INDUSTRIAL HYGIENE REPORT

WALK-THROUGH SURVEY OF WOOD PRESERVATIVE TREATMENT FACILITY

at

B. J. CARNEY AND COMPANY

Spokane, Washington

Survey conducted by

Stewart-Todd Associates, Incorporated
on
June 26, 1979

Report written by

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Report Date

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INDUSTRIAL HYGIENE SECTION
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Worker exposures to pentachlorophenol (87865) (PCP) were determined at B.J. Carney and Company (SIC-2491) in Spokane, Washington on June 26, 1979. Approximately 14 of the employees at this facility were involved in operations that entailed potential PCP exposure. The company had no formal medical or industrial hygiene program. A safety program was in effect. Medical services were provided by local hospitals and workers trained in first aid PCP concentrations were 0.04 milligrams per cubic meter (mg/cu m) using the NIOSH sampling method and less than 0.13 mg/cu m using a silica gel tube. PCP concentrations taken later in the day were 0.10mg/cu m for the NIOSH procedure and 0.13mg/cu m for the silica gel tubes.

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PURPOSE OF SURVEY:	This walk-through survey was conducted as a part of the Phase II study of the INDUSTRIAL HYGIENE ASSESSMENT OF NEW AGENTS - III, NIOSH Contract No. 210-78-0060. Specifically, this survey was for the first group which includes all agents used in wood preserving. This facility was selected on the criteria set forth in the Study Proposal based on information gathered in Phase I.
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EMPLOYEE REPRESENTATIVES	Lewis Yuse, Steward Chauffeurs,Warehousemen, and Helpers of America, Local #690 - Teamsters.
ACKNOWLEDGEMENTS:	James L. Oser, NIOSH Battelle Columbus Laboratories (Richard E. Heffelfinger, Ph.D.)
STANDARD INDUSTRIAL CLASSIFICATION OF PLANT:	SIC #2491 Wood Treater (Utility Poles)

ABSTRACT

A preliminary survey of the B. J. Carney and Company, Spokane, Washington Utility Pole processing and treatment plant, was done as partial fulfillment of obligations to the National Institute for Occupational Safety and Health under Contract No. 210-78-0060, "Industrial Hygiene Assessment of New Agents - III." The field site visit of June 26, 1979 provided familiarization with current and past process methods and controls utilized to reduce exposure. Employee training and work practices, as well as general occupational educational efforts were evaluated along with any historical data and experience from industrial hygiene monitoring. A description of the current employee medical monitoring program was also provided. Range finding air sampling was conducted during regular operations at sites of potential exposure, in order to evaluate different air sampling methods, define analytical limitations and obtain a range of potential exposure during critical short-term tasks.

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INTRODUCTION

Stewart-Todd Associates, Incorporated, in conjunction with the National Institute for Occupational Safety and Health, under Contract No. 210-78-0060, "Industrial Hygiene Assessment of New Agents - III," conducted a preliminary industrial hygiene survey of the B. J. Carney and Company, Spokane, Washington plant, on June 26, 1979. The plant processes and treats utility and power poles. It was selected as being representative of a typical West Coast treating facility which uses a single non-pressure treatment system for wood preservation.

The purpose of the preliminary survey is to gain familiarity with process methods, potential or known exposure conditions, and test sampling methods in addition to determining the need for comprehensive field investigations to evaluate long-term health effects associated with pentachlorophenol treating. The information obtained through this research effort will be utilized in technical reports on the wood preservative industry.

DESCRIPTION OF THE FACILITY

The B. J. Carney, Spokane treating plant was originally built in 1915 on a 26-acre tract, to supply treated poles to the utility industries. Creosote treating was initially used, primarily on Western Red Cedar, by the thermal non-pressure butt-treating method. The plant switched to PCP-oil treatment exclusively in 1967 at the request of the utility companies which preferred the penta treated poles for aesthetic and other reasons. Cedar has continued to be the principal wood for treatment with a minor use of Pine and Tamarack.

The plant has a large pole yard where peeled poles are stacked for natural air seasoning, and a small inventory of treated poles are stocked. A debarking-peeling machine is housed in a small semi-enclosed building in the yard area. It is operated only 2-3 times per week since most of the peeling is done during the logging operations in the timberlands. The framing area is located adjacent to the treatment tanks. The manual tasks, such as roughing and inspection are done outside; whereas, the machining operations; i.e., boring, incising, etc., are conducted in a wood-frame building. The poles are transferred from one framing process to the next by conveyor system.

The plant presently has three butt-treatment tanks which are each 26' square and 14' deep. The two full-length immersion tanks were added, one in 1947 and one in 1960, which are 12 x 12 x 107 and 14 x 13 x 50 ft., respectively. All treating facilities are entirely outside with tank pumps and valving located in small below-ground level rooms adjacent to the treatment tanks. The treated poles are shipped out both by rail and truck.

DESCRIPTION OF WORKFORCE

There are presently a total of twenty-seven (27) employees at the plant, fourteen of whom work in the yard on pole preparation and treatment. Most of these hourly personnel are engaged in log debarking, peeling, framing, incising, and the movement of poles throughout the yard. Treating is done five days per week on essentially two shifts (9 hours). There are two full-time treatment operators, one per shift. The second shift, however, may involve longer working hours to complete the assigned tasks. The treating engineer operates the boilers, maintains treatment solution levels in the tanks, controls length of treatment cycle and does some of the routine equipment maintenance.

A number of other personnel have potential exposures to the wood treatment materials; e.g., the Quality Control man who takes sample borings on the freshly treated poles, while they are still in the tank, to determine penta depth pene-

tration and concentration. The crane operators, with unfavorable wind conditions, might also be affected, but not nearly to the extent of the yard crew which assists in unloading the freshly treated poles from the horizontal or butt-treatment tanks.

The hourly employees are members of the Teamsters, Chauffeurs, Warehousemen, and Helpers of America, (Local No. 690). There are no women employed in the plant except as secretaries and clerks in the adminstrative offices.

DESCRIPTION OF PROCESS

Logs or peeled poles are received throughout the year and are peeled, sized, graded and stacked for seasoning. Air drying to satisfactory moisture levels for effective Penta treatment (17-24% moisture) typically requires a year. Some poles are received peeled while others require debarking before going into the drying pile prior to treatment. The poles are inspected for rot areas, residual bark, or other defects requiring removal prior to treatment. This is primarily a manual task with draw knives followed by incising the pole one foot above and two feet below estimated ground level. Framing and hole drilling are done according to utility customer specifications.

The poles are placed in either the butt or full-length treatment tanks in the latter part of the day shift and penta oil treatment begins with the addition of the hot oil.

The process, including the hot and cold cycles, is completed on the second shift. Poles in the full-length tanks are held in place by steel I-beams in order to assure complete immersion. The tanks are also covered with loose fitting sheet steel lids. The butt dip tanks, however, must remain open but are accessible only from the adjoining raised platform.

A 5% PCP, P-9 oil is used to penetrate and treat all the sapwood in the poles, with more limited penetration of the Cedar heartwood. For poles other than Cedar, PCP penetration depth is specified by customers. P-9 oil is supplied by the Husky Oil Company's Cody, Wyoming refinery. It is described by the treating industry specifications as a straight run or catalytically cracked oil approximating the boiling range of a heavy diesel fuel of No. 3 Heating oil. PCP is purchased from Reichhold Chemicals in 1000 lb. blocks. It is dissolved in heated circulating P-9 oil in the treatment tank, checked for PCP concentration, and pumped to storage tanks for use. The PCP blocks are handled by cranes and other heavy equipment; thereby, minimizing routine employee contact and exposure.

After the poles are placed in the treatment tanks, hot PCP oil at 190-230° F. is introduced. This first step in thermal non-pressure processing removes residual water from the sapwood and exposed heartwood, opens the cells and creates a partial vacuum. After approximately 6 hours treatment, the hot oil is replaced with a cold PCP solution of 100-150° F. which

penetrates and coats the cells due to the partial vacuum created. After two or three hours of cold treatment, the solution is pumped out to storage. The poles, drained of excess oil are then inspected for penetration and PCP content.

Compliance with both the utility industry and specific customer specifications are determined, at least qualitatively, before poles are removed from the treatment tanks. This is done by taking borings and visual evaluation, followed by more elaborate analysis. After the Qualtiy Control checks are done by both the plant personnel and independent testing company representatives, poles are typically loaded directly onto truck or rail cars for shipment to utilities. Those not meeting specifications would be re-treated as needed.

The plant averages approximately 800 finished poles per week which may vary in length from 35-125 ft, with most in the 45-60 ft. range. If poles exceeding 107 ft. in length require full-length treatment, two treatment cycles are required in the large horizontal tank, one for each end of the pole. This, however, occurs infrequently in the production schedule.

DESCRIPTION OF PAST EXPOSURES

The plant has been inspected by both the Washington State Compensation Board and the State OSHA organization, but no air monitoring was done. Air sampling was conducted by the State air pollution group, but it was unrelated to occupational exposures.

Audiometric examinations have been done in the past on noise-exposed employees involved in peeling, framing, and fork-lift operations. The affected employees were issued earmuffs and asked to wear them during the more noisy tasks.

The plant has had limited past experience with photosensitization reactions when using creosote treatment, but since the complete conversion to the penta treatment there have not been any known cases of skin irritation or dermatitis.

DESCRIPTION OF MEDICAL, INDUSTRIAL HYGIENE, AND SAFETY PROGRAMS

The company presently has a Department of Transportation bi-ennial medical examination done on truck drivers hauling logs and poles. They indicate it meets DOT specifications for drivers, but the examination is done at the physician's convenience. There is no formal medical program for the regular plant employees. Pre-employment examinations, again, are only conducted on truck drivers.

Emergency services are utilized at either Valley General or Sacred Heart Hospitals, located within a few minutes driving time from the plant. The company does not have a doctor on retainer for compensation or emergency illness or accident cases. There are three employees trained in First-aid at the plant during the day shift

The plant does not have an industrial hygiene program for assessing occupational exposure risks. No specific engineering controls are used to minimize exposure to the treatment materials. The natural ventilation of outside facilities assists in reducing airborne materials by wind and thermal dispersion. The system is semi-closed from storage tanks to treating tank.

The plant has a joint management-employee safety committee, chaired by Colin Port, which meets periodically to review problems and recommend operating or work practice changes. Health and safety policy matters are established by plant management and implemented through the Joint Safety Committee. The work force is relatively stable and no formal training of new hirees is conducted beyond the safety and technical aspects of the job or work area.

There is no safety glasses policy for the plant for specific jobs or tasks. Goggles are available but optional and only used where the employee feels they are necessary. Hardhats are required and used throughout the pole yard. Gloves are suppied to loading crews and treaters. Their use is well-accepted but, typically, they are not needed for the entire shift. Cork boots are required for the top man on pole loading of vehicles. Wilson Respirators with filter and cartridges are purchased for employees but utilization is optional. Cleaning is the responsibility of the employee

but in most instances, there use appears to be limited or of short duration. Aprons impervious to oil are available for use when needed.

Periodic Management/Union safety meetings are held and walk-through inspections of the plant are sometimes conducted to evaluate complaints or safety suggestions.

All new employees must go through an orientation in which general safety rules and protective equipment are discussed. The plant encourages good personal hygiene and washup at breaks and lunchtime. Showering at the end of the shift is infrequent, although a facility is available. The company does not provide work uniforms for the yard crew or treaters, but employees are encouraged to change clothing or shoes soiled by PCP oil during a splash or spill.

INSPECTION OF THE PLANT

An industrial hygiene walk-through survey of the treatment facility was conducted following preliminary discussions with plant personnel. Mr. Leland Lloyd provided the basic description of the treatment equipment and process flow. Personal protective gear and supplies were examined along with a review of employee work practices and personal hygiene.

Area air sampling was conducted adjacent to the large full-length treating tank during most of the day shift operations. The PCP

treatment cycle is typically run on night shift so the tank can be unloaded and reloaded with poles during the day shift production tasks. At the beginning of the day shift, the tank lid sections are removed, the wood is visually inspected, and test borings are collected. Immediately following this, the treated poles are hoisted from the tank and loaded on rail-cars or trucks. On the day of the survey, however, the poles were not removed from the tank due to shipment scheduling problems.

The air sampling equipment was located downwind of the penta fume and/or steam emissions, approximately 6 ft. from the side of the tank. The measured airborne concentrations represent potential peak exposures for individual treaters, as well as yard crew working in this area throughout the day. The levels do not reflect actual operating condictions since the treated wood was not removed from the tank. The visible emissions decreased throughout the workday; therefore, the second set of samples is expected to contain lower concentrations of penta.

DESCRIPTION OF SURVEY METHODS

The recommended NIOSH impinger sampling and analytical procedure S-297 and a silica gel adsorption method were used for collecting airborne penta. These samples were collected side by side, in order to evaluate and compare both methods. Bendix BDX-41, MSA Model S, and Bendix C-115 air sampling pumps, pre- and post-calibrated with a Universal Pump Calibrator, Model 301, were

operated at flow rates of approximately 1.5 liters per minute (LPM) for the NIOSH impinger method and 0.5 LPM for the silica gel tube.

The sampling train for the NIOSH method included a prefilter of a 0.8 micron Millipore Type AA filter supported by a stainless steel screen in a three-piece cassette connected in series with a midget bubbler containing 15 ml. of ethylene glycol. This was followed by a second empty midget bubbler used as a trap to protect the sampling pump from solvent splashover or condensation. When the sampling period was completed, the filter was removed from the cassette and added to the bubbler of ethylene glycol in order to prevent sublimation of any of the collected PCP. The samples were analyzed by high pressure liquid chromatography using an ultraviolet detector. The lower limit of PCP detection by this method is 12.5 micrograms per sample.

PCP collected on large size silica gel tubes (260/520 mg) were desorbed with 10% methanol in diethyl ether and analyzed using gas chromatography and a flame ionization detector. The lower limit of detection by this analytical method is 0.033 micrograms of PCP per sample. 0.8 micron Millipore AA prefilters in three-piece cassettes were also added to determine if there was any airborne particulate PCP. At the end of the sampling period, the filter was removed from the cassette, submerged in a jar containing ethylene glycol and later analyzed by the NIOSH method.

RESULTS

The air samples collected adjacent to the full-length treating tank at the beginning of the day shift showed airborne PCP concentrations of 0.04 milligrams per cubic meter (mg/m^3) by the NIOSH sampling and analytical method and less than 0.13 mg/m^3 using the silica gel tube. The PCP levels in the second set of samples taken at the same locations during the afternoon were 0.10 mg/m^3 for the NIOSH procedure and 0.13 mg/m^3 for the silica gel tubes.

ANALYSIS AND DISCUSSION

The monitoring results represent potential peak exposures for any employees working at this specific location on the day of the survey. As was stated previously, these were not routine operating conditions since the treated poles were not removed from the tank. PCP levels for the first set of samples were significantly different by the two sampling procedures. The second set of samples also varied, but to a lesser degree. With the limited data collected, these differences cannot be adequately explained.

In addition, when comparing the morning and afternoon samples, those collected by the NIOSH method were lower in the morning, and for the silica gel method were virtually the same, morning

and afternoon. The air concentrations were initially thought to have been higher in the morning since the treatment cycle had just ended, the tank lids had just been removed, and fume and/or steam emissions were observed. Whereas, by the afternoon, the poles had cooled and emissions were negligible. The sampling data, however, does not follow these deductions.

B. J. CARNEY AND COMPANY
Spokane, Washington

APPENDIX A
AIR MONITORING RESULTS - PRELIMINARY WALK-THROUGH
NIOSH Contract No. 210-78-0060

Survey Date: 6/26/79

SAMPLE DESCRIPTION	PUMP# SAMPLE#	SAMPLING TIME (min)	FLOW RATE TOTAL AIR VOLUME	COMPONENT	µg	CONCENTRATION Mg/m³
Area Sample - downwind of full-length tank, lid sections had been removed; tank was still fuming. Treating Cedar poles with Penta	C-115 Bubbler & prefilter CARN-003	6:48a--11:04a 256 min.	1.49 LPM 0.381 m³	Pentachlorophenol	15.2	0.04
	BDX-116 CARN-002 Silica gel	6:48a-11:04a 256 min.	0.53 LPM 0.135 m³*	Pentachlorophenol	< 0.033	
	Prefilter CARN-001			Pentachlorophenol	18.0 <18.033	0.13
Same location as above. Yard crew employee was filling small full-lenth tank with poles. Treated poles were never removed from large tank. All fuming had stopped before the end of the sampling period.	MSA-#2 Bubbler & prefilter CARN-004	11:18a-2:55p 217 min.	1.60 LPM 0.348 m³	Pentachlorophenol	36.2	0.10
	BDX-124 Prefilter CARN-005	11:18a-2:55p 217 min.	0.54 LPM 0.117 m³	Pentachlorophenol	15.0	
	CARN-006 Silica gel			Pentachlorophenol	0.64 15.64	0.13
NIOSH Blank				Pentachlorophenol	< 12.5	
Silica gel Blank				Pentachlorophenol	0.56	

(The blank values were subtracted from the individual sample results prior to calculating air concentrations and µg quantities as appearing in the tables have been corrected.)

* There was a leak in pulsation dampler, air volume may be artificially high.