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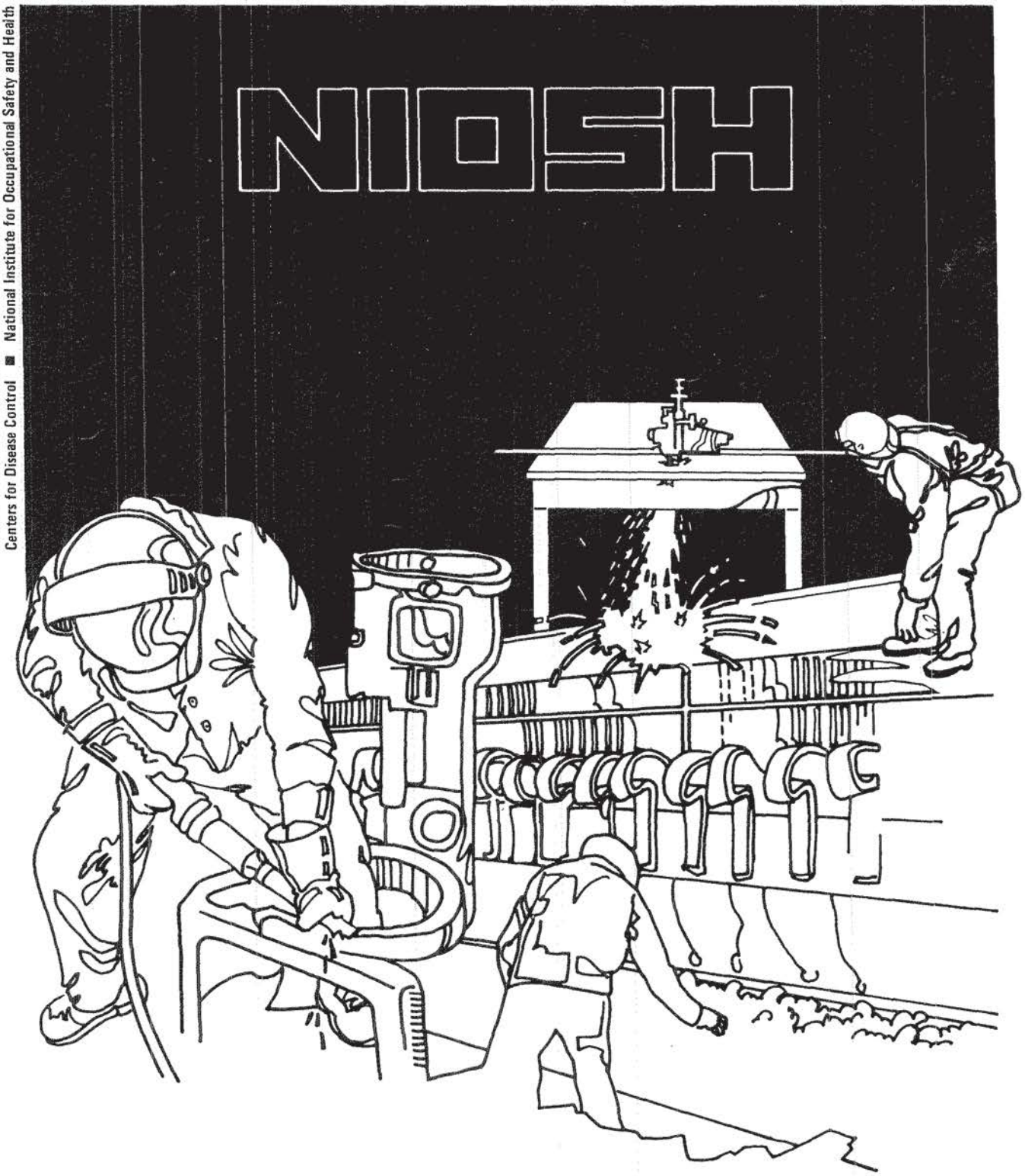

Health Hazard Evaluation Report

80-100-798

PREFACE

The Hazard Evaluations and Technical Assistance Branch of NIOSH conducts field investigations of possible health hazards in the workplace. These investigations are conducted under the authority of Section 20(a)(6) of the Occupational Safety and Health Act of 1970, 29 U.S.C. 699(a)(6), which authorizes the Secretary of Health and Human Services, following a written request from 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.

HE 80-100-798
January 1981
Jehl Cooperage Company Inc.
Memphis, Tennessee

NIOSH INVESTIGATORS:
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I. SUMMARY

On March 24, 1980, NIOSH received a Health Hazard Evaluation request from the United Auto Workers of America, District 65, Division 19, to investigate potential worker exposures to various chemical wastes, and the general working conditions at Jehl Cooperage Company Incorporated in Memphis, Tennessee. The workers complained of chemical burns, shortness of breath, lung congestion, dizziness, and stomach cramps. The company manufactures new 55-gallon drums and reconditions used ones obtained from various industries. An environmental and medical survey was conducted on April 23-25, 1980.

The concentrations of the substances analyzed in the personal and general area samples collected at Jehl, with their recommended exposure limits in parentheses were: toluene, none detected (N.D.) - 81.1 ppm (100 ppm); xylene, N.D. - 44.8 ppm (100 ppm); aliphatic hydrocarbons, N.D. - 14.6 ppm; aromatic hydrocarbons, N.D. - 1.7 ppm; ethyl acetate, 0.6 - 13.0 ppm (400 ppm); cellosolve acetate, N.D. - 1.1 ppm (100 ppm); isobutanol, N.D. - 0.9 ppm (50 ppm); methyl isobutyl ketone, N.D. - 0.2 ppm (50 ppm); methyl ethyl ketone, N.D. - 7.7 ppm (200 ppm); isopropyl alcohol, N.D. - 3.7 ppm (400 ppm); isopropyl acetate, N.D. - 1.7 ppm (250 ppm); lead, stable at 0.003 mg/M^3 (0.05 mg/M^3); hexavalent chromium, 0.0008 - 0.0018 mg/M^3 (0.001 mg/M^3); iron oxide, 0.42 - 1.72 mg/M^3 (5 mg/M^3); and sodium hydroxide, 0.004 - 0.02 mg/M^3 (2 mg/M^3).

At the time of the survey, there were no personal exposures in excess of the recommended exposure limits. The Threshold Limit Index (TLI) for the combination of the different organic vapors was determined for each worker sampled. The values ranged from 0 to 0.84 (a value exceeding 1 denotes an overexposure).

Twenty two of 51 (43%) production workers were interviewed. The most common complaints were headaches, respiratory irritation, skin rashes and nervousness, which workers attributed to liquid chemicals, fume, and dust while cleaning and reconditioning used drums. The receiving yard was the most heavily contaminated area, and had the highest potential for exposure. The personal protective clothing provided for these workers was generally inadequate. There was also a lack of eye washing facilities in chemical handling areas.

Although no recommended exposure limits were exceeded at the time of the survey, the workers interviewed reported significant adverse health effects due to their occupational exposures. Those most severely affected, worked in the yard, wash house, and shot blasting areas. Recommendations to maintain safety and health are included in Section VIII of this report.

KEYWORDS: SIC 3490 (miscellaneous fabricated metal products) organic vapors, lead chromate, lead, hexavalent chromium, sodium hydroxide, dermatitis, hepatitis, respiratory irritation, anxiety.

II. INTRODUCTION

On March 24, 1980, NIOSH received a request from the United Auto Workers, District 65, Division 19, to conduct a health hazard evaluation at Jehl Cooperage Incorporated in Memphis, Tennessee. Several employees had complained of dizziness, shortness of breath, lung congestion, and other symptoms related to occupational exposures to solvents and chemical wastes in the workplace.

III. BACKGROUND

The company employs 51 men, 41% of whom began work there during the past 5 years. They manufacture and recondition drums used in many industries. The facility is organized into several shops and areas: Receiving, the burner shed, the incinerator, shot blasting, the drum wash house, ring dip painting, lid and drum lining, spray painting, and new drum manufacturing.

In the receiving area (outside) 3 men unload used drums from tractor trailers. The drums commonly contain residual chemicals of generally unknown composition (paints, solvents, etc.) They are transported to the burner shed via a chain conveyor where the tops are removed and the contents are dumped into a pit (2 men work in this area). From the burner shed, the drums are transferred to the incinerator, where the paint and residual chemicals are burned off. Every Saturday, an overtime crew transfers the contents of the pit into drums, which are stored the in the yard. At the time of the survey, there were approximately 1500 drums stacked in the yard.

After incineration, the drums are conveyed to the shot blast area where the dents are rolled out, residual matter is blasted off with steel shot, and the drums are inspected for leaks and quality. The 4 men, working in this area, are potentially exposed to iron oxide fumes. Tight head drums (i.e. those drums with integrated tops) are further cleaned in the drum wash house with jets of steam, and 7% sodium hydroxide. Here, used rings (which hold the tops on open headed drums) are soaked in a caustic solution, dried, and dipped in a tank of industrial aluminum paint by 1 man in the ring dip area. The rings are stacked on the sides of the tank to dry. There is no ventilation provided at this site. There are potential exposures to sodium hydroxide, toluene and xylene in this area.

New drums are also manufactured in a production line within the building. Sheet steel is rolled into shape and welded to form a cylinder. Large presses punch lids from the sheet steel.

Drums (new and used) that will contain food additives, are lined with an epoxy phenolic resin. This occurs in the lid and drum lining areas. After

lining, the lids and drums are oven dried and transferred to one of two spray paint booths. Here, the exteriors of the drums and lids are painted and the lids are sealed to the drums. In these two areas, 4 men are potentially exposed to a variety of solvents, lead, and hexavalent chromium.

IV. EVALUATION METHODS

On April 23-25, 1980, NIOSH conducted an environmental and medical survey at the company. Several bulk material samples of chemical residue were collected from both the yard's surface and the burner shed for qualitative analysis using gas chromatography and mass spectrophotometry (GC/MS). The samples were collected by drawing the liquids through large charcoal tubes (600 mg) under negative pressure. Three bulk air samples were collected from the receiving area, the burner shed, and the incinerator's smoke stack. These samples were collected on large charcoal tubes (600 mg) at 1.5 liters per minute (LPM).

Personal breathing zone (BZ) samples were collected from the workers employed in the following areas: Receiving, the burner shed, lid and drum lining, lid sticking (the area where the lids are inserted in the drying oven), spray painting, the oven, and ring dip painting. These were collected on small charcoal tubes (150 mg) using low flow pumps (operating at flowrates of about 200 cubic centimeters per minute (cc/min) and analyzed for toluene, xylene, aliphatic and aromatic hydrocarbons, ethyl acetate, cellosolve acetate, isobutanol, methyl isobutyl ketone, methyl ethyl ketone, isopropyl alcohol, and isopropyl acetate. The samples were collected using NIOSH validated methods[1], and analyzed by gas chromatography. Several general area air samples were also collected in some of these areas.

Six general area air samples were collected in the drum wash house for sodium hydroxide (NaOH). Portable pumps operating at flowrates of 1.5 LPM drew air through impingers containing dilute hydrochloric acid (HCl). The method of sample analysis was a modified version of NIOSH PC&A #173.

Two general area air samples were collected at spray paint booth #1 (vertical paint booth) for lead and hexavalent chromium existing as lead chromate. These were collected on AA filters at a flowrate of 1 LPM. Three personal breathing zone samples, using AA filters at a flowrate of 1.5 LPM, were collected from workers in the shot blast area and analyzed for iron oxide. Both the lead chromate and iron oxide samples were analyzed by inductively coupled argon plasma emission spectrophotometry.

Twenty-two employees were interviewed by a NIOSH physician, who also toured the premises and observed the work practices of the employees.

V. EVALUATION CRITERIA

Several criteria are used to determine whether or not a worker has been overexposed to a chemical, biological, or physical agent. The OSHA Federal Standards given in Tables Z-1 & 2 of The General Industry Standards[2] are time weighted averages (TWA's) that shall not be exceeded. These are legally-enforced occupational health standards. The American Conference of Governmental Industrial Hygienists (ACGIH) recommends health standards known as Threshold Limit Values (TLV's)[3]. These represent levels of harmful agents to which the majority of the workers can be exposed without harm during their working years. NIOSH also recommends health standards for a variety of chemical substances[4]. Like the ACGIH's TLV's, they are recommended standards which are based on the best available research and information.

When a mixture of hazardous substances are present, their combined effect (i.e., the Threshold Limit Index) should be considered. The effects of the different hazards should be thought of as additive unless there is information to the contrary. Hence, if the sum of the following series is greater than unity, then the worker has been overexposed:

$$\frac{C_1}{T_1} + \frac{C_2}{T_2} + \frac{C_3}{T_3} + \ldots + \frac{C_n}{T_n}$$

Where C = measured atmospheric concentration
T = recommended exposure limit

Since the Health Hazard Evaluation Program was designed with the worker's safety and health in mind, then the most appropriate standard will be used to determine whether or not he is overexposed.

Table I lists the evaluation criteria selected for the organic and inorganic substances sampled.

VI. EVALUATION RESULTS AND DISCUSSION

A. Environmental

The substances identified in the bulk samples are presented in Table II. The results of the air samples taken for organic, and inorganic substances appear in Tables III and IV respectively. The personal air samples taken for toluene, xylene, aliphatic and aromatic hydrocarbons, ethyl acetate, cellosolve acetate, isobutanol, methyl isobutyl ketone, methyl ethyl ketone, isopropyl alcohol, isopropyl acetate, lead, hexavalent chromium, iron oxide, and sodium hydroxide indicated that no health standards were exceeded. Furthermore, assuming additive effects of the organic solvents, the recommended exposure limit (i.e., a TLI of 1) was not exceeded. One general area sample taken for hexavalent chromium at the vertical spray paint booth (booth #1) was above the most stringent standard of 0.001 milligrams per cubic meter (NIOSH). This sample however, was collected from within a ventilated area, away from the worker's breathing zone, and should not be considered as a personal exposure.

The exposures in the receiving yard were attributed to the handling and storage of drums, the incinerator's emissions, and the lack of personal protective equipment such as respirators and impervious clothing.

The sources of exposure in the production building include fuming drums entering into the shot blast area from the incinerator, iron oxide fume from shot blasting, and various solvents and metals from the lid and drum lining, and spray paint booths. Overspray from the spray paint nozzles entering the workers' breathing zones was observed.

The capture velocities of the drum and lid lining ventilation systems were each determined to be 200 FPM. Although they met the minimum requirements of the ACGIH Hood Design recommendations (i.e. 200-500 FPM)[5], thermal currents from the drying oven, ambient air flows, and the position of the spray nozzles resulted in paint overspray. The design of both the vertical and horizontal spray booths did not lend themselves to velocity measurements - but overspray was observed, and the systems were judged to be inadequate.

Although the drum wash house was not operating during our survey, the effectiveness of the existing ventilation system was questionable. In one area, there was an intake fan adjacent to a local exhaust ventilation hood. The intake fan would clearly reduce the effectiveness of the exhaust ventilation.

The workers (inside) reported that their exposures were much worse during the winter months. They attributed this to the windows and doors being closed, thereby reducing fresh air exchange and cross ventilation.

B. Medical

Twenty-two production workers were interviewed by a NIOSH physician. These men were currently working, or had recently worked, in the following areas:

Receiving Yard	- 3
Burning Shed	- 2
Shot Blasting Area	- 5
Wash House	- 4
Paint Spraying	- 6
Warehouse/Dispatch	- 2

Their ages ranged from 22-63 years (mean 39 years). Thirteen (59%) had worked at the plant for more than five years.

Outside in the receiving yard and burning shed, workers complained of respiratory irritation and headaches following exposure to the fumes from the incoming drums. Symptoms were most severe in the summertime - especially

when removing the tops of drums. They occasionally suffered chemical burns from the contents of drums and complained of a lack of protective eye washing facilities in the event of accidental injury. Other complaints included back pain and "nervous problems".

Those working in the wash house complained of irritation of the skin, eyes, and respiratory tract following exposure to heat and steam from hot caustic solution. A meter used to measure volumes of sodium hydroxide to be mixed in solution had recently failed and workers were obliged to guess the volumes of solution to be mixed. As a result, workers had suffered shortness of breath, burning of the chest, headache, and bleeding from the nose. Others complained of sinus problems, sore throat, hoarseness, and skin rashes. Two workers complained of foot problems. One suffered a chemical burn of the foot from caustic penetrating his shoe, and the other complained of uncomfortable hard patches forming on the feet. Another complained of a rash that developed on the inside of both thighs when his trousers became wet. The worker who paints the metal rings complained of dizziness and intoxication from fumes from the solvent in the paint. He dipped the rings in a paint bath in an area with no ventilation.

Workers exposed to the heated drums in the blasting area complained of skin and eye irritation and respiratory difficulty. All complained of high dust levels in the area. Dust settled in the nose and was coughed up in sputum. One worker complained of nose bleeds.

Workers in the paint spraying areas complained of similar symptoms which they attributed to exposure fumes from hot drums, paint fumes from the drying areas, and proximity to the shot blasting areas. The fumes were particularly troublesome in the wintertime when doors and windows were shut. Two complained of a lack of adequate ventilation in the area. Several workers complained of "nervousness", i.e., anxiety, difficulty in sleeping, "stomach ulcers", and depression.

During our investigation, an employee who had been working in the yard area was admitted to the hospital for investigation of malaise and joint pains associated with abnormal liver function tests. The appearance of his biopsy specimen was histologically consistent with a diagnosis of "toxic hepatitis", and his attending physicians were concerned that his toxic exposures at work might have caused this. Although the worker had been exposed over a long period to several potentially hepatotoxic chemicals it was not possible to identify a causitive relationship in this case.

VII. CONCLUSIONS

Health risks to workers exposed to solvents when cleaning barrels have been described previously[6]. Industrial solvents may be absorbed through the skin, through the lungs as vapors, or following ingestion. Acute toxic

symptoms such as headache, nausea, light headedness, fatigue, and mental confusion have been described, but other more severe and lasting damage to the liver and central nervous system may occur.

Short term transient narcotic effects are frequently reported by workers exposed to solvent fumes. However, there has been recent concern about possible long term effects, and in particular, psychological disturbances[7]. These may be subtle and not easily demonstrated in this relatively small group of workers, exposed to a variety of substances. The chemical exposures of these workers should therefore be carefully controlled and monitored to reduce the risk of these effects.

VIII. RECOMMENDATIONS

Suggested measures to control chemical exposures at the plant are as follows:

A. The Yard:

1. The most frequent complaints were associated with the handling of used drums containing chemical residues. Therefore, it is recommended that management receive those drums whose contents have been removed by their clients. During the interim, management should make every effort to accurately identify the contents of the drums, in order that the proper protection may be instituted (e.g., respirators, impervious clothing, etc.). The enclosed NIOSH Certified Equipment List should be used to select the proper respiratory protection. The employees should be trained in the use and maintenance of personal protective equipment. Furthermore, first aid and eye wash stations should be placed within easy access.

2. It is strongly recommended that management clean up the yard and dispose of all chemical residues in accordance with EPA regulations.

3. The ground level smoke exposure from the incinerator's stack should be reduced by increasing the stack's height.

B. The Main Production Building:

1. The exposure to the smoke from the hot drums entering the shot blast area after their incineration should be reduced by storing the drums outside to cool, or spraying or immersing the drums in cool water, or by installing local exhaust ventilation.

2. The levels of dust and iron oxide fume should be reduced by sealing up the shot blast machine and by improving the existing local exhaust ventilation system.

3. Overspray in the lid and drum lining areas, as well as the paint booths, should be minimized by adjusting the paint nozzles, increasing the capture velocity of the existing ventilation systems, and by installing a shield to deflect any excess spray. Employees should be provided with, and trained in the use of personal protective equipment such as respirators, goggles/face shields, gloves, and aprons/coveralls.

C. Drum Wash House

1. In the drum wash house, the exposures to sodium hydroxide should be minimized by improving the existing ventilation system on the drum wash platform adjacent to the caustic wash. The meter that monitors the volume of concentrated sodium hydroxide should be repaired so that solutions of known concentration may be prepared.

2. The employees who work with the sodium hydroxide should be provided with respirators, goggles, impervious gloves, aprons and boots. Furthermore, eye wash and first aid stations should be placed on the drum washing platforms. The ring dip tank has no ventilation whatsoever. The installation of local exhaust ventilation is strongly recommended for this process and the drying area. The ring dipper should be provided with the personal protection mentioned previously.

3. Management should institute an industrial hygiene program to identify and reduce potentially hazardous exposures. This includes periodic air monitoring, and inspection and maintenance of engineering control systems.

IX. AUTHORSHIP AND ACKNOWLEDGEMENTS

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X. DISTRIBUTION AND AVAILABILITY OF DETERMINATION REPORT

Copies of this report are currently available upon request from NIOSH, Division of Technical Services, Information Resources and Dissemination Section, 4676 Columbia Parkway, Cincinnati, Ohio 45226. After 90 days, the report will be available through the National Technical Information Service (NTIS), Springfield, Virginia 22161.

The employer shall post a copy of this evaluation for a period of 30 calendar days at or near the workplace(s) or affected employees. The employer will ensure that this evaluation is not altered, defaced, or covered by other material for this time period.

Copies of this report have been sent to:

1. Jehl Cooperage Company Incorporated
2. United Auto Workers, District 65, Division 19
3. NIOSH Region IV
4. OSHA Region IV
5. United Auto Workers International Union

XI. REFERENCES

1. NIOSH Manual of Analytical Methods, DHEW, PHS, CDC, NIOSH, 1979.
2. General Industry Standards OSHA Safety and Health Standards, 29 CFR 1910, Tables Z - 1 & 2, Revised November, 1978.
3. Threshold Limit Values for Chemical Substances and Physical Agents in the Workroom Environment With Intended Changes For 1980, American Conference of Governmental Industrial Hygienists, Cincinnati, Ohio.
4. NIOSH/OSHA Pocket Guide to Chemical Hazards, DHEW, NIOSH, Publication No. 78-210.

5. Industrial Ventilation A Manual of Recommended Practice, American Conference of Governmental Industrial Hygienists, Cincinnati, Ohio, 1978.

6. Hughes, J.P., Hazardous Exposures to Some So-Called Safe Solvents, JAMA, Sept. 18, 1954.

7. Report of the Swedish American Conference on Chemical Hazards in the Work Environment, Occupational Health and Safety, March 22, 1980.

TABLE I

Primary Health Effects and Evaluation Criteria
Jehl Cooperage Company Incorporated
Memphis, Tennessee
HE 80-100

April 23-25, 1980

	Toluene	Xylene	Aliphatic Hydrocarbons	Aromatic Hydrocarbons	Ethyl Acetate	Cellosolve Acetate	Isobutanol
PRIMARY HEALTH EFFECTS	Eye, skin, and upper respiratory tract irritant. Fatigue, confusion, skin burns, and dermatitis.	Eye, skin and mucous membrane irritant, dermatitis, possibly heart, liver and kidney damage.	Asphixiants and central nervous system depressants. Hexane has neurotoxic properties.	Liver, kidney and bone marrow damage, central nervous system depression, and dermatitis.	Eye, mucous membrane, nasal passage, and throat irritant.	Eye, mucous membrane, nasal passage, and throat irritant.	Narcotic stupor and eye irritant.
OSHA Standard[1]	200 (300) ppm[4]	100 ppm	*	*	400 ppm	100 ppm	100 ppm
ACGIH TLV[2]	100 (150) ppm	100 (150) ppm	*	*	400 ppm	100 (150) ppm	50 (75) ppm
NIOSH[3]	100 (200) ppm	100 (200) ppm	*	*	-------	-------	-------

	Methyl Isobutyl Ketone	Methyl Ethyl Ketone	Isopropyl Alcohol	Isopropyl Acetate	Hexavalent Chromium	Lead	Iron Oxide Fume	Sodium Hydroxide
PRIMARY HEALTH EFFECTS	Eyes, skin, and mucous membrane irritant, nerve tissue damage and dermatitis.	Eyes, skin, and mucous membrane irritant, nerve tissue damage and may cause dermatitis.	Eye, nose and throat irritant, a narcotic stupor.	Eye, nose, and and throat irritant a narcotic stupor.	Severe irritants of the skin, larnyx and nasapharnyx. Lung cancer.	Severe gastrointestional ailments, and anemia. Neuromuscular dysfunction and encephalopathy (a degenerative disease of the brain).	Causes a benign pneumocontosis known as siderosis.	Severe skin, eye and upper respiratory irritant.
OSHA Standard[1]	100 ppm	200 ppm	400 ppm	250 ppm	0.5 mg/M^3	0.05 mg/M^3	10 mg/M^3	2 mg/M^3
ACGIH TLV[2]	100 (125) ppm	200 (300) ppm	400 (500) ppm	250 (310) ppm	0.05 mg/M^3	0.15 mg/M^3	5 mg/M^3	2 mg/M^3
NIOSH[3]	50 ppm	200 ppm	400 (800) ppm	-----	0.001 mg/M^3	0.10 mg/M^3	------	(2 mg/M^3)

1. Occupational Safety and Health Administration, Permissible Exposure Limit
2. American Conference of Governmental Industrial Hygienists, Threshold Limit Value
3. National Institute for Occupational Safety and Health, Recommended Value
4. Figures in Parenthesis indicate a Short Term Exposure Limit or Ceiling

* No standards exist for occupational exposure to aliphatic and aromatic hydrocarbons

Table II

Jehl Cooperage Company, Inc.
Memphis, Tennessee
HE 80-100

April 23-25, 1980

Bulk Samples for Qualitative Analyses

Location	Sample Type	Analyses	
		Major Components	Minor Components
Receiving 4/24/80	bulk air charcoal tube	toluene xylene	trimethyl benzene methylethyl benzene perchloroethylene isopropanol isobutanol
Burner Shed 4/24/80	"	toluene xylene ethyl acetate	isopropanol methyl isobutyl acetone perchloroethylene isobutanol
Incinerator 4/24/80	"	toluene xylene	benzene methyl styrene
Yard (chain conveyor) 4/25/80	bulk material sample on charcoal tube	2,6 di-tert-butyl-p-cresol toluene xylene various naphthalenes alkanes (C_9 - C_{18}) phthalates high molecular weight amines	
Dumping Pit (at burner shed) 4/25/80	"	toluene xylene higher alkanes (C_{13} - C_{18}) phthalates	

TABLE III

Air Samples Taken For Organic Vapors

Jehl Cooperage Company Inc.
Memphis, Tennessee
HE 80-100

April 23-25, 1980

Location/Sample Type		Collection Date	Sampling Time (min.)	Toluene*	Xylene*	Aliphatic * Hydrocarbons	Aromatic * Hydrocarbons	Ethyl* Acetate	Cellosolve* Acetate	Isobutanol*	Methyl Isobutyl* Ketone	Methyl Ethyl* Ketone	Isopropyl* Alcohol	Isopropyl* Acetate
Receiving (in vicinity of tractor-trailor and chain conveyor)														
	P[1]	4/25/80	364	3.1	0.2									
	P	4/25/80	365	0.4	0.2									
	P	4/24/80	457	0.6	0.1									
	P	4/24/80	456	0.6	0.4									
Drum Lining	P	4/25/80	363	N.D.[4]	N.D.				N.D.	N.D.	N.D.	N.D.	N.D.	N.D.
	P	4/25/80	361	0.9	0.7				N.D.	N.D.	N.D.	N.D.	N.D.	1.7
	P	4/24/80	413	1.2	1.3				1.1	0.9	0.2	7.7	3.7	N.D.
Lid Lining	G[2]	4/24/80	236	0.4	0.6				N.D.	N.D.	N.D.	0.5	1.7	N.D.
	P	4/24/80	410	0.7	1.2				0.3	0.7	0.2	4.3	2.9	N.D.
	S[3]	4/24/80	3	N.D.	7.6				N.D.	N.D.	N.D.	N.D.	N.D.	N.D.
	S	4/24/80	7	6.3	N.D.				N.D.	N.D.	N.D.	N.D.	N.D.	N.D.
Lid Sticking	S	4/24/80	15	10.1	17.0	3.6	N.D.							
	P	4/25/80	160	9.9	7.1	6.0	1.3							
Vertical Spray Painting	P	4/25/80	360	9.4	6.8	6.1	1.3							
	P	4/24/80	420	4.7	3.5	1.4	0.7							
	S	4/24/80	26	5.9	5.1	N.D.	N.D.							
Burner Shed	P	4/24/80	389	2.8	2.3	14.6	0.3	13.0						
	P	4/24/80	388	0.6	0.5	2.2	0.3	1.7						
	P	4/24/80	344	1.0	2.1	0.7	0.4	0.6						
Shot Blasting (Pole)	P	4/24/80	392	0.3	0.4									
Horizontal Spray Painting	P	4/24/80	422	2.3	2.9	0.8	0.9							
Oven	G	4/24/80	426	4.9	6.0	3.3	1.7							
Ring Dip Area	P	4/24/80	285	10.7	6.0									
	S	4/24/80	16	81.1	44.8									
	G	4/24/80	265	14.0	8.4									
Recommended Environmental Level (ppm)				100	100	**	**	400	100	50	100	200	400	250

[1] Personal Breathing Zone Air Sample
[2] General Area Air Sample
[3] Short Term Exposure Limit (Personal Sample)
[4] None Detected

**No standards exist for the occupational exposure to aliphatic or aromatic hydrocarbons.

* Results shown are in ppm.

TABLE IV

Air Samples Taken For Inorganic Substances
Jehl Cooperage Company, Inc.
Memphis, Tennessee
HE 80-100

April 23-25, 1980

Location and Sample Type		Collection Date	Sampling Time (min)	Cr (VI) mg/M3	Pb mg/M3	Fe_2O_3 mg/M3	NaOH mg/M3
Vertical Spray Painting Booth (#1 Booth)	G	4/24/80	224	0.0018	0.003		
	G	4/24/80	270	0.0008	0.003		
Shot Blasting	P	4/24/80	391			0.42	
	P	4/24/80	348			1.72	
	P	4/24/80	415			0.45	
Drum Wash House	G	4/24/80	248				0.02
	G	4/24/80	243				0.02
	G	4/25/80	240				0.01
	G	4/25/80	245				0.01
	G	4/25/80	110				0.02
	G	4/25/80	110				0.004
Recommended Environmental Level				0.001	0.05	5	2

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