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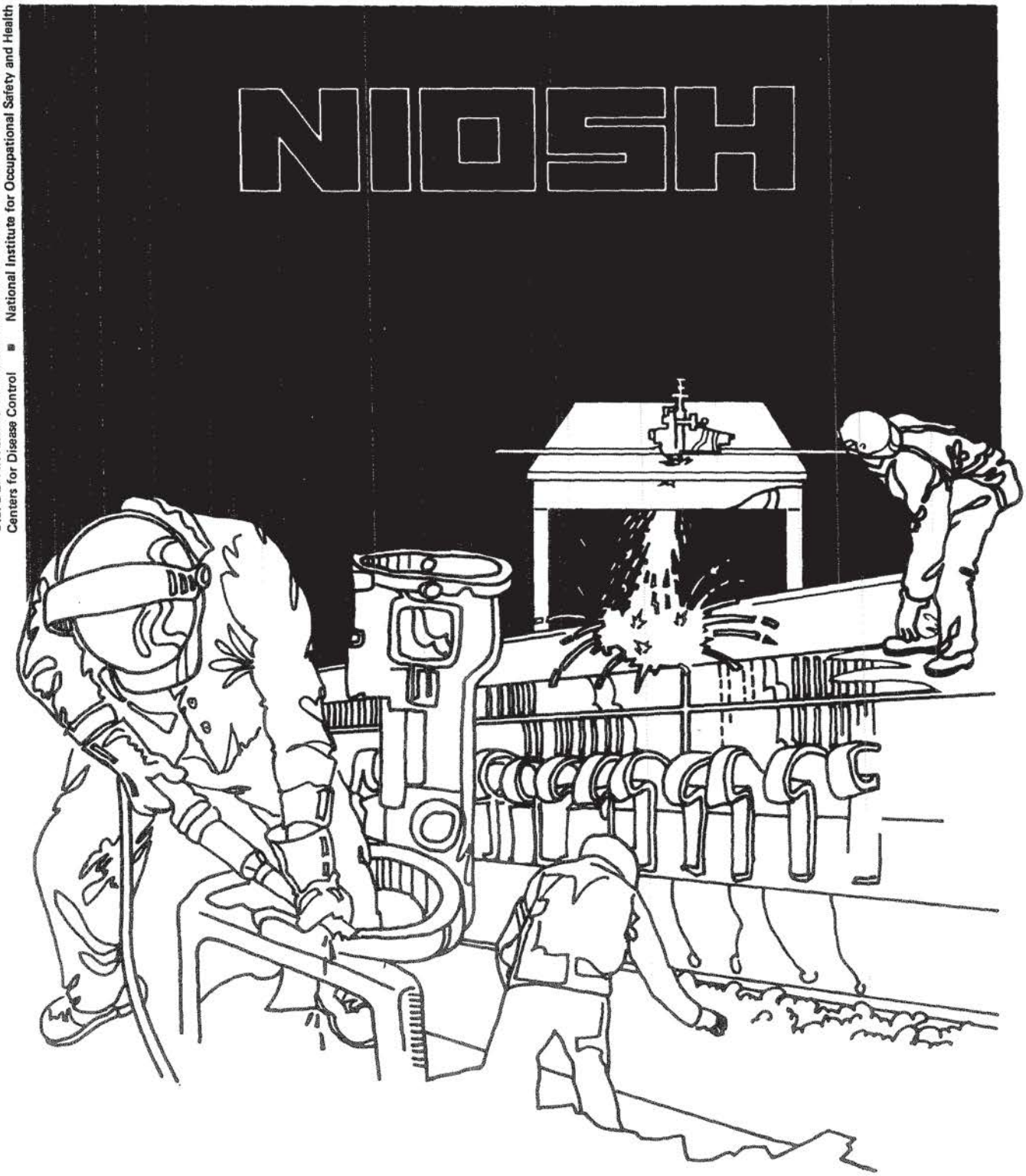

Health Hazard Evaluation Report

HETA 81-192-1028
HILLERICH AND BRADSBY COMPANY
JEFFERSONVILLE, INDIANA

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. 669(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.

The Hazard Evaluations and Technical Assistance Branch also provides, upon request, medical, nursing, and industrial hygiene technical and consultative assistance (TA) to Federal, state, and local agencies; labor; industry and other groups or individuals to control occupational health hazards and to prevent related trauma and disease.

HETA 81-192-1028
December 1981
Hillerich and Bradsby Co.
Jeffersonville, Indiana

NIOSH INVESTIGATOR:
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I. SUMMARY

In February, 1981, the National Institute for Occupational Safety and Health (NIOSH) received a request for a health hazard evaluation at the Hillerich and Bradsby Company, Jeffersonville, Indiana. The request submitted by the United Steelworkers of America-Local No. 3931, indicated that employees were concerned about possible harmful effects from exposure to various chemicals that are used in the Poly-Spray and Star-Lak operations. The operations involve spraying of golf club heads with urethane or varnish coatings, and dipping of baseball bats in laquer. Because of a strike by the workers, NIOSH conducted its industrial hygiene survey on June 16, 1981, to determine exposure levels of the chemicals used and interviewed exposed workers for past and present symptoms associated with exposure to these substances.

Ten personal breathing zone samples were obtained in the Poly-Spray area. Analysis of these samples indicated that the four workers in this area were exposed to less than 13% (43 mg/M^3) of the NIOSH 8- to 10-hour criteria of 350 mg/M^3 for mineral spirits (naphtha). None of the other substances measured including xylene, toluene, cellosolve acetate, diacetone alcohol, methyl ethyl ketone, methyl isobutyl ketone, acetone, or toluene-2,4-diisocyanate were present at levels greater than 5% of their respective occupational criteria.

Four personal breathing zone samples obtained in the Star-Lak area indicated that the one employee was exposed to less than 25% (85 mg/M^3) of the NIOSH criteria for mineral spirits (naphtha) of 350 mg/M^3. Xylene, toluene, butyl alcohol, ethyl alcohol, diacetone alcohol, methyl ethyl ketone, methyl isobutyl ketone, acetone, and butyl cellosolve were present at levels less than 20% of their respective 8- to 10-hour environmental criteria.

Non-directed medical questionnaires administered to nine workers did not indicate any symptomatic effects.

On the basis of the data obtained in this investigation, NIOSH has determined that a health hazard did not exist from over-exposure to airborne concentrations of xylene, toluene, cellosolve acetate, diacetone alcohol, methyl ethyl ketone, methyl isobutyl ketone, acetone, toluene-2,4-diisocyanate, butyl cellosolve, butyl alcohol, or ethyl alcohol on the day NIOSH sampled. Recommendations to improve work practices are contained in Section VII of this report.

Keywords: SIC 2752: golf clubs, spraying, baseball bats, dipping, ethyl alcohol, butyl alcohol, diacetone alcohol, mineral spirits (naphtha), toluene-2,4-diisocyanate, butyl cellosolve, cellosolve acetate, methyl ethyl ketone, methyl isobutyl ketone, acetone, toluene, xylene.

II. INTRODUCTION

On February 16, 1981, the National Institute for Occupational Safety and Health (NIOSH) received a request from a representative of the United Steel Workers of America-Local No. 3931, to evaluate employee complaints at Hillerich and Bradsby Company, Jeffersonville, Indiana. The evaluation was not conducted until June, 1981, as the workers were on strike until the end of May. The request was prompted by employee concerns of harmful agents in chemicals that were used in the Star-Lak and Poly-Spray areas.

III. BACKGROUND

The Hillerich and Bradsby Company, Jeffersonville, Indiana, manufactures wood baseball bats and assembles golf clubs. The health hazard evaluation involved the Star-Lak and Poly-Spray operations which employs two and four workers, respectively.

The Star-Lak area is located in a closed room with its own ventilation system. Baseball bats are dipped by hand in either a tinted or a clear lacquer by one or two people, placed on a drying rack directly in front of the worker(s) for several minutes, and then restacked on a cart to be taken to the next step in the bat manufacturing process.

In the Poly-Spray area, wood golf club heads are sprayed with a polyurethane or varnish coating by four workers. All four spray booths used are of a water-wash type. One is automatic with the remaining three manual operations. The automatic and two of the manual booths used compressed air with the fourth using an airless spray gun. During the June 18, NIOSH survey, the automatic spray machine was inoperative due to machine misalignment.

IV. EVALUATION DESIGN

Two personal air samples were taken, one each in the Poly-Spray and Star-Lak areas, for acetone, MEK, MIBK, and diacetone alcohol. These personal samples were collected on charcoal tubes connected to sampling pumps calibrated at approximately 0.1 liters per minute (lpm). The samples were analyzed according to NIOSH Method P&CAM 127 using gas chromatography with flame ionization detector (GC/FID). The analytical limits of detection (LOD) for each sample was 0.01 milligram (mg) for acetone, MIBK, and MEK and 0.05 mg for diacetone alcohol.[1]

The one sample taken in the Star-Lak area for butyl cellosolve was collected on a charcoal tube connected to a battery powered sampling pump operating at approximately 0.1 lpm. The sample was analyzed according to NIOSH Method P&CAM 76 (modified) using a GC/FID.[2] The limit of detection for this chemical is 0.01 mg per sample.

One sample taken in the Star-Lak area for butyl alcohol and ethyl alcohol was collected on a charcoal tube using battery powered sampling pump operating at approximately 0.1 lpm. Analysis of this sample was by GC/FID according to NIOSH Method P&CAM 56 (modified) with a LOD of 0.02 mg per sample for ethanol and 0.01 mg per sample for butanol.[3]

The two cellosolve acetate personal air samples taken in the Poly-Spray area were collected on charcoal tubes using a battery powered sampling pump calibrated at approximately 0.1 lpm. Analysis of these samples were performed according to NIOSH Method P&CAM 41 (modified) using GC/FID with a LOD of 0.01 mg per sample.(4)

Four samples, three in the Poly-Spray area and one in the Star-Lak area, were taken for xylene, toluene, and mineral spirits (naphtha). These samples were collected on charcoal tubes connected to sampling pumps operated at approximately 0.1 lpm. Analyses of these samples were performed by GC/FID according to NIOSH Method P&CAM 127.(5) The LOD for mineral spirits was 0.1 mg per sample and 0.01 mg per sample for toluene and xylene.

The four personal air samples taken in the Poly-Spray area for toluene-2,4-diisocyanate (TDI) were collected on specially impregnated charcoal tubes using a battery powered sampling pump operated at a flow rate of 0.1 lpm. Analyses of these samples were performed according to NIOSH Method P&CAM 236 with a limit of detection of 0.0003 mg per sample.(6)

Air velocity measurements were obtained on four spray booths and one lateral exhaust hood using a constant temperature thermal-anemometer.

Non-directed health questionnaires were administered to elicit past and present symptoms associated with exposure to the substances listed above.

V. EVALUATION CRITERIA

Environmental standards and criteria considered applicable to this evaluation are shown in Table I. These criteria and standards are established at levels to protect workers occupationally exposed to a substance on an 8- or 10-hour day, 40-hour per week basis over a normal working lifetime. Ceiling values, where given in Table I, are concentrations of that chemical that should not be exceeded along with the corresponding time limit.(7,8,9,10,11,12,15,16)

Combined exposure to substances which affect the body in a similar fashion, producing additive effects, were calculated. To determine these additive exposures, air sampling results for each substance were divided by its corresponding standard and summed for each personal sample. If the total of these fractions exceed unity, 1.0, as set forth by ACGIH, the employee is considered over-exposed.(17)

VI. RESULTS AND DISCUSSION

Table II presents the analyses of the ten personal samples taken in the Poly-Spray area. The maximum concentration of mineral spirits (naphtha) was less than 13% (16 mg/M^3 to 43 mg/M^3) of the NIOSH 8- to 10-hour Time Weighted Average (TWA) of 350 mg/M^3. Xylene, toluene, cellosolve acetate, diacetone alcohol, MIBK, MEK, and acetone were present at levels less than 5% of their respective environmental criteria. TDI was below the laboratory limit of detection of 0.0003 mg per sample.

Table II presents the analyses of the four personal samples taken in the Star-Lak area. The maximum concentration of mineral spirits (naphtha) was less than 25% (85 mg/M^3) of the NIOSH 8- to 10-hour TWA of 350 mg/M^3. Xylene, toluene, butyl alcohol, ethyl alcohol, diacetone alcohol, MIBK, MEK, and acetone were found to be present at levels less than 20% of their respective environmental criteria. Butyl cellosolve was below the laboratory limit of detection of 0.01 mg per sample.

Combined exposure data (CED) calculated for the five applicable samples in the Poly-Spray area ranged from 0.01 to 0.14. CED calculated for the three samples in the Star-Lak area ranged from 0.06 to 0.43. None of the workers were over-exposed to a combination of the solvents as set forth by the ACGIH TLV.

Ventilation measurements obtained on the four water-wash spray booth's in the Poly-Spray area showed minimum face velocities of between 100 feet per minute (fpm) and 330 fpm on the day NIOSH sampled. The minimum recommended face velocities for a water-wash type spray booth is 100 fpm.[18,19] Therefore, these booths were achieving adequate air velocities.

Ventilation measurements taken in the Star-Lak area at the face of the lateral exhaust hood measured an average of approximately 230 fpm (or 200 cubic feet per minute (cfm)). By comparison, this type of lateral exhaust system should have a minimum air flow of 170 cfm at the face of the exhaust hood.[18,19] The air flow performance of this system does exceed the recommended guidelines.

Non-directed medical questionaires administered to the nine workers did not indicate any symptomatic effects.

None of the workers were over-exposed, on the day that NIOSH sampled, to excessive airborne concentrations of chemicals or to a combination of the chemicals used in the Star-Lak or Poly-Spray areas. However, due to the procedure used to dip the baseball bats, the worker(s) performing this operation have an increased potential for skin contact. Butyl alcohol, toluene, and xylene have the potential to contribute to the overall exposure by cutaneous absorption including mucous membranes and eye, either by airborne, or more particularly, by direct contact with the substance. Gloves which were worn by the worker(s) did not adequately provide skin protection to these substances.

VII. RECOMMENDATIONS

1. Impervious protective clothing, gloves, and/or other coverings to protect potentially exposed areas of the body should be supplied to employees in operations requiring continued exposure to liquid xylene, toluene, and/or butyl alcohol.

2. Safety goggles or glasses should be worn in areas where splash or spill is likely (ie. Star-Lak area).

3. In the Star-Lak area several modifications to the existing ventilation system might be considered to further improve its effectiveness. The first would be to adjust the angle of the air supply louvers to direct the flow of air so that it moves from the front to the back of the worker(s). This would provide both comfort ventilation and reduce the amount of vapors that will enter the breathing zone of the worker(s).

   The second consideration is to remove the slot hood located above the face of the lateral exhaust hood. From observations, this slot hood is providing little or no assistance to the lateral exhaust system but appears to be causing air turbulance around the face of the lateral system.

VIII. REFERENCES

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X. DISTRIBUTION AND AVAILABILITY

Copies of this report are currrntly available upon request from NIOSH, Division of Standards Development and Technology Transfer, 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. Information regarding its availability through NTIS can be obtained from the NIOSH Publications Office at the Cincinnati address.

Copies of this report have been sent to:

1. Hillerich and Bradsby Company
2. Union President United Steel Workers of America, Local 3931
3. OSHA, Region V
4. NIOSH, Region V

For the purpose of informing the approximately six affected employees, a copy of this report shall be posted in a prominent place, accessible to the employees, for a period of thirty (30) calendar days.

TABLE I

ENVIRONMENTAL CRITERIA AND LIMITS OF DETECTION
HILLERICH AND BRADSBY COMPANY
JEFFERSONVILLE, INDIANA

Substance	NIOSH	OSHA-TWA	ACGIH-TLV	LOD[1]
Acetone	590*	2400	2400 (1780)P	0.01
Methyl ethyl ketone	590	590	590	0.01
Methyl isobutyl ketone	200	410	205	0.01
Diacetone alcohol	240	240	240	0.05
Toluene-2,4-diisocynate	0.035 0.14 10-min.[2]	0.14	0.14 (0.04)P	0.0003
Xylene	434 868 10-min.[2]	434	435	0.01
Toluene	375 750 10-min.[2]	750 1875 10-min.[2]	375	0.01
Cellosolve acetate	---	540	270	0.01
Butyl cellosolve	---	240	120	0.01
Ethanol	---	1900	1900	0.02
Butanol	---	300	150	0.01
Mineral Spirits (naphtha)	350	2950	575	0.01

* mg/M^3 Approximate milligrams of substance per cubic meter of air sampled.

1 LOD Laboratory Limit of Detection in milligrams per sample.

2 Ceiling value with corresponding time limit.

P Proposed Threshold Limit Value (TLV).

TABLE II
RESULTS OF PERSONNAL SAMPLING FOR VARIOUS ORGANICS
HILLERICH AND BRADSBY COMPANY
JEFFERSONVILLE, INDIANA
JUNE 16, 1981

Sample Type	Sample Time	Sample Volume (Liters)	Sample Area	RESULTS(mg/M3)* Acetone	MEK[1]	MIBK[2]	Diacetone Alcohol	Ethanol	Butanol	CED[3]
Personal(P)	0642-1552	52	Poly-Spray	1.7	0.19	0.38	1.9	---	---	0.01
P	0745-1335	35	Star-Lak(SL)	---	---	---	---	49.	5.7	0.06
P	0745-1335	33	SL	6.4	4.9	1.5	25.	---	---	0.12
			LOD[4]	0.01	0.01	0.01	0.05	0.01	0.02	
	ENVIRONMENTAL CRITERIA		NIOSH	590	590	200	240	---	---	---
			OSHA	2400	590	410	240	1900	300	---
			ACGIH	2400	590	205	240	1900	150	1.0

* approximate milligrams of substance per cubic meter of air sampled.

1 Methyl Ethyl Ketone

2 Methyl Isobutyl Ketone

3 CED Combined Exposure Data

4 LOD Laboratory limits of detection in milligrams per sample.

-- No analysis for this substance on this sample.

TABLE II (CONT)
RESULTS OF PERSONNAL SAMPLING FOR VARIOUS ORGANICS
HILLERICH AND BRADSBY COMPANY
JEFFERSONVILLE, INDIANA
JUNE 16, 1981

Sample Type	Sample Time	Sample Volume (Liters)	Sample Area	RESULTS (mg/M3)* Cellosolve Acetate	Butyl Cellosolve	TDI[1]	Xylene	Toluene	Mineral Spirits[2]	CED[3]
PersonaT(P)	0705-1554	69	Poly-Spray(PS)	--	--	--	8.3	2.8	16.	0.05
P	0705-1554	48	PS	0.62	--	--	--	--	--	0.00
P	0642-1552	65	PS	ND[4]	--	--	--	--	--	---
P	0802-1556	47	PS	--	--	--	17.	9.6	43.	0.14
P	0759-1550	47	PS	--	--	--	8.1	3.8	21.	0.07
P	0745-1335	47	Star-Lak(SL)	--	--	--	78.	38.	85.	0.43
P	0745-1335	35	SL	--	ND	--	--	--	--	---
P	0705-1554	53	PS	--	--	ND	--	--	--	---
P	0759-1550	45	PS	--	--	ND	--	--	--	---
P	0642-1552	49	PS	--	--	ND	--	--	--	---
P	0802-1556	46	PS	--	--	ND	--	--	--	---
			LOD[5]	0.01	0.01	0.0003	0.01	0.01	0.1	
		ENVIRONMENTAL	NIOSH	--	--	0.04	434	375	350	---
		CRITERIA	OSHA	540	240	0.14	435	750	400	---
			ACGIH	270	120	0.14	435	375	575	1.0

* Approximate milligrams of substance per cubic meter of air sampled.

1 Toluene-2,4-diisocyanate.

2 Mineral Spirits (Naphtha).

3 CED Combined Exposure Data

4 ND Non-detectable below the limit of laboratory detection in milligrams per cubic meter.

5 LOD Laboratory limits of detection in milligrams per sample.

-- No analysis for this substance on this sample.

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