

THE RELATIONSHIP BETWEEN RESIDUAL
VINYL CHLORIDE MONOMER (RVCM) IN
POLYVINYL CHLORIDE RESINS AND
AMBIENT VINYL CHLORIDE MONOMER (AVCM)
IN THE WORK ATMOSPHERE

September, 1975

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- Exhibit I Analysis of Bendix Personnel Monitoring Collection
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Flasher - Chromatograph System
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- Exhibit II Residual Vinyl Chloride Monomer Content of Polyvinyl
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B.F.Goodrich Chemical Company Procedure 1005-T
- Exhibit III Residual Vinyl Chloride Monomer Content of Polyvinyl
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B.F.Goodrich Chemical Company Procedure 999-T
- Exhibit IV Residual Vinyl Chloride Monomer in Geon Compound or
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B.F.Goodrich Chemical Company Procedure 937-C
- Exhibit V Ambient Vinyl Chloride (AVCM) Monitoring Data at B.G.
Warehouse, Louisville, Ky., March, April, 1975
- Exhibit VI Ambient Vinyl Chloride (AVCM) Monitoring Data at
B.F.Goodrich Chemical Company Distribution Center,
Avon Lake, Ohio, April, 1975
- Exhibit VII Ambient Vinyl Chloride (AVCM) Monitoring Data at
B.F.Goodrich Chemical Company Distribution Center,
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- Exhibit VIII A Physical Model for the Diffusion of Vinyl Chloride
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I. OBJECTIVES, CONCLUSIONS AND SUMMARY

1. OBJECTIVE

Demonstrate that the amount of residual vinyl chloride monomer (RVCM) in Geon PVC resins and compounds is so low at the time of shipment from the BFGCC manufacturing plants that employees engaged in the transportation, storage, processing and use of these products will not be exposed to quantities of ambient vinyl chloride (AVCM) above the action level of 0.5 part per million (ppm) averaged over an 8-hour work day under normal, good work practices without special engineering controls. Under these conditions it should no longer be necessary to use the cancer-suspect label on PVC packages.

2. CONCLUSION

The testing conducted and reported herein demonstrates that personnel engaged in the transportation, storage, and processing of BFGCC resins are not exposed to vinyl chloride above the action level when resin containing a low level of RVCM is shipped. Much of the testing done outside of BFGCC manufacturing areas during 1974 was conducted on resins having much higher levels of RVCM than the same resins contain today. The significant decrease in RVCM achieved to date and the additional improvement anticipated by year end when new equipment is installed provided further assurance that safe exposure will not be exceeded.

3. SUMMARY

During the past year, BFGCC has determined the amount of RVCM in its resins at every manufacturing plant. This was done several times per week until new analytical equipment was installed at each location to permit analysis of every production lot. Concurrently, intensive efforts were undertaken to minimize the amount of residual vinyl chloride in the resins. These efforts included modification of the physical structure of the resin itself to foster release of VCM as well as improvements in manufacturing techniques and in stripping process technology.

Effectiveness of the program is indicated by the constantly decreasing levels of RVCM. Resins not responsive to these techniques have been discontinued.

Analysis of ambient vinyl chloride (AVCM), after shipment from BFGCC plants, in the transportation, storage, and customer processing areas has shown that personnel are not exposed above the action level under normal, good work practices.

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The information in subsequent sections will show:

Section II - Analytical Methods

The methods used in obtaining the data contained in this report,

Section III - Residual Vinyl Chloride Content of PVC Resins at the Time of Packaging in B.F. Goodrich Chemical Company Plants

- A. the level of RVC in our large volume general purpose and easy processing PVC resins at the time of packaging in the five producing plants during the last quarter of 1974 and weekly during the first half of 1975,
- B. the RVC of compounds made in our plants from resins of known RVC content,
- C. a study of personal monitoring results on personnel engaged in the manufacture of compounds at the five producing plants in 1975,

Section IV - Field Tests During Transportation, Storage, and Processing of PVC Resins and Compounds

The results of personal and static monitoring in the field during 1974 and during 1975 when lower levels of RVC were achieved, and

Section V - A Physical Model for the Diffusion of Vinyl Chloride Monomer from PVC Under Various Conditions of Storage

The results from large scale, laboratory modeling experiments to study the variables of temperature, RVC content, ventilation rate, and mass/volume ratios on the diffusion of VCM from a number of different types of PVC resins.

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II. ANALYTICAL METHODS

The method used to determine ambient vinyl chloride (AVCM) in the atmosphere, BFGCC Procedure No. 1021-T, is described in the appendix as Exhibit I. During 1974, glass sample tubes were used in accordance with the method approved by NIOSH at the time. During 1975, carbon tubes were used. The pump is calibrated for each sample and is operating during static samplings. The sensitivity* of the AVCM analysis is 0.01 ppm.

The method now used, starting January, 1975, to determine residual vinyl chloride (RVCM) in PVC resin is BFGCC Procedure No. 1005-T, described in the appendix as Exhibit II. The sensitivity of this analysis on resin is 0.02 ppm. In the last part of 1974, a manually operated version of this method was used (BFGCC Procedure No. 999-T, Exhibit III). Prior to October, 1974, a solvent method, similar to NIOSH P&CAM #178, was used.

The method used to determine RVCM in compounds (both powder and hot mixed cubical granule types) is BFGCC Procedure No. 937-C, described in the appendix as Exhibit IV. The sensitivity of this analysis on compound is 1.0 ppm.

*

How small a difference between samples the test can detect reproducibly.

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III. RVCM CONTENT AT THE TIME OF PACKAGING IN BFGCC PLANTS

A. Resin

Samples of each resin are taken at the time of packaging whether the container be bag, box, bulk rail-car, or bulk truck. The analytical method used during most of 1974 was solvent extraction of the sample and subsequent determination of VCM content in a gas chromatograph. Starting in October, 1974, Perkin Elmer "Head Space" units, which analyzed the gas directly in the gas chromatograph, were introduced (BFGCC Procedure No. 999-T).

Beginning February 1, 1975, all five plants were so equipped, permitting increased frequency of testing so that results are reported on each lot of resin. The attached graphs (Figures 1-4 inclusive) on Geon resin 102EP F-5, 103EP, 103EP F-76, and 92, starting with the average values for the fourth quarter of 1974, show these average values on a weekly basis in 1975 for each manufacturing location at which the particular resin is produced.

A condensed summary of the 1975 data on which the graphs are based is contained in Table I. This includes the number of analytical tests used to determine the average value, the average of these determinations, as well as the highest single value and the lowest single value. During the last quarter of 1974, 1,044 analyses were made on about 135,000,000 pounds of resin. In the first half of 1975, 2,700 analyses were made on about 175,000,000 pounds of resin.

These data show the effects of product and process technology improvements in reducing the RVCM content of resins during this period from 100 to 150 ppm in the last quarter of 1974 to about 20 ppm in June of 1975.

B. Compound - RVCM

The RVCM content of compounds, as well as the RVCM of the specific lot of resin used in their manufacture, is listed in Table II. All of these compounds, except 85721 and 83824, were made by hot mixing in Banbury type mixers and are supplied in the form of cubical granules. The 85721, a rigid compound, and 83824, a flexible compound, were made in powder form on a high intensity, internal mixer.

Of those compounds (48) made from resin having 20 ppm or less RVCM, 95% contained less than 1.0 ppm RVCM.

Of the 18 compounds made from resin having 20 ppm to 100 ppm RVCM, only two compounds were above 1.0 ppm RVCM.

There were three compounds made from resin containing more than 100 ppm RVCM. All three contained more than 1.0 ppm RVCM.

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C. Compound - AVCM

As a responsible manufacture under existing regulations a study was undertaken to determine the relationship between the level of RVCM in resin and the degree of exposure to AVCM in compounding operations within our own plants. Thus, the entire study was made under close control.

The study involved five manufacturing locations where both resin and compound are made. The compounding operations included:

1. Mill Mixing
2. Banbury Mixing
3. Continuous Mixer
4. Sheetting, Granulating and Packaging Operations connected with each of the above
5. High Intensity Powder Mixing, Cooling and Packaging

Products made include flexible and rigid compounds in both powder and hot mixed granule form.

After resin is manufactured, it is stored in bins and transferred in bulk to the compound lines. RVCM content of the resin is determined on a sample taken from the bin. Thus, the time lag between manufacture of resin and consumption in compound is relatively short compared to that in a customer's plant since resin must first be shipped to his location.

Personal monitoring was conducted on each of the operators involved in the compound manufacturing process, viz. the men involved in weighing, charging the mixer, tending the strip mill and packaging.

The data determined in March, April, May and June, 1975 are included in Table III and plotted in Figure 5. The data indicate that, with resin containing less than 25 ppm (95% confidence) or 15 ppm (99% confidence), personnel engaged in the manufacture of PVC compounds are not exposed above the action level in the work atmosphere. These results are consistent with those obtained in the modeling study discussed later in this report (page and Exhibit VIII).

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IV. FIELD TESTS DURING TRANSPORTATION, STORAGE, AND PROCESSING

A. Introduction

During the latter part of 1974, personal monitoring was done to determine the exposure of AVCM to personnel during transportation, storage, and processing. During this period, BFGCC did not have the capability to analyze each lot of resin for RVCN, but the data available in the previous section are sufficient to show that the levels of RVCN in the resins produced at the time of most of this testing were a great deal higher than the amounts contained in the equivalent products today, i.e., values of up to 150 ppm have been reduced to about 20 ppm. Despite the higher levels of RVCN, almost all of the personal monitoring indicated that personnel were not exposed above the action level.

The reduction of RVCN to low levels and the commitment that resin will not be shipped or used in compound should the RVCN exceed this level provides assurance that those engaged in the transportation, storage, and processing of these materials will not be exposed above the action level under normal, good work practices.

Evidence to support this conclusion has been developed in more recent testing based on low RVCN resin and compound, and additional support is provided by the VCM diffusion modeling study.

B. Transportation

Personal monitoring was conducted on men engaged in loading and unloading bulk trucks and truckloads of bags of PVC resins and compounds. Bulk loading is done by gravity from a storage tank and unloading by air conveying under vacuum or pressure. A truckload of bags is usually loaded or unloaded with forklift trucks in 30 to 45 minutes.

In the case of bulk trucks, monitoring is done on the truck driver who may make the hose connections and operate the valves for loading and unloading. In bag or box shipments, monitoring is done on the driver of the forklift truck used to move the pallets. The presence of combustion products from some forklift trucks using propane as a fuel interferes with the analysis for VCM, giving high values part of which are caused by the combustion products.

In most recent testing, two carbon tube samples are taken so that, if the first reading is high, a second analysis can be carried out to distinguish between combustion products of propane and VCM.

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Table IV shows results obtained by personal monitoring during the last quarter of 1974. Personal monitoring of forklift truck operators in 1975, with compounds based on lower RVCM resins, is included in Table V.

Outside of the resin manufacturer's plant, these operations are short time and sporadic in nature. All instances were below the action level.

The effect of the reduction of RVCM in resin on the amount of AVCM which can accumulate within a closed trailer for three days is shown in Table VI.

C. Storage

Table VII summarizes the AVCM data obtained in 1974 in public warehouses which contain from 50,000 to 350,000 pounds of PVC resins and compounds. Though some values with high RVCM resin are marginally above the action level, more recent data with low RVCM resin show results below this level. Evidence of this is contained in Exhibit V listing results obtained from the BFGCC warehouse in Louisville, Kentucky. Special engineering controls are not used in this building for there is no forced ventilation. Monitoring results are all below the action level. The amount of PVC raw materials in this warehouse was approximately 10,000,000 pounds.

Exhibits VI and VII represent AVCM data obtained in BFGCC distribution centers at Avon Lake, Ohio, and Pedricktown, New Jersey. Both of these buildings contain in excess of 15,000,000 pounds of PVC resins and compounds. Both make use of forced ventilation. All of the results are below the action level except one at Pedricktown where the resin stored contained 69 ppm RVCM and the ventilating fans were turned off.

D. Processing In Customer Plants

Within customer plants, resin containing low levels of RVCM does not result in exposure of personnel above the action level in the work space areas. Equipment in which VCM may be released in confined areas above the action level include internal, high intensity powder mixers, Banbury mixers, and the various types of processing equipment such as extrusion and molding machines, as well as calenders. Such equipment is ventilated. Personal monitoring of operators actually working in each of these areas in 1974, shown in Table VIII, has never indicated exposure above the action level even with resin containing up to 150 ppm of RVCM. Table VIII lists the results of 77 analyses of personal and static monitoring carried out in nine customer plants during 1974.

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Reduction of RVCM to less than 20 ppm increases the margin on safety as shown in Table IX. This table shows the results of 75 analyses of personal and static monitoring carried out in 1975 at eleven different customer plants.

Static samples were taken in storage or processing points where AVCM would be expected to accumulate. At the same time, personal monitoring was conducted on operators working in these specific areas. In all cases, including the two where static sampling indicated a concentration above the action level, actual exposure of workers as determined by personal monitoring was below the action level.

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V. A PHYSICAL MODEL FOR THE DIFFUSION OF VINYL CHLORIDE MONOMER
FROM PVC RESINS UNDER VARIOUS CONDITIONS OF STORAGE

A model, based on large scale laboratory experimental data, has been developed to show the relationship between the amount of residual vinyl chloride monomer in PVC resins (RVCM) and the concentration of atmospheric vinyl monomer (AVCM) under various conditions of storage. The variables studied in the experimental work leading to the development of this model included temperature, time, ventilation rate, RVCM content of the resin, mass/volume ratio and resin type (varying in porosity).

The results obtained from a statistically designed series of 24 experiments show the interactions of all the variables and permit (1) the effects of the variables to be established, and (2) the derivation of a model which permits the AVCM levels to be predicted for any combination of the variables.

The developed model has been used to predict the AVCM level in BFG warehouses at Avon Lake, Louisville and Pedricktown. We have found excellent agreement between predicted and measured AVCM levels at these three locations and under a variety of storage conditions.

Additionally, the model has been used to show that under less than the most severe storage conditions, the OSHA action level will not be exceeded (500 ppb AVCM) when the RVCM content of the stored resin does not exceed 18 ppm. Even under the most extreme storage conditions the OSHA action level is not exceeded when the RVCM content of the resin is 8.5 ppm or less.

The details of this study are shown in Exhibit VIII.

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OF FINISHED PVC RESINS

PARTS PER MILLION (PPM) BY WEIGHT

OCTOBER--DECEMBER, 1974 -- SUMMARY

RESIN TYPE	PLANT 1			PLANT 2			PLANT 3			PLANT 4			PLANT 5		
	OCT.	NOV.	DEC.	OCT.	NOV.	DEC.	OCT.	NOV.	DEC.	OCT.	NOV.	DEC.	OCT.	NOV.	DEC.
G-92															
Average	156	59	39				1	4	4						
Minimum	1	0	0				0	0	0						
Maximum	667	858	373				5	50	18						
Data Points	53	100	52				13	22	20						
102EP F-5															
Average	131	333	182	161	61	59				35	30	15			
Minimum	0	0	0	9	8	11				35	30	15			
Maximum	846	9225	996	392	140	138				35	30	15			
Data Points	104	131	81	4	3	3				1	1	1			
103EP															
Average							285	226	296	46	92	76	54	18	54
Minimum							32	7	6	6	27	32	18	6	23
Maximum							1350	771	1113	90	219	144	109	52	147
Data Points							48	78	71	6	6	4	4	7	7
103EP F-76															
Average	11	12	6	192	171	73	172	201	113	279	142	190		498	
Minimum	0	0	0	56	63	46	11	119	30	87	54	87		246	
Maximum	49	114	53	528	230	117	465	334	290	454					
Data Points	74	138	103	5	5	6	15	13	17						

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RESIDUAL VCM CONTENT OF FINISHED PVC PRODUCTS

Data Expressed in PPM VCM

PLANT: 1WEEK ENDING: 1/3/75

<u>RESIN TYPE</u>	<u>NO. DATA POINTS</u>	<u>AVERAGE</u>	<u>HIGH</u>	<u>LOW</u>
G-92	8	2.9	10.6	0.2
102EP F-5	9	165.2	722.0	1.7
103EP F-76	35	10.1	42.9	0.3

WEEK ENDING: 1/10/75

G-92	7	19.9	35.7	12.7
102EP F-5	3	0.4	0.5	0.4
103EP F-76	16	5.1	10.9	1.0

WEEK ENDING: 1/17/75

G-92	9	146.9	271.0	3.1
102EP F-5	10	10.6	20.5	0.6
103EP F-76	19	6.3	52.8	0.7

WEEK ENDING: 1/24/75

G-92	14	5.8	33.6	0.5
102EP F-5	24	1.1	6.0	0.1
103EP F-76	28	5.9	17.5	0.3

WEEK ENDING: 1/31/75

102EP F-5	8	0.8	1.5	0.2
103EP F-76	11	6.2	27.8	0.3
110X400 (102EP F-5)	8	10.1	49.2	0.4

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RESIDUAL VCM CONTENT OF FINISHED PVC PRODUCTS

Data Expressed in PPM VCM

PLANT: 2WEEK ENDING: 1/3/75

<u>RESIN TYPE</u>	<u>NO. DATA POINTS</u>	<u>AVERAGE</u>	<u>HIGH</u>	<u>LOW</u>
102EP F-5	2	187.0	190.0	183.0
103EP F-76	4	62.0	133.0	16.0

WEEK ENDING: 1/10/75

102EP F-5	1	15.0	15.0	15.0
103EP F-76	2	82.0	152.0	12.0

WEEK ENDING: 1/17/75

102EP F-5	1	15.0	15.0	15.0
103EP F-76	2	82.0	152.0	12.0

WEEK ENDING: 1/24/75

102EP F-5	8	41.0	120.0	0.0
103EP F-76	8	24.0	43.0	0.0

WEEK ENDING: 1/31/75

102EP F-5	2	22.0	32.0	12.0
103EP F-76	9	17.0	42.0	10.0

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RESIDUAL VCM CONTENT OF FINISHED PVC PRODUCTS

Data Expressed in PPM VCM

PLANT: 3WEEK ENDING: 1/3/75

<u>RESIN TYPE</u>	<u>NO. DATA POINTS</u>	<u>AVERAGE</u>	<u>HIGH</u>	<u>LOW</u>
G-92	1	1.0	1.0	1.0
103EP	7	255.1	797.0	3.0
103EP F-76	3	94.0	129.0	70.0

WEEK ENDING: 1/10/75

G-92	6	3.7	14.0	0.0
103EP	14	114.3	310.0	23.0
103EP F-76	6	44.8	74.0	22.0

WEEK ENDING: 1/17/75

G-92	5	0.2	1.0	0.0
103EP	20	181.1	453.0	0.0
103EP F-76	6	42.7	77.0	8.0

WEEK ENDING: 1/24/75

G-92	4	1.2	3.0	0.0
103EP	15	206.0	538.0	3.0

WEEK ENDING: 1/31/75

G-92	4	0.3	1.0	0.0
103EP	19	151.9	374.0	7.0
103EP F-76	4	101.5	171.0	32.0

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RESIDUAL VCM CONTENT OF FINISHED PVC PRODUCTS

Data Expressed in PPM VCM

PLANT: 4WEEK ENDING: 1/3/75

<u>RESIN TYPE</u>	<u>NO. DATA POINTS</u>	<u>AVERAGE</u>	<u>HIGH</u>	<u>LOW</u>
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PLANT CLOSED FOR HOLIDAY VACATION

WEEK ENDING: 1/10/75

103EP	1	45.0	45.0	45.0
103EP F-76	6	25.0	49.0	7.0

WEEK ENDING: 1/17/75

103EP	1	19.0	19.0	19.0
103EP F-76	6	20.0	32.0	5.0

WEEK ENDING: 1/24/75

103EP	1	1.0	1.0	1.0
103EP F-76	8	12.0	19.0	4.0

WEEK ENDING: 1/31/75

103EP	1	22.0	22.0	22.0
103EP F-76	11	17.8	26.0	8.0

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RESIDUAL VCM CONTENT IN FINISHED PVC PRODUCTS

Data Expressed in PPM VCM

PLANT: 5WEEK ENDING: 1/3/75

<u>RESIN TYPE</u>	<u>NO. DATA POINTS</u>	<u>AVERAGE</u>	<u>HIGH</u>	<u>LOW</u>
103EP	2	29.0	38.0	19.0

WEEK ENDING: 1/10/75

103EP	2	29.0	33.0	24.0
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WEEK ENDING: 1/17/75

103EP	3	31.0	77.0	8.0
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WEEK ENDING: 1/24/75

103EP	4	6.8	15.6	2.5
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WEEK ENDING: 1/31/75

102EP F-5	1	0.7	0.7	0.7
103EP	4	7.2	15.6	2.5

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RESIDUAL VCM CONTENT OF FINISHED PVC PRODUCTS

Data Expressed in PPM VCM

PLANT: 1WEEK ENDING: 2/7/75

<u>RESIN TYPE</u>	<u>NO. DATA POINTS</u>	<u>AVERAGE</u>	<u>HIGH</u>	<u>LOW</u>
G-92	14	11.5	88.5	0.2
102EP F-5	4	0.4	0.9	0.2
103EP F-76	59	5.7	35.7	0.1

WEEK ENDING: 2/14/75

G-92	1	222.0	222.0	222.0
102EP F-5	14	28.2	206.0	0.4
103EP F-76	59	7.0	76.1	0.0

WEEK ENDING: 2/21/75

G-92	12	41.9	262.0	0.2
102EP F-5	9	9.0	40.5	0.8
103EP F-76	38	12.5	61.8	0.7

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RESIDUAL VCM CONTENT OF FINISHED PVC PRODUCTS

Data Expressed in PPM VCM

PLANT: 2WEEK ENDING: 2/7/75

<u>RESIN TYPE</u>	<u>NO. DATA POINTS</u>	<u>AVERAGE</u>	<u>HIGH</u>	<u>LOW</u>
102EP F-5	2	12.0	12.0	11.0
103EP F-76	2	9.0	13.0	4.0

WEEK ENDING: 2/14/75

102EP F-5	6	0.1	0.1	0.0
103EP F-76	6	3.7	13.0	0.4

WEEK ENDING: 2/21/75

102EP F-5	7	0.2	0.4	0.1
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RESIDUAL VCM CONTENT OF FINISHED PVC PRODUCTS

Data Express in PPM VCM

PLANT: 3WEEK ENDING: 2/7/75

<u>RESIN TYPE</u>	<u>NO. DATA POINTS</u>	<u>AVERAGE</u>	<u>HIGH</u>	<u>LOW</u>
G-92	3	0.3	1.0	0.0
103EP	4	84.0	174.0	0.0
103EP F-76	3	136.0	169.0	101.0

WEEK ENDING: 2/14/75
2/21/75

G-92	9	2.0	6.0	0.0
103EP	21	70.0	317.0	0.0
103EP F-76	8	74.0	171.0	4.0

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RESIDUAL VCM CONTENT OF FINISHED PVC PRODUCTS

Data Expressed in PPM VCM

PLANT: 4WEEK ENDING: 2/7/75

<u>RESIN TYPE</u>	<u>NO. DATA POINTS</u>	<u>AVERAGE</u>	<u>HIGH</u>	<u>LOW</u>
102EP F-5	1	23.0	23.0	23.0
103EP	2	13.5	17.0	10.0
103EP F-76	10	17.6	32.0	7.0

WEEK ENDING: 2/14/75

103EP	1	11.0	11.0	11.0
103EP F-76	10	18.1	70.0	4.0

WEEK ENDING: 2/21/75

103EP F-76	16	7.4	22.0	1.0
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RESIDUAL VCM CONENT OF FINISHED PVC PRODUCTS

Data Expressed in PPM VCM

PLANT: 5WEEK ENDING: 2/7/75

<u>RESIN TYPE</u>	<u>NO. DATA POINTS</u>	<u>AVERAGE</u>	<u>HIGH</u>	<u>LOW</u>
102EP F-5	1	2.8	2.8	2.8
103EP	5	7.0	11.4	3.8

WEEK ENDING: 2/14/75

103EP	4	19.1	29.8	1.3
103EP F-76	4	27.8	52.0	2.7

WEEK ENDING: 2/21/75

103EP	3	0.8	1.1	0.5
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BFG37851

25110005

RESIDUAL VCM CONTENT IN FINISHED PVC PRODUCTS

Data Expressed in PPM VCM

PLANT: 1WEEK ENDING: 3/7/75

<u>RESIN TYPE</u>	<u>NO. DATA POINTS</u>	<u>AVERAGE</u>	<u>HIGH</u>	<u>LOW</u>
G-92	12	1.2	6.1	0.2
102EP F-5	7	0.8	1.9	0.2
103EP F-76 (110X401)	11	7.0	24.0	2.8
110X400 (102EP F-5)	7	5.3	14.0	0.2
110X401 (103EP F-76)	11	22.3	42.6	6.7

WEEK ENDING: 3/14/75

G-92	11	35.1	93.4	0.0
102EP F-5	7	7.3	10.7	2.3
103EP F-76 (110X401)	12	20.2	38.7	5.1
110X400 (102EP F-5)	6	2.6	14.1	0.1
110X401 (103EP F-76)	11	8.1	11.5	3.9

WEEK ENDING: 3/21/75

G-92	1	12.1	12.1	12.1
102EP F-5	5	0.5	1.8	0.1
103EP F-76 (110X401)	22	11.3	47.6	2.9
110X400 (102EP F-5)	1	1.4	1.4	1.4
100X401 (103EP F-76)	16	5.9	11.4	2.2

WEEK ENDING: 3/28/75

G-92	3	24.1	55.1	0.0
102EP F-5	6	0.4	0.6	0.2
103EP F-76	37	3.1	6.4	0.2
110X401 (103EP F-76)	1	1.5	1.5	1.5

BFG37852

25140025

RESIDUAL VCM CONTENT OF FINISHED PVC PRODUCTS

Data Expressed in PPM VCM

PLANT: 2WEEK ENDING: 3/7/75

<u>RESIN TYPE</u>	<u>NO. DATA POINTS</u>	<u>AVERAGE</u>	<u>HIGH</u>	<u>LOW</u>
102EP F-5	3	0.1	0.1	0.1
103EP F-76 (110X401)	3	3.4	4.4	1.4

WEEK ENDING: 3/14/75

102EP F-5	6	0.4	1.3	0.1
103EP F-76 (110X401)	7	7.2	10.0	2.0

WEEK ENDING: 3/21/75

102EP F-5	2	0.2	0.2	0.2
103EP F-76 (110X401)	7	1.4	3.9	0.5

WEEK ENDING: 3/28/75

102EP F-5	1	0.2	0.2	0.2
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BFG37853

25140027

RESIDUAL VCM CONTENT OF FINISHED PVC PRODUCTS

Data Expressed in PPM VCM

PLANT: 3WEEK ENDING: 3/7/75

<u>RESIN TYPE</u>	<u>NO. DATA POINTS</u>	<u>AVERAGE</u>	<u>HIGH</u>	<u>LOW</u>
G-92	5	2.0	5.0	1.0
103EP	23	125.4	310.0	4.0
103EP F-76 (110x401)	7	58.4	265.0	16.0

WEEK ENDING: 3/14/75

G-92	3	0.3	1.0	0.0
103EP	4	199.5	363.0	6.0
103EP F-76 (110X401)	9	72.6	390.0	8.0

WEEK ENDING: 3/21/75

G-92	3	0.0	0.0	0.0
103EP	9	83.2	258.0	3.0
103EP F-76 (110X401)	8	142.8	388.0	3.0

WEEK ENDING: 3/28/75

G-92	4	0.3	1.0	0.0
103EP	10	57.7	152.0	2.0

BFG37854

251A01028

RESIDUAL VCM CONTENT OF FINISHED PVC PRODUCTS

Data Expressed in PPM VCM

PLANT: 4WEEK ENDING: 3/7/75

<u>RESIN TYPE</u>	<u>NO. DATA POINTS</u>	<u>AVERAGE</u>	<u>HIGH</u>	<u>LOW</u>
103EP F-76 (110X401)	23	22.0	154.0	4.0
103EP	1	0.7	0.7	0.7

WEEK ENDING: 3/14/75

103EP F-76 (110X401)	34	12.0	33.0	3.0
103EP	5	22.6	99.0	2.0

WEEK ENDING: 3/21/75

103EP F-76 (110X401)	15	16.1	44.0	3.0
103EP	1	7.0	7.0	7.0

WEEK ENDING: 3/28/75

103EP	15	10.6	29.0	2.0
103EP F-76	19	22.9	78.0	5.0

BFG37855

COPY

RESIDUAL VCM CONTENT OF FINISHED PVC PRODUCTS

Data Expressed in PPM VCM

PLANT: 5WEEK ENDING: 3/7/75

<u>RESIN TYPE</u>	<u>NO. DATA POINTS</u>	<u>AVERAGE</u>	<u>HIGH</u>	<u>LOW</u>
103EP	15	2.0	11.3	0.4

WEEK ENDING: 3/14/75

103EP	19	21.2	112.3	0.4
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WEEK ENDING: 3/21/75

103EP	4	11.9	19.1	3.4
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WEEK ENDING: 3/28/75

103EP	3	47.1	128.6	5.5
103EP F-76	15	182.6	400.9	22.8

BFG37856

25110000

RESIDUAL VCM CONTENT OF FINISHED PVC PRODUCTS

Data Expressed in PPM VCM

PLANT: 1WEEK ENDING: 4/4/75

<u>RESIN TYPE</u>	<u>NO. DATA POINTS</u>	<u>AVERAGE</u>	<u>HIGH</u>	<u>LOW</u>
G-92	4	31.2	54.9	8.0
102EP F-5	10	0.3	0.6	0.1
103EP F-76	10	3.8	14.9	0.7
110X400 (102EP F-5)	1	0.8	0.8	0.8
110X401 (103EP F-76)	11	4.4	12.6	0.7

WEEK ENDING: 4/11/75

G-92	5	5.7	27.2	0.1
102EP F-5	10	1.2	3.1	0.2
103EP F-76	6	1.0	4.4	0.2
110X400 (102EP F-5)	3	1.2	1.3	1.1
110X401 (103EP F-76)	17	6.5	18.2	0.2

WEEK ENDING: 4/18/75

G-92	3	1.4	3.5	0.0
102EP F-5	25	1.1	7.3	0.1
103EP F-76	3	3.9	5.6	2.1
110X400 (102EP F-5)	3	0.5	0.6	0.5
110X401 (103EP F-76)	11	4.0	20.0	0.5

WEEK ENDING: 4/25/75

G-92	7	34.4	105.0	0.1
102EP F-5	27	2.0	18.8	0.1
103EP F-76	8	10.2	23.9	0.9
110X400 (102EP F-5)	2	0.3	0.5	0.1
110X401 (103EP F-76)	10	1.4	2.8	0.1

BFG37857

RESIDUAL VCM CONTENT OF FINISHED PVC PRODUCTS

Data Expressed in PPM VCM

PLANT: 2WEEK ENDING: 4/4/75

<u>RESIN TYPE</u>	<u>NO. DATA POINTS</u>	<u>AVERAGE</u>	<u>HIGH</u>	<u>LOW</u>
102EP F-5	6	0.2	0.3	0.1
103EP F-76	3	2.1	5.5	0.3

WEEK ENDING: 4/11/75

102EP F-5	11	0.1	0.3	0.0
103EP F-76	3	5.0	5.6	4.5

WEEK ENDING: 4/18/75

102EP F-5	9	0.1	0.2	0.0
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WEEK ENDING: 4/25/75

102EP F-5	3	0.3	0.5	0.2
103EP F-76	3	5.5	6.6	4.2

BFG37858

RESIDUAL VCM CONTENT OF FINISHED PVC PRODUCTS

Data Expressed in PPM VCM

PLANT: 3WEEK ENDING: 4/4/75

<u>RESIN TYPE</u>	<u>NO. DATA POINTS</u>	<u>AVERAGE</u>	<u>HIGH</u>	<u>LOW</u>
G-92	4	0.0	0.0	0.0
103EP	10	26.5	119.0	0.0
103EP F-76	9	10.7	26.0	0.0

WEEK ENDING: 4/11/75

103EP	20	61.7	147.0	4.0
103EP F-76	3	4.0	9.0	1.0

WEEK ENDING: 4/18/75

G-92	3	0.0	0.0	0.0
103EP	5	6.1	20.0	0.3
103EP F-76	5	5.2	11.0	0.7

WEEK ENDING: 4/25/75

G-92	5	0.3	1.0	0.0
103EP	6	4.2	14.0	0.4
103EP F-76	2	8.5	13.0	4.0

BFG37859

RECEIVED

RESIDUAL VCM CONTENT OF FINISHED PVC PRODUCTS

Data Express in PPM VCM

PLANT: 4WEEK ENDING: 4/4/75

<u>RESIN TYPE</u>	<u>NO. DATA POINTS</u>	<u>AVERAGE</u>	<u>HIGH</u>	<u>LOW</u>
103EP	3	6.3	12.0	3.0
103EP F-76	13	16.6	41.0	5.0

WEEK ENDING: 4/11/75

103EP	2	16.0	18.0	14.0
103EP F-76	21	33.2	78.0	15.0

WEEK ENDING: 4/18/75

102EP F-5	4	18.0	21.0	2.0
103EP F-76	15	40.9	90.0	14.0

WEEK ENDING: 4/25/75

103EP	9	21.1	55.0	3.0
103EP F-76	11	9.1	17.0	0.5

BFG37860

BFG37860

RESIDUAL VCM CONTENT OF FINISHED PVC PRODUCTS

Data Expressed in PPM VCM

PLANT: 5WEEK ENDING: 4/4/75

<u>RESIN TYPE</u>	<u>NO. DATA POINTS</u>	<u>AVERAGE</u>	<u>HIGH</u>	<u>LOW</u>
103EP	9	9.1	16.8	2.3
103EP F-76	2	74.5	79.6	69.3

WEEK ENDING: 4/11/75

103EP	19	16.2	49.2	1.1
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WEEK ENDING: 4/18/75NO DATA AVAILABLE THIS WEEK --- PLANT SHUTDOWNWEEK ENDING: 4/25/75

103EP	14	5.2	25.0	0.5
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BFG37861

251400035

RESIDUAL VCM CONTENT OF FINISHED PVC PRODUCTS

Data Expressed in PPM VCM

PLANT: 1WEEK ENDING: 5/2/75

<u>RESIN TYPE</u>	<u>NO. DATA POINTS</u>	<u>AVERAGE</u>	<u>HIGH</u>	<u>LOW</u>
G-92	4	20.7	52.1	1.9
102EP F-5	5	4.3	14.4	0.2
103EP F-76	3	2.9	5.4	1.2
110X400 (102EP F-5)	1	1.1	1.1	1.1

WEEK ENDING: 5/9/75

G-92	4	8.4	30.3	0.1
102EP F-5	21	0.7	7.8	0.1
110X400 (102EP F-5)	4	19.1	72.3	0.2

WEEK ENDING: 5/16/75

G-92	9	8.2	20.7	0.1
102EP F-5	14	1.9	16.8	0.1
103EP F-76	29	1.0	3.9	0.1
110X400 (102EP F-5)	5	2.4	5.8	0.1
110X401 (103EP F-76)	5	5.1	13.4	0.8

WEEK ENDING: 5/23/75

G-92	8	0.1	0.2	0.1
102EP F-5	10	0.5	2.1	0.1
103EP F-76	14	1.8	3.5	0.2
110X400 (102EP F-5)	2	0.1	0.1	0.1
110X401 (103EP F-76)	8	2.3	4.2	0.1

WEEK ENDING: 5/30/75

G-92	6	26.6	159.0	0.0
102EP F-5	6	0.8	1.2	0.2
103EP F-76	14	1.0	3.1	0.2
110X400 (102EP F-5)	7	4.5	24.6	0.1
110X401 (103EP F-76)	3	1.0	1.7	0.2

BFG37862

23140005
05/03/75

RESIDUAL VCM CONTENT OF FINISHED PVC PRODUCTS

Data Expressed in PPM VCM

PLANT: 2WEEK ENDING: 5/2/75

<u>RESIN TYPE</u>	<u>NO. DATA POINTS</u>	<u>AVERAGE</u>	<u>HIGH</u>	<u>LOW</u>
102EP F-5	10	0.7	2.3	0.0
103EP F-76	6	4.3	5.8	3.2

WEEK ENDING: 5/9/75

103EP F-76	5	8.7	14.1	3.3
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WEEK ENDING: 5/16/75

103EP F-76	6	5.9	11.9	2.3
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WEEK ENDING: 5/23/75

102EP F-5	2	0.6	0.8	0.4
103EP F-76	2	3.9	4.9	2.9
1BEP	1	0.0	0.0	0.0
2BEP	1	6.4	6.4	6.4

WEEK ENDING: 5/30/75

102EP F-5	2	2.0	3.6	0.4
103EP F-76	6	3.2	7.5	1.2
1C	1	0.8	0.8	0.8

BFG37863

RECEIVED
7/1/75

RESIDUAL VCM CONTENT OF FINISHED PVC PRODUCTS

Data Expressed in PPM VCM

PLANT: 3WEEK ENDING: 5/2/75

<u>RESIN TYPE</u>	<u>NO. DATA POINTS</u>	<u>AVERAGE</u>	<u>HIGH</u>	<u>LOW</u>
G-92	3	0.4	0.5	0.1
103EP	4	3.8	10.0	1.0

WEEK ENDING: 5/9/75

G-92	5	0.8	2.0	0.0
103EP	22	25.0	211.0	0.1
103EP F-76	3	0.5	0.8	0.1

WEEK ENDING: 5/16/75

G-92	6	0.1	0.2	0.0
103EP	13	7.3	21.0	0.0
103EP F-76	3	0.9	1.0	0.8

WEEK ENDING: 5/23/75

G-92	6	0.0	0.1	0.0
103EP	14	3.3	20.9	0.1
103EP F-76	4	3.6	13.0	0.1
2BEP	1	1.0	1.0	1.0
92B	1	0.3	0.3	0.3

WEEK ENDING: 5/30/75

G-92	5	0.0	0.1	0.0
103EP	12	3.2	19.0	0.4

BFG37864

BFG37864

RESIDUAL VCM CONNENT OF FINISHED PVC PRODUCTS

Data Expressed in PPM VCM

PLANT: 4WEEK ENDING: 5/2/75

<u>RESIN TYPE</u>	<u>NO. DATA POINTS</u>	<u>AVERAGE</u>	<u>HIGH</u>	<u>LOW</u>
102EP F-5	1	2.0	2.0	2.0
103EP	7	14.3	24.0	9.0
103EP F-76	22	13.9	35.0	1.0

WEEK ENDING: 5/9/75

103EP	8	9.0	15.0	6.0
103EP F-76	31	25.6	76.0	3.0

WEEK ENDING: 5/16/75

103EP	4	5.8	8.0	4.0
103EP F-76	26	20.1	50.0	4.0

WEEK ENDING: 5/23/75

103EP	22	23.9	72.0	5.0
103EP F-76	5	12.2	47.0	2.0

WEEK ENDING: 5/30/75

103EP	2	16.5	29.0	4.0
103 F-76	19	55.7	292.0	3.0

BFG37865

25160039

RESIDUAL VCM CONTENT OF FINISHED PVC PRODUCTS

Data Expressed in PPM VCM

PLANT: 5WEEK ENDING: 5/2/75

<u>RESIN TYPE</u>	<u>NO. DATA POINTS</u>	<u>AVERAGE</u>	<u>HIGH</u>	<u>LOW</u>
103EP	9	2.3	5.0	1.3

WEEK ENDING: 5/9/75

103EP	18	1.3	3.3	0.6
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WEEK ENDING: 5/16/75

103EP	6	3.4	13.2	0.4
2B	1	0.3	0.3	0.3

WEEK ENDING: 5/23/75

103EP	17	3.8	10.6	1.2
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WEEK ENDING: 5/30/75

103EP	26	4.5	23.8	0.4
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BFG37866

RESIDUAL VCM CONTENT OF FINISHED PVC PRODUCTS

Data Expressed in PPM VCM

PLANT: 1WEEK ENDING: 6/6/75

<u>RESIN TYPE</u>	<u>NO. DATA POINTS</u>	<u>AVERAGE</u>	<u>HIGH</u>	<u>LOW</u>
G-92	11	0.3	1.4	0.0
102EP F-5	3	3.7	10.8	0.1
103EP F-76	6	6.4	10.2	0.4
110X400 (102EP F-5)	3	0.3	0.3	0.2
110X401 (103EP F-76)	9	8.0	10.6	0.1

WEEK ENDING: 6/13/75

G-92	3	0.1	0.1	0.1
102EP F-5	2	3.8	4.6	3.1
103EP F-76	5	1.7	3.9	0.1
110X400 (102EP F-5)	6	0.3	0.7	0.0
110X401 (103EP F-76)	15	20.4	65.2	4.2

WEEK ENDING: 6/20/75

G-92	11	11.6	34.8	0.0
102EP F-5	7	0.1	0.1	0.1
110X400 (102EP F-5)	13	1.5	4.8	0.2
110X401 (103EP F-76)	22	12.7	47.1	2.5

WEEK ENDING: 6/27/75

G-92	7	4.1	20.9	0.1
102EP F-5	13	1.4	4.6	0.2
103EP F-76	1	1.2	1.2	1.2
110X400 (102EP F-5)	10	4.8	15.3	0.4
110X401 (103EP F-76)	5	9.1	15.5	2.9

BFG37867

RESIDUAL VCM CONTENT IN FINISHED PVC PRODUCTS

Data Expressed in PPM VCM

PLANT: 2WEEK ENDING: 6/6/75

<u>RESIN TYPE</u>	<u>NO. DATA POINTS</u>	<u>AVERAGE</u>	<u>HIGH</u>	<u>LOW</u>
102EP F-5	3	0.1	0.2	0.0
103EP F-76	9	27.4	54.7	8.6
1C	3	2.5	6.4	0.1

WEEK ENDING: 6/13/75

102EP F-5	1	0.1	0.1	0.1
103EP F-76	9	34.9	56.9	18.9
2BEP	2	3.9	6.4	1.4

WEEK ENDING: 6/20/75

102EP F-5	15	0.4	3.2	0.0
103EP F-76	1	3.3	3.3	3.3

WEEK ENDING: 6/27/75

102EP F-5	6	0.3	0.5	0.0
103EP F-76	8	10.2	18.1	3.3

BFG37868

25171032

RESIDUAL VCM CONNTEXT IN FINISHED PVC PRODUCTS

Data Expressed in PPM VCM

PLANT: 3WEEK ENDING: 6/6/75

<u>RESIN TYPE</u>	<u>NO. DATA POINTS</u>	<u>AVERAGE</u>	<u>HIGH</u>	<u>LOW</u>
G-92	5	0.0	0.0	0.0
103EP	12	3.5	20.0	0.0
103EP F-76	3	4.8	5.9	4.2

WEEK ENDING: 6/13/75

G-92	7	0.1	0.4	0.0
103EP	9	2.0	7.4	0.2
103EP F-76	2	2.8	3.6	2.0

WEEK ENDING: 6/20/75

G-92	7	0.0	0.0	0.0
102EP F-5	1	11.0	11.0	11.1
103EP F-	6	5.0	10.0	1.1
103EP F-76	4	5.4	9.7	0.1
103EP B	1	11.0	11.0	11.0

WEEK ENDING: 6/27/75

G-92	5	0.1	0.2	0.0
103EP	7	5.8	24.9	0.2
103EP F-76	3	12.5	17.3	3.0
103EP B	1	117.0	117.0	117.0

BFG37869

RESIDUAL VCM CONTENT OF FINISHED PVC PRODUCTS

Data Expressed in PPM VCM

PLANT: 4WEEK ENDING: 6/6/75

<u>RESIN TYPE</u>	<u>NO. DATA POINTS</u>	<u>AVERAGE</u>	<u>HIGH</u>	<u>LOW</u>
102EP F-5	2	17.0	18.0	16.0
103EP	5	38.0	70.0	28.0
103EP F-76	23	72.0	231.0	5.0

WEEK ENDING: 6/13/75

102EP F-5	3	25.6	42.0	7.3
103EP	6	57.5	79.0	16.0
103EP F-76	42	32.9	117.0	2.0

WEEK ENDING: 6/20/75

102EP F-5	2	25.0	35.0	15.0
103EP	10	30.2	73.0	15.0
103EP F-76	32	30.4	54.0	1.0

1C F-76 Tailings	1	39.0	39.0	39.0
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WEEK ENDING: 6/27/75

102EP F-5	2	10.0	18.0	2.0
103EP	12	32.0	58.0	20.0
103EP F-76	26	44.0	108.0	11.0

BFG37870

22 JUN 75

RESIDUAL VCM CONTENT OF FINISHED PVC PRODUCTS

Data Expressed in PPM VCM

PLANT: 5WEEK ENDING: 6/6/75

<u>RESIN TYPE</u>	<u>NO. DATA POINTS</u>	<u>AVERAGE</u>	<u>HIGH</u>	<u>LOW</u>
103EP	26	2.0	15.4	0.3

WEEK ENDING: 6/13/75

103EP	16	1.4	3.9	0.4
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WEEK ENDING: 6/20/75

103EP	26	4.1	13.8	0.4
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WEEK ENDING: 6/27/75

103EP	22	15.9	114.1	0.5
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BFG37871

TABLE II

RESIDUAL VINYL CHLORIDE CONTENT OF GEON PVC COMPOUND
AND THE RESIN FROM WHICH EACH COMPOUND WAS MADE

I. RESIDUAL VINYL CHLORIDE (RVCM) IN GEON RESIN AND FLEXIBLE COMPOUND

1. Hot Mixed Cubical Granules

Date	Time on Shift	Type Resin	Resin RVCM ppm	Compound	
4/4/75	12:25P	103	118	8801 Blk 288	
4/4/75	2:10P	103	74	" " "	
4/4/75	12:45P	103	4	8812 Blk 288	
4/4/75	2:00P	103	4	" " "	
4/4/75	5:00P	103	2	8815 Blk 288	
4/4/75	5:45P	103	<1	" " "	
4/4/75	1:30A	103	104	80755 Blk 299	
4/8/75	12-8	103	2	8815 White 132	115-1
4/8/75	12-8	103	3	8815 White 132	115-2
4/8/75	3:10A	103	26	83794 Nat 012	112-1
4/8/75	10:30A	103	10	" " "	113-7
4/9/75		103	37	83714 Trans 004	35-18
4/8/75	12:45P	103	48	8800 Nat 021	987-3
4/8/75	10:45P	103	1	8814 White 132	133-1
4/9/75	8:00P	103	39	83714 Trans	37
4/9/75	7:30P	103	1.8	8884 Nat 021	380-10
4/9/75	10:15A	103	2	" " "	380-6
4/9/75	12-8	103	1	8814 White 132	135-2
4/10/75	1:40P	103	10	80456 Trans 004	66-Bx. 16
4/10/75	4:30P	103	10	80456 Trans 001	67-Bx. 6
4/10/75	6:00P	103	<1	83974 Gr 248	13-Bx. 4
4/10/75	9:10P	103	<1	83974 Gr 248	13-Bx. 8
4/10/75	9:00P	103	22	83823 Gr Trns524	113-Bx. 4
4/10/75	11:00P	103	59	83823 Gr Trns524	113-Bx. 14
4/11/75	4:50A	103	45	8813 Nat 021	98-11
4/11/75		103	33	8813 Nat 021	99-10
4/11/75	8:20P	103	21	8898 Nat 021	58-10
4/12/75	12:20A	103	39	8898 Nat 021	59-18
4/12/75	2:20	102 F5	<1	80801 Nat 025	113-Bx. 27
4/12/75	12:40P	103	19.5	83700 Brown 366	1-2
4/12/75	5:15P	103	16.4	83700 Brown 366	1-4
4/12/75	10:30P	103	26	82718 Blk 289	43-1
4/15/75	3:50A	103	21	80801 Nat 025	114 Bx. 26
4/15/75	9:00P	103	11	8830 Nat 021	248-1
4/15/75	2:30A	102 F5	<1	8862 Nat 021	1-1
4/14/75	4-12	103	8	8882 Blk 288	1-1
4/15/75	4:15P	103	66	83718 Nat 021	90-6
4/15/75	2:20	102	70	83741 White 132	74-4
4/16/75	10:45	103	2	83937 Wht Trns014	107-6
4/16/75	9:40A	103	15	8804 Blk 288	924-9
4/17/75	3:25A	103	8	80755 Blk 292	ACFX 54635
4/17/75	1:40P	103	8	8804 Blk 288	926-4
4/18/75	12:40	103	36	8730 Nat 021	298-14
4/18/75	3:20P	103	25	2042 Gray 249	256-24
4/18/75	7:20P	103	26	2042 Gray 249	258-7

Continued.....

NR - Not run

BFG37872

I. RESIDUAL VINYL CHLORIDE (RVCM) IN GEON RESIN AND FLEXIBLE COMPOUNDS (continued)1. Hot Mixed Cubical Granules

<u>Date</u>	<u>Time on Shift</u>	<u>Type Resin</u>	<u>Resin RVCM ppm</u>	<u>Compound</u>	<u>Lot No.</u>	<u>Compound RVCM ppm</u>
4/19/75		103	<1	8800 Blk 288	208-2	<1
4/19/75		103	<1	8800 Blk 288	208-6	<1
4/19/75	11:15A	103	26	83718 Gray 250	254-4	<1
4/19/75	12:10P	103	32	83718 Gray 250	254-8	
4/19/75	2:45P	103	25	83718 Gray 250	255-4	
4/19/75	9:15P	103	3	83741 Blk 288	130-4	<1
4/19/75	12:00A	103	<1	80457 Red 762	1-2	
4/19/75	5:35	103	12	8896 Gray 250	160-6	<1
4/19/75	11:00A	103	<1	80457 Red 262	1-1	<1
4/22/75	6:40P	103	<1	8801 Gray 243	52-1	<1
4/22/75	7:30P	103	<1	8801 Gray 243	52-1	<1
4/22/75	6:00P	103	26	83008 Nat 021	140-11	
4/22/75	4:20P	103	24	83008 Nat 021	140-5	1.2
4/22/75		G-92	<1	84280 White 132	21-1	<1
4/22/75	11:00P	103	25	83741 Nat 021	102-4	<1

2. Powder Compound

<u>Date</u>	<u>Time on Shift</u>	<u>Type Resin</u>	<u>Resin RVCM ppm</u>	<u>Compound</u>	<u>Lot No.</u>	<u>Compound RVCM ppm</u>
4/11/75	10:30A	G-92	<1	83824 Nat 021	68-12	<1
4/11/75		G-92	2	83824 Nat 021	68-6	<1

BFG37873

17

RESIDUAL VINYL CHLORIDE (RVCM) IN GEON RESIN AND RIGID COMPOUNDS1. Hot Mixed Cubical Granules (Use: Rigid Profiles)

<u>Date</u>	<u>Time (hrs)</u>	<u>Type Resin</u>	<u>Resin RVCM ppm</u>	<u>Time (hrs)</u>	<u>Compound</u>	<u>Compound RVCM ppm</u>
5/5/75	1110	102 F5	< 1	1130	7082-138	< 1
5/7/75	1115	102 F5	< 1	1130	7082-138	< 1
5/8/75	1310	102 F5	1.70	1330	7082-138	< 1
5/9/75	1045	102 F5	< 1	1100	7082-138	< 1
5/13/75	0900	102 F5	9.05	0915	8700A-640A	< 1

2. Powder Compound (Use: Pipe - 85707, Profile - 85721)

<u>Date</u>	<u>Time (hrs)</u>	<u>Type Resin</u>	<u>Resin RVCM ppm</u>	<u>Time (hrs)</u>	<u>Compound</u>	<u>Compound RVCM ppm</u>
4/8/75	2:55P	103 F76	< 1		85721 Nat 021 Lot 440-1	< 1
4/8/75	3:00P	103 F76	< 1		85721 Nat 021 Lot 440-2	< 1
4/9/75	11:20A	103 F-76	127		85721 Nat 021 Lot 442-2	6
5/6/75	1315	110X401	3.19	1335	85707-025 Pwd	< 1
5/7/75	1330	110X401	< 1	1345	85707-025 Pwd	< 1
5/8/75	1600	110X401	4.70	1620	85707-025 Pwd	< 1
5/9/75	1400	110X401	4.90	1400	85707-025 Pwd	< 1
5/15/75	1540	110X401	1.69	1600	85707-025 Pwd	< 1

6/4/75

BFG37874

6/5/75
BFG37874

TABLE III

PERSONAL MONITORING FOR EXPOSURE TO AVCM, PPM,
IN BFGCC COMPOUND BUILDINGS
ALL SAMPLES OVER 4 HOURS

1975	AVE. RVCM OF RESIN USED	No.* Mon.	AVCM			AVE. RVCM OF RESIN USED	No.* Mon.	AVCM		
			PPM AVG.	PPM MAX.	PPM MIN.			PPM AVG.	PPM MAX.	PPM MIN.
			MARCH					APRIL		
Plant #1										
438	10.3	35	0.03	0.09	0.01	4.9	58	0.05	0.27	0.00
441	10.3	16	0.06	0.25	0.02	4.9	27	0.03	0.28	0.00
Plant #2										
741	2.5	6	0.03	0.10	0.00	1.1	7	0.07	0.16	0.01
Plant #3										
2	84.0	83	0.55	9.60	0.00	22.8	7	0.14	0.40	0.00
20	84.0	14	0.26	1.10	0.00	22.8	8	0.31	2.50	0.00
Plant #4										
814	16.6	25	0.29	1.30	0.01	24.9	13	0.55	1.90	0.00
Plant #5										
541	48.7	4	0.25	0.38	0.15	11.4	13	0.11	0.31	0.03
TOTAL	28.0	183	0.32	9.60	0.00	11.7	133	0.12	2.50	0.00
			MAY					JUNE		
Plant #1										
438	3.3	8	0.01	0.04	0.00	5.5	40	0.09	0.77	0.00
441	3.3	9	0.05	0.12	0.01	5.5	14	0.07	0.30	0.01
Plant #2										
741	3.5	1	0.08	0.08	0.08	11.7	1	0.01	0.01	0.01
Plant #3										
2	7.4	8	0.10	0.40	0.00	4.8	6	0.02	0.10	0.00
20	7.4	6	0.03	0.10	0.00	4.8	4	0.05	0.20	0.00
Plant #4										
814	23.8	15	0.52	1.60	0.01	40.3	6	0.59	1.10	0.02
Plant #5										
541	4.0	20	0.07	0.92	0.01	12.6	8	0.07	0.23	0.01
TOTAL	9.1	67	0.16	1.60	0.00	16.6	79	0.11	1.10	0.00

*Number of personal monitoring samples.

BFG37875

25140001

TABLE IV
PERSONAL MONITORING OF INDIVIDUALS ENGAGED
IN THE TRANSPORTATION OF PVC RESINS AND COMPOUNDS - 1974

Date	Customer	Geon Resin	Package	RVCN At Time Of Shipment	Loading			Unloading		
					Person	Amount	Time Min.	Person	Amount	Time Min.
12/13/74	BFG-IPC Marietta, OH	92	Bulk Truck	<50	Driver ¹ Loader Inspector	.29 1.00 .55	102 102 102	Driver ¹ Driver ¹	<0.1 0.2	10 15
12/ 6/74	BFGCC Avon Lake, OH	103EP F-76	TL, Bag	<50	Driver ² Driver ²	2.20 2.00	6 16			
12/12/74	BFGCC Louisville, KY	103EP	TL, Bag	<50	Driver ²	.80	10			
12/ 6/74	BFGCC Louisville, KY	121	TL, Bag	<25	Driver ²	0	10			
12/12/74	OK Trucking Terminal	121 83794 Flex. Compd.	TL, Bag	<25 <25				Driver ² Driver ²	<0.1 0.1	15 20
12/20/74	BFGCC	8720 Flex. Compd. 83741 Flex. Compd.	TL, Bag	<25 <25	Driver ²	.60	10			

¹Bulk truck driver

²Forklift truck driver

(4/4/75)

BFG37876

TABLE V

PERSONAL MONITORING OF INDIVIDUALS ENGAGED
IN THE TRANSPORTATION OF PVC RESINS AND COMPOUNDS - 197

<u>Material</u>	<u>RVC</u> <u>(ppm)</u>	<u>Sample</u> <u>Type</u>	<u>Sample Point or Operation Monitor</u>	<u>Sampling</u> <u>Time</u> <u>(Minutes)</u>	<u>AVCM</u> <u>(ppm)</u>
Customer: #10					
Date: 4/18/75 and 4/21/75					
Package Type: Box					
Geon 83741-132	< 1.0	Static	Inside nose of the trailer immediately upon opening doors	29	0.22
Lot 00073		Personal	Forklift operator	29	< 0.01
(Louisville, Ky.)		Personal	Forklift operator	29	< 0.01
Customer: #11					
Date: 4/23/75 and 4/24/75					
Package Type: Box					
Geon 85721-020	< 1.0	Personal	Forklift operator	49	< 0.01
Lot 26049					
(Avon Lake, Ohio)					

BFG37877

25140035

Material	RVC (ppm)	Sample Type	Sample Point or Operation Monitored	Sampling Time (Minutes)	AVCM (ppm)
Customer: #12 Date: 4/29/75 Package Type: Bag					
Geon 83741-021 Lot 00111 (Louisville, Ky.)	1.0	Static	Inside nose of the trailer immediately upon opening doors	55	<0.01
		Personal	Forklift operator	55	<0.01
		Personal	Forklift operator	55	<0.01
Customer: #13 Date: 4/30/75 Package Type: Bulk Truck					
Geon 92 Resin Lot 21088 (Avon Lake, Ohio)	35	Personal	Technician sampling resin from truck	74	0.02
		Static	Opening on top of storage silo	74	19.32
Customer: #14 Date: 5/6/75 Package Type: Bag					
Geon 92 Resin Lot 22393 (Avon Lake, Ohio)	<1.0	Static	Inside nose of the trailer immediately upon opening doors	51	0.12
		Personal	Forklift operator	51	<0.01

BFG37878

25140036

Sampling
Time
(Minutes)

AVCM
(ppm)

Sample Point or Operation Monitored

Sample
Type

RVC
(ppm)

Material

Customer: #15
Date: 5/12/75
Package Type: Box and Bulk Railcar

Geon 83714-004
Lot 41
Lot 43
(Louisville, Ky.)

Static
Inside nose of the trailer immediately upon opening doors

33 0.13

Personal
Forklift operator

33 0.04

Personal
Extruder operator

195 0.07

Customer: #16
Date: 5/16/75
Package Type: Box and Bulk Truck

Geon 85802-518
Lot 950510
(Henry, Il.)

Personal
Forklift operator

49 <0.01

Customer: #17
Date: 5/7/75
Package Type: Bag

Geon 83789-021
Lot 00216
(Louisville, Ky.)

Static
Inside nose of the trailer immediately upon opening doors

48 0.15

Personal
Material handler operating electric cart

48 0.06

BFG37879

25410077

Sampling
Time
(Minutes)

AVCM
(ppm)

Sample Point or Operation Monitored

Sample
Type

RVC
(ppm)

Material

Customer: #18
Date: 5/19/75
Package Type: Bag

Geon 83700-290
Lot 263
(Louisville, Ky.)

Inside nose of the trailer immediately
upon opening doors

Static

<1.0

36

<0.02

Customer: #19
Date: 6/2/75
Package Type: Bag

Geon 7081-136
Lot 910769

Forklift operator

Personal

0.05

72

<0.01

BFG37880

80007122

TABLE VI

EFFECT OF THE REDUCTION OF RESIDUAL VINYL CHLORIDE
IN PVC RESIN ON AMBIENT VINYL CHLORIDE WITHIN A CLOSED TRAILER

<u>Test Date</u>	<u>Resin</u>	<u>Lot Number</u>	<u>AVCM ppm</u>	<u>RVCN ppm</u>	<u>Test Conditions</u>
11/18/74	103EP	L2106 (bags)		144	49°F. unheated trailers Louisville
		1 skid	4		
		2 skids	15		
		4 skids	29		
		9 skids	12 and 14		
		L2107		119	
		1 skid	6		
		2 skids	26		
		4 skids	35		
		9 skids	16 and 29		
4/11/75	103EP	02195		30	55°F. unheated trailers Louisville
		9 skids	1.5		
		02195		30	
		02194		49	
		4 skids	0		
		02195		30	
		02194		49	
		4 skids	0		

(5/8/75)

BFG37881

25140660

*Where more than one material per sample is noted, there is only one sampling point.

TABLE VII
SUMMARY OF AVCM MONITORING IN PUBLIC WAREHOUSES, 1974

Test Date	Warehouse	Sample Number	Compound or Resin	Lot No.	RVC Resin ppm	RVC Compound ppm	AVCM Storage ppm	Test Conditions
11/12/74	Kelmer Chicago, IL	1	Geon 121 Geon 128	950139	<25 <25		0.05	40°F., Improper ventilation
		2	Dup. of #1				0.07	
11/18/74	Sack Storage Worcester, MA	1	80x5	545209	<100		0.08	Good ventilation 48°F.
		2	Dup. of #1	545104			0.33	
		3	H1-temp 88925		110x285 - <100	<50	0.34	48°F. Inside of 45 foot trailer
		4	80x5				0.11	
		5	Dup. of #4				0.11	
		8	80x5		<100		0.05	Taken as driver opened door of 45 foot van, 40,000#
		9	Dup. of #8				0.06	
11/19/74	Flexi-Flo Bulk Terminal Acton, MA	5	102EP F-5		<50	<25	0.26	Taken near bottom outlet of hopper car
		6	Dup. of #5				0.43	
11/26/74	Consumers Warehouse Hickory, NC	1	84209-288 80644-021 8806-021	00074	103EP - <150 102 103EP - <150	<75 <75	0.81	50°, all readings may be affected by presence of Union Carbide solvent vinyls stored in paper bags

BFG37882

Test Date	Warehouse	Sample Number	Compound or Resin	Lot No.	RVC Resin ppm	RVC Compound ppm	AVCM Storage ppm	Test Conditions
11/26/74	Consumers Warehouse (Continued)	2	8818-021 84209-288 80534-243	000211 54090	103EP - <150 103EP - <150 102EP F-5 - <50	<75 <75 <25	0.87	Large truck door was open
		3	Dup. of #2	00073	103EP - <150	<75	0.87	
		4	8806-021 8801-021	540910	103EP - <150	<75	0.60	
		5	Dup. of #4	00073	103EP - <150	<75	0.71	
		6	8806-021				0.40	
12/10/74	California Warehouse Vernon, CA	1	8883-001 83794-288	73237 0064	103EP - <150 103EP - <150	<75 <75	1.20	2 open boxes; sample taken across from bags of U.S. solvent vinyl 60°F., fairly good Ventilation from 2 open truck doors
		2	Dup. of #1				1.40	
		3	83741-201 83794-288	73208 00064	103EP - <150 103EP - <150	<75 <75		
		4	Geon 128 Dup. of #3	960038	<25		1.10 1.01	
		5	83421-001 120x241 Geon 121 8814-021 Geon 427	73175 546841 23445 73158 00744	103EP - <150 <25 103EP - <150	<75 <75	0.32 0.32	
		6	Dup. of #5					
		9	Geon 124 Geon 131 120x241	546904				

BFG37883

02001122

Test Date	Warehouse	Sample Number	Compound or Resin	Lot No.	RVC Resin ppm	RVC Compound ppm	AVCM Storage ppm	Test Conditions
		9 (Continued)	82491-021 8883-001	00045 73237	103EP - <150 103EP - <150	< 75 < 75	0.33 0.46	
		10	Dup. of #9					

BFG37884

25140034

TABLE VIII

SUMMARY OF RESULTS OF AVCM MONITORING AT CUSTOMER PLANTS, 1974

Date	Company	Compound or Resin	Lot #	RVC Resin (ppm)	RVC CMPD (ppm)	AVCM Storage Area (ppm)	AVCM Shipping Compartment (ppm)	AVCM Process Area (ppm)	Conditions or Operations
5/2/74	Customer #1	103EPF76		< 100	< 50		1520.0	0	Vapor Space of Hopper Car
		Hi-Temp 3007		103EP < 150	< 75			0	Mixing Area
		Inj. Molding 85297		80x5 < 100	< 50			0	Extrusion Area
								0	Extrusion Area
								0	Injection Mold Area
								0	Extrusion Area
								0	Extrusion Area
								0	Blending Operation
								0	Extrusion Area
								0	Extrusion Area
								0	Extrusion Area
5/17/74	Customer #2	Inj. Molding 85297		80x5 < 100	< 50			0	Injection Mold Area
		Geon 121		< 25				0.3	Mixing Area
		Geon 121		< 25				0	Mixing Area
								0	Screening & Deaeration
								0	Coating Area
								0	Coating Area
								0	Oven Area
								0	Oven Area
								0	Coating Area
								0	Warehouse Area
								0	Sample Taken Approx. 30 Yds. From Bldg.
								0	Print-Line Area

BFG37885

99001122