PRELIMINARY SURVEY REPORT:

Particleboard Plant
Timber Products Company
Medford, Oregon

SURVEY CONDUCTED BY:
Vincent D. Mortimer, Jr.

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November 19, 1981

REPORT WRITTEN BY:
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U.S. DEPARTMENT OF HEALTH AND HUMAN SERVICES
Public Health Service
Centers for Disease Control
National Institute for Occupational Safety and Health
Division of Physical Sciences and Engineering
Engineering Control Technology Branch
Cincinnati, Ohio 45226

PURPOSE OF SURVEY:

To observe the processes involving adhesives, with emphasis on the method of application and the associated occupational health hazard controls.

EMPLOYER REPRESENTATIVES CONTACTED:

Mr. Don Buntrock, Particleboard Plant Manager
Mr. Fred Johnson, Production General Foreman

EMPLOYEE REPRESENTATIVES CONTACTED:

Mr. Mike Hicks, President, IWA Local #3-6

STANDARD INDUSTRIAL CLASSIFICATION CODE OF PLANT:

2492: Particleboard

ABSTRACT

A preliminary survey of the particleboard plant of Timber Products Company was conducted as part of a NIOSH study of occupational health hazard controls associated with the industrial use of adhesives. The production processes, especially those involving the urea/formaldehyde resin, were observed. Detector tube samples were taken to document the approximate level of airborne formaldehyde in various parts of the plant.

No values were greater than 2 parts formaldehyde per million parts of air (ppm); however, some were in the area of 1 ppm. Resin formulation used by Timber Products may contribute significantly to maintaining the low ambient levels of formaldehyde. Engineering controls included control rooms for process operators, a canopy hood over the board cooling unit, and roof fans above the press.

Introduction

Industrial adhesives may involve agents, such as formaldehyde, organic solvents, and a variety of additives, which pose potential occupational health hazards. An appropriate implementation of control technology may prevent the overexposure of workers to these substances.

The Engineering Control Technology Branch of NIOSH is conducting a research study to document control methods associated with the industrial use of adhesives. The first phase of this project involves preliminary surveys to assess the application of control technology in conjunction with the use of adhesives in a number of industries. The information gathered will be used to focus future efforts on the industries which can benefit most from further study and to plan for a second, more detailed survey at those plants which are selected for in-depth study.

The primary contact was the particleboard plant manager, Mr. Don Buntrock. Mr. Fred Johnson, the Production General Foreman for the particleboard plant, lead the walk-through. We met briefly with Mr. Mike Hicks, President of the International Woodworkers of America Union Local 3-6, to explain the purpose and scope of the study.

Description of Facilities

The particleboard plant is part of a complex of facilities operated by Timber Products on McAndrews Road on the northwest corner of Medford. This company has been involved in the timber/wood products industry on this location since the 1930's. Since the building's construction in 1965, production speed has been increased approximately five-fold, but no major building or ventilation modifications have been made. The large wood frame/wood siding structure has overhead steam heaters, the general workplace is not air-conditioned.

The layout of the plant is diagrammed in Figure 1. The equipment for making particleboard requires considerable space. The main production structure is approximately 300 feet long and 60 feet wide with a 50 foot ceiling height. In the larger wing, particleboard panels are sanded, sized, stored and shipped, and solid particleboard door cores are manufactured. Offices for the plant manager and the production supervisor and a small laboratory (which also serves as a break room) are constructed along the inside west wall. Two small buildings for the men's rest room facilities and a lunch/break room have been built in the outside area between the two parallel sections of the building.

Approximately 70 people are employed in the building, spread over three shifts with roughly 25% on the night shift and 10% on the graveyard shift. Approximately 13% of the work force is salaried. Three to four workers are required each shift for particleboard production.

Description of Processes

The wood particles are first graded, coarse particles for the core and the finer particles for the face. The resin is sprayed onto the particles as they fall through a blending chute. The resin-coated particles are then conveyed to bins from which layers are coated onto large, metal caul plates; two core layers between two face layers.

Using an indexing mechanism, the caul plates carrying unformed boards are loaded into a magazine from which the press will be loaded with a stack of particle-laden caul plates. At the conclusion of the press cycle, the stack is pulled out of the press and automatically unloaded one at a time onto a conveyor belt. A blast of compressed air blows loose particles from the press at the end of the cycle.

Having been separated from the caul plates, the newly formed boards are conveyed to the cooling wheel. This apparatus is like a paddle-wheel with the boards resembling fins. The boards are picked up on one side and passed through a 180° arc to the other side where they are mechanically unloaded and stacked.

After initial cooling on the wheel, stacks of boards are taken to a staging area to await sanding, sizing and shipping. For all operations, the boards are either moved in stacks with forklift trucks or transported singly on mechanical conveyors.

Description of Controls

Local exhaust ventilation is used over the cooling wheel. A canopy hood covers the boards as they make a 180° pass over a supply of air from underneath. Smoke tube analysis showed fairly good capture by the hood, although there was an interfering flow of air horizontally accross the boards. A detector tube (Drager 0.5/a) sample taken at floor level required 13 pump strokes, indicating less than one part formaldehyde per million parts of air. The sampling site was about 5 to 15 feet below the boards, close to both the cooling wheel and the unloaded stack of boards.

Two roof fans located above the press remove much of the heated air from the press, although there is not much air flow observable at the level of the platform which provides worker access to all points of the production line. A detector tube sample taken close to the press showed less than 1.5 ppm (8 strokes), and this location is not usually occupied by any employee.

Around 1973, control rooms were built for the press operator and for the former-operator who controls the layering of particles on the caul plates. Now only a few workers involved in maintenance and clean-up regularly work outside these booths. An air conditioner has been installed in each control room for cooling during hot weather. The units are small, commercially available, window models which are vented to the indoor workplace air just outside the booth. They were not operating on the day of the survey, and it is not known what effect, if any, they would have on formaldehyde levels in the control rooms.

A detector tube sample showed approximately 1 ppm (10 strokes) formaldehyde in the press control room; however, the door to this booth was open before and during the period of observation. The detector tube sample in the other booth was taken through 16 strokes, and the yellow color which developed indicated an interfering substance and probably little if any formaldehyde.

There is no ventilation in the area where the resin is pumped and sprayed; however, large doors at each end and in the middle of the building are open

most of the time. A detector tube sample taken alongside a bank of spray nozzles only developed a yellow color after 16 strokes, indicating an interfreing substance and probably little, if any, formaldehyde. One employee works in this area, cleaning the resin spray nozzles, for an hour or two each shift.

The other wing of the building has four roof fans spaced out along its length. Together with the adjoining railway car facility, there are probably over two million cubic feet of enclosed space. In this section also, large doors at the ends and in the middle were open, as they usually are most of the year. A detector tube sample taken in the finishing area close to a stack of boards showed no significant color development after 16 strokes indicating less than 0.5 ppm, if any, formaldehyde.

Although at this time, there is no acceptable substitute for urea/formaldehyde resin, the resins being used today are modified to reduce formaldehyde emissions. The U/F resin used by Timber Products includes ammonia sulfate, an acidic catalyst which speeds up the polymerization reaction, and a scavenging agent to reduce the free formaldehyde in the board after pressing. The effectiveness of this resin modification can not be assessed without comparison data for resin not containing these additives.

Workplace sampling data was requested from the state of Oregon back before 1978 when Timber Products switched to the scavenger-modified resin. Only one set of sampling results was available. On October 5, 1977, 10 personal samples were taken, averaging 30 minutes in duration, were taken by the Oregon Workers' Compensation Department. The calculated concentrations ranged from approximately 1.0 to 3.2 ppm, with a mean ($\pm$ standard deviation) of 1.4($\pm$ 0.6) ppm.

Other Factors Affecting Occupational Health

No single personal protective equipment item is required for every worker. Hearing protectors and safety glasses are required for some jobs; respirators are not mandatory for any worker.

Each employee is covered by a hospitalization plan, and each is given a pre-employment physical. The state provides an industrial accident compensation program, which includes some inspection and monitoring services.

The duties of the full-time safety director include fire safety as well as accident prevention. All workers are responsible for keeping the workplace clean, which contributes to explosion prevention. The building is equipped with a sprinkler system for fire suppression.

Conclusions and Recommendations

Although pockets of air were encountered in which the formaldehyde odor was stronger than the mild ambient level, the workplace concentrations of formaldehyde were measured to be quite low on the day of the survey. Using color comparison detector tubes to obtain a rough estimate of the numerical value of formaldehyde vapor in air, no sample was taken which exceeded the Threshold Limit Value of two parts formaldehyde per million parts of air

proposed by the American Conference of Governmental Industrial Hygienists. Only the sample taken alongside the press was above the NIOSH recommended standard of 1 ppm; however, detector tube measurement is not equivalent to the sampling method on which the NIOSH recommended standard is based. The OSHA permissible exposure limit is 3 ppm.

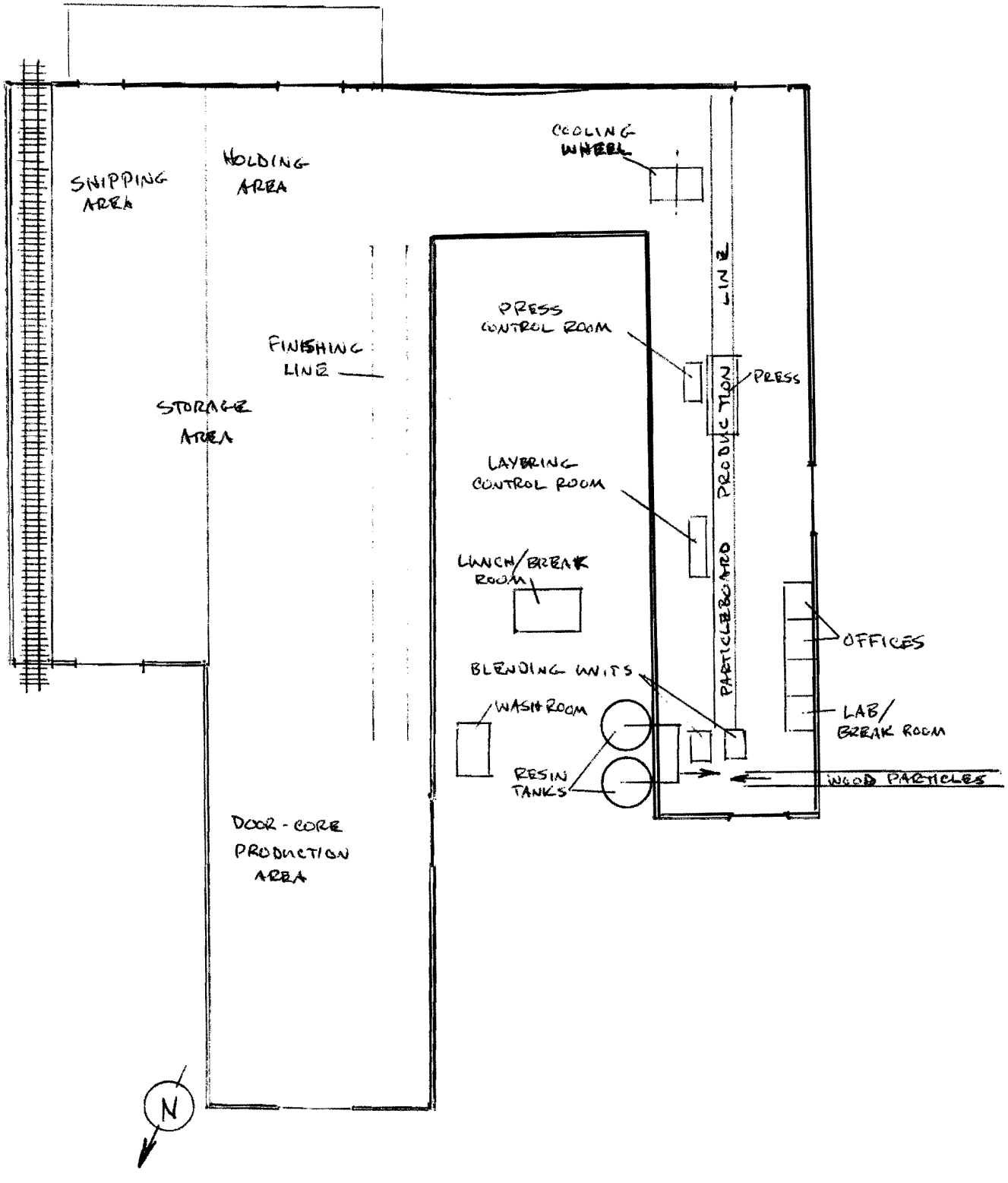

FIGURE 1. TIMBER PRODUCTS, INC. PARTICLEBOARD PLANT