Air Products and Chemicals INC.

ESCAMBIA PLANT

INTEROFFICE MEMORANDUM

To: Distribution

Date: 25 March 1980

Copies: ~~R. E. Jones~~
T. J. Regan

From: L. W. Allen

Re: Leak Detection and Elimination Program

Please find attached the newly revised Leak Detection and Elimination Program. This reflects the change in hydrocarbon detectors and the current use of horns in the area monitoring system.

Larry Wm Allen

Larry W. Allen

LWA:bg

Attachment

Distribution:
R. E. Gilbert
L. W. Allen
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PVC Shift Supervisors
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APR 8 1980
R. E. JONES

AP00042636

AIR PRODUCTS AND CHEMICALS, INC.

PACE (ESCAMBIA) PVC PLANT

LEAK DETECTION AND ELIMINATION PROGRAM

Revised: March 24, 1980

Original Issued: December 6, 1976

Air Products and Chemicals, INC.
ESCAMBIA PLANT

LEAK DETECTION AND ELIMINATION PROGRAM

The purpose of this program is to detect and correct any leaks which may occur in vinyl chloride handling equipment in the Pace (Escambia) PVC Plant of Air Products and Chemicals, Inc. The overall responsibility for the proper administration of this program belongs to the PVC Area Superintendent.

I. DESCRIPTION OF VINYL CHLORIDE "FIXED POINT MONITORING SYSTEM"

A. SAMPLE SYSTEM

There are three 16 stream sample systems installed at the analyzer house and two 10 stream units which will be reserved for process application at a later date.

Sample System Operation

There are 45 sample points at the PVC plant. These points are located on and around VCl pumps, reactors, strippers, stripping columns, recovery system, thermal oxidizer stack, and other pumps that pump liquids or gases. They are also at the loading and the unloading locations. From each point a tubing is run to the analyzer building where it is connected to sample pumps. The sample is pumped from each point successively. While the sample from one point is being analyzed, another pump is pulling gas from the remaining sample points to ensure that current samples will be taken. A back-pressure regulator controls the pressure of the sample loop to compensate for different line lengths since there are pressure drops in the sample lines. It is constantly controlled by a three-way valve which will block the sample flow to equalize the pressure before the sample is injected.

Gas Chromatographs

The five Bendix FID gas chromatographs will analyze and detect 0.1 ppm VCl with a range up to 36,000 ppm and accuracy below 1 ppm to meet OSHA specifications. The time required for each sample to be analyzed is 60 seconds.

Analyzer/Computer Interface

The interface between the analyzers and the host mini-computer will be done through Arcas micro-computers. Each micro-computer will operate two GC's. One micro-computer will operate #1 and #2 analyzers and the other will operate #3 analyzer. The GC's can be functioning even when the host computer is down or off the line. The host and micro-computers are interconnected with one 4-conductor signal cable. Additional micro-computers can be added in the future if needed.

A micro-computer unit is capable of operating two 16 stream units (15 sample points and 1 calibration).

A micro-computer chromatograph control unit will control the following equipment:

1) Valve Operations: Sample block, sample inject, column switch and all stream selection valves which are controlled independently for each chromatograph.
2) Calibration: Calibration automatically is done at specific times and when requested.
3) Peak Analysis: The analog signals are converted to digital values by 12 bit A/D converter. The A/D becomes active during a specified peak time. A threshold is established at the start of each gate to eliminate and suppress signal noise. When the peak slope exceeds the threshold, integration begins until the gate closes or the slope falls below the threshold. When the integration is complete, a factor calculated during calibration is applied for conversion of the peak to concentration units and stored in memory.
4) Stream Selection: Control is provided for sequential stream selection and its criteria at the completion of each chromatograph cycle. The

next sequential stream is selected and the peak concentration is properly identified by a peak number and stream identification.

5) Computer Linkage: After peak concentration is established and calculated, it will be transmitted to the central computer for reporting and storage. It will hold in memory the necessary peak data until all the parameters required have been received.

6) Controller Diagnostics: This can be initiated to check the proper operation of each controller at the main computer. If an error is detected, a report is generated on the main terminal.

7) Analog Outputs: This will be registered on a chart through a recorder.

8) Alarm Relay Control: An alarm will be initiated if the proper specification has been violated for each point (see Alarm System).

HOST COMPUTER

This is the main computer that is primarily used to control chromatographs simultaneously in a real time environment. The computer is equipped with the following:

1) General purpose computer system
2) Micro-computer chromatograph control unit
3) Real time software executive and application

a) General Purpose Computer: This is a PDP-8 family of processors. It has 32K core memory and will interface with many industrial devices. The configuration includes:

1) PDP-8/A computer with 32K core memory and omnibus.

2) DKC-8/AAI/0 option board, includes: Real time clock, 12 bit parallel I/O interface.

3) KM-8/AA extended option board. Includes: Memory extension and time share control.

4) RX-8/BA dual floppy disc drive and controller.

5) LA36-CE DEC writer. 30 characters per second keyboard printer up to 132 columns.

6) VT50-AA scope, video display/entry terminal.

7) KL8-A quad serial line interface unit.

b) Real Time Executive and Application Package: Software which resides in the mini-computer system. It handles the following:

a) Micro-computer chromatographs control unit interface software. Central control of all chromatographs through the micro-computer for report generation and data.

b) Real time clock interface software - monitors the system time as data received from chromatographs.

c) Diagnostic software - assists in troubleshooting system failures.

d) Permanent table storage and retrieval - information will be saved on floppy disc and enter information when needed plus complete program.

B. STANDARD OPERATION OF EQUIPMENT

Two micro-computers handle three gas chromatographs. Each gas chromatograph sample is points in the field and has one calibration point. Each GC is calibrated once per shift. All three gas chromatographs overlap. This means two GC's can cover the plant if any one of the three GC's goes down. Three sample points are analyzed each minute. The entire plant 45 points is covered every 15 minutes.

C. ALARM LIGHTS AND HORNS

The area is divided into seven zones with six to seven sample points in each zone. Each zone will have a horn for a total of seven horns.

Warning lights are also installed in the seven zones. A total of 51 lights in red, yellow and green colors.

The horns and lights operate from 110 VAC contacts operated by the micro-computer. Each horn will sound to indicate an alarm condition 5ppm or greater for that zone. The horn will repeat when the sample point

causing the alarm condition is analyzed again and found to have the same alarm condition or higher.

The light signals will indicate the different concentration levels that are preset by APCI as follows:

Concentration, PPM	Lights
0 - 1	Steady Green
1 - 10	Blinking Green
10 - 100	
100 - 1000	Steady Yellow
1000 - 3600	Blinking Yellow
3600 - 36,000	Steady Red
36,000 - Up	

E. REPORTS

1) Excursion Alarm Report: Generated when a point has exceeded one of four alarm levels and has been automatically verified by the system. The point identification, point concentration time of alarm will be contained in the report. The above information will also be contained in the point-alarm summary report which is generated upon request.

2) Point Alarm Summary Report: Provides a print-out containing each sample point, the total number of samples taken, the time weighted average concentrations and the number of times each alarm level was exceeded during a specified time interval. Upon request.

3) Area (Zone) Excursion Summary Report: Will provide a print-out of the points assigned to each zone, the average concentration, the maximum concentration detected and the number of excursions above the lowest alarm level for each point. The points averages will be averaged and included in the printout along with the zone average concentration, the maximum concentration detected and the total number of excursions for each zone. The report may be generated on an 8-hour and daily basis.

4) Calibration Report: Printed each time a calibration is requested and provides a means by which the operation may enter calibration standard changes. The report includes the chromatograph identification, the standard use, the time of day, and the results of calibration.

5) Daily Employee Entry Log: Logs the time and ID number of each employee that entered the gate during the previous day.

6) Shift and Daily Point Zone Summary: At the end of each shift and each day a date report is generated which is the average concentration for each point in each zone. These reports are kept for permanent record.

7) Data Dump Report: Provides the user with the ability to examine the data collected for a specified time interval (not to exceed a calendar day) by chromatographs (upon request).

II. DESCRIPTION OF PORTABLE HYDROCARBON DETECTOR

A. Type

Bacharach Instrument Company

TLV Sniffer

Portable Hydrocarbon Detector
(See attached sheets)

B. Principle of Operation

To detect and measure concentrations of vinyl chloride in the air, the TLV Sniffer catalytically oxidizes gas in a pumped-in sample of air by means of a catalyst-coated resistance element. The resistance of this element changes with changes in heat that are proportional to the amount of oxidized gas, thereby altering the electrical balance of the catalytic element as compared to the resistance of a reference element. Both the catalyst-coated ("active") element and the reference element are incorporated

in a Wheatstone Bridge circuit in such a way as to produce an electrical output proportional to their differences in resistance. Since any changes in air sample temperature and humidity affect both active and reference elements equally, the electrical signal output is proporational to the concentrations of combustible gas or vapor in the sample of air (expressed in volumetric terms as ppm). However, sudden changes in humidity may affect the zero reading on the x-1 range. The instrument should, therefore, be zeroed at the same R.H. prevailing during use.

The audible alarm response at the desired gas concentration ppm level is accomplished by comparing the gas concentration signal level with an internal reference voltage. Amplification of the difference between signal and reference voltages will, at a present level, operate the audible alarm.

C. Use

Every Monday, Wednesday and Friday a complete area leak check is made. An area map of the PVC plant is used. (Refer to attached map). All equipment and tanks are shown on the area map. A portable combustible gas detector manufactured by Bacharach Instrument is used. Vinyl chloride (ppm) is recorded on the plant map. All potential leaks are noted on the map. Daily maps are kept.

The gas holder and any items requested by Production are checked daily. If any piece of equipment is out of service on Monday or Wednesday, it is then checked on Tuesday or Thursday.

Any leaks which cannot be repaired immediately are brought to the attention of the Day Supervisor or Senior Operator. A maintenance request is then written to repair the leak. Checks for vinyl chloride emissions are made after the repairs.

III. CALIBRATION AND MAINTENANCE SCHEDULED FOR VINYL CHLORIDE MONITORING SYSTEM AND PORTABLE HYDROCARBON DETECTOR

A. Vinyl Chloride "Fixed Point Monitoring System"

1. Calibration

On a shift basis, the chromatographs are calibrated using a standard 1.0 ppm VCM gas to assure accuracy of the area analysis. The following routine is followed in the calibration of each chromatograph.

(a) The standard gas is valved into the sample header while isolating the header from the sample points.

(b) The calibration gas is then injected to the chromatograph. This is handled by the computer to simulate a sample from the sample system.

(c) The output of the calibration analysis is printed out.

(d) Calibration standard changes can be entered through the computer by the operator.

(e) Periodically the sample gas is checked with the laboratory to assure that it is still accurate.

2. Maintenance

The sampling system and chromatographs (in addition to calibrations) are checked daily for necessary repairs and adjustments. These include:

(a) Flow rates to each chromatograph are checked and adjusted as necessary.

(b) Chromatograph temperatures are checked and adjusted.

(c) Conditions of sample lines and connections are checked.

B. Portable Hydrocarbon Detector

Sensitivity Ranges

The TLV Sniffer circuitry and meter provide readings from 0 - 10,000 ppm

in three range settings. The first, with MODE SELECTOR switch set at PPM x 100, incidates from 0 to 10,000 ppm on the meter. The second range, with MODE SELECTOR set at PPM x 10, gives readings between 0 to 1000 ppm. The third range setting, at MODE SELECTOR position PPM x 1, provides readings from 0 to 100 ppm. Each range setting requires an easily made adjustment of the ZERO ADJUST control knob on the instrument front panel to set the meter indicating pointer to zero. Span adjustments for full-scale pointer deflection within each range are made periodically as necessary by means of three gain potentiometers located within the instrument.

Accuracy and Reliability

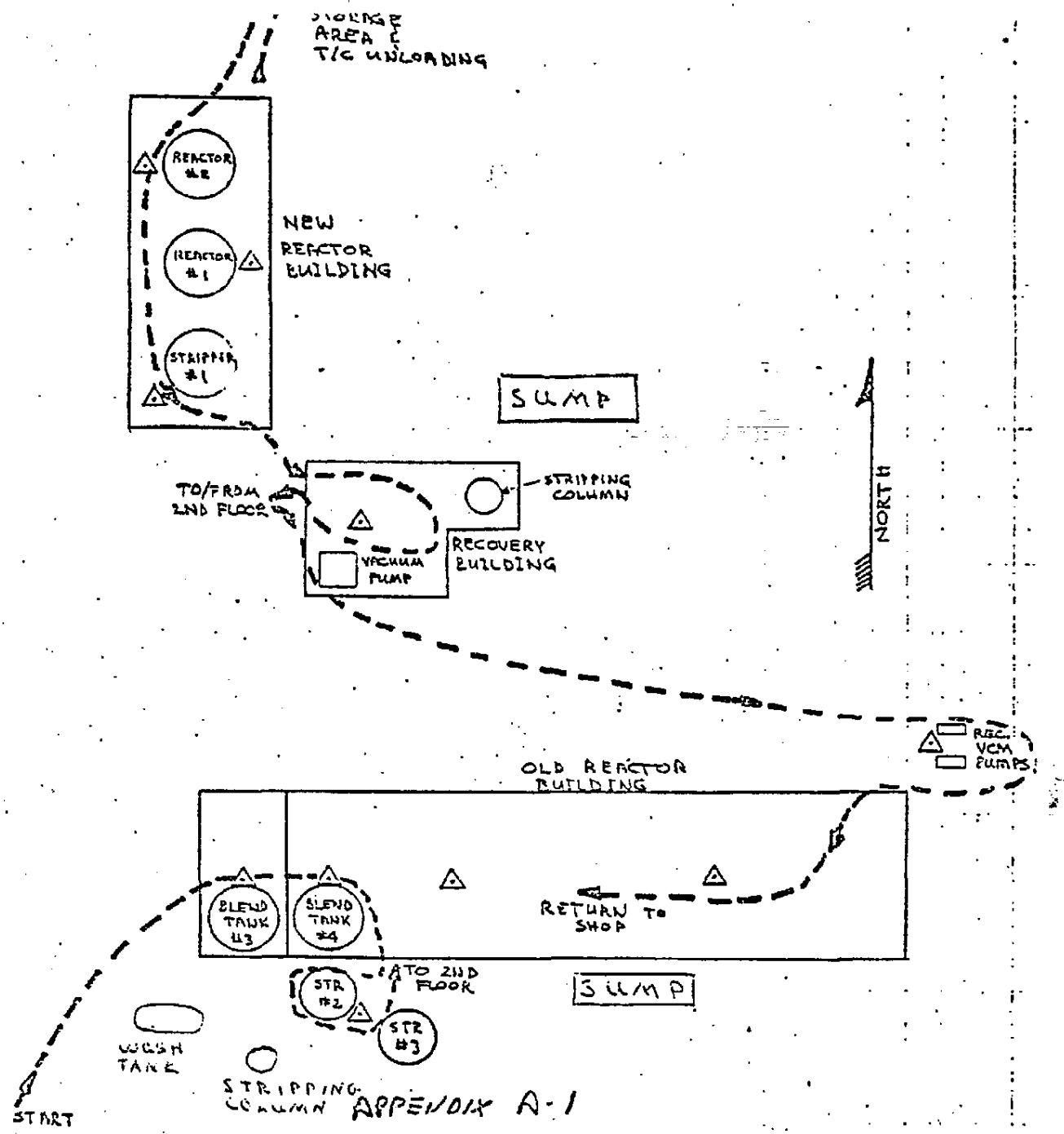
The extent to which meter readings correspond to actual parts per million of combustible gases in sampled air depend upon (1) the internal electrical stability of the instrument, (2) proper calibration of the instrument on gas mixtures of known concentration, and (3) purity of the air sample used for meter pointer zero setting.

The electrical stability of TLV Sniffer circuitry is best demonstrated with the MODE SELECTOR switch set at PPM x 1. In this most sensitive range of the instrument, all gas signal voltages are multiplied by 100, so that a 0-to 1-millivolt signal actually drives the meter pointer with the necessary 0 to 100 millivolts to achieve full-scale deflection. Thus a pointer deflection of 1/100 sensitivity of the TLV circuitry to minute electrical changes, the meter needle shows practically no deflection as power is applied to the speaker for the audible beep signal.

Given this electrical stability, any lack of correspondence between actual parts per million of combustible gas and the meter readings would be much more likely to arise from improper calibration of the instrument, or from setting meter zero in the presence of impure air than from instability of the TLV Sniffer circuitry.

It is calibrated for vinyl chloride at the factory (every year). Conversion curves are also available for correctly interpreting readings from combustible gases that release energy at different rates.

Thus, purity of the air sample used for meter pointer zero settings is by far the most important factor in obtaining accurate ppm readings. Ideally, the pointer should be zeroed in the PPM x 1 mode of operation, where deviations from zero would be more apparent because of maximum deflection. In this range, however, extreme sensitivity causes the instrument to respond to the slightest traces of gas. Wisps of cigarette smoke, fumes from passing autos, and subtle air contaminations from any other sources may affect the zero setting. The extent to which zero readings are biased because of air sample impurities will be reflected in less accurate readings of actual gas concentration ppm. Frequently, an apparent negative drift of the meter pointer may be caused by carrying the instrument to an area of fresher air after zeroing the meter inadvertently on air that was not as pure.



APPENDIX A-1

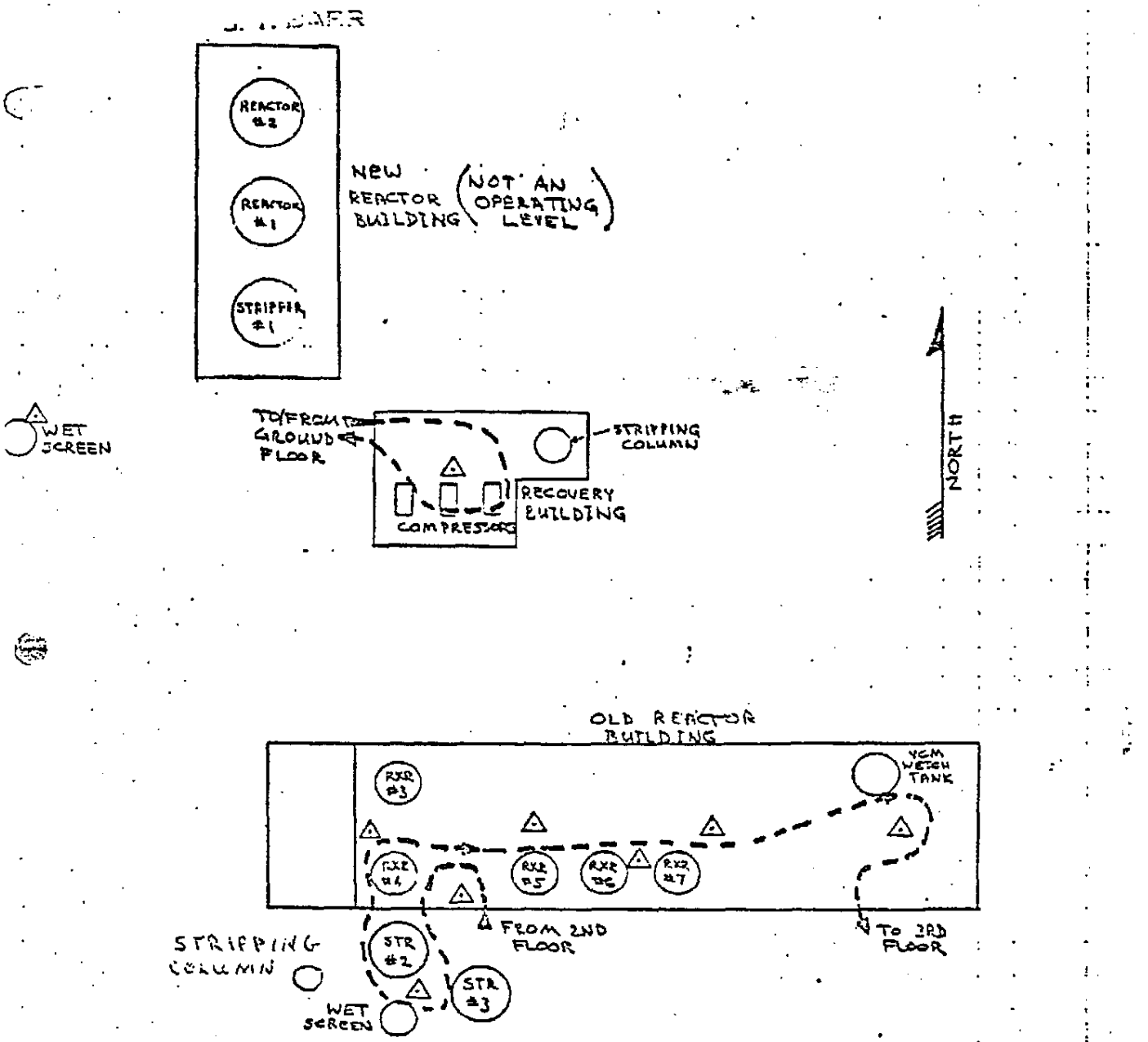
GROUND LEVEL

VCM MONITORING SYSTEM

△ ← SAMPLE POINT LOCATIONS

STR = STRIPPER

– – – – PATH OF LEAK PATROL

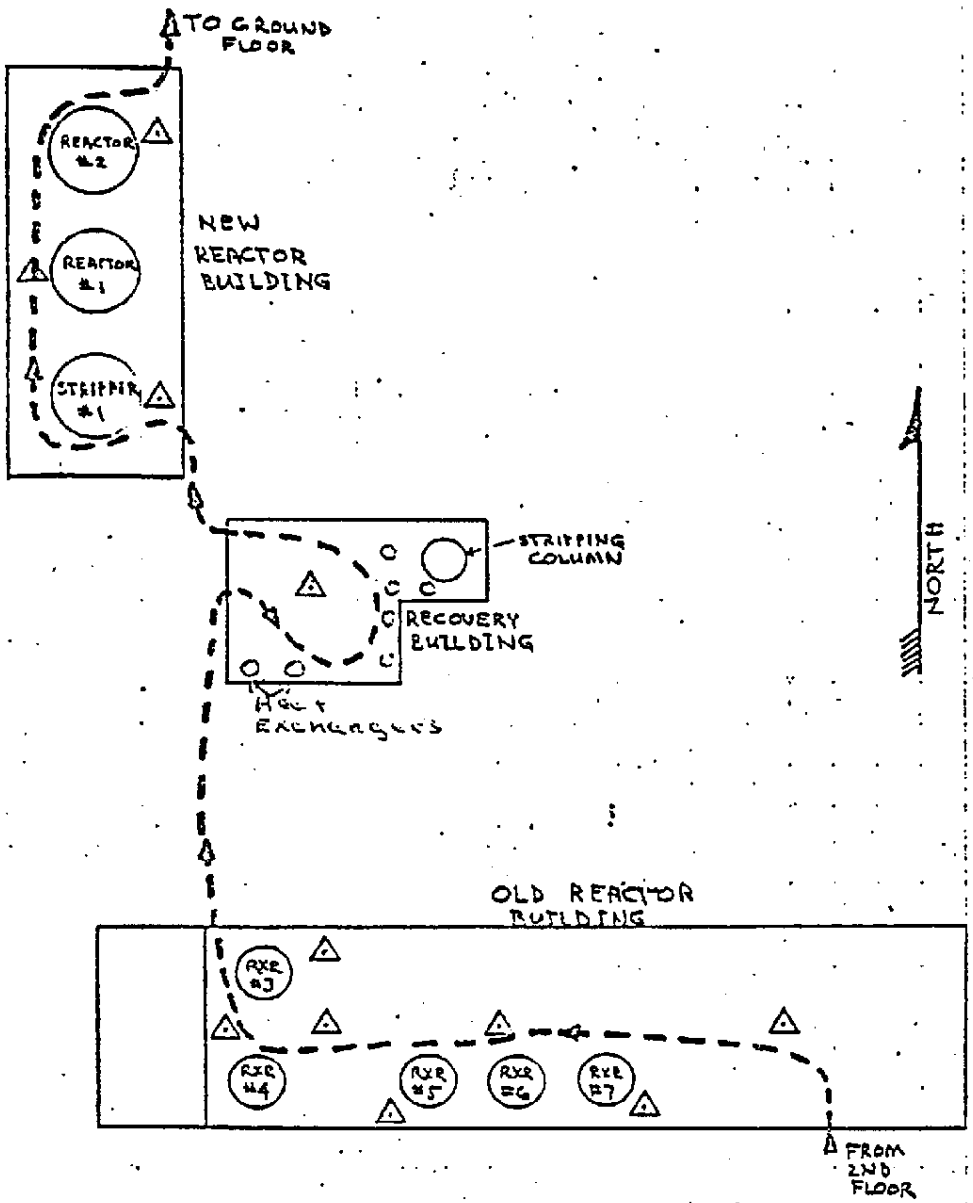


APPENDIX A-2

20' LEVEL FLOORS
VCM MONITORING SYSTEM
△ ← SAMPLE POINT LOCATIONS

RXR = REACTOR
STR = STRIPPER

– – – – – PATH OF LEAK PATROL



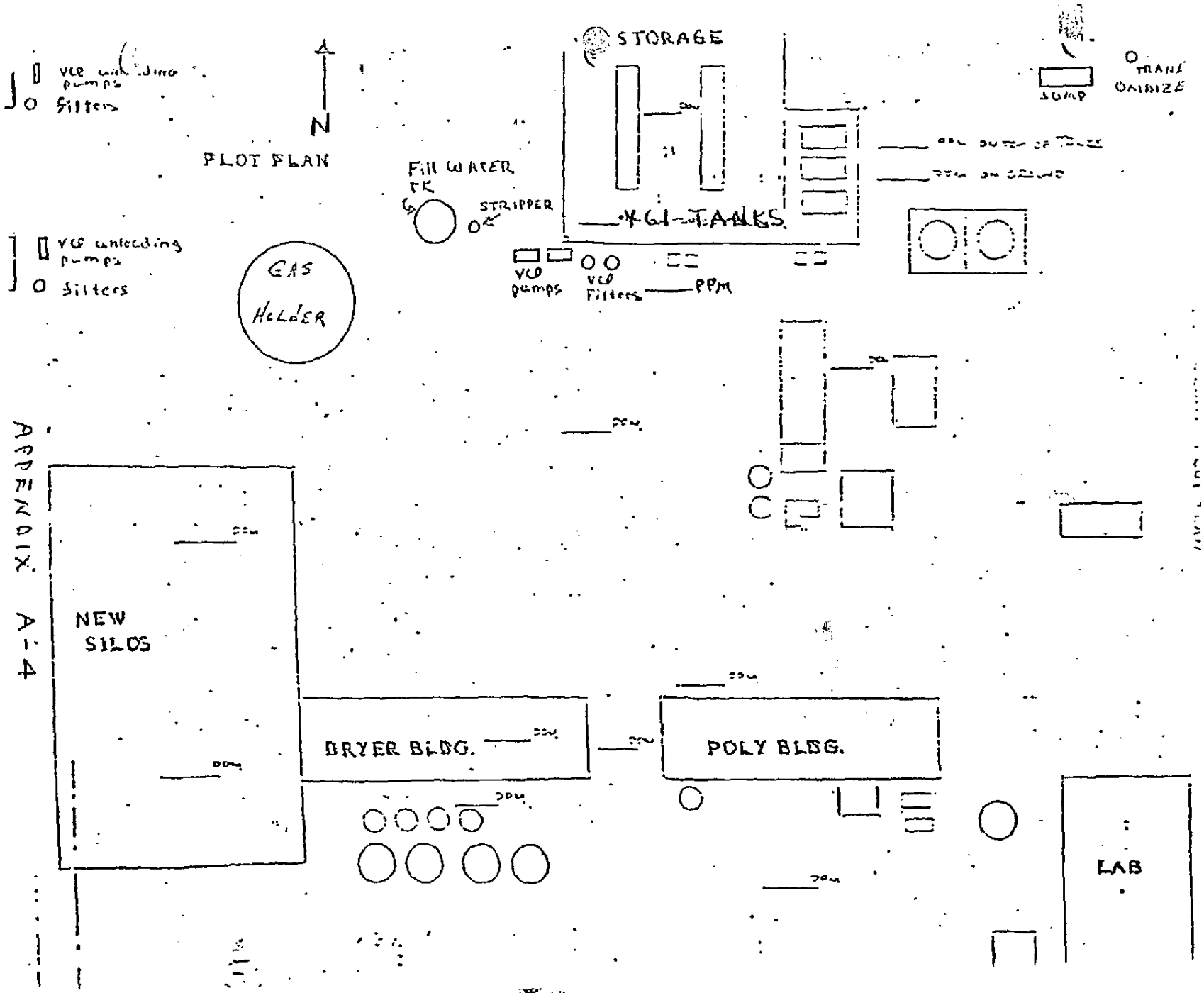
APPENDIX A-3

REACTOR LEVEL
VCM MONITORING SYSTEM

△ ← SAMPLE POINT LOCATIONS

RXR = REACTOR

- - - - - - - PATH OF LEAK PATROL


PLOT PLAN
N
STORAGE
VCM TANKS
Fill WATER TK
STRIPPER
VCM pumps
VCM Filters
PPM
VCM unloading pumps
Filters
GAS HOLDER
JUMP
TRANS OXIDIZE
NEW SILOS
DRYER BLDG.
POLY BLDG.
LAB
APPENDIX A-4

IV. PLAN OF ACTION TO BE TAKEN WHEN A LEAK IS DETECTED

A. Leak Detection Procedure

The PVC CRT operation will monitor the results of chromatograph system as it is output to the teletype. All readings over 10 ppm are to be circled. When two consecutive readings over 10 ppm are noted, the word "leak" is written next to the second reading, and the date, time and zone noted on the teletype output sheet.

The CRT operator is then to notify the Supervisor (or Senior Operator if the Supervisor is unavailable) of the leak. The Supervisor is responsible for getting the portable analyzer and looking for the source of the leak. He may do this himself, or he may assign one of the operators to do this. The person doing the searching for the leak will have to remain in radio contact with the Board Operator to prevent wasting time looking for a leak that has already disappeared. If a leak is found, the "Procedure for VCM Leaks" should be followed.

B. Plan to Action to be Taken When a Major Leak Is Detected

The following operational plan will be used for handling emergency situations (unexpected massive release of VCM) for facilities storing, handling or otherwise using VCM as a liquid or compressed gas. Appropriate portions of the plan shall be implemented in the event of an emergency.

Employees engaged in hazardous operations shall wear proper respiratory equipment and protective garments.

1. Major VCM Releases

   Should a major VCM release occur, i.e., flange, broken line, blown manways gasket, etc., follow the emergency procedure given below:

   a. Notify foreman and all personnel in area that there is a bad VCM leak. Air masks will be put on by all personnel in area

b. Every attempt should be made to stop the leak as soon as possible. Proper respiratory and protective equipment should be worn.

c. All persons not required for emergency repairs should go to a safe area. The decision to leave the building will be made by the supervisor, or in his absence, the senior floor operator.

d. Advise the boiler operator who will notify personnel in other operating areas.

e. Barricade roads in path of vapors.

f. Do not connect or disconnect extension cords, or drop tools or metal objects that could cause a spark.

g. Shift Supervisor should check to make sure all people not engaged in emergency work are out of the area and are at a safe distance.

h. Maintenance personnel should be called out to repair the leak as soon as the area is cleared.

C. Plan of Action for Minor Leak

1. These leaks can often be stopped by tightening down on the bolts in the flanges or on the valve stem and valving off the supply of VCM to the point of leakage, if possible. Give maintenance a written work order to repair the leak. On shifts other than day shift, it will be the Shift Supervisor's decision if the leak is serious enough to call out maintenance personnel; but if the leak keeps the readings on the area monitor over 10 ppm for more than one hour, it should in general be considered serious enough to warrant a callout.

2. If the leak does not stop after tightening flange bolt and the valving off the VCM supply, immediately follow the instructions in the "Major VCM Release" section.

3. Sight Glass Leaks

DO NOT tighten down on the holding nuts. This may cause the glass to fail completely and compound the problem. If a sight glass leak is minor, ventilate the area well and then notify foreman. If it is a major leak, valve off the VCM supply, and immediately follow the instructions in the "Major VCM Release" section.

D. General

In case of any VCM leaks, major or minor, be certain to observe all of the precautions listed below.

1. Be sure all ventilating fans are operating.
2. Shut off VCM if feasible.
3. Put on breathing air face mask.
4. Caution all operation personnel.
5. Do not connect or disconnect any extension cords. Do not drop tools or any metal objects. Do not provide any source of sparks.
6. Stop maintenance or any outside contractors from working in the area or doing hot work.
7. Vessels or reactors with leaks that cannot be repaired immediately should have their contents transferred to another vessel, if possible.
8. Be sure no one is in a vessel. If so, get them out.

VI. Definition of a Leak

a) Two consecutive readings of any sample point on the vinyl chloride monitoring system of 10 ppm or greater shall constitute a "leak."

b) Definition of leak by the portable unit is as follows: A significant and persistent elevation of the local concentration above the background, for example, greater than 1,000 ppm at a point within a few cm. of the source.

VII. RECORDKEEPING

The original copy of all Shift Supervisor's Logs, vinyl chloride monitoring system charts, and calibration and maintenance reports for the area monitor and the portable hydrocarbon detector shall be kept by the PVC clerk for a period of two (2) years.