

U.S. DEPARTMENT OF HEALTH, EDUCATION, AND WELFARE
NATIONAL INSTITUTE FOR OCCUPATIONAL SAFETY AND HEALTH
CINCINNATI, OHIO 45202

HEALTH HAZARD EVALUATION DETERMINATION
REPORT NO. 73-53-183

CONVERTERS INK COMPANY, INC.
DIVISION OF BEATRICE FOOD
LINDEN, NEW JERSEY
APRIL 1975

I. TOXICITY DETERMINATION

It has been determined that solvent vapors of ethyl acetate, isopropyl acetate, ethanol, n-propyl acetate, n-propyl alcohol, n-heptane, isopropanol, toluene and lead, chromium, titanium dioxide and inert dust are not toxic to employees in the Ball Mill and Mixing Rooms at the concentrations measured during the evaluations conducted September 20-21, 1973 and March 26-27, 1974. This determination is based upon environmental measurements in the workplace and medical interviews with employees.

Two maintenance men servicing the solvent pumps under current procedure are potentially exposed to toxic levels of solvent vapors while repairing the pumps inside the building.

The fact that many workers could sometimes pinpoint particular chemicals causing symptoms, suggests that exposure to at least some of the chemicals is at times sufficient to cause symptoms and hence should be regarded as having at least a minor toxic effect.

The fact that no serious health problems were found attests more to the minor toxic nature of the substances used than to the control measures in effect. Thus, the introduction of any new substance should be done only after careful consideration of its toxic potential.

II. DISTRIBUTION AND AVAILABILITY OF DETERMINATION REPORT

Copies of this determination report are available upon request from the Hazard Evaluation Services Branch, NIOSH, U.S. Post Office Building, Room 508, Fifth & Walnut Streets, Cincinnati, Ohio 45202.

Copies have been sent to:

- a. Converters Ink Co., Inc., Division of Beatrice Food,
Linden, New Jersey
- b. Authorized Representative of Employees
- c. U.S. Department of Labor - Region II
- d. NIOSH - Region II

For the purposes of informing the approximately 42 "affected employees", the employer will promptly "post" the determination report in a prominent place(s) near where exposed employees work for a period of 30 calendar days.

III. INTRODUCTION

Section 20(a)(6) of the Occupational Safety and Health Act of 1970, 29 U.S.C. 669(a)(6), authorizes the Secretary of Health, Education, and Welfare, following a written request by any employer or authorized representative of employees, to determine whether any substance normally found in the place of employment has potentially toxic effects in such concentrations as used or found. The National Institute for Occupational Safety and Health received such a request from an authorized representative of employees regarding exposures to dust and organic compounds in the Ball Mill and the Mixing Room at Converters Ink Co., Inc., Division of Beatrice Food, Linden, New Jersey.

IV. HEALTH HAZARD EVALUATION

A. Description of Process - Condition of Use

Pigment concentrate is formulated in the Ball Mill Room. Dry pigments and varnish are added to the ball mills which then run approximately 18 hours to thoroughly mix the ingredients. In the mixing room, cloth gloves are often worn. Several major processes are used. One operation is devoted exclusively to mixing white ink using titanium dioxide as the pigment. Two large covered vats are utilized. Another standing operation is the varnish mixer which also utilizes covered vats. Other mixtures are made in 55 gallon drums which are wheeled around on platform scales while ingredients are added and then are placed onto mixers. Most mixing is done on the first shift which has 9 men as compared to 2 men on the second shift. These color concentrates are then used as needed in the mix room to get the color and consistency desired. When the mixture appears about right, a sample is placed in a paper cup and taken to the laboratory section by the cup runner. There it is compared with the specified standard and either passed or modifications prescribed. After the ink has passed, it is strained into 55 gallon drums or 5 gallon pails, sealed, labeled, and moved out for shipping.

In the Mill Room it was observed that some solvents were carried to the individual mills in open buckets. Other solvents were added to the mill by hose. For ease of loading there was an elevated platform along the wall behind the mills. The solvent pumps were located under this platform. The mills were water jacketed, primarily for cooling, and could be tipped to empty into containers brought in at floor level.

Ventilation was supplied by an exhaust system which had hood type vents near some of the dustiest processes, and pipes which could be introduced into the open top of drums on the mixers. Unfortunately, vents often

worked at cross purpose with other air currents. This was most noticeable around the white mixing tanks and in the mixing drums. There reportedly had been considerable expansion of the ventilation system several years ago.

B. Evaluation Design

1. Preliminary Survey

A preliminary observational survey of the Ball Mill Room and the Mixing Room was made on September 20-21, 1973 to assess the alleged dust and solvent hazard. During the visit, air sampling tubes containing activated charcoal were saturated with airborne solvent vapors using MSA model G battery powered pumps. Bulk samples of solids and liquids in use were also obtained. The saturated charcoal tubes were analyzed and found to contain heptane, isopropyl acetate, isopropyl alcohol, ethanol, n-propyl alcohol, toluene, xylene and ethyl acetate. The multitude of substances found in the saturated air samples and the need for medical support to adequately evaluate employees complaints precipitated a follow-up environmental-medical evaluation.

Five filter samples were collected in the 2 areas (2 personal and 3 general area samples) and analyzed for total weight, titanium dioxide (nuisance dust) lead, and chromium. Of the 5 samples collected all were found to be well below currently accepted levels for occupational exposure. A summary of these preliminary evaluations is presented in Table I.

2. Follow-up survey

On March 26-27, 1974 a follow-up environmental-medical evaluation was conducted. Operators were monitored on the first and second shifts in the Ball Mill Room and the Mixing Room. A total of 21 personal breathing zone samples were collected. The average length of employee exposure per shift was approximately 6-7 hours. Private medical interviews with all available workers were conducted in an attempt to elicit any symptoms which could be related to the agents to which they were exposed. Employees were asked non-directed followed by directed questions regarding their health and employment by a NIOSH physician.

A. Evaluation Methods

1. Environmental

Employee exposures to ethyl acetate, isopropyl acetate, ethanol, n-propyl acetate, and n-propyl alcohol vapors were monitored using personal air sampling equipment. Solvent vapors were collected in air sampling tubes containing activated charcoal. The charcoal tubes were analyzed at NIOSH's Cincinnati laboratories by the gas chromatographic techniques reported by White, et. al.¹ This gas chromatographic procedure was modified to accommodate the specific solvents previously mentioned.

2. Medical

Private medical interviews were performed on all available workers during each shift by non-directed and directed questioning by a NIOSH physician to elicit health complaints and general information regarding working conditions.

B. Evaluation Criteria

1. Environmental Criteria

In this study, a review of the most current toxicological literature indicates that the following environmental exposure levels be used as guides to prevent excessive or hazardous exposure to toxic dusts and vapors: it should be pointed out that these guides pertain to single component exposures only. They do not take into account the overall effect of simultaneous exposure to two or more components which, in many cases, are not only additive, but actually synergistic, i.e., the combined effect is greater than the sum of the individual effects.

The three primary sources of environmental evaluation criteria considered in this report are: (1) NIOSH criteria documents recommending occupational health standards, (2) American Conference of Governmental Industrial Hygienists (ACGIH) threshold limit values with supporting documentation, and (3) federal occupational health standards. For brevity, federal standards are used as reference points in the following presentation of evaluation criteria.

The occupational health standards promulgated by the U.S. Department of Labor (Federal Register, June 27, 1974, Vol. 39, No. 125, Title 29, Chap. XVII, Part 1910, Subpart G, Table G-1-2&3) applicable to the individual substances of this evaluation are as follows:

<u>Substance</u>	8-Hour Time-Weighted-Average Exposure Standard	
	<u>ppma</u>	<u>mg/M³</u> ^b
Ethyl Acetate	400	
Isopropyl Acetate	250	
Ethyl Alcohol	1,000	
N-propyl Acetate	200	
N-propyl Alcohol	200	
2-Nitro Propane	25	
Lead ^c		0.2
Chromium		0.5
Total Dust ^d (Titanium Dioxide)		15

- a - parts of vapor or gas per million parts of contaminated air by volume.
 b - approximate milligrams of particulate per cubic meter of air.

- c - NIOSH in its criteria for a recommended standard - occupational exposure to inorganic lead recommends that employee exposure to inorganic lead be controlled to 0.15 mg/M³ for a 40-hour week and 0.12 mg/M³ for a 50-hour week.
- d - the ACGIH in its threshold limit values for some nuisance particulates (titanium dioxide) in the workroom air recommend that employee exposure be controlled to 10 mg/M³ on an 8-hour time-weighted-average basis.

Occupational health standards for individual substances are generally established at levels designed to protect workers occupationally exposed on an 8-hour per day, 40-hour per week basis over a working lifetime.

C. Evaluation Results and Discussions

1. Environmental

Results of follow-up environmental sampling are contained in Table II. Time-weighted-average employee exposure are summarized as follows:

Ethyl Acetate	3-14 ppm
Isopropyl Acetate	2-25 ppm
Ethanol (Ethyl Alcohol)	10-92 ppm
N-propyl Acetate	3-44 ppm
N-propyl Alcohol	2-55 ppm

"When two or more hazardous substances are present, their combined effect rather than of either individually, should be given consideration. In the absence of information to the contrary, the effects of different hazards should be considered additive." The sum of the fractions, concentration over the occupational health standard for each substance ($C_1/T_1 + C_2/T_2 + C_3/T_3 + \dots + C_N/T_N$) should not exceed unity. Using this relationship, no employee was found to have a significant exposure to this mixture of solvents, ($C_1/T_1 + \dots + C_N/T_N > 1$), during normal processes and operations.

Maintenance is mainly concerned with keeping operations running on an "as needed" basis. The usual procedure, when it is necessary to enter a tank, is to empty it as far as possible, rinse it down with water and allow it to sit idle for a day. If it is more urgent, a thorough water flush is used. According to employees interviewed the greatest solvent exposure is encountered with working on the solvent pumps under the platform in the Mill Room where there is practically no ventilation. A respirator is not used. It is expected that the pumps will eventually be moved outside the building into a building of their own. No measurements were made of exposure to maintenance workers, since their services were not used on the days of this survey. However, it is quite

probable that exposures to solvent vapors are excessive during such operations as repairing or removing the solvent pumps. This, therefore, must be considered a potentially toxic exposure that requires respiratory protection.

During the environmental sampling on March 26-27, 1974, the solvent (2 nitropropane) was not used and therefore was not detected on the activated charcoal air sampling tubes.

General housekeeping in the Ball Mill and Milling Rooms was poor. Floors were covered with a variable coating of dried ink. Accumulations of dry pigments were observed near dry handing operation. Although solvents were stored in closed containers, there were many drums of inks left uncovered. The mixing area, in particular, was cluttered. There was even some clutter positioned beneath the emergency shower near the caustic cleaning tank.

A visit to the employees rest area also showed a general low level of housekeeping, although little dust and ink were found there.

2. Medical

After an initial walk through survey by the NIOSH physician and conference with management and labor representatives on March 26, 1974, it was determined to interview all workers on duty from both shifts. Except for one worker who preferred not to talk with the doctor, this was accomplished. An additional four workers who were not on duty, were not seen. All workers were males. The average age was 35.0 years with a range of 23-62 years. The average length of service was 8.0 years with a range of 4-17 years. A total of 27 men were seen, 21 on the first shift and 6 on the second shift.

The breakdown of the sample by position and shift is included in Table III. Table IV lists symptomatology as elicited on non-directed and directed questioning. This is primarily historic data covering the total period of the workers employment at Converters Ink Company. The workers were not particularly complaining on the day of the visit. The non-directed question asked "Do you have any health problems you feel might be related to your work?" The low level of specific positive responses make a specific, recurrent, acute problem area unlikely. The directed questioning is designed to pick up potential problems with the compounds in use which may not occur frequently enough or in a sufficient degree to cause the men to comment spontaneously.

The major specific complaint in response to the non-directed question was that of headaches but this involved only 4 out of 27 workers (15%). On total questioning (non-directed and directed) the leading specific complaints were a bad taste - 16 of 27 workers (59%); eye irritation - 14 of 27 (52%); headaches - 13 of 27 (48%); dizziness or fatigue - 12 of 27 (44%); and nasal irritation or stuffiness - 11 of 27 (41%).

There was a marked difference between first and second shift in the incidence of symptoms relating to bad taste, nausea, indigestion, or ulcer. All men

with these complaints were on the first shift except for one complaining of a bad taste and another complaining of nausea. Otherwise, there was no marked differences between shifts.

Some of the symptoms detailed in Table III were related to specific pigments or solvents.

Sixteen of 27 men reported a bad taste. The Gold and Silver pigments were reported to be the greatest offenders. Out of the 16 men reporting this symptom, 6 mentioned no specific agent, 8 specifically mentioned gold. Six of these 8 mentioned silver as well. The first shift was primarily involved and not only the man doing the mixing, but others in the area were affected. This bad taste was particularly brought out by smoking after the exposure.

Nine of 27 men reported nausea. Of the several solvents specifically mentioned as causing nausea, 2-Nitropropane was most frequently mentioned. Out of the 9 men reporting this symptom, 2 mentioned no specific agent and 5 specifically mentioned 2-Nitropropane.

The Molydated Orange pigment was mentioned as causing headaches more frequently than any individual solvent. As the pigment itself is not known to produce headaches, this symptom probably relates to the solvent which is a mixture of denatured alcohol, isopropyl alcohol, isopropyl acetate and normal propanol.

Both of the two maintenance workers identified symptoms of intoxication from solvent vapors when having to work in cramped quarters, particularly when working with the solvent pumps. They have experienced headaches and occasionally some dizziness, as well as irritation of the eyes and occasionally upset stomach. One of the workers mentioned problems when working with the pumps in response to the non-directed question.

D. Discussion and Conclusion

The fact that most complaints were historic and not current suggests there was no acute problem at the time of the visit. The NIOSH investigational team did not notice any symptomatology in themselves either.

The fact that spontaneous complaints about one specific problem were not high suggests that there is not a serious acute problem with general exposure to the various chemicals used in this plant. The fact that workers could sometimes pinpoint the particular chemical causing symptoms, suggests that exposure to at least some of the chemicals is at times sufficient to cause symptoms and hence should be regarded as having at least a minor toxic effect. That effects were not always confined to the person working directly with the substance is shown by others than the involved mixer getting a bad taste when Gold or Silver pigments were being mixed.

The directed questioning brought out that a large majority of the workers have had some symptoms from time to time suggesting that measures to control exposure are not completely satisfactory.

V. RECOMMENDATIONS

1. Investigate the possibility of moving the solvent pumps outside the building to reduce the solvent exposure to the maintenance staff.
2. NIOSH approved respirators for solvent vapors should be worn by maintenance men when servicing the solvent pumps in confined area.
3. Strict enforcement of covering all containers containing solvents whenever possible would help to reduce the concentration of solvent vapors in the air.
4. Good housekeeping practice should be instituted as a safety measure, primarily to assure clear aiseways and ready access to emergency showers and eye wash facilities.
5. Improve ventilation control by reevaluation of the entire ventilation system, and design installation of effective control velocities at points of dust and vapor generation.

VI. REFERENCES

1. White, W.D., D.B. Taylor, P.A. Mauer, and R.E. Kupel; "A Convenient Optimized Method for the Analysis of Selected Vapors in the Industrial Atmosphere", American Industrial Hygiene Association Journal, Volume 31, 225-227, March-April 1970.
2. Documentation of the Threshold Limit Values, ACGIH, 3rd Ed., Cincinnati, Ohio, 1971.

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TABLE I

SUMMARY OF AIR SAMPLES AT CONVERTERS INK COMPANY, INC.
September 20, 1973

<u>Operation</u>	<u>Location</u>	<u>Type of Sample</u>	<u>Dust mg/M³* Total Dust</u>	<u>Lead mg/M³</u>	<u>Chromium mg/M³</u>
Mixer	White Paint Area	Personal	8.63	.003	.002
Mixer	White Paint Area	Personal	1.21	.003	.003
	General Mixing Area	General Area	0.63	.007	.003
	Ball Mill Room	General Area	0.70	.006	.004
	Ball Mill Room	General Area	0.40	.004	.003

*Milligrams of particulate per cubic meter of air

Federal Standards

Total Dust	15 mg/M ³
Lead	0.2 mg/M ³
Chromium	0.5 mg/M ³

TABLE II

SUMMARY OF ENVIRONMENTAL RESULTS AT CONVERTERS INK CO., INC., DIVISION OF BEATRICE FOOD,
LINDEN, NEW JERSEY, ON MARCH 26-27, 1974 IN THE BALL MILL ROOM AND THE MIXING ROOM

Job Classification	Type of Sample	Date	Time of Samples	TWA EXPOSURE IN PPM ^a					
				Ethyl Acetate PPM	Isopropyl Acetate PPM	Ethanol PPM	N-Propyl Acetate PPM	N-Propyl Alcohol PPM	Combined Exposure Weighing
Varnish-Man	Personal (BZ)	3-26-74	2:40 pm - 9:37 pm	14	3	10	44	55	0.55
Working-Foreman	Personal (BZ)	3-26-74	2:42 pm - 9:38 pm	3	3	17	4	11	0.11
Cup-Runner	Personal (BZ)	3-26-74	2:45 pm - 9:39 pm	12	11	48	11	9	0.22
Fill-Off-Man	Personal (BZ)	3-26-74	2:48 pm - 9:40 pm	4	3	22	3	6	0.09
Shipper	Personal (BZ)	3-26-74	2:57 pm - 9:40 pm	3	3	12	3	2	0.06
Fill-Off-Man	Personal (BZ)	3-27-74	8:21 am - 3:31 pm	2	3	18	3	7	0.08
Fill-Off-Man	Personal (BZ)	3-27-74	8:30 am - 3:17 pm	6	2	22	5	4	0.09
Mixer	Personal (BZ)	3-27-74	8:30 am - 3:31 pm	6	6	42	7	11	0.17
Mixer	Personal (BZ)	3-27-74	8:34 am - 3:37 pm	3	2	22	3	8	0.09
Mixer	Personal (BZ)	3-27-74	8:45 am - 3:37 pm	4	5	32	4	7	0.12
Mixer	Personal (BZ)	3-27-74	8:39 am - 3:28 pm	5	7	54	8	17	0.22
Cup-Runner	Personal (BZ)	3-27-74	8:40 am - 3:27 pm	9	3	25	3	6	0.10
White-Man Oper.	Personal (BZ)	3-27-74	8:50 am - 3:25 pm	6	2	26	6	4	0.10
Varnish-Man	Personal (BZ)	3-27-74	8:55 am - 3:22 pm	12	11	48	11	32	0.34
Mill-Hand	Personal (BZ)	3-27-74	9:00 am - 3:19 pm	12	11	48	11	9	0.22
Supervisor	Personal (BZ)	3-27-74	9:02 am - 3:13 pm	3	3	26	3	4	0.08
Supervisor	Personal (BZ)	3-27-74	9:05 am - 3:29 pm	9	3	20	7	7	0.12
Filling Pr. with S-44	Personal (BZ)	3-27-74	10:45 am - 11:05 am	10	9	62	9	7	0.20
Fill-Off-Operator	Personal (BZ)	3-27-74	11:43 am - 12:01 noon	8	20	86	15	16	0.34
Fill-Off-Operator	Personal (BZ)	3-27-74	2:42 am - 3:13 pm	5	25	92	10	7	0.29
San-Mill -Operator	Personal (BZ)	3-27-74	9:33 am - 3:24 pm	3	2	44	6	4	0.11

a - PPM = parts of vapor or gas per million parts of contaminated air by volume at 25°C and 760 mm Hg pressure
BZ - Breathing Zone

Federal Standards

	PPM
Ethyl Acetate	400
Isopropyl Acetate	250
Ethanol (Ethyl Alcohol)	1000
N-Propyl Acetate	200
N-Propyl Alcohol	200

Combined Exposure 1.0

TABLE III
WORKERS SEEN BY POSITION AND SHIFT

POSITION	1st SHIFT	2nd SHIFT	TOTAL
Working Foreman	1	1	2
Shipping	1	1	2
Maintenance	2	0	2
Cup Runner	2	1	3
Mixers - Varnish	1	1	2
Mixers - White	2	0	2
Mixers - Other	4	0	4
Lead Mill Hand	1	0	1
Mill Room	3	0	3
Lead Fill Off	1	0	1
Fill Off	2	2	4
General Laborer (Pot Washer)	<u>1</u>	<u>0</u>	<u>1</u>
TOTALS	21	6	27

TABLE IV
SYMPTOMATOLOGY POSSIBLE JOB-RELATED

SYMPTOMS	NON DIRECTED QUESTION ONLY		NON DIRECTED AND DIRECTED QUESTIONING	
	No. With Symptoms	% Of Those Seen	No. With Symptoms	% Of Those Seen
Bad Taste	0	0	16	59
Bausea	2	7	7	26
Indigestion	2	7	4	15
Ulcer or Possible Ulcer	0	0	3	11
Sub-total	4	15	20	74
Nasal Irritation or Stuffiness	2	7	11	41
Loss of Taste or Smell	1	4	6	22
Sub-total	3	11	14	52
Headaches	4	15	13	48
Dizziness or Fatigue	1	4	12	44
Sub-total	4	15	21	78
Eye Irritation	1	4	14	52
Throat Irritation	0	0	6	22
Job Related Cough	1	4	8	30
Chest Discomfort or Shortness of Breath	2	7	7	26
Sub-total	4	15	21	78
Skin Irritation	2	7	6	22
Dry Skin	1	4	7	26
Sub-total	2	7	11	41
All Other Job Related Symptoms	5	19	6	22
<u>TOTAL SEEN</u>		27		27

NOTE: The non directed question asked "Do you have any health problems you feel might be related to your work?"
This is primarily historic data and not currently symptomatology.