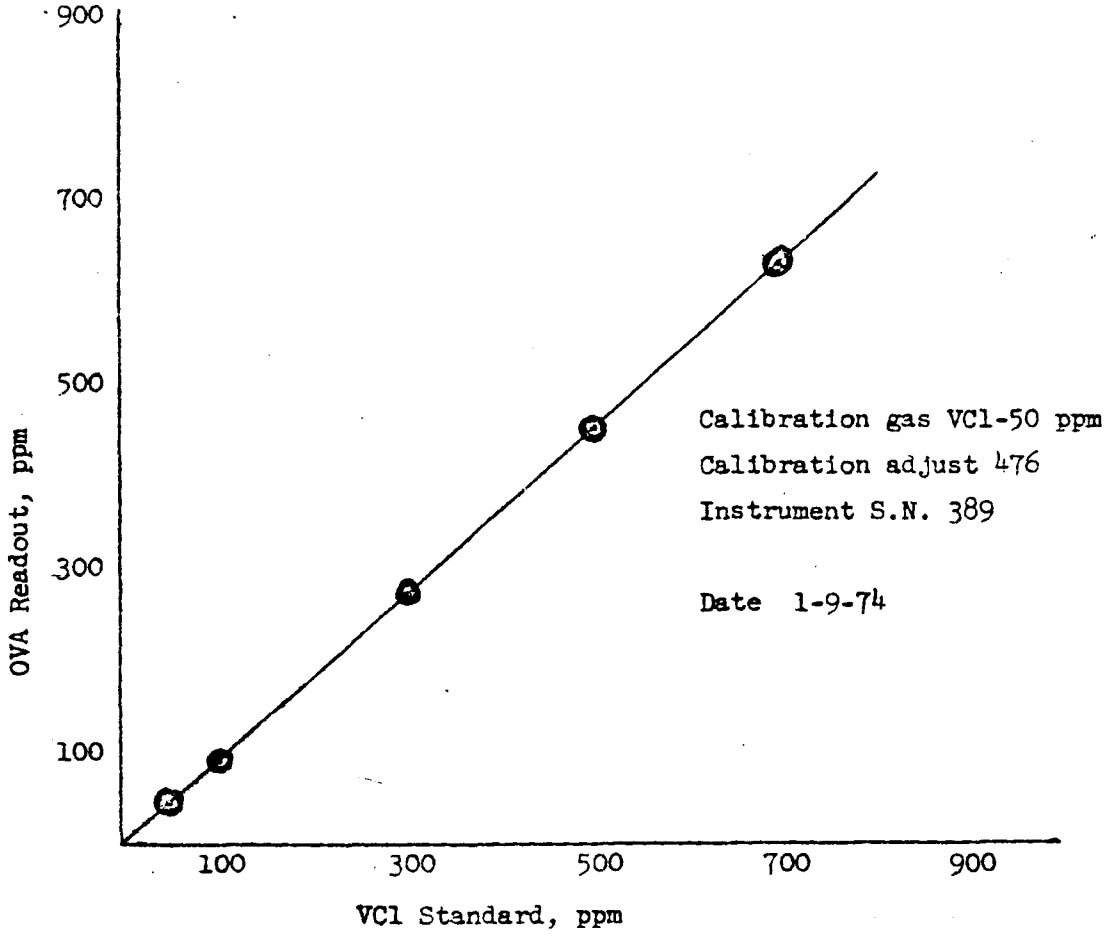
VIII. Spot Check Calibration

A weekly calibration check is required using 25 ppm or 100 ppm of vinyl chloride in air compressed gas cylinder (or any monomer to be surveyed). This calibration will align the instrument readout with the previous prepared scale calibration graph.

1. Turn on instrument, air pump, hydrogen flow and ignite flame.
2. Allow the flame to burn for 10 minutes prior to calibrating.
3. Place a hydrogen two-stage regulator on the VCl standard cylinder with a $\frac{1}{4}$ inch O.D. tube on the regulator delivery fitting. Open the cylinder with a quick spurt to blow dust from the cylinder fitting prior to attaching regulator. Close the cylinder valve quickly.
4. Slowly open the gas cylinder valve.
5. Turn the regulator knob until a low level of flow is audible from the flexible tubing.
6. Place sample pickup probe inside flexible tubing. Do not have a sealed system.
7. With the HIGH-LOW switch in the OFF potision, turn the CALIB ADJ knob until the needle on the probe readout assembly points to the exact concentration on the certified gas standard cylinder.
8. Turn the H_2 TANK and H_2 SUPPLY valves OFF.
9. Turn the PUMP switch to the OFF position.
10. With the INSTR switch in the ON position, unlock (counterclockwise) the GAS SELECTOR ADJUST knob and rotate until the needle on the probe readout assembly is on 10 PPM.
11. Lock (clockwise) the GAS SELECTOR ADJUST knob and record the reading on the log sheet. To read the three digit number, read the single number in the "window" (e.g. 4) and then the two digit number on the "dial" (e.g. 76). In this example, the GAS SELECTOR ADJUST reading would be 476.
12. The instrument is ready for use in ambient vinyl chloride surveys (or other monomers when substituted). The above steps may be repeated using 1.0% vinyl chloride in air for blend tank exhaust surveys.

IX. Full Scale Calibration

Each instrument placed in service should immediately be checked for linearity or non-linearity and a graph prepared with the serial number of the instrument recorded on the graph. This graph should be made available to those people interpreting the survey data. A copy of the graph should be inside the instrument case at all times. All data reported on data sheets is considered raw data until corrected by use of this graph.



A reading from this graph indicates that an OVA calibrated with a 50 ppm VCl standard may read 275 for 300 ppm standard gas.
There are various ways to calibrate the OVA scale. Listed below are two methods using certified standards purchased from Precision Gas, New Jersey. A sample calculation for a gas dilution concentration using Method No. 2 is:

17.28 LPM AIR
.09 LPM 1.0% vinyl chloride
17.37 LPM Total Volume

$$\text{ppm} = \frac{.09 \text{ LPM} \times .01 \text{ VCl}}{17.37 \text{ LPM Air}} \times 10^6$$

$$\text{ppm} = 51.8$$

X. Method No. 1

1. Follow steps 1 through 11 in the Spot Check Calibration procedure above using 25 or 100 ppm vinyl chloride (or other monomer).

2. Using certified vinyl chloride gas cylinders record the probe readout assembly readings for these approximate values 25, 100 and 500 ppm.

3. Draw graph using these three points on a 0-1000 ppm scale.

4. Use a fourth standard, e.g. 1.0%, and take a reading. If this reading is 2.0%, then the factor to be used for all readings above a 1000 ppm is 0.5. In other words, divide all readings above 1000 ppm by two (2).

5. Record the instrument serial number, GAS SELECTOR ADJUST reading and the standard gas used on the graph.

XI. Method No. 2

1. Follow steps 1 through 11 in the Spot Check Calibration procedure above using 25 or 100 ppm vinyl chloride (or other monomer).

2. Calibrate precision laboratory rotameters (accuracy $\pm$ 0.1 LPM) with air and nitrogen using the bubble tube or wet gas meter method.

   A Bendix Model 8851 Dynamic Flow Calibration unit may be used with or without a vinyl chloride permeation tube.

3. Connect compressed breathing air or charcoal filtered instrument air to the air rotameter and the 1.0% certified vinyl chloride compressed cylinder to the nitrogen rotameter. The outlet flow is manifolded to give a blend of air and vinyl chloride. A restriction is placed in line to maintain a constant stable flow.

4. Make various blends to allow two concentrations in 10-100 ppm range and two in 100-1000 ppm range.

XII. Trouble Shooting Procedure

Follow the guide provided by the attached Table 6-1, Trouble Shooting Procedure. Any problems associated with the hydrogen regulator system should be handled by shipping directly to this factory address.

Century Systems Corporation
Box 133
Arkansas City, Kansas 67005
Phone: 316-447-3311 or 3371

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M. D. Rider or M. E. Spe[illegible]y may be of assistance in trouble shooting prior to shipping.

XIII. Recommended Spare Parts

See attached sheet.

XIV. Reference

Operating and Service Manual on Century Portable Organic Vapor Analyzer, Model 98A, Revision A.

TABLE 6-1

TROUBLE	TROUBLE SHOOTING PROCEDURE	REMEDY
6-1 Low sample flow rate on flow indicator	a) Check particle filter in pickup assembly.	Replace or clean filter if clogged.
	b) Determine assembly containing restriction by process of elimination, i.e., remove probe, remove readout assembly, remove elbow tubing connector and etc.	Investigate the assembly containing the restriction to determine cause of blockage. Clean or replace as required.
	c) If the restriction is in the side pack assembly, further isolate by disconnecting the sample flow tubing at various points, i.e., pump output, chamber input, etc. Note: The inherent restrictions due to length of sample line, flame arrestors, etc., must be taken into account when trouble shooting.	If the restriction is found to be in the detector chamber, remove and clean or replace porous metal flame arrestors. If pump is found to be faulty, remove and clean or replace unit.
6-2 . H_2 flame won't light	a) Check sample flow rate (see 6-1 above).	If sample flow rate is low, follow procedure of 6-1 above.
	b) Check glow plug by removing the chamber exhaust port and observing the glow when the IGNITE button is depressed.	If glow plug does not light up, replace the plug.
	c) Check for rated H_2 Supply Pressure.	If low, adjust to proper level by turning the allen wrench adjustment on the regulator cap.
	d) Check H_2 flow rate by observing the PSI decrease in pressure on the H_2 Tank Pressure gauge. The flow rate should be greater than 150 PSI decrease in pressure per hour. Note: Sufficient time (1 to 2 min.) should be allowed for the H_2 to flow through the capilliary to the detector chamber at initial turn-on/	The normal cause for H_2 flow restriction would be a blocked or partially blocked capillary tube. If flow rate is marginally low, attempt to compensate by increasing the H_2 Supply Pressure by one half or one PSI. If flow rate cannot be compensated for, replace capillary tubing.

TABLE 6-1 (Continued)

TROUBLE	TROUBLE SHOOTING PROCEDURE	REMEDY
6-2 (Continued	e) Check to see if H_2 supply system is frozen up by taking unit into a warm area.	If there is moisture in the H_2 supply system and the unit must be operated in sub-freezing temperatures, purge the H_2 system with dry N_2 and ensure the H_2 gas used is dry.
	f) Disassemble the flame chamber and check for contamination (see Figure 6-2).	If the chamber is dirty, clean with ethyl alcohol and bake dry. If H_2 fuel jet is misaligned, ensure the porous metal flame arrestor is properly seated.
6-3 H_2 flame lights but won't stay lighted.	a) Follow procedures 6-2 (a), (c), (d) and (f) above.	
6-4 Flame out alarm will not go on when H_2 flame is out.	a) Check instrument calibration setting.	The probable cause of the output signal not going low enough to trigger the flame out alarm is current leakage to the collecting electrode due to contamination or moisture in the chamber or electronics housing. Dry chamber out by running unit or purging with dry N_2 or disassemble and clean (see Figure 6-2). If moisture is in the electronics housing replace desicant container (see 6.2.5)
	b) If procedure (a) does not resolve the problem, the probable cause is a malfunction in the preamp assembly.	Return electronics assy to factory for repair.

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TABLE 6-1 (Continued)

TROUBLE	TROUBLE SHOOTING PROCEDURE	REMEDY
6-5 Slow response time, i.e., time to obtain response after gas is applied to input.	a) Check to ensure that Probe is firmly seated on the rubber seal in the Readout Assembly	Reseat by holding the probe firmly against the rubber seat and then lock in position with the knurled locking nut.
	b) Check sample flow rate per procedure 6-1 above.	See 6-1 above.
	c) Investigate whether sample input system is leaking by closing off input at the probe and observing the flow rate and sound of the pump. Another method is to blow smoke around the various connections and observe the instrument response.	Through the process of elimination, find the source of the leak and repair.
6-6 Slow recovery time, i.e., too long a time for the reading to get back to ambient after exposure to a high level organic vapor.	a) This problem is normally caused by contamination in the sample input line which absorbs the organic vapor and then has to be pumped for a long period to get the system clean of vapors again. Charcoal in the lines would be the worst type of contamination. Isolate through the process of elimination where the contamination is (see 6-1 (b)).	Clean or replace contaminated sample line or assembly as required.
	b) Check flame chamber for contamination.	Clean as required.
6-7 Ambient background read in clean environment is too high	a) An ambient background reading can be caused by hydrocarbons in the H_2 fuel or fuel supply system. Place finger over sample probe tube restricting sample flow and if meter indication does not go down significantly the contamination is probably in the H_2 fuel.	Use a higher grade of hydrocarbon-free hydrogen. Check for contaminated fittings on filling hose assembly.

BFG37767

TABLE 6-1 (Continued)

TROUBLE	TROUBLE SHOOTING PROCEDURE	REMEDY
6-7 (Continued)	b) An ambient background reading can also be caused by hydrocarbon contamination in the sample input system. The most likely cause would be a contaminent absorbed or condensed in the sample line.	Clean and/or replace the sample input lines. Normally the lines will clear u with sufficient running.
	c) It should be pointed out that running the instrument tends to keep down the buildup of background vapors. Therefore, run the unit whenever possible and store it with the carrying case open in clean air.	
6-8 Pump will not run	a) Check 1 AMP slow blow fuse on battery pack cover.	Replace fuse. If fuse continues to blow when igniter switch is closed check ignitor for short circuit. If igniter is not the problem there is a short in the wiring or pump motor.
6-9 No power to electronics but pump runs.	a) Check 1/4 AMP fuse on top of battery pack.	Replace fuse. If fuse continues to blow there is a short in the electronic assembly.
6-10 No power to pump or electronics	a) Place battery on charger and see if power is then available.	If power is available battery pack is dead or open.

CENTURY SYSTEMS CORPORATION

P.O. BOX 133 ARKANSAS CITY, KANSAS 67005
TELEPHONE 316 447-3311 or 447-3271

PRICE LIST FOR OVA-98 SPARES

520000-1

Effective Date - Dec. 1, 1973

Part No.	Description	Price
510027-1	Igniter	$ 2.00
510030-2	Readout Assembly	105.00
510035-2	Probe Assembly	25.00
510040-2	Funnel Sampler Assembly	6.50
510045-1	A.C. Battery Charger Assembly	95.00
510052-1	Shield (Switchguard)	.95
510055-1	Cylinder Assembly	135.00
510060-2	Pump Assembly	39.40
510063-1	Pump Diaphragm	2.00
510070-1	Battery Pack Assembly	75.00
510073-1	Capillary Tube Assembly	7.50
510075-2	Flow Indicator Assembly	19.50
510080-1	Case Assembly (Side Pack)	30.00
510085-1	Hydrogen Filling Assembly	60.00
510090-1	Instrument Carrying Case Assembly	60.00
510094-1	Carrying Strap Assembly (Shoulder Strap)	9.75
510100-1	H.P. Regulator Assembly	35.00
510100-2	L.P. Regulator Assembly	35.00
510113-1	Motor Assembly (Mod)	70.00
510116-1	Replaceable Porous Metal Filters	5.00/pkg. (10
510125-1	Close Area Sampler Assembly	4.75
510126-1	Tubular Sampler Assembly	4.75

PRICE LIST FOR OVA-98 SPARES
(Cont'd.)

Part No.	Description	Price
510250-1	Mixer/Burner Assembly	$ 23.10
	Mixer/Burner Assembly (Rebuilt with exchange)	8.10
510250-2	Mixer/Burner Assembly (with stainless steel filters)	23.10
510254-1	Handle Assembly	8.50
510301-1	Eccentric Assembly	7.95
510319-2	Exhaust Port Assembly (with stainless steel flame arrestor)	5.00
510251-2	Elbow Connector Assembly	4.95
250S	Meter Movement	35.00
MDL-1	Slo-Blo fuse, 1 amp.	.40
AGC-1/4	Standard fuse	.15
1/4 Amp	Littlefuse Microfuse	1.25
	Teflon Tubing	1.00/ft.

Prices are f. o. b. Arkansas City, Kansas, and are subject to change without notice. Shipping will be by Parcel Post or United Parcel Service unless otherwise instructed. Prices are valid for use in continental U.S.A. only.

Henry
F.G.
N/R
N. 2nd

MINUTES

AMBIENT VINYL CHLORIDE STANDARDS COMMITTEE MEETING

Cleveland Office

May 10, 1974

PRESENT:

E. W. Harrington	L. B. Crider
A. M. Fairlie	H. Waltemate
G. H. Metzger	P. M. Zakriski
C. R. Flynn	D. L. Kent
W. J. Wilcox	E. G. Schwaegerle
E. B. Katzenmeyer, Jr.	G. D. Schaaf

1. All Bendix installations have been completed except for the Long Beach plant (sampling system has not been received). Local alarms have been provided at the Bendix as follows: Avon Lake alarm at 50 ppm, Pedricktown at 50 ppm, and Henry at 25 ppm. Louisville has ordered equipment to provide local alarms. Until that time their OVA man alerts building operators of high concentrations.

   The data for the weekly reports is still primarily supplied by OVA readings. Only Henry and Building 451 at Avon Lake use the Bendix readings for preparation of weekly reports. It is requested that all plants should use the Bendix data as soon as possible in preparing weekly reports. In the case of Long Beach, they should allow approximately two weeks after the Bendix start-up to check correlation between the OVA and the Bendix before using the Bendix data for weekly reporting.

   Mr. Harrington pointed out there is a need to monitor the inlet and outlet air of our ventilating systems. This will be especially true in our modern ventilation systems such as Avon Lake, Pedricktown, and Long Beach. Our new vinyl chloride maximum will be in the range of zero to five parts per million and the method must be sensitive to one part per million with an accuracy of plus or minus 50%. It was agreed that we would purchase a Bendix gas chromatograph system and suitable sampling system for use in Unit A to monitor vinyl chloride concentrations. This data will then be compared to our Bendix unit to get a better idea of the effect of other components than vinyl chloride which would effect the Bendix readings.

2. The mini-computer E.A. for Avon Lake has been approved and the equipment is being ordered. The Louisville E.A. is now circulating in Cleveland. Pedricktown is currently running lines from the Mass and Pearl polymerization areas

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NOTE: Underlining denotes "Action Items"

over to the computer so they can utilize the computer to analyze the data from the Bendix installations. We will hold up on ordering other mini-computers until we get some experience with our installations.

3. The personnel monitoring seminar was held at the Avon Lake Technical Center and personnel from ten plant locations were present at this seminar. Equipment such as pumps and carbon sampling tubes should be at all plant locations by Monday, May 13th, to begin personnel monitoring. The type of monitoring we will be doing will be collecting four-hour samples with the carbon tube. The OVA should be used in addition to collecting the personnel monitoring sample. The OVA is a personnel monitoring device and it will measure peak or ceiling concentrations rather than a TWA. Initially, all carbon tubes will then be returned back to Paul Zakriski at the Research Center for his analysis. He will then report the data back to the plants. He has the capability of running 20 samples per day. On a longer-range basis, it may be possible to run some of these analyses at the individual plant locations. Personnel monitoring will be done only to verify the results we are getting from our Bendix installations. Paul will continue to pack and supply all personnel monitoring tubes.

   It is suggested that the job classification with the highest exposure levels be checked by a personnel monitoring first. Personnel monitoring samples with 250 mm glass tubes will be taken only at our customers' plants. These samples will be analyzed using a combined gas chromatograph and mass spec technique to pick up any materials other than vinyl chloride present. If your plant personnel have any questions on personnel monitoring, have them contact Paul Zakriski for further explanations.

4. We will continue to wear respirators for vinyl chloride concentrations between the levels of 25 and 50 ppm. Above 50 ppm an air line mask or Scott Air Pak is required. On a long-range basis we feel that self-contained air masks will be impractical. Mike O'Mara has been requested to get some data accurate to one part per million on the amount of time required for breakthrough in vinyl chloride levels of 10 and 25 ppm. We may then take a building and have everyone wear masks for a long period of time to determine its effect upon their working conditions and to get operator feedback. One of the problems with respirators is the problem of leaking around the face piece, especially with people who have beards or mustaches. Therefore, this could present a problem in a production-type situation.

5. Our Long Beach plant was cited by Cal-OSHA for failure to wear cartridge masks when opening the manheads and failure to wear air line respirators during polymerizer entry. Also, a stand-by was not provided for cleaning polymerizers. Subsequently, OSHA has canceled the citation for wearing respirators upon opening the manhead, but we still have to pay fines for the other two citations. A stand-by for poly cleaning has been in the California code for at least ten years.

   Pedricktown received citations for high levels of dust at the bagging stations in the mass and paste bagging areas. Operators were wearing respirators at the time and local ventilation will be provided later. Therefore, we may be able to appeal these violations and win.

6. Ventilation will be provided in our modern PVC buildings such as Pedricktown, Unit A, and Henry based on 12 air changes per hour. These systems will be forced air systems. We will make provisions on an interim basis to handle ventilation on some of the buildings in Louisville where necessary. An 80-foot stack will be installed at the Henry plant to handle vents from the recovery area and all other areas.

   Dow and ICI have looked at vinyl chloride levels around the outside perimeter of their plant. In general, they have found values in the range of 1/2 ppm.

7. We have capabilities for measuring residual vinyl chloride in PVC resins at Avon Lake, Henry, Louisville, and Pedricktown. The new chromatograph for Pedricktown was just shipped this week so it should be on line quickly. A second chromatograph will be sent to the Louisville plant to speed up their testing. The integrator for the chromatograph at Long Beach still has to be received before a check-out of their system will be completed.

   Samples will be sent out by John Whitney to determine the reproducibility of our current procedure for measuring vinyl chloride levels. The temporary procedure has now been sent out and received at all plant locations.

8. Our current weekly reporting system of presenting building averages and percent of values over 50 parts per million will be maintained for the time being.

9. L. B. Crider mentioned the work being done with the new type OVA analyzer which has a small gas chromatograph column that is specific for vinyl chloride monomer. We have one of these instruments and are working with it. We may have to modify the column to use it on a routine basis. This type of instrument could be useful in compounding and other areas where a number of components would be picked up. Mr. Crider also mentioned the possibility of getting more accurate readings specific to vinyl chloride by placing a second detector after the Bendix unit, which would be specific for chlorine. Some work has been done with IR sampling at the Avon Lake plant, but there are a number of instrument problems. We feel that this is not a good way to accurately measure in the 0-1 ppm range. If we are required to measure in the 0-1 ppm range, then a gas chromatograph appears to be the best method of doing it.

G. D. Schaaf

GDS/cls
5/14/74

cc: Attendees
A. Vittone
R. D. Scott
J. L. Nelson
R. N. Rylands
P. H. Lawrence
A. R. Webber
C. B. Cooper
A. W. Clements
C. L. Woods
R. M. Kreager
R. J. Fawcett
R. W. Strassburg
F. E. Krause
J. F. Malone
G. Pow
P. J. Weaver
T. R. Linak
B. M. G. Zwicker
H. R. Rex
J. M. Whitney

H. Waltemate

M I N U T E S

AMBIENT VINYL CHLORIDE STANDARDS COMMITTEE MEETING

Cleveland Office

April 9, 1974

PRESENT:

C. R. Flynn	L. B. Crider
E. G. Schwaegerle	A. M. Fairlie
W. J. Wilcox	E. W. Harrington
J. W. Gressler	G. H. Metzger
J. M. Whitney	G. D. Schaaf

1. The status of the Bendix installations are as follows:

   Louisville has two complete units installed; one in Building 15 and one in Building 121. The remaining two Bendix units will be installed as soon as the sampling systems arrive (Shipped on March 29, 1974).

   Henry has now completed their installation, and it is working very satisfactorily.

   The Bendix unit for the mass plant at Pedricktown is installed and working satisfactorily. The instrument for the pearl-paste building has been shipped and the sampling system is under construction.

   Long Beach has received the Bendix systems but they are not installed.

   Avon Lake has two Bendix systems completely installed - the original one in Building 451, and a new one in Building 461. Two more Bendix units have been shipped to Avon Lake and two more sampling systems are under construction and will be shipped soon from Bendix.

   Shawinigan (Canada) has received one Bendix instrument and the sampling system is being constructed.

   The Welland plant (Canada) lost their instrument in customs, but it is now being traced. Their sampling system is also under construction.

   The target date for completion at Bendix of the five remaining sampling systems is April 25, 1974.

   The fifth Bendix system for the Louisville plant will be shipped to Avon Lake for interim use. This is the equipment that was ordered for the large poly installation.

2. The mini computer EA for the Avon Lake General Chemical plant is currently being rewritten. The interfacing equipment has been placed on order since

it is the longest delivery item. It is expected the EA write-up will be completed the week of April 15th. This will include provisions for alarms at three levels of vinyl chloride concentration -- 30, 50, and 200 parts per million. Suitable EA's for Louisville, Henry, and Long Beach will be prepared in Cleveland on an individual plant basis.

3. John Whitney presented a report on the test methods for residual vinyl chloride monomer in PVC resins. The details of his report are included in the attachment. The standard procedure is now being written for the solution method to measure residual vinyl chloride content of PVC. This procedure should provide more uniformity from sample to sample and plant to plant. We now have identical chromatographs and equipment at the following locations: Avon Lake Technical Center, Avon Lake General Chemical plant, Henry, and Louisville. Equipment for the Pedricktown and Long Beach plants will be available soon. John Whitney will arrange for a statistical round robin study to define the plant-to-plant bias with the new test procedure.

   The Berens-Tomanek test method looks very promising and will be integrated into the plant operation only when it is completely evaluated.

4. E. Katzenmeyer has conducted personnel monitoring studies at the Avon Lake plant and is now in Louisville conducting studies there. Generally, good agreement with personnel monitoring and the Bendix data have been obtained. A total of 41 pumps have been ordered for personnel monitoring work at all plant locations. The pumps will be sent out to each plant for their use. The Plant Manager will assign one man in each plant to work on the personnel monitoring program. The man assigned to personnel monitoring will be trained in the technique in a training session to be held at the Technical Center.

   Each plant will be provided with four pumps for personnel monitoring. Three pumps will be in use at one time and one pump will be kept for a spare. It is planned to monitor three different job classifications in a given building each day. Since the actual monitoring requires four hours, it would be possible to get a building completely finished in one day. For the large plants with multiple buildings, one building per day can be monitored such that each building will be monitored at least once a week. This will continue for a period of three weeks as specified by the OSHA standards. After the initial three-week monitoring is completed, then a decision will be made concerning what periodic and systematic monitoring will be required.

5. The question of continuing with the NIOSH standards for PVC polymerization plants was discussed in light of the new OSHA emergency temporary standards. It was agreed that B. F. Goodrich will continue to live with the NIOSH standards. Questions concerning individual plant interpretation should be directed to H. Waltemate or J. Gressler. In the case of removal of PVC dust from overhead structures, this will be done at least once and the cost reviewed before setting the frequency for recleaning.

6. A letter will be issued to all plants by A. M. Fairlie detailing how the Bendix data should be handled in the interim period before the mini computers

are available. This will provide a system to generate the data for the weekly reports.

7. The statistical analysis of Doctor Maltoni's toxicology study on rats was presented by A. M. Fairlie. A report will be written and distributed.

8. It is important that we do proper work surveys at all plants to determine how much time operators spend on certain floors. This work survey will then be combined with the Bendix data to provide time weighted averages. A letter has been sent out to the four plants that are not currently getting work survey data to start this program immediately. They can be assisted in this operation by E. E. Deane and C. A. Brunot.

9. Bill Wilcox presented the program for the analysis of the employee health and work history data to be obtained and collected. This report has been sent out separately to all Plant Managers.

G. D. Schaaf

GDS/cls
Att. 7
4/17/74

cc: Attendees
H. Waltemate
E. B. Katzenmeyer, Jr.
T. R. Linak
B. M. G. Zwicker
H. R. Rex
A. Vittone
R. D. Scott
J. L. Nelson
R. N. Rylands
P. H. Lawrence
A. R. Webber
C. B. Cooper
A. W. Clements
C. L. Woods
R. M. Kreager
R. J. Fawcett
R. W. Strassburg
F. E. Krause
J. F. Malone
G. Pow
P. J. Weaver
E. E. Deane
C. A. Brunot

To: Ambient Vinyl Chloride Standards Committee

April 9, 1974

Item III - a) Reliability of Percent Vinyl Chloride in Product
b) Status of Reproducibility of Our Present Test
c) Report on New Test Method

a) One of the problems in establishing reliability is in obtaining a sample of PVC resin which is known to contain an exact amount of vinyl chloride. We do not have this type of primary standard. Therefore, the various methods are based on the use of secondary type standards. Comparative runs have been made using the various methods of RVCM analysis now available. Results of these runs are shown in the two attached graphs. Most of this work has been performed at the higher levels of RVCM content (150 to 3000 ppm). Work is currently planned, using Geon 103 EP F-76, which will provide information in the 10 to 500 ppm range.

Reference to the graph showing Geon 80X5, Run No. 3, indicates that a relatively smooth curve can be obtained by connecting the points determined by any of the four methods used. This tends to suggest that we may be encountering some calibration problems. The fact that smooth curves are obtained tends to indicate fairly good reproducibility.

b) The reproducibility of the present test, as indicated by a cross check program run several months ago, was very poor. At that time we had rather crude equipment in the plants to run this test. (The plants used whatever instrumentation and accessory equipment that was available.) No concentrated effort had been made to standardize the equipment. Since that time a number of things have been done to improve the reproducibility within and between plants.

1) Each plant will shortly be equipped with a standard gas chromatograph and column.

2) Each plant will have a peak integrator for determining peak area.

3) New shakers have been ordered (three have been delivered) to standardize the solution step. Special jigs have been designed to hold the polymer solutions. Glass beads have been added to the vials to improve solution preparation.

4) Standard procedure is being prepared by D. G. Desrosiers and E. G. DeCapita. Samples taken in the plant must be properly sealed and delivered to the laboratory within 30 minutes. The laboratory must start the solution preparation within 30 minutes from time sample is received. A new Poropak column, which has higher sensitivity for VCl, has been specified. The sample must be shaken until it

visually appears to be in solution. Then mix for at least one more hour. Samples should be left on the shaker till they are used. The back flushing step has been modified to keep the second column clear of solvent.

5) Cross checks run on resin should be run on non-porous resins to minimize sample changes. If porous resins are required, then they should be "glass sealed" in ampules.

A recent cross check between Avon Lake G. C. and Pedricktown on a special sample of 80X5 resin produced the following results:

	1st Run	2nd Run
Avon Lake	3529	3716
Pedricktown	3316	--

With careful standardization of this solvent method we certainly have indications that the reproducibility can be brought to an acceptable level. It is unfortunate that this method has seemed to gain a "bad reproducibility" reputation simply because each plant rushed into it faster than the method could be completely developed and standardized.

c) The most recent method evaluated is the vapor equilibrium method proposed by A. Berens. C. Tomanek (ALTC) worked on this technique and was able to obtain excellent reproducibility. He then assisted the ALGC laboratory in setting up to run this method. Run number 3 of 80X5, graph and data attached, illustrates the data obtained in this initial run. Although a few minor problems were encountered in the ALGC laboratory, the method seems to have much to offer.

1) Technique has fewer steps, consequently less chance for human errors.

2) Calibration is easier than the solution method. It requires only known mixtures of VCM in air. These are generally available in each plant for OVA calibrations.

3) This method is faster since it eliminates the solution preparation steps.

4) No change in the chromatograph is required except possibly a slightly longer column. The integration system is equally applicable for both methods.

5) This method would be somewhat easier to automate in the laboratory than the solution method.

One word of caution at this point. Let's not repeat the experience of the solvent method. This method should not be turned over to all plants at this time. It should be promptly debugged and developed prior to considering it as a standard method. Another run on 80X5 is being made today at ALGC which will compare the different methods. C. Tomanek is working with ALGC in developing this method. We have tentatively scheduled a meeting with A. Berens for the week of April 15, 1974, to review the results obtained with this new method.

J. M. Whitney

JMW:dl
3 attachments

4/9/74

Analysis of Residual Vinyl Chloride Concentration Data From Model Fluidizer

The data were analyzed via analysis of variance techniques to determine method differences and S_{test} for each method. The S_{test} values were not found to significantly differ. They are:

Method	S_{test}
Solvent, ALGC	3.1%
Vapor Equil., ALGC	2.3%
Vapor Equil., ALTC	1.9%

This means that at a 2000 ppm concentration, for example, S_{test} for the vapor equilibrium method at ALTC would be about 38 ppm, while at a 200 ppm concentration, S_{test} would be about 3.8 ppm.

Significant differences were found between the concentrations detected for the 3 analyses. For example, average initial concentrations of residual vinyl chloride detected by the 3 methods are:

Method	Concentration
Solvent, ALGC	2365.5
Vapor Equil., ALGC	2133
Vapor Equil., ALTC	1600.25

Additionally, the average differences between the methods significantly varied, as indicated by comparison of the above initial concentrations with the 335 minute concentrations.

Method	Concentration
Solvent, ALGC	189.0
Vapor Equil., ALGC	229.0
Vapor Equil., ALTC	210.75

Note that the solvent method now detects the least amount of VCl, while initially it detected the most.

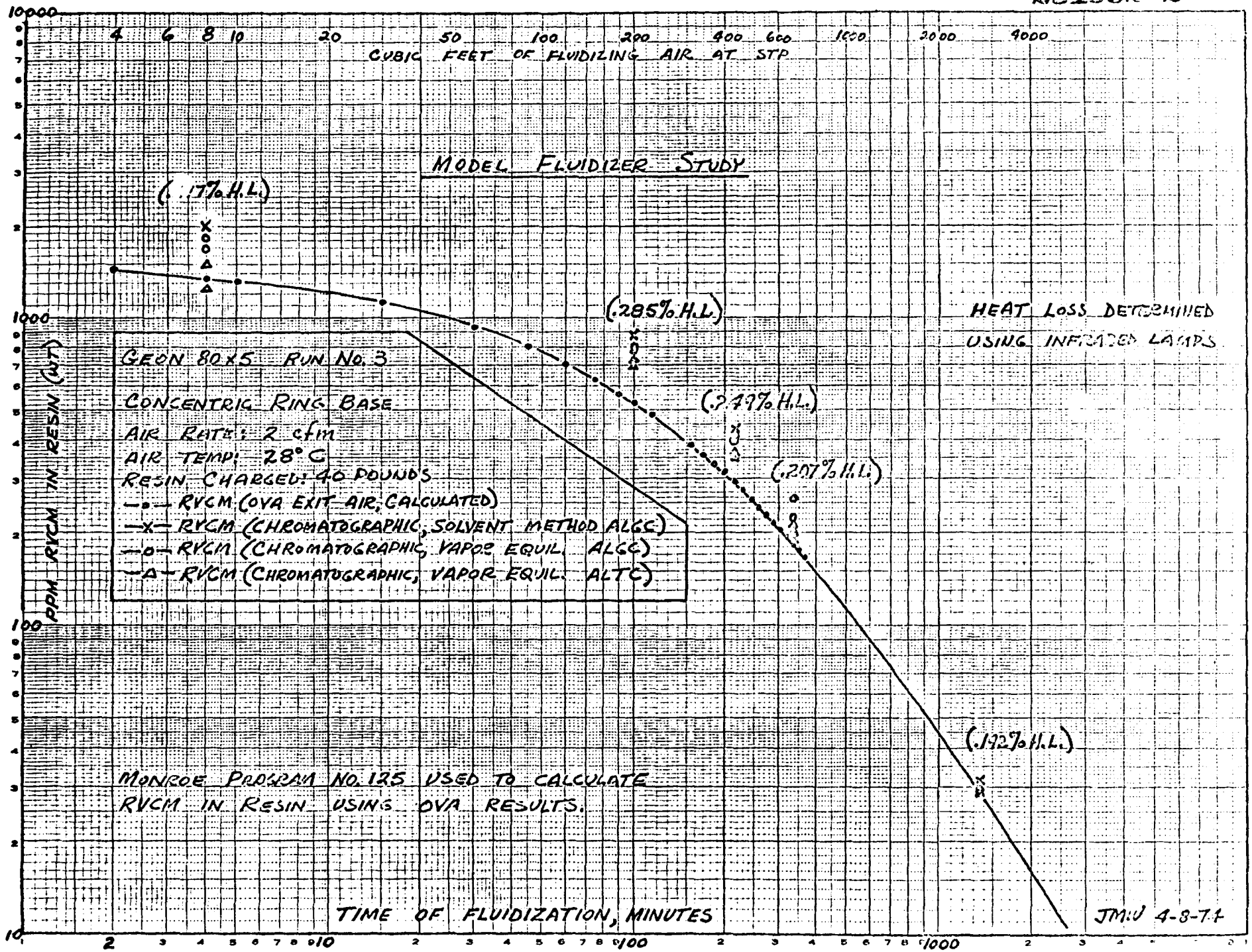
Thus, we can say that the 3 methods significantly differ in the concentrations of vinyl chloride detected. The solvent method gives generally higher results (although not always) than the vapor equilibrium method as run at ALGC, which in turn gives higher results than the vapor equilibrium method as run at ALTC. S_{test} is approximately the same for each method.

Data Summary for Geon 80X5, Run No. 3

Sample	Solvent Method ALGC	V. Equil. Method ALGC	V. Equil. Method
1A-1	2368 ppm	2079 ppm	1659 ppm
-2	----	(1459)	1587
1B-1	2363	2126	1570
2	----	2194	1585
2A-1	2015	1707	(1191)
-2	----	1715	1453
2B-1	1995	1824	1501
-2	----	1820	1486
3A-1	869	780	724
-2	----	784	716
3B-1	902	790	692
-2	----	790	691
4A-1	433	407	357
-2	----	405	357
4B-1	433	409	358
-2	----	408	349
5A-1	198	232	209
-2	----	(306)	214
5B-1	180	232	209
-2	----	223	211
6A-1	29	----	----
-2	----	----	----
6B-1	30	----	----
-2	----	----	----

( ) indicates a probable error in sample injection

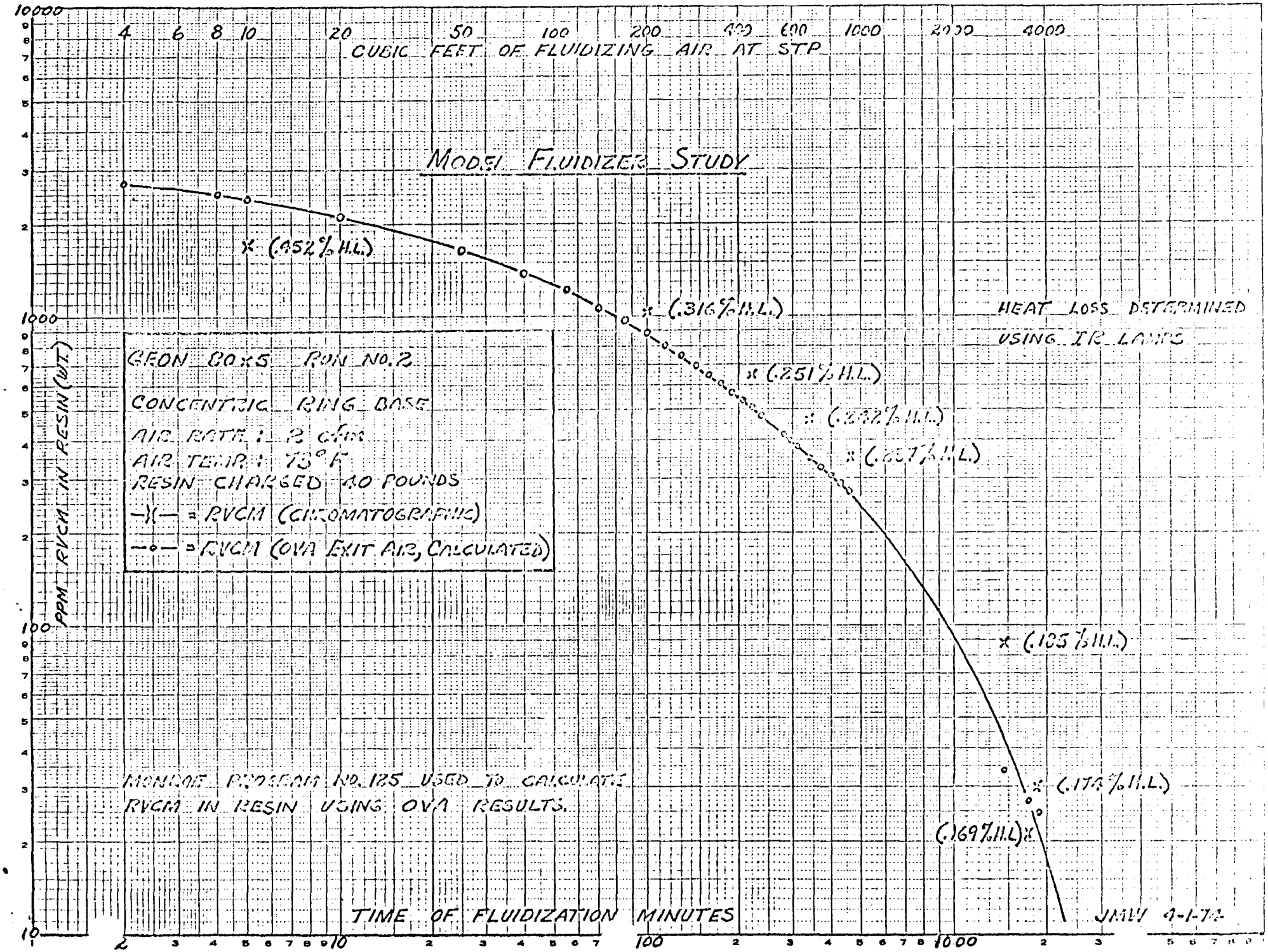
Samples 1A-1; 1A-2; 1B-1; 1B-2 represent samples taken at exactly the same time. Therefore, they should all have the same RVCM content.


MODEL FLUIDIZER STUDY
CUBIC FEET OF FLUIDIZING AIR AT STP
PPM RVCM IN RESIN (WT)
TIME OF FLUIDIZATION, MINUTES
(.17% H.L.)
(.285% H.L.)
(.249% H.L.)
(.207% H.L.)
(.192% H.L.)
HEAT LOSS DETERMINED USING INFRARED LAMPS
GEON 80 x 5 RUN No. 3
CONCENTRIC RING BASE
AIR RATE: 2 c.f.m.
AIR TEMP: 28° C
RESIN CHARGED: 40 POUNDS
—•— RVCM (OVA EXIT AIR, CALCULATED)
—x— RVCM (CHROMATOGRAPHIC, SOLVENT METHOD ALGC)
—o— RVCM (CHROMATOGRAPHIC, VAPOR EQUIL. ALGC)
—Δ— RVCM (CHROMATOGRAPHIC, VAPOR EQUIL. ALTC)
MONROE PROGRAM NO. 125 USED TO CALCULATE RVCM IN RESIN USING OVA RESULTS.
JM:V 4-8-71
EUGENE DIETZGEN CO.
NO. 340-L33 DIETZGEN GRAPH PAPER
LOGARITHMIC
3 CYCLES X 3 CYCLES

BFG3[illegible]2

BFG37783

2510383



A G E N D A

AMBIENT VINYL CHLORIDE STANDARDS COMMITTEE

Tuesday, April 9, 1974

Cleveland Office

CONFERENCE ROOM 1-B, 1:00 P.M.

TO:

E. W. Harrington
G. H. Metzger
L. B. Crider
E. G. Schwaegerle
A. M. Fairlie
E. B. Katzenmeyer, Jr.
C. R. Flynn
Herman Waltemate
B. M. G. Zwicker
W. J. Wilcox
G. D. Schaaf
H. R. Rex

I.	Status on Bendix Installation -- Future Plans	G. D. Schaaf
II.	Mini Computer Status	G. D. Schaaf and Group
III.	Reliability of Percent Vinyl Chloride in Product -- Status of Reproducibility of our Present Test -- Report on New Test Method	J. M. Whitney L. B. Crider
IV.	Status of Personnel Monitoring	E. B. Katzenmeyer, Jr.
V.	Status of NIOSH Standards Implementation	J. W. Gressler
VI.	Interim Data Handling with Bendix	A. M. Fairlie
VII.	Toxilogical Studies of Ambient Vinyl Chloride in Rats	A. M. Fairlie
VIII.	Set Up a Schedule for Job Analysis Data at Each Plant Location for TWA	Group
IX.	Health Records Study	W. J. Wilcox

Glen D. Schaaf

G. D. Schaaf

GDS/cls
4-3-74

cc: J. M. Whitney
J. W. Gressler

BFG37784

M I N U T E S

AMBIENT VINYL CHLORIDE STANDARDS COMMITTEE MEETING

Cleveland Office

March 8, 1974

PRESENT:

Herman Waltemate	W. J. Wilcox
E. B. Katzenmeyer	E. G. Schwaegerle
A. M. Fairlie	E. R. Clayson
T. R. Linak	G. H. Metzger
B. M. G. Zwicker	G. D. Schaaf

1. Herm Waltemate reported on the NIOSH review of the Avon Lake plant. It appears that approximately 10-12 plants of the total industry will be reviewed. Three or four of these plants will have an in-depth study. Louisville and Avon Lake will probably be included in this group. The age of the plant and size of the work population are all primary selection factors.

   At Avon Lake NIOSH was interested in such things as the number of employees, the job classification, the ventilation of the buildings, and the work history of the employees.

   Poly entry procedure and history of poly entry was discussed. There was no specific recommendations from NIOSH on what type of permanent records to be kept. They were interested in excursions, how high they were, and how long the people were in the affected area. The present Bendix time cycle of 12 minutes for the six sample points should be maintained as the minimum for proper monitoring.

   A. W. Clements was contacted both by OSHA and the state of California. It should be pointed out that no information should be given out over the phone. The person should be invited to the plant and their credentials checked before giving them any information. A record of material discussed with NIOSH should be maintained and things that are classified as "Company Confidential" should be clearly marked.

2. Ed Katzenmeyer reported on the progress of the personnel monitoring systems. Several sampling devices have been installed in Building 451 at the same point of the Bendix sample. The units are allowed to run for four hours and the analysis is then compared to the analysis from the Bendix instrument. To date, agreements appear to be good between sampling systems.

NOTE: Underlining denotes "Action Items"

Work will start on people at the Avon Lake plant during the week of March 10, 1974. This data must be evaluated before work can be started on other plants. The absorption tube will be designed for four-hour duration. The successful completion of this analysis requires attention to many small details. When the personnel monitoring evaluation at Avon Lake is completed, then the work will begin at Louisville. Ed Katzenmeyer will contact the plants when he is ready to get individual plants involved into the program.

Jack Ryan will be in Louisville the week of March 10th to monitor Building 15 with the IR to obtain the analysis of the amount of vinylidene chloride in the building. In addition, he will check for chloroform, vinyl chloride, and other ingredients. The individual component monitoring will require a simple gas chromatograph. Possibly a new type Bendix instrument could be used at a later date.

3. Andy Fairlie presented to the committee the recommendations for the mini computer. He proposed that the data from the Bendix unit be sent to the mini computer, which would then generate a report each shift for each building. This data would be printed out on a typewriter-type output. The information would then be transferred to a magnetic tape system where it would be stored for preparation of weekly and monthly reports. It would also be possible to transfer data from the magnetic tape unit into the time sharing terminal and into the IBM 370 in Cleveland. This type of system would allow extreme versatility. It will also permit information (individual shift data) to be stored in Cleveland in a panvalet file for periods of time up to one year.

   Monthly reports will then be issued for each building including the amount of time operators spend in the various areas so that the time weighted averages could be printed. To obtain this type of data a time study survey would be required and would be integrated into the computer program. This data would then be retained for a 20-year period to meet NIOSH requirements. For unusual situations in cases where the monomer concentration in the building was high, an exception or safety report would be written.

   It was agreed by the committee that an EA will be prepared to purchase three of the mini computer type systems for all plants where we do not presently have computer capabilities (Long Beach, Avon Lake, and Henry). Possibly, the Long Beach unit could be utilized at Louisville until the computer from the large poly is available.

4. The recent work with the analysis of respirator cartridges was discussed by L. B. Crider. A written report has been issued. A respirator is not recommended except for emergency use in low levels of exposure. If a respirator is used to clean polys, the cartridge must be changed after each poly entry (respirators are being used on a temporary basis at Avon Lake). Herm Waltemate will define all these standards with his meeting with the Safety Engineers on March 14th.

5. Work Practices -- One of the items to reduce the vinyl chloride contamination at the tank farm would be evacuation of the vinyl chloride unloading lines with the recovery systems. This procedure is recommended for all plants. After

careful review, it may reduce the wearing of a Scott airpack for tank car unloadings.

Samples of disposable coverhauls and PVC wetsuits were sent out to all plants.

6. Vinyl Chloride in the Product -- The sampling and test reproducibility of the vinyl chloride in PVC product remains to be defined. A preliminary evaluation of the round robin shows much discrepancy in the test data. Andy Fairlie will work with Hugh Marty to define test and sampling reproducibility.

Work is underway at the Louisville plant to reduce the residual monomer level of 222 using the steam stripping method. Slurry samples after being stripped for eight hours showed a considerable reduction in vinyl chloride levels. Tests still must be made on the finished product to determine if its level is also low.

Other programs are underway to evaluate methods of reducing residual monomer in 222. Samples have been sent to Al Berens for diffusion analysis. A sample has been sent to Ron Davis for work with the stripping column at Brecksville. Work is in progress to determine if the vinyl chloride content of Geon 222 can be reduced by air fluidization.

Ben Zwicker suggested something might be used to swell the particle to provide better access of vinyl chloride exit. Possibly, something like methanol might be used. Ed Schwaegerle agreed to talk to Doctor Collins regarding this approach.

It was mentioned that we may have to label all finished products over 1/10th of a percent vinyl chloride as hazardous to your health. Therefore, it is very imperative that we get all resins below this level. Effort could be undertaken with the customers to produce a more porous product, hence one which will allow residual monomer to be released more readily.

Ed DeCapita will continue working with all plants to get our vinyl chloride analysis in the PVC product lined out, equipment-wise and test-wise. The question of resin particle size and the vinyl chloride content of the individual particle size fractions was discussed. It was agreed that we will determine the vinyl chloride content of screened resin samples collected at the various mesh sizes (John Whitney and his lab have been requested to undertake this project).

Ed Katzenmeyer reported on his recent visit to both the Marietta and the Gloucester plants. In general, vinyl chloride residual levels around the equipment was fairly low, and certainly no reason for concern. However, it was mentioned we need some more data with our own resin at high or low levels of residual monomer to determine the ambient vinyl chloride levels in the compounding areas. For example, we should take a resin at about 1,000 ppm and determine with a standard formulation what ambient levels of vinyl chloride the compounding workers are exposed to. Correspondingly, the same thing should be done with the resin containing about 200 ppm of residual monomer. This test will be handled on a M.A. basis and followed by Dick Coffey. This will allow us to get our customers some idea of what levels of monomer their workers may be exposed to.

7. Delivery of all Bendix instruments, recorders, and sampling systems should be completed during the month of March. Lou Salzer will follow the instrument delivery and initial start-up in the PVC plants. He is scheduled to be at the Louisville plant the week of March 11th. March 20th and 21st is a scheduled training program for instrument people at the Bendix plant. This training program is meant to include all instrument people who were not in attendance at the first session. Following the training program, Lou will go to Henry for the installation and start-up of their system. The Pedricktown and Long Beach plants will follow in that order.

8. Bill Wilcox reported on the Tabershaw-Cooper program to investigate employee death records at our older plants. So far we have only seen problems with angiosarcoma with the employees at Louisville. No evidence of problems from Niagara Falls or Avon Lake people have been noted.

9. Ed Katzenmeyer reported on his dust sampling at the Avon Lake plant. Ed has done some work at Avon Lake using a gravimetric sampling method and comparing it to a GCA sampling-type instrument. Tabershaw-Cooper also uses a GCA dust instrument at the Louisville plant, but this instrument is not yet approved as a dust measuring device. Ed plans to do the Louisville plant dust sampling next. The best guard against dust problems are to spend adequate time on housekeeping, to keep dust levels low. Currently, there is no standard quantity for PVC dust. More work is required in this area.

G. D. Schaaf

GDS/cls
3/13/74

cc: Attendees
E. W. Harrington
L. B. Crider
C. R. Flynn
A. Vittone
R. D. Scott
J. L. Nelson
R. N. Rylands
P. H. Lawrence
A. R. Webber
C. B. Cooper
A. W. Clements
C. L. Woods
R. M. Kreager
R. J. Fawcett
R. W. Strassburg
F. E. Krause
J. F. Malone
G. Pow
P. J. Weaver

M I N U T E S

AMBIENT VINYL CHLORIDE STANDARDS COMMITTEE MEETING

Cleveland Office

February 20, 1974

PRESENT:

E. W. Harrington	L. B. Crider
H. R. Rex	G. H. Metzger
A. M. Fairlie	C. R. Flynn
John Gressler	G. D. Schaaf
H. Waltemate	

1. To clear up any misunderstanding, the following units of measure are defined:

   A. The residual vinyl chloride in PVC resins is measured and reported in weight percent.

   B. The OVA and Bendix readings are measured and recorded in volume percent of vinyl chloride in air. The OSHA standards for gases in air for time weighted average and TLV are also expressed in volume percent in air.

2. The amount of residual vinyl chloride level in our finished products was reviewed with H. R. Rex from Sales. The data to date indicated a problem (above 1,000 parts per million) with solution resins and Geon 202. G. D. Schaaf will review with the plants what can be done on a short-term basis to reduce this level. Marketing will prepare a position paper for review with the BMG. All resins must be reduced to the lowest residual vinyl chloride content possible, consistent with our current processing conditions. A list of resins for critical applications has been prepared by Marketing and is attached to these minutes. Manufacturing and Marketing will review what should be done with hi temp resin and compound which contains sizeable quantities of residual carbon tetrachloride.

3. Ventilation is proceeding on a design basis for 6, 12, and 20 interchanges at all plant locations. At the Henry plant it may be necessary to provide two ducts for air intake; one to the North and one to the South. This system then would be used with a damper depending upon the wind direction.

4. Herm Waltemate reviewed his discussions with the NIOSH representatives at the Pedricktown plant. He will prepare a set of revised guidelines as a result of

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NOTE: Underlining denotes "Action Items"

this discussion. In general they were convinced that we could use a throw-away suit for dry poly entry. In case of a entry into a wet poly, we would have to use an impervious suit or one similar to rain gear. A wet poly is defined as a vessel in which the operator would be likely to come in contact with slurry or water.

The NIOSH representatives were quite impressed with the housekeeping at the Pedricktown plant and they felt the operators were not exposed to as much dust as the operators are in the Louisville plant.

Mr. Harrington said that as a result of a meeting with management on the 16th, all plants have been requested to implement the NIOSH standards, and to identify what problems are created as a result of this order. A routine report will be issued by each plant showing their compliance with the NIOSH standards in their progress toward that goal.

5. It was recommended that Ed Katzenmeyer get together with NIOSH representatives in Cincinnati to obtain their guidelines on measurement of dust. It appears they have some information that would be useful in our plants.

6. L. B. Crider summarized the results of the tests with the cartridges from our respirators supplied by Welsch. The preliminary information indicates that vinyl chloride concentrations as high as 100 parts per million can be protected against for one hour in normal breathing operations (30 liters per minute). Work will now be done to identify the breakthrough point at 500 parts per million. It appears that we can use the respirator cartridges for one shift before discarding under present conditions. More data will be supplied later.

7. The background level of our OVA's range from 5-7 parts per million. Currently, we cannot subtract this from our OVA reading since we do not know what is the cause of the background. It is possible the background is caused by measuring residual carbon in the air of the normal environment or the background can be caused by some problems in the instrument itself. L. B. Crider will work on this problem to define the causes of the background level. The problem with the use of the Bendix is not severe, since we have a completely enclosed sampling system and always have a constant source of air for calibration and no changing of cylinders is required such as with the OVA which could contribute to a variation in background levels.

8. Currently there are five sampling systems on order from Bendix to be used with the total carbon analyzers. It was agreed to purchase six more sampling systems so that the plants would have them in time to use with their Bendix instrument.

9. Ed DeCapita has been sent to Louisville to monitor the concentration of vinylidene chloride in Building 15 on an interim basis. He will set up a plan whereby the gas in the building is sampled and taken to the laboratory for analysis in the chromatograph. Next week we will then set up an infrared unit in the building to monitor for vinylidene chloride on a continuous basis.

10. Mr. Harrington requested that OVA readings be taken in the Paste Drier Building since there is quite a bit of dust in that area. This will start at Louisville immediately.

11. A. M. Fairlie presented the data requirements for the mini computer. A letter formulating these requirements will be sent out to all plants for their review. Mark Forsythe and Bob Carroll will review the requirements and recommend the type of computer system required. We want to provide a system that can store data so we can get a monthly report which can then be saved for at least twenty years to meet OSHA requirements. A sample data sheet is attached to this report.

G. D. Schaaf

GDS/cls
Atts.
2/25/74

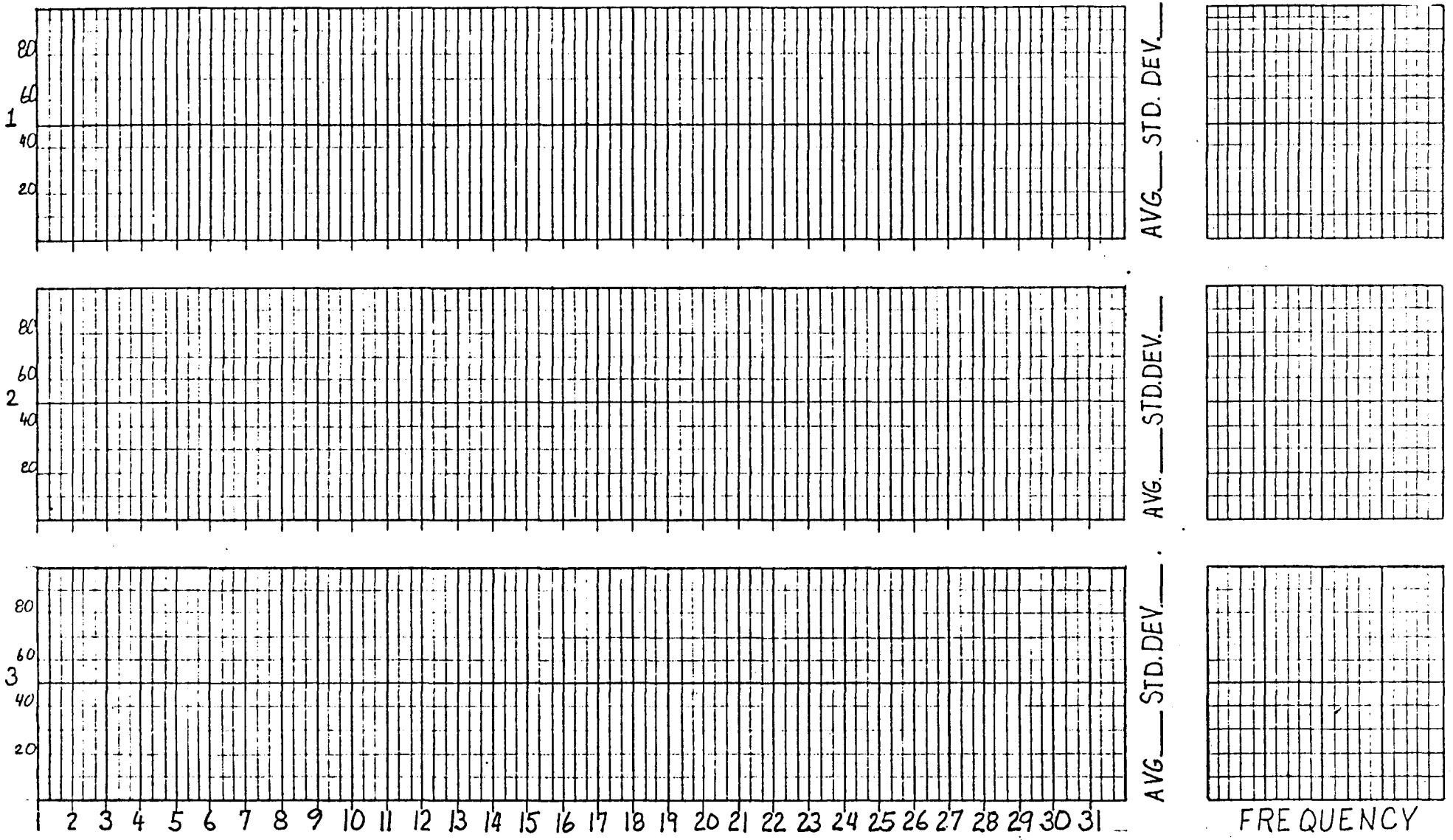
CC: Attendees
E. B. Katzenmeyer
B. M. G. Zwicker
W. J. Wilcox
E. G. Schwaegerle
A. Vittone
R. D. Scott
J. L. Nelson
R. N. Rylands
P. H. Lawrence
A. R. Webber
C. B. Cooper
A. W. Clements
C. L. Woods
T. R. Linak
R. M. Kreager
R. J. Fawcett
R. W. Strassburg
F. E. Krause
J. F. Malone
G. Pow
P. J. Weaver

R_[illegible]

AMBIENT VCI VAPOR AVG., PPM

PLANT _____ BLDG. _____ MONTH _____

BFG37792



TO	FIELD POINT OR AKRON DEPARTMENT & BLDG. NO.	DATE YOUR LETTER
J. F. Malone	Cleveland D/5401	
FROM	**FIELD POINT OR AKRON DEPARTMENT & BLDG. NO.**	**DATE THIS LETTER**
H. R. Rex	Cleveland D/5401	2/21/74

SUBJECT

Critical Uses of PVC Resin

The table below summarizes data submitted by Product Managers concerning criticality of end-use applications in terms of possible residual monomer in applicable resins. The original reports are attached. The figures are volumes used in packaging and toy applications. Whether or not the critical share of a given resin total sales volume can be isolated out is not known at this time.

PVC VOLUME IN VCM - CRITICAL USES
(M lbs)

Resin/PMG	I	II	III	IV
103EP	3.0	Ham wrap, bottle closures		
92	6.0	Cap liners		
103F76		*		
80 X 5		Gloucester		
202			3.2	(46% of 7 M lbs; 40% Pkg., 6% Toys)
121			10.08	(21% of 48 M lbs; 13% Pkg., 8% Toys)
128F1			2.88	(100%, all in Pkg.)
80 X 5			3.42	(18% of 19 M lbs. for Film and Sheet)
128			2.16	(11% of 19.6 M lbs; 1% Pkg., 10% Toys)
222			0.19	(5% of 3.8 M lbs; all Pkg.)
140 X 31			0.93	(35% of 2.65 M lbs; all Pkg.)

Harold R. Rex

HRR/cjb

Attachments

cc: G. F. Cohan
D. D. Ditmer
D. G. Kuharik
R. W. MacCuspie
R. W. Tannehill

*Pipe: Very large volume, much of which must be looked upon as critical. However, specific customers might be isolated who can tolerate VCM levels "somewhat over" the critical spec.

A G E N D A

AMBIENT VINYL CHLORIDE STANDARDS COMMITTEE

Friday, March 8, 1974

Cleveland Office

CONFERENCE ROOM 1-B, 9:00 A.M.

TO:

E. W. Harrington	C. R. Flynn
G. H. Metzger	Herman Waltemate
L. B. Crider	B. M. G. Zwicker
E. G. Schwaegerle	W. J. Wilcox
A. M. Fairlie	G. D. Schaaf
E. B. Katzenmeyer	H. R. Rex

I.	Discussion of NIOSH Review of Avon Lake Plant	H. Waltemate
II.	Status of Personnel Monitoring System	E. B. Katzenmeyer L. B. Crider
III.	Data Logging for Mini Computer and Explanation of Hardware Required	A. M. Fairlie
IV.	Report on Recent Data for Respirators	L. B. Crider
V.	Discussion of B.F.G. Work Practices	Group
VI.	Percent Vinyl Chloride in PVC Products Solution Resin Work Glouster and Marietta Report	G. D. Schaaf E. R. Clayson E. B. Katzenmeyer
VII.	European Situation	B. M. G. Zwicker
VIII.	Bendix Delivery and Installation Plans	G. D. Schaaf
IX.	Report on Tabershaw Findings on Epidemilogical Study	W. J. Wilcox
X.	Dust Sampling	E. B. Katzenmeyer

Glen H. Schaaf

G. D. Schaaf

GDS/cls
3-4-74

cc: E. R. Clayson

A G E N D A

AMBIENT VINYL CHLORIDE STANDARDS COMMITTEE

Wednesday, February 20, 1974

Cleveland Office

CONFERENCE ROOM 1-B, 1:00 P.M.

TO:

E. W. Harrington
G. H. Metzger
L. B. Crider
E. G. Schwaegerle
A. M. Fairlie
E. B. Katzenmeyer
C. R. Flynn
Herman Waltemate
B. M. G. Zwicker
W. J. Wilcox
G. D. Schaaf

I.	Review of NIOSH Standards for PVC Production and the Results of Discussion with Mr. Rose at Pedricktown	H. Waltemate
II.	Report on Test With Respirators	L. B. Crider
III.	Use of Dow Personnel Monitoring System	E. B. Katzenmeyer
IV.	Report on VPC Analysis of Monomer Levels in Building 15 at Louisville	L. B. Crider
V.	Proposed Purchase of Additional Sampling Systems	Group
VI.	Report on Percent Vinyl Chloride in Finished Products	G. D. Schaaf
VII.	Review of Data Logging Requirements for Mini Computer	A. M. Fairlie
VIII.	Ventilation Status	G. H. Metzger
IX.	Report from MCA Meeting in Chicago (By Phone)	B. M. G. Zwicker

G. D. Schaaf

GDS/cls
2-18-74

2-18-74

BFG37795

H. Waltemate

TO	SUBJECT	DATE COPIES SENT
Plant Managers	VCl Polymerization Plants	
FROM	FIELD POINT OR ANSON DEVELOPMENT & BLDG. NO.	DATE THIS LETTER
A. M. Fairlie	Cleveland	January 4, 1974

Initial Plan for VCl Vapor Sampling Program

INTRODUCTION

The Plan which follows outlines the VCl vapor sampling program for the plants as we anticipate its development. It also describes the initial survey in more detail (lasting for one week) and the second phase with the OVA tests which should begin immediately afterward.

More planning is needed as to methods of data analysis and to the details of the second phase of OVA sampling. We plan to complete these as early as possible next week and will keep you advised. To enable the plants to move quickly, we propose having the PIC Engineers analyze data on site. To expedite the analysis and standardize the method, we may call the PIC Engineers in for a one-day meeting unless we feel it can be adequately spelled out in a letter.

PLANS

1. Overall Plan

   a. Survey polymerization area (4-5 days)

   b. Set up and install routine OVA sampling program (1-3 months)

   c. Take immediate action on high vinyl chloride locations

   d. Set up and install Bendix Continuous Monitoring System

   e. Study other plant areas (drying, etc.)

2. Prepare Survey Plan

   a. Make diagram of each floor showing all equipment

   b. Select at least thirty points per building -- include various possible VCl sources

      1. refer to enclosed ALGC list -- Table 1 -- as a guide (all buildings are different)

      2. make list of sampling points selected and put them on the prototype data sheet attached -- Table 2 -- (show locations exactly on floor diagram)

   c. Prepare final data sheet for use in plant; it should appear approximately as the prototype sheet

3. Execution of Survey Plan

   a. Make sure equipment has been calibrated in an appropriate VCl concentration zone according to the procedures outlined in the OVA Instruction Manual. Calibrations should be done at least once per week. Doug Rider of ALGC is preparing a standard calibration procedure to be issued as soon as possible. Call him if you have any questions.

   b. Start survey immediately in all plant buildings where VCl and/or VCl_2 polymerization occurs.

   c. Collect 2-3 sets of data per shift, sampling all 30 (or more) points in each building. Sampling rounds should be about 2-3 hours apart. Sampling for each day may be done within one shift or across two shifts during this initial survey. However, cover all shifts equally.

   d. Carry survey out for 4-5 days during the first week, collecting at least ten samples at each sample point.

4. Analysis of Survey Plan (to be done within each plant by the PIC Engineer)

   a. Identify approximately six points per building which represent average vinyl chloride concentration at any time plus being sensitive to upsets. (PIC Engineers will be advised how to perform this analysis.)

   b. Identify high vinyl chloride concentration areas so that corrective action can start immediately.

   If the initial survey experienced no serious difficulties, especially in performance of the OVA instrument, this completes Item (a) in the overall plan.

5. 1-3 Month OVA Study (Item b in the Overall Plan)

   a. To begin during the second week.

   b. Sample the six points per building determined in Step 4, above.

   c. A detailed sampling plan will be provided in the near future. This plan will tentatively cover each shift at least twice a week.

   d. This plan will be provided with action rules which indicate when the foreman (or some other appropriate person) must sample a high VCl concentration area in depth and identify and correct the problem if possible.

   e. Each high vinyl chloride occurrence must be noted in a record book for level, location, cause, and solution of the problem.

This log should be used in plant meetings to initiate permanent corrective action.

6. Analyze Results in Step (5) to Determine Where and How the Bendix Continuous Monitoring System Should be Installed

A. M. Fairlie

AMF/cls

DISTRIBUTION

ALGC

R. N. Rylands
R. S. Mather
R. W. McKay
T. E. Neff - B. A. Prusinoski

LONG BEACH

A. W. Clements
E. L. Beeler
W. D. Robb
R. A. Vanko

ALTC

L. B. Crider
R. M. Kreager
R. L. Bowles
F. E. Krause - H. H. Marty

CLEVELAND

G. H. Metzger
E. G. Schwaegerle
C. R. Flynn
H. Waltemate
B. M. G. Zwicker
W. J. Wilcox
O. F. Beckmeyer
E. W. Harrington
G. D. Schaaf

HENRY

C. B. Cooper
M. D. Tawney
A. W. Otto
C. J. Lee

LOUISVILLE

P. H. Lawrence
P. A. Wagner
S. S. Michels
J. R. Kute

PEDRICKTOWN

A. R. Webber
J. W. Goetsch
W. A. Reed
J. A. Klupar
J. Goodman

[illegible] SHEET FROM HLSC

AMBIENT VCL SURVEY
B/469

	DATE			
	TIME			
	FIRST FLOOR OF Vent. Cond.*			
1	Transfer Pump (BT 1)			
2	BDT 2-3			
3	Transfer Pump (BT4)			
4	BDT 4-5			
5	Transfer Pump (BT 6)			
6	Refrigeration Comp.			
7	Seal H_2O System			
8	CTW Chromate Trt.			
9	HRC Pumps			
10	VCI Pumps			
11	Exhaust Fans **			
	SECOND FLOOR OF Vent. Cond.			
12	BDT 1			
13	BT 2			
14	BDT 2			
15	BDT 3			
16	BDT 4			
17	BDT 5			
18	BT 5			
19	BDT 6			
20	S. Pump set (Recovery)			
21	N. Pump set (Recovery)			
22	Scale Tk			
23	Exhaust Fans			
	THIRD FLOOR OF Vent. Cond.			
24	Pigment Room			
25	Polys 201-202			
26	Polys 205-206			
27	Polys 209-210			
28	Polys 213-214			
29	Vacuum jets			
30	Foam Trap Tk			
31	Scales			
32	Metering Station			
33	Control Room			
34	Exhaust Fans			

* No of fans operating, speeds, no of air changes/minute, as appropriate

** Locations as appropriate

BFG37799