Tenneco Chemicals
A Tenneco Company

Organics & Polymers Division

P.O. Box 849
Pasadena, Texas 77501
(713) 479-3411

September 3, 1974

Mr. Sam Crowther
Texas Air Quality Services
8520 Shoal Creek Blvd.
Austin, Texas 78758

Dear Sam:

Enclosed with this letter are some data pertaining to VCM emissions from our New Jersey PVC plants which we are submitting for your information.

Part A contains descriptions of the suspension and dispersion processes. The suspension process as described is very similar to the process we plan to use at Pasadena.

I would like to call two points to your attention in the section headed Operating Efficiency. We have been able to make substantial reductions in monomer losses in the Burlington homopolymer process which we have used as a pilot operation. This has been done at the expense of product quality. The lower quality has resulted in customer complaints at a level which would be a matter of serious concern were it not for the general shortage of PVC in the market.

A second point of particular interest in attempting to extrapolate Burlington experience to the Pasadena plant is the initially high levels of loss at Burlington as compared to those anticipated at Pasadena -- 5.35% vs a maximum of 3%.

We certainly anticipate some of the work at Burlington being applicable to Pasadena but we do not now think we can expect the same percentage of improvement at both plants.

Part B describes several emission control systems in existence, being installed, or under study.

Adsorption by activated carbon is covered in some detail. Even though pilot results to date are not encouraging in regard to carbon life, we are installing two full scale units at Pasadena as stated in our permit application.

Tenneco believes the area monitoring systems being installed in all three of its plants will have a beneficial effect on pollution control by giving an early warning of any unusual fugitive emission and so lead to a generally higher standard of maintenance.

The ambient air monitoring information in Part D is the same that we gave to the E.P.A. during their visit to Burlington on August 22, 1974. For comparison, losses to the air are approximately 15,000 lbs/day at Burlington (plant capacity at 150 million pounds per year) and 4,800 lbs/day at Flemington (plant capacity at 80 million pounds per year). During the periods covered, Pasadena losses are projected to be about 4,800 lbs/day for comparison.

If you have any further questions on these subjects, please do not hesitate to call on us.

Yours very truly,

TENNECO CHEMICALS, INC.

W. P. Anderson
Director, Environmental Sciences

WPA/cjm
Enc.

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A. PROCESS DESCRIPTIONS

NEW JERSEY PVC PLANTS

Tenneco currently manufactures two types of suspension resin - hompolymer and copolymer - and dispersion resin in its New Jersey plants. A description of these processes is given below:

PVC Suspension Resin

Suspension resin is manufactured by charging a weighed amount of recovered and virgin VCM into a reactor containing a metered amount of water, suspending agency and a peroxide initiator. In the case of copolymer, vinyl acetate is also added. Under automatic control, the batch is heated to a predetermined temperature at which time the exothermic polymerization reaction takes place. The batch temperature is maintained with cooling water until no further exotherm exists and the pressure starts to drop. At this point, the batch is transferred into a stripper vessel and any remaining VCM in the reactor is drawn into the recovery system until a vacuum of 20 to 22" Hg exists in the reactor. This vacuum is broken with nitrogen and the reactor is washed out with water and made ready for the next batch.

In the stripper, the unreacted monomer is recovered until the stripper is at a vacuum of 20 to 22" Hg. Heat is applied by injection of live steam and further monomer is recovered. In the case of copolymer, vinyl acetate is removed from the exiting vapor stream by a condenser before it reaches the compressors. This recovered vinyl acetate is then reused in subsequent batches.

When stripping is complete, the batch is transferred into a blend tank where it is mixed with other previous batches. It is transferred as a slurry by pump to a solid bowl centrifuge where most of the water is removed. The wet cake drops from the centrifuge into a hot air dryer and is air conveyed as dry

resin into a collector. This dried PVC or copolymer is then screened to remove coarse particles and lumps and is then sent to bulk storage or to the bagging machines for bagging, palletizing and warehouse storage. The bulk product is stored in silos until ready for shipment in either rail hopper cars or hopper trucks.

PVC Dispersion Resin

Dispersion resin is manufactured by first combining a weighed amount of water, emulsifier and recovered and virgin monomer in a batch mix tank which is supported on a scale mechanism. A quantity of peroxide initiator is added and after sufficient mixing time, the batch is pumped through a series of high pressure pumps and orifices into the reactor. An exothermic polymerization reaction occurs and heat is removed over a period of twelve to eighteen hours by circulating cooling water.

When the reaction is complete, as evidenced by a loss of pressure and absence of an exotherm, the batch is transferred to a stripper. Once empty, the reactor is evacuated to the recovery system and most of the monomer remaining is recovered. The reactor is then ventilated, opened and cleaned with high pressure water.

In the stripper, the residual vinyl chloride monomer is removed by the recovery system until a vacuum of approximtely 22" Hg is reached. Further removal of monomer is effected by gradual heating. After stripping, the batch is transferred to the blend tank.

Water is removed from the PVC by the rotary vacuum filters. The resultant wet cake is then introduced into a hot air stream and is dried to a moisture content below 1%. This very fine dry powder is collected in a standard bag-house type collector whereupon it is conveyed into a Mikro-Atomizer size reduction machine.

Another collector separates this fine product from the air stream out of the Mikro-Atomizers and delivers it to a blender where small amounts of other materials are added. This finished product is then bagged, palletized and sent to the warehouse for storage and shipping.

OPERATING EFFICIENCIES

The efficiency of VCM utilization to saleable product varies as a function of the process with the dispersion technology practiced at Burlington being the least efficient. Through the years efficiencies have been improved for all processes, i.e., dispersion, suspension copolymer and homopolymer. Increased utilization of VCM in suspension hompolymer at Burlington has been improved significantly over 1973 as shown by Table I, attached. Some of this improvement is due to increasing the severity of stripping conditions whereby VCM is recovered and some, perhaps, to a better accounting for product. Equipment to permit more efficient stripping of homopolymer at the Flemington plant is being installed and is expected to be operational by October of this year.

The more severe stripping of copolymer and homopolymers over the last months has resulted in a product with a lower VCM content, however, this treatment has had a deleterious effect on product quality. Up to this point in time, we have had only a small number of shipments rejected by our customers for poor quality which is due to the shortage of PVC in the marketplace rather than product quality itself. Thus, we do not see our current stripping techniques as a long-term solution to the problem and significant R&D work to develop better techniques is currently underway.

Stripping VCM from the PVC slurry in the dispersion plant has so far been unsuccessful as the latex produced in this process is relatively unstable.

TABLE I

VCM OPERATING EFFICIENCY

	LOSSES AS VCM[1]		LOSSES AS PVC[1]		TOTAL LOSS	
	1973	1974	1973	1974	1973	1974
BURLINGTON HOMOPOLYMER	3.82	2.27	1.53	1.38	5.35	3.65
BURLINGTON COPOLYMER	2.61	2.46	0.66	0.63	3.27	3.09*
BURLINGTON DISPERSION POLYMER	3.68	3.39	5.08	3.71	8.26	7.10
FLEMINGTON HOMOPOLYMER	3.33	-	1.59	-	4.92	-

[1] All losses as pounds/100 lbs. monomer charged.

* Discrepancy is vinyl acetate loss.

B. POLLUTION CONTROL DEVICES

There are two basic types of emission control devices used in the PVC manufacturing facilities at Tenneco. One type is installed only for dust control. The device used is a bag filter collector which has an operating efficiency of 99.9+%. The other catgeory is condensation of VCM vapors via heat exchangers. Three prime factors must be highlighted when dealing with VCM in the PVC manufacturing process.

1. VCM is a compressed reactive gas
2. VCM is highly flammable in air
3. The process uses water as the polymer carrier.

Because VCM is a compressed reactive gas, there are temperature and, therefore, pressure limits above which the gas cannot be properly handled without the hazard of reactions in the recovery system. Due to its inflammability, it must be handled in nonoxygen-containing streams and, therefore, all recovery efforts must be prior to exposure to air. The fact that the process uses water as a carrier tends to set a minimum temperature in the recovery system in order to prevent freezing the water vapors in the heat exchangers.

In order to keep the various streams and vessels from air contact, nitrogen is used as a pad and purge gas. This inert gas is processed through the VCM recovery system and due to its noncondensing characteristics, it must be bled off in order not to build up excessive recovery system pressure. In the process of bleeding the nitrogen to maintain system pressure and temperature, some of the VCM vapors bleed off concurrently. Thus, we have the misnomer of monomer vent rather than the more accurate inert gas vent.

Proposed Techniques for VCM Emission Reduction

Tenneco is planning to install an activated carbon adsorption system in the new Pasadena PVC facility* for recovery of VCM from oxygen-free off-gas streams based on limited tests and data on activated carbon adsorption is given below. Other techniques which have been considered or seem promising for the future are:

1. More efficient stripping of monomer from the slurry, thus reducing VCM emissions from the dryer.

2. Use of condensible gases, such as steam, to purge vessels and piping between batches or prior to opening for maintenance.

3. Use of deep cryogenic condensation to recover VCM by liquification after drying.

4. Catalytic destruction or conversion of VCM in dilute streams.

5. Counter-current scrubbing of VCM from off-gas streams with a low volatility VCM solvating agent.

We have made preliminary calculations on the feasibility of removing the VCM contained in a PVC dryer outlet gas via absorption with a lean oil. Although such a system might be practical for oxygen-free streams, it was concluded that for the dryer outlet gas:

1. The system would be quite large and would have to be operated at several atmospheres pressure to allow practical lean oil rates.

2. Operating costs would be relatively high due to compression costs, heating and cooling and lean oil losses.

3. It would be a most dangerous operation which is the most powerful argument against it even if it were economical. Although actual organic vapor concentrations would be well below the explosive range, there would always be areas of mist formation which could easily be ignited by static electricity or other ignition sources.

*Under construction with expected start-up in late 1974

The description of the commercial activated carbon unit to be installed at Pasadena and its proposed application are presented in Table I. A photograph of the unit is also attached.

Tenneco has operated both laboratory and pilot plant activated carbon units for the recovery of VCM. The experimental results (laboratory) utilizing virgin VCM are attached as Tables II and III, and the results of pilot plant experiments using recovered vinyl chloride from a PVC pilot plant in Flemington, New Jersey are attached as Table IV. The Tenneco pilot plant was the one referred to by the Calgon representative who testified at the OSHA hearings in Washington, D.C.

The information presented in Table I shows that the commercial application for activated carbon adsorption designed for our Pasadena plant is solely for the purpose of recovering VCM from two small process streams which vent to the atmosphere and had posed a potential air pollution problem; that these streams have a composition in which air is not a major constituent and VCM concentration is relatively high (10-30 percent) and that no system has been designed to collect ambient air in the Pasadena, or any other plant, and to remove low concentrations of VCM from such ambient air.

The experimental results with virgin VCM, Tables II and III, show that tests carried out for 19 to 21 cycles indicate some decrease in bed capacity with time. Preliminary extraction experiments on the used carbon showed no PVC to be present, however, additional chemical tests are underway. Further, data on surface area and pore size are being obtained to determine the extent of physical degradation of the carbon.

Experimental results with a recycle VCM stream from the PVC pilot plant containing 29 mol percent VCM for longer periods, 28 cycles, show bed capacity

was adversely affected as in the tests with virgin monomer. These data for a limited number of cycles cast doubt on the commercial feasibility of using activated carbon to recover VCM, particularly when a commercial unit must be capable of operating for thousands of cycles to be practical. These data also show that short periods of operation in the laboratory, 15 cycles or less, are not sufficient to demonstrate the long-term efficiency of activated carbon for recovering VCM. Laboratory and pilot plant tests are continuing and it is hoped that perhaps other types of activated carbon or variations in the adsorption-desorption cycle can be developed which will give acceptable performance.

AREA MONITORING SYSTEM

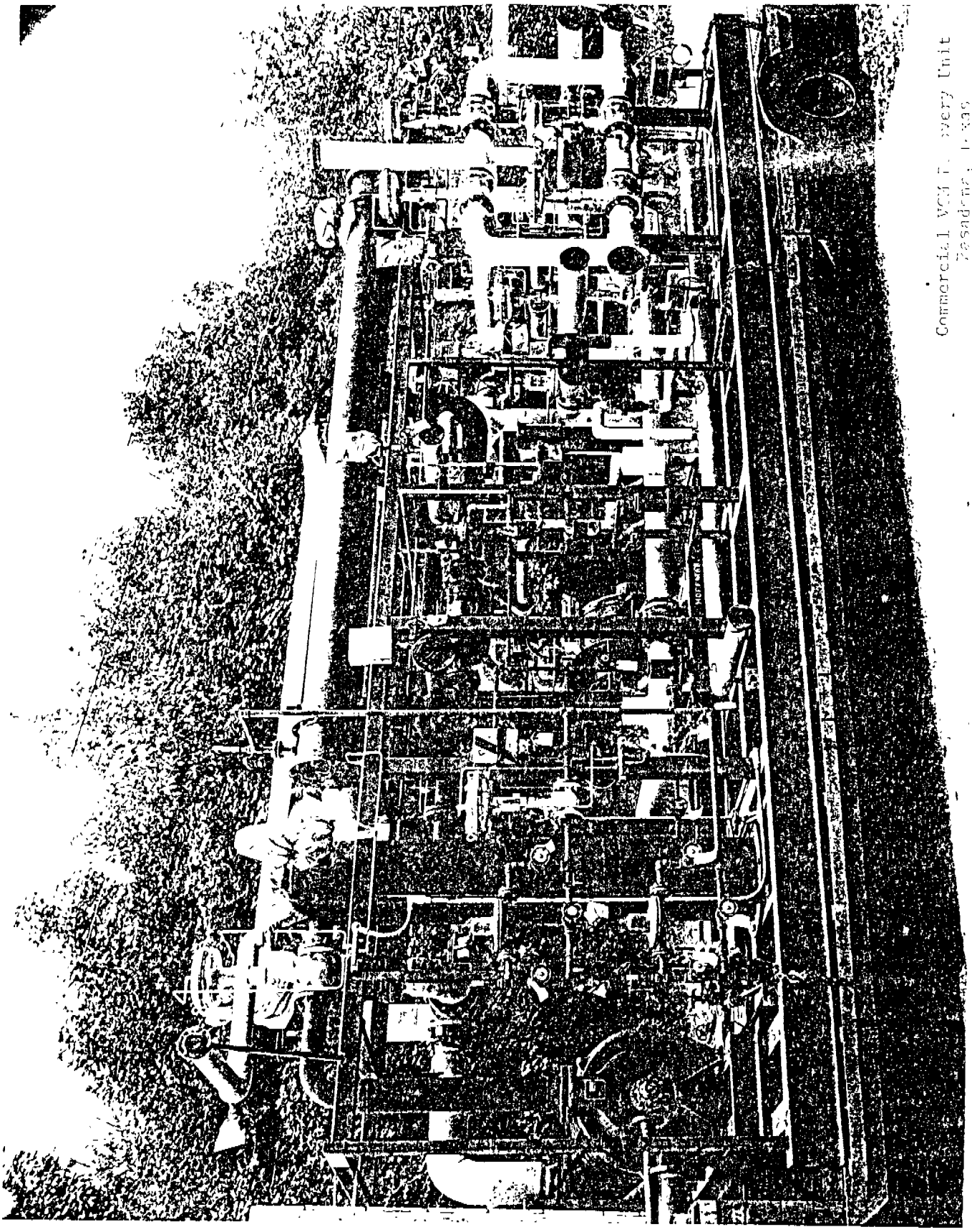
Other equipment which is expected to be of great value in minimizing losses of VCM are the sequential area monitoring systems that are being installed in the Burlington and Flemington, New Jersey PVC plants and the Pasadena facility. These instruments will provide essentially continuous monitoring of the working atmosphere in these plants. The systems are designed to give an audible alarm if the VCM concentrations increase above a set level, and thus, afford an immediate warning of VCM leakage. This "real time" analysis will permit mechanical and operating corrections to be made immediately; something that is not possible with the personnel monitoring procedures now used throughout the industry.

For the Burlington and Flemington plants, the gas chromotography monitoring systems have been purchased from Bendix. Sampling frequency at any

location will be every 10-15 minutes with an accuracy of ± 0.5 ppm VCM in the range of 0-50 ppm. Samples are to be taken at 90 points at the Burlington PVC facility and 35 points at the Flemington plant. Both units are scheduled to be operational by early November.

AUTOMATED REACTOR CLEANING SYSTEM

The development of an automated reactor cleaning system will measurably reduce emissions of VCM, particularly if such cleaning can be done without having to open the reactor between batches. Currently, Tenneco is evaluating the use of the Goodrich "HRC" high pressure water cleaning system and solvent cleaning for use in the New Jersey plants. Prototypes of automated cleaning devices have been built and tested at the Pasadena site, however, the effectiveness of this sytem will not be known until the Texas plant is in operation later this year.



Commercial VCR Recovery Unit
Pasadena, Texas

COLORITE 008321

TABLE 1

COMMERCIAL ACTIVATED CARBON UNIT

DESIGN CONDITIONS

The activated carbon unit to be installed in Tenneco Chemicals, Inc. Pasadena Polyvinyl Chloride facility is designed to recover vinyl chloride monomer (VCM) from two small process streams. Data concerning these streams and proposed conditions of operation of the activated carbon unit are given below:

	Slurry Tank Vent	VCM Condenser Purge
Design Conditions		
Flow (SCFM)	58.3*	1.1
Pressure (psig)	2	2
Temperature (^{o}F)	60	40
Composition (Mol. %)		
VCM	10.6	28.9
Nitrogen	75.2	64.3
Oxygen	-	6.6
Water	14.2	0.2

*This flow occurs 15 minutes every 2.6 hrs.

Operating Cycle

Step	Time (minutes)	Flow Rate (SCFM)	Direction of Flow
Adsorption	180	--	Down
Steam (10 psig 240^{o}F)	60	350	Up
Hot Nitrogen Purge (300^{o}F)	40	800	Down
Cold Purge (70^{o}F)	80	800	Down

Unit Specifications

Two (2) - 4 ft. I.D. vertical beds with a packed height of ten feet. Activated carbon to be Pittsburgh Type BPL manufactured by the Calgon Corporation, Pittsburgh, Pennsylvania. Skid mounted adsorption unit manufactured by Chemical Design, Inc., Lockport, New York.

TABLE 11

ADSORPTION OF VIRGIN VINYL CHLORIDE MONOMER

ON ACTIVATED CARBON

EQUIPMENT - Steel pipe, 1.61" ID packed with Pittsburgh Type BPL 4 x 10 mesh activated carbon manufactured by the Calgon Corporation, Pittsburgh, Pa. Packed height of bed 5'2".

EXPERIMENTAL CONDITIONS - Virgin vinyl chloride (VCM) manufactured by Shell Chemical Company, Houston, Texas mixed with air to give a gas composition of 29 mol percent VCM and 71 mol percent air was fed to the activated carbon bed at a nominal velocity of 29 feet per minute at ambient temperature (70°F) and pressure.

Step	Time (Min.)	Direction of Flow
Adsorption	20-30[2]	Downward
Steam Desorption (20 psig 0.6 lb/min)	60	Upward
Nitrogen Drying (250°F)(0.3 CFM)	60	Downward

Cycle Number	Bed Capacity (lbs VCM/lb Carbon)
1	17.8[1]
3	16.7[1]
5	20.0[1]
7	18.6[1]
9	21.3
11	21.3
13	22.0
15	18.1
17	19.4
19	14.9
21	13.6

(1) Concentration of VCM and gas velocity varied during first seven cycles.

(2) Time varied since adsorption step terminated when VCM breakthrough occurred.

Carbon Analysis - After 21 cycles the used carbon was removed from the unit and extracted with THF. The THF extract gave 0.11 weight percent liquid which on analysis proved to be a phenolic compound, however, no PVC was found to be present.

TABLE III

ADSORPTION OF VIRGIN VINYL CHLORIDE MONOMER

ON ACTIVATED CARBON

EQUIPMENT - Steel pipe, 1.61" ID packed with Pittsburgh Type BPL 12 x 30 mesh activated carbon manufactured by the Calgon Corporation, Pittsburgh, Pa. Packed height of bed 5'2".

EXPERIMENTAL CONDITIONS - Virgin vinyl chloride (VCM) manufactured by Shell Chemical Company, Houston, Texas mixed with air to give a gas composition of 29 mol percent VCM and 71 mol per cent air was fed to the activated carbon bed at a nominal velocity of 29 feet per minute at ambient temperature ($70^{\circ}F$) and pressure.

Step	Time (min.)	Direction of Flow
Adsorption	20 - 30 (2)	Downward
Steam Desorption (20 psig, 0.6 lbs./min.)	60	Upward
Nitrogen Drying ($250^{\circ}F$), (0.3 CFM)	60	Downward

Cycle No.	Bed Capacity (lbs. VCM/lb. Carbon)
1	21.9 (1)
3	22.1 (1)
6	19.1 (1)
7	24.1 (1)
9	19.0
11	20.6
13	22.2
15	20.6
17	16.7
19	18.2

(1) Concentration of VCM and gas velocity varied during first 7 cycles.

(2) Time varied since adsorption step terminated when breakthrough occurred.

Carbon Analysis - After 19 cycles, the used carbon was removed from the unit and extracted with THF. The THF extract gave 0.16 weight percent liquid which on analysis proved to be a phenolic compound, however, no PVC was found to be present.

TABLE IV

ADSORPTION OF RECOVERED VINYL CHLORIDE MONOMER

ON ACTIVATED CARBON

EQUIPMENT - Steel pipe, 1.61" ID packed with Pittsburgh Type BPL 4 x 10 mesh activated carbon manufactured by the Calgon Corporation, Pittsburgh, Pa. Packed height of bed 5'2".

EXPERIMENTAL CONDITIONS - Vinyl Chloride Monomer recovered from a pilot plant polymerization reactor in Flemington, New Jersey having a gas composition of 29 mol percent VCM and 71 mol percent air was fed to the activated carbon bed at a nominal velocity of 29 feet per minute at ambient temperature (70°F) and pressure.

Step	Time (Min.)	Direction of Flow
Adsorption	20 - 30 (1)	Downward
Steam Desorption (20 psig 0.6 lb/min)	45 - 120	Upward
Nitrogen Drying (250°F), (0.3 CFM)	60	Downward

Cycle Number	Bed Capacity (lbs. VCM/lb. Carbon)	Steam Desorption Step (min.)
1	19.4	45
3	15.1	45
5	18.7	70
7	15.1	45
9	18.7	75
11	18.0	75
13	17.3	75
15	18.4	75
17	14.4	100
19	18.0	100
21	12.2	110
23	11.2	120
25	9.8	120
27	6.1	120
28	8.3	120

(1) Time varied since adsorption step terminated when VCM breakthrough occurred.

Carbon Analysis - After 28 cycles the used carbon was removed from the unit and examined. There was no visible evidence of PVC on the carbon or change in carbon color. The carbon was extracted with THF and the extract gave 0.06 weight percent liquid which on analysis proved to be a phenolic compound, however, no PVC was found to be present. Unused carbon extracted with THF yields 0.06 weight percent of liquid of similar type as the used carbon.

C. FUGITIVE EMISSION SOURCES

The fugitive emissions from the PVC plants are extremely difficult to estimate since a sufficiently accurate material balance has not as yet been developed. The potential points of fugitive emissions, however, are in the main known and a number of these have been checked at the New Jersey plants to determine the general extent of leakage. These potential points and operations are connecting and disconnecting of VCM tank cars, opening of the reactors and strippers between batches, leakage at compressor packing and pump seals, and leakage at valve stems. Other areas where leakage can occur are at safety valves and flanged joints and during sampling and tank level gauging.

Periodic checks at valves and flanges with a Century Flame Ionization Detection unit capable of detecting levels of VCM of 2 ppm has shown that adequately maintained valves and flanged joints show no detectable leakage. Flanges near pumps and other vibratory equipment, however, need attention to maintain a no-leakage condition. Compressor seal leakage, opening of reactors and strippers and operations associated with unloading VCM tank cars are believed to be the major causes of fugitive emissions.

Cost Aspects of Pollution Control Devices

A review of the construction cost of the New Jersey PVC facilities was made to determine the cost of installed pollution control devices. At the Flemington plant, built in 1957, $448,000 was spent at that time for bag houses, other dust control equipment and a monomer vent condenser. In 1973, a fluid bed dryer was installed at this site and associated bag collectors, cyclones, etc. required an investment of $48,000.

The copolymer plant at Burlington was constructed in 1962 at which time $610,000 of the total plant investment was spent in the area of dust control and VCM recovery. In 1964 the plant was expanded with the equipment installed then currently in suspension homopolymer production. Cost of emission control items installed at that time was $895,000. Investment in pollution control equipment installed in the dispersion plant at Burlington in 1964 was $739,000. An expansion in 1969 of the dispersion plant required $1,100,000 for such equipment.

As indicated in an earlier section of this report, it is planned to install an activated carbon adsorption unit at the 240 million pound per year PVC plant now being constructed at Pasadena, Texas. The cost of this unit installed is projected at $300,000, however, actual operating costs are not available as yet.

Preliminary and very rough estimates of capital requirements for substantial reduction of emissions beyond the reductions already accomplished or demonstrated are in the multi-million dollar range. Estimates are subject to variation based on technical feasibility and requirements of other agencies, such as those of OSHA.

D. AMBIENT AIR MONITORING INFORMATION

At each of the two polymer plants a series of sampling points around the plant perimeter were selected and sets of grab samples were taken at these points starting in early April. Data for the period April 2 through August, 1974 are presented in the following tables:

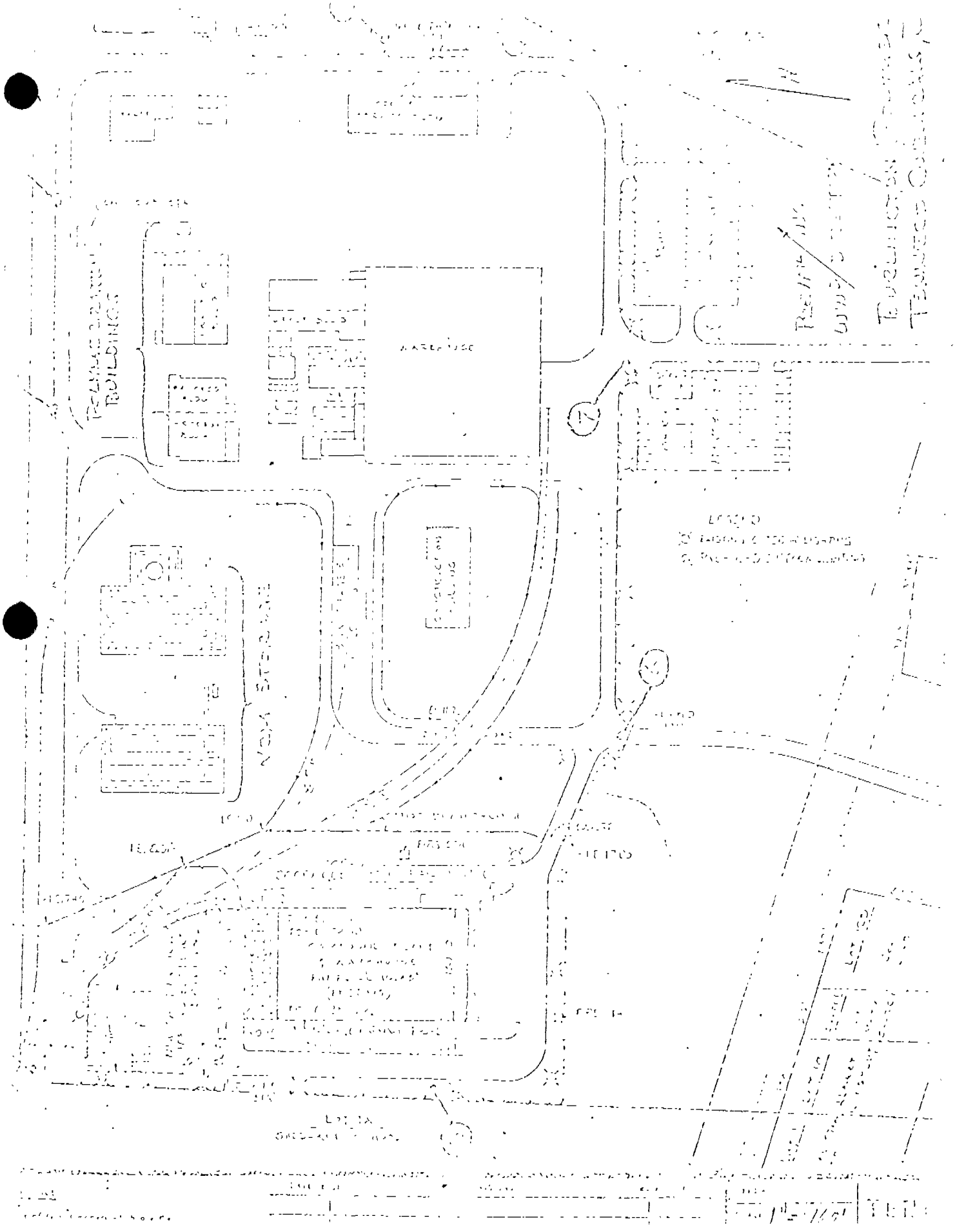
At the initiation of the sampling program, the gas chromotographic method used for VCM analysis was felt to be sensitive to 0.5 ppm V/V basis. However, with experience and refinement of the technique, it is now believed sensitivity is 0.1 ppm V/V basis. In approximately ninety percent of the samples, the VCM concentration was below the detectable level.

Attached are the following: 1) Plot plan of the Burlington plant; 2) Tabulation of the data at the Burlington plant; 3) Plot plan of the Flemington plant; and 4) Tabulation of the data at the Flemington plant.

Additional information on Tenneco sampling and analytical methods is given below:

All samples were grab samples taken in a standard glass 500 ml. gas burette fitted with a septum. Samples were collected by drawing air at 2 L/min. through the burette for 5 minutes, then closing the stop cocks. Samples for analyses were withdrawn through the septum using a syringe.

Analyses were carried out using a Hewlett-Packard Model 810 Gas Chromatograph or equivalent with a hydrogen flame ionization detector. The chromatographs were fitted with 1/4" x 2M columns packed with 15% V-Con 550X-LB on Anakrom ABS, 60-8 mesh. Columns were held at ambient temperatures. Flame hydrogen flow at 10 psig pressure was 30 ml/min. Helium carrier gas flow was 60 ml/min. at 50 psig. Sample size was 5.0 ml.



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VCM IN AMBIENT AIR - BURLINGTON PLANT SITE

VCM DETECTED - PPM

SAMPLING POINT / WIND DIRECTION	4/3 S	4/4 SW	4/10 NW	4/19 NW	5/21 NW	5/22 SW	5/24 SW	5/28 NW	5/30 NE	5/31 N	6/3 S
1. Office Parking Lot	ND	ND	ND	ND	ND	4.0	ND	0.5	ND	ND	ND
2. Catalyst Weigh Shack	ND	0.7	ND	ND	ND	3.0	ND	ND	ND	0.8	ND
3. North Gate	1.3	0.6	ND	ND	ND	ND	1.9	ND	ND	1.0	4.7
4. Railroad Gate	1.4	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
5. Fence Near CPD. Plant	0.7	ND	ND	ND	ND	ND	ND	ND	ND	0.5	ND
6. CPD. Plant Gate	0.7	ND	ND	1.7	ND	ND	ND	ND	ND	ND	ND
7. Main Gate	3.7	ND	ND	0.5	ND	0.5	ND	ND	ND	0.5	ND

ND = NONE DETECTED (0.5 PPM)

6/6/74
F.W.K.

[illegible]

[illegible] Detected – [illegible]

[illegible]	[illegible] 5	[illegible] 7	[illegible] 10	[illegible] 12	[illegible] 17	[illegible] 19	[illegible] 21	[illegible] 24	[illegible]	[illegible]	[illegible]	7/1	[illegible] 12	[illegible]	[illegible]	[illegible] 19	[illegible] 22	[illegible]	[illegible] 26	[illegible] 29	[illegible] 31	[illegible] 2	[illegible]	[illegible]	[illegible] 12	[illegible] 14	[illegible]	[illegible]
[illegible] Direction [illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]			[illegible]		[illegible]		[illegible]	S	[illegible]	[illegible]	S	[illegible]	S	[illegible]	No Wind	[illegible]	[illegible]		[illegible]
[illegible] Temperature [illegible]	[illegible]	[illegible]4	[illegible]	[illegible]	75	[illegible]	[illegible]	60	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	90	84	[illegible]2	[illegible]2	75	[illegible]4	[illegible]	[illegible]
[illegible] Humidity [illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	–		[illegible]	[illegible]	[illegible]		[illegible]	[illegible]	[illegible]	[illegible]	2	63	43	75	[illegible]	[illegible]	[illegible]	[illegible]	75	[illegible]
[illegible] Pressure [illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	30.2	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	29.9	–	30.1	[illegible]	[illegible]	[illegible]	30.1	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
[illegible] Velocity, mph	[illegible]	[illegible]	2-4	0-[illegible]	[illegible]-2	[illegible]	0-1	5-10	[illegible]	2-[illegible]	[illegible]	[illegible]-4	12	[illegible]	8-10	[illegible]	4	0-[illegible]	[illegible]	4-9	2-5	5	2-[illegible]	0	1-2	0-1	5	2-[illegible]
1. Office Parking Lot	0.2	[illegible]	[illegible]	1.[illegible]	ND	ND	0.4	ND	0.[illegible]	ND	ND	[illegible]	0.2	2.[illegible]	1.[illegible]	0.2	0.1*	ND	ND	0.7	1.2	1.7	ND	ND	ND	2.6	ND	ND
[illegible] Weigh Shack	0.[illegible]	[illegible]	1.[illegible]	ND	0.4	1.[illegible]	0.[illegible]	ND	[illegible]	[illegible]	[illegible]	[illegible]	0.[illegible]	[illegible]	[illegible]	[illegible]	1.3	0.4	[illegible]	ND	0.7	0.5	ND	ND	ND	ND	0.1	[illegible]
[illegible] North Gate	ND	0.[illegible]	[illegible]	ND	ND	0.1	[illegible]	0.4	ND	ND	[illegible]	[illegible]	0.2	[illegible]	[illegible]	[illegible]	0.1	0.4	[illegible]	0.7	1.9	3.2	0.3	ND	ND	2.6	[illegible]	ND
[illegible] Railroad Gate	ND	0.[illegible]	ND	ND	ND	0.1	0.[illegible]	0.5	ND	ND	[illegible]	0.1	0.2	ND	1.2	–	1.3	1.[illegible]	0.7	1.1	0.7	2.3	0.3	ND	ND	ND	0.1	ND
[illegible] Fence Near Cmpd. Plt.	ND	0.5	0.2	ND	ND	ND	0.5	0.4	0.2	0.1	ND	0.1	0.[illegible]	ND	[illegible]	0.4	0.3	ND	0.2	ND	0.3	1.4	ND	ND	ND	1.3	0.1	ND
[illegible] Plt. Gate	ND	0.5	[illegible]	ND	[illegible]	[illegible]	[illegible]	ND	[illegible]		1.5	0.1	[illegible]	[illegible]	1.3	[illegible]	0.1	[illegible]	[illegible]	[illegible]	0.9	[illegible]	ND	ND	ND	0.9	0.1	[illegible]
[illegible] Gate	ND	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	0.7	0.7	[illegible]	[illegible]		[illegible]	[illegible]	[illegible]	–	0.1	[illegible]	2.9	1.9	[illegible]	0.9	ND	ND	ND	ND	ND	[illegible]

* Starting 7-22-74 [illegible]

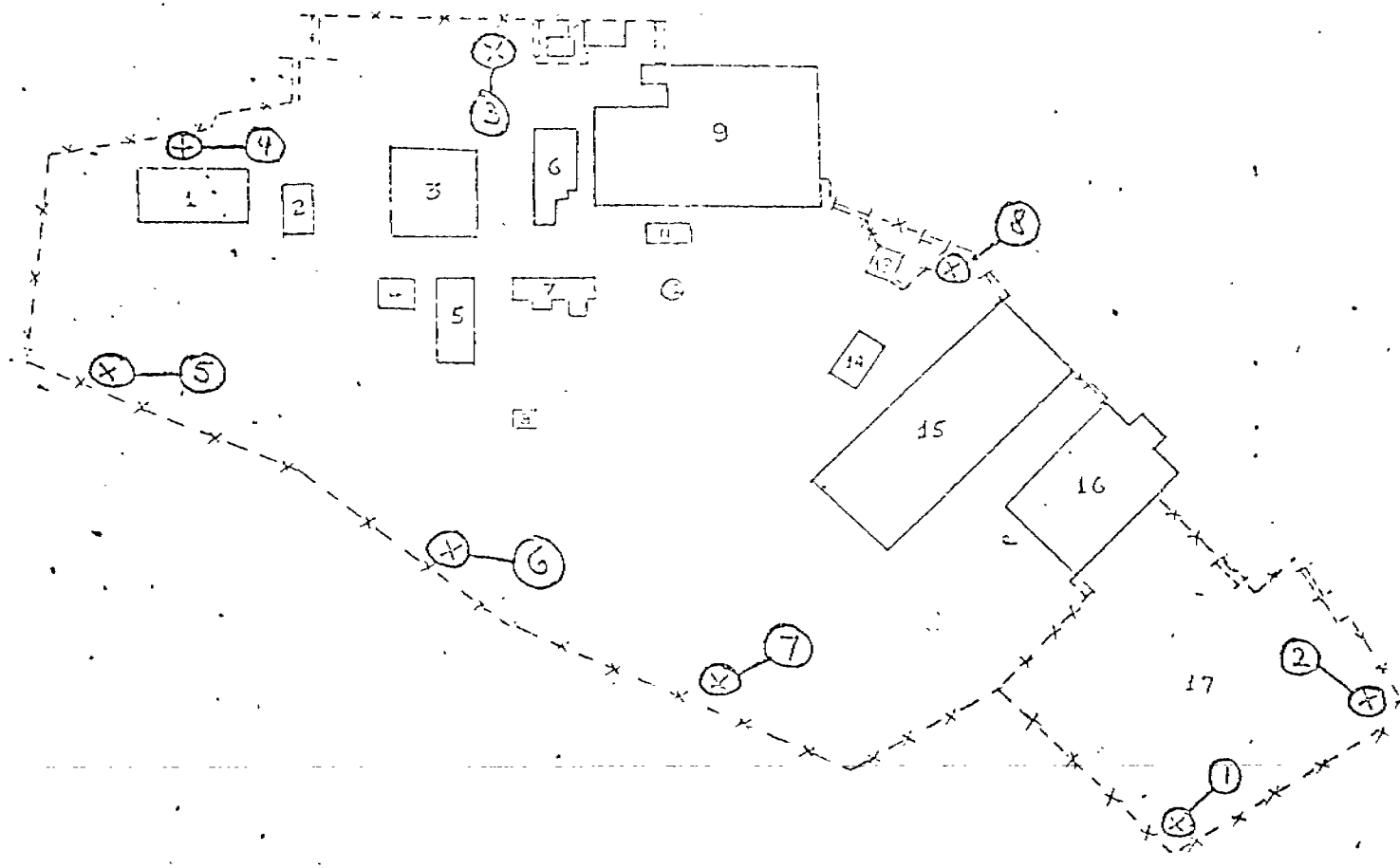
[illegible]

ND = None Detected <0.1 ppm

Note: Limit of detection improved to <0.1 ppm since last report

[illegible]

COLORITE 008331



1 REACTOR BUILDING
2 DAY TANK AREA
3 STORAGE TANKS
4 PILOT PLANT
5 PILOT PLANT
6 DRYING BUILDING
7 BOILER HOUSE
8 CATALYST STORAGE
9 WARE HOUSE
10 TRANSFORMER/ GENERATOR
11 LUNCH ROOM
12 WATER TOWER
13 GUARD ROOM
14 OFFICE
15 FABERCAL BUILDING
16 R+D CENTER
17 PARKING LOT

PREVAILING WIND DIRECTION

N

FLEMINGTON POLYMER PLANT
SITE PLAN
TENNECO CHEMICALS, INC.
SCALE: 1" = 160'

COLORITE 008332

VCM IN AMBIENT AIR - FLEMINGTON PLANT SITE

VCM DETECTED - PPM

SAMPLING POINT / WIND DIRECTION	4/2 NE	4/5 N	5/8	5/22	5/23	5/24	5/30	6/1	6/3
					Not Recorded				
1. R & D Parking Lot, South Corner	0.5	ND	ND	ND	ND	ND	ND	ND	ND
2. R & D Parking Lot, North Corner	--	--	--	ND	ND	ND	ND	ND	ND
3. Rail Car Unloading Area	3.0	0.8	ND	1.1	ND	ND	--	ND	ND
4. Fence Behind Reactor Bldg.	ND	ND	ND	ND	ND	ND	ND	ND	1.4
5. Fence Near Settling Ponds	ND	ND	--	ND	ND	ND	ND	ND	ND
6. Bushkill Creek Behind Catalyst Freezer Bldg.	1.0	ND	--	ND	ND	ND	0.5	ND	ND
7. Area Behind Storage Bldg.	ND	ND	ND	ND	ND	ND	--	--	--
8. Fence In Front of Prod. Office	--	--	--	0.8	ND	ND	--	ND	ND

ND = NONE DETECTED (<0.5 PPM)

6/6/74
F.W.K.

[illegible]

[illegible]

[illegible] POINT	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
Wind Direction [illegible]	[illegible]	[illegible]	[illegible]	[illegible]				ND		[illegible]	[illegible]	[illegible]	[illegible]	
[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]		[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
Relative Humidity [illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	65	[illegible]	45	[illegible]	
Wind Velocity, mph	5-10	1-2	2	5	1	2-4	4-[illegible]	2	1-2	1-2	2	1	0-[illegible]	1-2
1. [illegible] Parking Lot, [illegible] Corner	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	ND	ND	–	–	[illegible]	[illegible]	
2. [illegible] Parking Lot, North Corner	ND	ND	[illegible]	0.4	1.1	[illegible]	ND	ND	ND	ND	–	ND	[illegible]	[illegible]
3. Rail Car Unloading Area	0.1	ND	[illegible]	0.7	1.1	[illegible]	ND	ND	ND	ND	–	0.1	ND	ND
4. Fence Beyond Reactor Building	ND	ND	ND	0.4	ND	[illegible]	ND	ND	ND	ND	ND	[illegible]	[illegible]	[illegible]
5. [illegible] Near Settling [illegible]	–	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	–	ND	–	–	–
[illegible] [illegible]kill Creek Behind Catalyst Freezer Building	[illegible]	0.2	0.2	[illegible]	[illegible]	ND	[illegible]	[illegible]	ND	–	–	ND	ND	–
[illegible] [illegible] Behind Storage Building	ND	ND	0.1	[illegible]	[illegible]	ND	ND	ND	ND	–	–	ND		[illegible]
[illegible] [illegible] Production Office	[illegible]	1.2	–	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	ND*	[illegible]	–	[illegible]

ND: None Detected [illegible]

*: Limit of detection [illegible] to 0.1 ppm since last report

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