

**INDUSTRIAL HYGIENE REPORT**  
**PRELIMINARY SURVEY OF WOOD PRESERVATIVE**  
**TREATMENT FACILITY**

**AT**

**KOPPERS COMPANY, INC.**  
**Forest Products Group**  
**Florence, South Carolina**

**Survey conducted by**  
**Stewart-Todd Associates, Incorporated**

**July 25, 1979**

**Report written by**

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**Report Date**

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**Industrial Hygiene Section**  
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**Division of Surveillance, Hazard Evaluations, and Field Studies**  
**National Institute for Occupational Safety and Health**  
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**SPRINGFIELD, VA. 22161**

**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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**STANDARD INDUSTRIAL  
CLASSIFICATION OF PLANT:**

SIC #2491  
Wood Preserving

#### ABSTRACT

A preliminary survey of the Koppers Company, Inc., Florence, South Carolina wood 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 July 25, 1979 provided familiarization with current and past process methods and controls utilized to reduce occupational hazards. Employee classifications and accident prevention program were reviewed and evaluated along with historical data and experience from air monitoring. Range finding air sampling was conducted during regular operations to ascertain airborne levels of all the treatment chemicals.

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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 Koppers Company, Florence, South Carolina wood treatment plant on July 25, 1979. This plant purchases and processes mixed hardwood and pines for treatment and sale as poles, railroad ties, fence posts and dimension lumbars, using the two major primary pressure treatment processes. It was selected as being representative of a large diversified Southeastern United States pressure treating facility.

The purpose of the preliminary survey is to gain familiarity with process methods and potential or known exposure conditions; evaluate test sampling methods; and determine the need for comprehensive field investigations to evaluate long-term health effects associated with Pentachlorophenol, Creosote, and CCA (chromated copper arsenate). The information obtained through this research effort will be utilized in technical reports on the wood preservative industry.

## DESCRIPTION OF THE FACILITY

The Florence plant was built in 1946 on a 174-acre site. Pressure treating methods have always been used at this facility. PCP and creosote treatment was done in four manually opened cylinders. These included one PCP, 8' x 50', and three creosote; one, 8' x 60' and two, 8' x 135'. In approximately 1954, Koppers Company, Inc. acquired the facility and have made changes and additions to the plant. In 1958-59 an 8' x 185' PCP cylinder with hydraulically operated door and bridge rails was installed. In 1973 fire retardant treating cylinder (6' x 65') with hydraulic bridge rails and door was installed in a separate area of the plant. During 1978 the CCA treating plant was built on the site using an 8' x 135' cylinder with a hydraulic door and bridge rails. Since 1954 two of the original treating cylinders were modified with hydraulic doors and bridge rails.

The original three creosote cylinders and one PCP cylinder are located in the original treating building. The PCP cylinder that was added in 1958 is adjacent. These five cylinders are remotely operated from an air-conditioned control room. The NCX and CCA units are separated by considerable distance with their own yard storage areas and operating personnel. These two operations have been fully automated.

## DESCRIPTION OF WORKFORCE

The plant employs, at the present time, approximately 14 people, 125 of whom, are production workers and 16 are administrative. Wood treatment is conducted, typically on three shifts, seven days per week. There are four treatment operators, one per shift, in the PCP and creosote treating plant, and one in the NCX and CCA facility, which only operates on the day shift. The environ-

mental system operators are responsible to operate and maintain all of the equipment used in the environmental systems. The locomotive operators and some of the yard crew assist in loading and unloading charges from the treating cylinders. All other personnel in the plant are involved in wood preparation; i.e., sawing, peeling, boring, etc. and/or raw material storage and shipment.

The creosote and PCP treatment operators' tasks include making up and heating the PCP-oil solution; transferring PCP or creosote from the storage tank to pressure cylinders; checking pressure gauges and temperature treating cycle conditions; draining the cylinders and pulling vacuum; and opening the cylinder doors at the completion of the cycle. Minor leaks and pump repairs or adjustments are done in addition to assisting in loading and withdrawal of tram cars from the cylinders. Plant-wide maintenance personnel are responsible for major repair work on cylinders, lines, pumps, etc.

All the plant employees are members of the International Wood Workers of America, Local 5-77.

#### DESCRIPTION OF PROCESS

Poles, posts, railroad ties or dimension lumber are treated either for open market sales or as specified by customers. Utility poles commonly are treated by all three preservatives, with 60 percent of the poles given PCP treatment. Fence posts usually receive the creosote pressure treatment. The Grade I creosote solution, supplied by the Koppers Company, is used for both of these products. Mixed hardwoods are used for railroad ties. They are air-dried up to one year and pressure treated with a 60/40 creosote/coal tar mix. Treatment cycles for these products vary from 5-20 hours, with longest time periods for large poles or hardwoods. There is limited processing for specialized

uses such as subway supports and bridge timbers which receive creosote-triaryl phosphate for preservation and flame retardancy.

Dimension lumber is dried to suitable moisture content and typically receives either PCP-oil or CCA pressure treatment. This, in most cases, takes shorter time periods of 5-8 hours with large timbers and poles requiring up to a 20-hour cycle. CCA cycles typically are 4-6 hours for posts and dimension lumber.

PCP, which is received as 1,000 and 2,000 lb. blocks, is made up in a P-9 oil in a centrally heated tank and pumped to storage. CCA concentrate (50%) is received in tank trucks from Koppers Company in Atlanta and diluted to 2% for use at the plant. Grade I creosote and creosote/coal tar are received, mixed as requested, for the previously indicated wood product treatments.

The wood is stacked on large tram cars and pushed into the cylinders with forklifts and locomotives as directed by the heating department supervisor. Railroad locomotives are used to withdraw the treated lumber which are then placed on rail sidings to cool and await stacking in the storage area.

#### DESCRIPTION OF PAST EXPOSURES

Air monitoring data was developed in 1978 as part of EPA's RPAR response to document potential creosote exposures during typical treatment operations. All airborne levels were well-below OSHA limits, with the exception of a few. The State OSHA agency has conducted an inspection at this facility, but no air sampling data was obtained. There have not been any significant occupational illness related to any of the treatment chemicals except for typical photosensitization resulting from creosote contact exposure.

#### DESCRIPTION OF MEDICAL, INDUSTRIAL HYGIENE AND SAFETY PROGRAMS

The Koppers Company, Forest Products Group, provides the basic industrial hygiene and safety guidelines for the Florence,

South Carolina plant. Industrial Hygiene monitoring has been performed by the company since 1976-77. As stated above, some of this information has been utilized in the EPA RPAR response.

Mr. J. W. Evans, the Safety and Health Supervisor for the Florence wood treating plant, conducts formal monthly plantwide safety meetings. Questions or problems concerning safety or industrial hygiene are discussed. Weekly safety meetings are also held within each department and from these each production supervisor provides a written report.

Pre-employment medical examinations are conducted on employees; but, no periodical physical are conducted. No physician or licensed nurse is located at the plant. There are two employees trained in first-aid who are responsible for providing any emergency treatment on site.

All employees are required to wear a hard hat and safety shoes. Treating operators and helpers are supplied with eye protection, gloves, boots, disposable coveralls, and slicker suits for use as needed. Scott Air-packs are provided for cylinder entry and cartridge respirators are utilized when handling Penta blocks.

Almost half of the employees use work uniforms while the remainder bring work clothing from home. Those utilizing the uniforms also use a commercial laundering service. The Plant has showers and change-room facilities. Some employees shower before leaving the

plant premises at the end of the shift, but it appears to be a matter of preference. In most cases, the employees do change from street clothing to work clothing at the beginning of the shift.

#### INSPECTION OF THE PLANT

An industrial hygiene walk-through survey of the treatment facility was conducted following preliminary discussions with plant personnel. Mr. Elton McGough, Assistant Plant Manager, and B. L. Allison of the Koppers Company, Loss Prevention Department 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 monitoring was conducted in the treatment building adjacent to transfer and vacuum pumps used for creosote treating on the day of the survey. The operators spend relatively short periods of their work day in this area, unless there are pump leaks or equipment problems which would require additional time for correction. During most of the shift they are in the control room or outside assisting with cylinder loading and unloading, mixing treatment chemicals and involved with other yard related tasks.

Air monitoring was also done during the removal of PCP treated wood from #5 cylinder. Samples were taken adjacent the cylinder

door opening where the treater operator stands at the control panel. Because of mechanical problems with cylinder drainage, by the time the door was opened, the charge had cooled to approximately 145° F. Some steam and fume emissions were, however, still visible. Area samples were taken on bundles of both PCP and creosote treated wood after it was removed from the cylinders.

Treating operators and yard crew assisting in the unloading operation used gloves to minimize skin contact with the treatment chemicals. No respiratory protection was utilized.

#### DESCRIPTION OF SURVEY METHODS

The NIOSH sampling and analytical method P & CAM 217 was utilized for evaluating airborne levels of creosote. Bendix BDX-41 air sampling pumps, pre- and post-calibrated with a Universal Pump Calibrator, Model 302, were operated at flow rates of 1.5-2.0 liters per minute (LPM). The sampling train included a glass fiber, type A, prefilter and a 0.8 micron silver membrane filter with a cellulose back-up pad in a 37 mm, 3-piece closed-face cassette. In the laboratory, the filters were analyzed by a cyclohexane soxhlet extraction, evaporation, and gravimetric determination of the residue.

A silica gel adsorption tube and a sodium hydroxide impinger

method were used for collecting airborne PCP. The samples were taken side by side in order to evaluate and compare both sampling and analytical methods. Bendix BDx-41 and MSA Model S pumps, calibrated as described above, were operated at flow rates of approximately 0.5 LPM for the silica gel tube and 1.7-2.5 LPM for the impinger method.

The impinger method included a midget bubbler containing 15 ml. of sodium hydroxide solution followed by a second empty bubbler used as a trap to protect the sampling pump from solvent splash-over or condensation. The samples were analyzed according to the method of Cranmer and Frael<sup>1</sup> using gas chromatography and an electron capture detector. The lower limit of PCP detection by this method is 0.02 micrograms ( $\mu\text{g}$ ) per sample.

PCP collected on large size silica gel tubes (260/520  $\mu\text{g}$ ) was desorbed with 10% methanol in diethyl ether, derivatized and analyzed by gas chromatography using a flame ionization detector. 0.8 micron Millipore AA prefilters in three-piece cassettes were also added to determine if there was any airborne particulate PCP. Methylene chloride was used to extract the PCP from the filters, a solvent exchange was carried out to transfer the PCP to a methanol diethyl ether solution, the sample was derivatized and then analyzed by gas chromatography. The lower limit of detection by this method is 0.1  $\mu\text{g}$  per sample.

<sup>1</sup>"Gas Chromatographic Analysis of PCP in Human Urine by Formation of Alkyl Ethers", M. Cranmer, and J. Frael, *Li's Sciences*, Vol. 9, Part 2, pp. 121-128, 1970.

## RESULTS

The creosote samples collected in the treatment building and on the bundle of treated wood showed spurious results. The blank filter used in the analysis indicated high levels of extractable aromatic hydrocarbons. The area sample contained 0.9 mg and 1.4 mg cyclohexane extractable, respectively. Whereas, the blank had 1.2 mg. No valid air concentrations can be calculated.

The set of PCP air samples collected at the cylinder door while the charge was being unloaded showed PCP concentrations of 0.01 milligrams per cubic meter ( $\text{mg}/\text{m}^3$ ) by the impinger method and 0.04  $\text{mg}/\text{m}^3$  by the silica gel/prefilter method. PCP levels on top of the bundles of treated wood were 0.11  $\text{mg}/\text{m}^3$  by the impinger method and 0.12  $\text{mg}/\text{m}^3$  by the combined silica gel/prefilter method.

## ANALYSIS AND DISCUSSION

Following a review of the erroneous creosote data, analytical laboratory procedures were investigated. A number of inconsistencies in the techniques used compared with those recommended in the NIOSH method, were found. A Soxhlet extraction was utilized instead of ultrasound; the 5 milliliter soluble portion was evaporated to dryness instead of a 1 milliliter fraction; and a vial was used for the gravimetric determination instead of a teflon cup. All of these modifications resulted in poor analytical sensitivity and therefore, inaccurate and invalid data.

KOPPERS COMPANY  
Florence, South Carolina

APPENDIX A  
AIR MONITORING RESULTS

Survey Date: 7/25/79

SAMPLE DESCRIPTION	PUMP# SAMPLE#	SAMPLING TIME (min)	FLOW RATE TOTAL AIR VOLUME	COMPONENT	CONCENTRATION
Area Sample - Inside treatment building, adjacent transfer & vacuum creosote pumps	BDX-104 KOP-005	12:40p-4:41p 241 min.	1.55 LPM 0.375 m <sup>3</sup>	Creosote (Coal Tar Pitch Volatiles)	0.9 mg
Area Sample - on 35' poles following removal from #4 creosote cylinder	BDX-60 KOP-020	3:45p-7:55p 250 min.	2.03 LPM 0.507 m <sup>3</sup>	Creosote (Coal Tar Pitch Volatiles)	1.4 mg
Blank Filter	KOP-021			Creosote	1.2 mg
Area Sample - at #5 penta cylinder adjacent door opening where oper- ator stands at control panel; mechanical prob- lems with cylinder draining and charge had cooled to 145° F. by the time door was opened.	BDX-101 KOP-006	3:00p-3:32p 32 min.	0.54 LPM 0.017 m <sup>3</sup>	Pentachlorophenol	0.5 µg
	KOP-007 silica gel			Pentachlorophenol	0.24 µg
	#1 MSA KOP-008 Impinger (NaOH)	3:00p-3:32p 32 min.	1.67 LPM 0.053 m <sup>3</sup>	Pentachlorophenol	0.74 µg 0.34 µg
Blank Prefilter	KOP-012			Pentachlorophenol	0.1 µg
Blank silica gel	KOP-013			Pentachlorophenol	0.1 µg
Blank NaOH Impinger Solution	KOP-014			Pentachlorophenol	0.02 µg

KOPPERS COMPANY  
Florence, South Carolina

APPENDIX A  
AIR MONITORING RESULTS - Survey Date: 7/25/79

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SAMPLE DESCRIPTION	PUMP# SAMPLE#	SAMPLING TIME (min)	FLOW RATE TOTAL AIR VOLUME	COMPONENT	CONCENTRATION
Area Sample - on PCP treated bundle of wood following removal from #5 cylinder	BDX-83 KOP-010 prefilter	3:15p-4:40p 85 min.	0.44 LPM 0.037 m <sup>3</sup>	Pentachlorophenol	4.2 µg
	KOP-011 silica gel			Pentachlorophenol	$\frac{0.33 \mu\text{g}}{4.53 \mu\text{g}}$ 0.12 mg/m <sup>3</sup>
	BDX-66 KOP-009 Impinger (NaOH)	3:13p-4:40p 87 min.	2.50 LPM 0.217 m <sup>3</sup>	Pentachlorophenol	24 µ 0.11 mg/m <sup>3</sup>

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