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INDUSTRIAL HYGIENE REPORT

PRELIMINARY SURVEY OF WOOD PRESERVATIVE TREATMENT FACILITY

at

MISSOURI WOOD TREATING COMPANY
Raymondsville, Missouri

Survey Conducted by

Stewart-Todd Associates, Incorporated
Wayne, Pennsylvania

July 11, 1979

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Report Date

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Industrial Hygiene Division
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ABSTRACT: The Missouri Wood Treating Company (Standard Industrial Classification 2491) of Raymondsville, Missouri was surveyed on July 11, 1979 to provide information on the company's current and past process methods, review occupational safety and health procedures, determine exposure concentrations of pentachlorophenol (87865) (PCP) during routine treatment processes, assess air sampling methods, and collect information for future criteria documentation or technical reports on the wood preservative industry. Six employees had potential routine exposure to the PCP in light oil which is used in a vacuum impregnation process to preserve soft and hard wood lumber. The company had no formal medical surveillance, industrial hygiene, or safety program for its employees at the time of the survey. Safety equipment was limited primarily to leather gloves used for handling treated lumber. Company management reported no history of medical problems arising from the work process. Area air monitoring performed with the NIOSH impinger method indicated airborne PCP concentrations of 0.13 to 0.25 milligrams per cubic meter (mg/cu m). Analysis by the silica gel absorption method indicated that all PCP concentrations were below 0.09mg/cu m. The authors conclude that the two sampling procedures provided significantly different results, which suggested a poor correlation between procedures. However, too few samples were collected to evaluate the difference adequately.

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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.
EMPLOYER REPRESENTATIVES CONTACTED:	Vera Chips, Plant Manager James Chips, Plant Owner (417) 457-6225
EMPLOYEE REPRESENTATIVES CONTACTED:	None
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STANDARD INDUSTRIAL CLASSIFICATION OF PLANT:	SIC # 2491 Wood Treater

ABSTRACT

A preliminary survey of the Missouri Wood Treating Company, Raymondsville, Missouri, 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 July 11, 1979 provided familiarization with current and past process methods. Controls utilized to reduce exposures in addition to employee training, work practices, and general occupational educational efforts were evaluated. Current and past medical assistance to the plant and experience from health and safety monitoring were reviewed. Range finding air sampling was conducted during regular operations at potential exposure sites both to evaluate and compare field sampling methods, and document exposure levels during routine treatment processes. The limited area sampling conducted did not indicate excessive air concentrations in the facility during the monitoring period. Airborne levels of PCP varied from 0.13 mg/m^3 to 0.25 mg/m^3 for the NIOSH impinger method and were all less than 0.09 mg/m^3 for the silica gel adsorption procedure. Too few samples were collected to adequately evaluate the differences between the two methods.

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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 at the Missouri Wood Treating Company, Raymondsville, Missouri, on July 11, 1979. This plant treats wood with pentachlorophenol (PCP), one of the three major preservative chemicals, by the vacuum impregnation process. The plant was selected from a group of wood treaters as being representative of a small Southeastern United States non-pressure treating facility which uses the basic PCP oil preservation system.

The purpose of the preliminary survey is to gain familiarity with process methods and potential or known exposure conditions; evaluate air sampling methods; and determine the need for comprehensive field investigations to evaluate the long-term health effects associated with this type of wood treatment operation. The information obtained through this research effort will be utilized for criteria documentation or technical reports on the wood preservative industry.

DESCRIPTION OF THE FACILITY

The first wood treating facility at Raymondsville was built in 1951 by the Chips family. The initial vacuum retort utilized a

PCP and P-9 oil treatment, essentially identical to the current material and equipment in use. All process materials have remained the same since the initial start-up of the unit, except that the PCP oil mix which was formerly shipped from Monsanto in St. Louis is now supplied through an Osmose distributor in Cabool, Missouri. A second vacuum retort was build and went into service in 1965. Both retorts are 5' x 5' x 50' in size. The older equipment is no longer in use but could be put into service with minor repairs and additions. There are no plans for doing this in the forseeable future.

The wood treating operations are located on a nine-acre site and include three enclosed buildings. Two of these are for wood storage and the third serves as the administrative and business office. The vacuum retort is outside with a small enclosure for the operator and control equipment. PCP oil storage tanks are adjacent and behind the vacuum retort. The remainder of the yard area is for preparation of the untreated lumber and storage of the treated wood prior to shipment by truck.

DESCRIPTION OF WORKFORCE

Eight people are currently employed in the wood treating plant. Six of these have potential routine exposure to the PCP/oil system. Production is conducted on a single day shift, five days per week with one treatment unit, four forklift operators and a mechanic. The treating operator's tasks include checking vacuum gauges before and after each treatment cycle; measuring

uptake of PCP solution into the wood as specified by type of wood or the customer; manually unbolting the retort door and supervising the unloading and loading of the retort; and maintaining the treatment chemical feed tanks. He may also do minor maintenance to correct pump or other leaks, if needed.

The forklift operators assemble and stack the wood to be treated on the tram cars and unload the treated lumber at the end of the cycle. Most of the materials are handled mechanically but manual lifting and stacking are done occasionally. These men also load the dried lumber onto trucks and unload or transfer untreated wood.

The mechanic assists throughout the yard, both on stationary and mobile equipment maintenance and repair. None of the employees are unionized and the company has not had a union in its 28-years of operation.

DESCRIPTION OF PROCESS

Pentachlorophenol (PCP 5%) in a light oil is received in 6000 gallon batch lots from Simonsene Chemical in Cabool, Missouri. Wood for treating is either purchased as finished lumber, planed and cut to dimension, or sawed locally and treated after a few months of air drying.

Lumber to be treated is loaded on tram cars and are pushed by forklift into the vacuum chamber. The bolts are tightened for proper seal and a vacuum is applied to remove the moisture

from the wood cells. After sufficient vacuum is attained, the chamber is filled with PCP oil solution and absorption into the wood continues until the sight glass indicates sufficient uptake to meet AWPA and/or customer specifications. For the Southern Pine and other soft woods, this is about six pounds of treating solution per cubic foot of lumber. For the hardwoods such as Oak, three pounds per cubic foot is considered satisfactory. After sufficient treating solution is absorbed, the chamber is pumped out and the residual oil removed with vacuum. The chamber is returned to atmospheric pressure, manually unbolted, opened and the tram cars are withdrawn. Lumber is removed from the tram cars in a semi-wet but ambient temperature condition to permit reloading of the next batch of lumber for treatment.

Typically, the plant treats three batches of lumber per day. The soft woods, if not excessively high in moisture take 3-4 hours. Oak, if treated, is usually left overnight, unattended, for removal first thing in the morning. The primary wood products now being treated are rough sawed and finished lumber. Formerly, a large part of the business was fence posts and small poles, which were peeled in the adjacent lumber mill.

The process has basically remained unchanged since 1951 except that the second chamber was constructed to replace the original steel vessel. During cold weather this plant shuts down treatment because they lack the capability to heat the vacuum chamber and treating solution. In recent winters wood treatment has been discontinued from December through February.

There is no engineering or ventilation control installed at the treating facility or its adjacent control room.

DESCRIPTION OF PAST EXPOSURES

The company and plant is too small to have access to either medical or industrial hygiene capabilities. However, they have had an OSHA inspection in about 1977, presumably safety oriented since no details were provided. Their insurance carrier performs periodic inspections but no air monitoring has been conducted by either organization. The plant management indicates verbally that they have no history of health effects from the treatment process or chemicals, either by skin contact or inhalation.

DESCRIPTION OF MEDICAL, INDUSTRIAL HYGIENE, AND SAFETY PROGRAMS

Missouri Wood Treating Company has no formal medical surveillance, industrial hygiene, and safety program for its employees at this time. Emergency medical assistance is available through Dr. Myers at Licking, Missouri for injuries and illnesses. Safety guidance is provided through their insurance carrier, with no indication of any previous efforts in the area of Industrial Hygiene assessment. There are no emergency first-aid trained personnel on site.

The safety equipment provided is primarily limited to leather gloves for use when handling treated lumber. These are disposed of when they become oil soaked. Hardhats and eye protection

are not typically used. Wash facilities are provided for cleaning hands and arms in the event of a spill or splash situation and prior to breaks and lunch. There are no emergency respirators on the plant site.

INSPECTION OF THE PLANT

An industrial hygiene walk-through survey of the wood treatment plant was conducted following the preliminary discussions with plant personnel. Mr. and Mrs. Chips, Manager and Owner of the plant provided the basic description of production equipment, process methods and historical information. Work practices and personal hygiene aspects were reviewed.

Area air monitoring was conducted during a typical treatment process. Samples were taken on top of the retort at the door end during the removal and reloading of tram cars and the treatment cycle. These airborne concentrations represent potential peak exposures encountered by the treating operator and any of the yard crew assisting him while opening and closing the door of the retort. Another set of samples taken in the control building adjacent to the vacuum pump equipment, are also representative of maximum peak exposures. The treating operator spends a part of his workday in this area since he is responsible for regulating the treatment cycle and all valves and gauges are located in this building.

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 PCP. Bendix BDX-41 and C-115 air sampling pumps, pre- and post-calibrated with a Universal Pump Calibrator, Model 302, were operated at flow rates of approximately 1.5 liters per minute (LPM) for the NIOSH method and 0.5 LPM for the silica gel tube.

The sampling train for the NIOSH procedure included a prefilter of 0.8 micron Millipore type AA filter, supported by a stainless steel screen in a three-piece cassette, and connected in series with a midget bubbler containing 15 mls. of ethylene glycol. This was followed by a second empty midget bubbler acting 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 a high pressure liquid chromatograph with an ultraviolet detector. The lower limit of PCP detection by this method is 13.0 micrograms per sample.

PCP collected on large size silica gel tubes (260/520 mg) was 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 0.03 micrograms PCP per sample. A prefilter (Millipore 0.8 micron) was added to these sampling trains in order 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 on top of the treating tank showed airborne PCP concentrations of 0.25 milligrams per cubic meter (mg/m^3) by the NIOSH method and less than 0.09 mg/m^3 using the silica gel tube. The PCP samples collected in the pump room were 0.13 mg/m^3 and less than 0.09 mg/m^3, respectively, for the NIOSH and silica gel methods.

ANALYSIS AND DISCUSSION

The monitoring results represent potential peak exposures for the treater operator and/or the yard crew during the treatment process on the day of the survey. PCP levels for the samples collected at the retort were significantly different by the two sampling procedures. The other set of samples also varied, but to a lesser degree. This suggests a very poor correlation between monitoring procedures, but due to the limited data obtained, no specific conclusions can be drawn.

The prefilters used with the silica gel method did not show any particulate PCP. However, the filter portion of the sample was analyzed according to the NIOSH procedure and the limit of detection for this technique is only 13 μg compared with 0.03 μg for the silica gel. Therefore, particulate PCP may have been present but it was less than the detectable limit.

The air sampling data indicates that peak exposure levels during the treatment process were not excessive on the day of the survey. Too few samples were collected, however, to adequately evaluate the monitoring methods.

SAMPLE DESCRIPTION	PUMP# SAMPLE#	SAMPLING TIME (min)	FLOW RATE TOTAL AIR VOLUME	COMPONENT	CONCENTRAT µg	mg/
Area Sample - On top of retort as door is opened for unloading tram car of treated wood; fumes were being emitted; wood was removed from tram cars and cars were reloaded while door was open. Sampling included a second tank opening which occurred at 1:00 p.m.	#1 C-115 MW-004 Impinger Prefilter	9:39a-2:20p 281 min.	1.58 LPM .0444 m^3	Pentachlorophenol	110	0.2
	BDX-58 Silica gel MW-003A	9:39p-2:20p 281 min.	0.50 LPM .140 m^3	Pentachlorophenol	0.16	
	Prefilter MW-003B			Pentachlorophenol	< 13.0	
					< 13.16	< 0.0
Area Sample - In control building adjacent vacuum pump. Retort is not pressurized, only evacuated	BDX-110 MW-002 Impinger Prefilter	10:05a-2:20p 255 min.	1.62 LPM 0.413 m^3	Pentachlorophenol	52	0.1
	BDX-158 Silica gel MW-001A	10:05a-2:20p 255 min.	0.59 LPM 0.150 m^3	Pentachlorophenol	0.22	
	Prefilter MW-001B			Pentachlorophenol	< 13.0	
					< 13.22	< 0.0
Ethylene glycol solution, with prefilter	MW-005B Blank				< 13	
Silica gel Tube	MW-005A			Front section	0.07	
	Blank			Back Section	< 0.03	0.0

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