PRELIMINARY REPORT

Health and Safety Survey of the George Banta Printing Company

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The passage of the Occupational Safety and Health Act of 1970 brought forth a multitude of new national occupational safety and health standards. Two purposes of the Act were to encourage "...employers and employees in their efforts to reduce the number of occupational safety and health hazards at their places of employment, and to stimulate employers and employees to institute new, and perfect existing programs for providing safe and healthful working conditions." On several occasions, Sheldon Samuels, Industrial Union Department, AFL-CIO, and William Schroeder, Vice-President of the Graphic Arts International Union, proposed the possibility of developing a cooperative project addressed at a specific work population, namely, the printing industry. The National Institute for Occupational Safety and Health (NIOSH) recognized the potential value of such a pilot effort and thus the Banta study was conceived.

Ideally, such a study should be designed in such a manner that, after studying a select population, the findings could be disseminated across the nation to all like exposed employers and employees. The George Banta Printing Company, Menasha, Wisconsin, employing 1400, was selected as an excellent setting for this project for the following reasons:

1. It was a large plant with examples of all types of printing operations present,

2. Management was cooperative,

3. The union had excellent relationship with management and was most willing to cooperate in correcting safety and health problems.

The National Institute for Occupational Safety and Health was asked to provide its support to the project by assisting in:

1. Identifying health and safety problems within the plant,

2. Developing recommendations for the control of identified health and safety hazards,

3. Assisting in the design of a training course for workers to be conducted by the unions.

4. Defining hazards which were probably typical for the industry and should be included in a fact sheet or pamphlet for the industry.

In this light, on January 22, 1973, members of each of the organizations mentioned above met at the George Banta Printing Company to discuss the feasibility of such a project. It was at this meeting that an agreement was reached, that the members of the union, NIOSH personnel, and the George Banta Printing Company management would enter into a cooperative evaluation of the health and safety hazards at the George Banta Printing Company. The management also agreed to correct all hazards identified. The correction schedule would be based on (1) the nature of the hazard and (2) the cost of controls.

This project was thought to be best explored by dividing it into six phases:

1. Team walk-around for a rough delineation of problem areas.

2. Sampling and analysis survey.

3. Development of preliminary report.

4. Presentation of recommendations.

5. Assistance in the development of a training program.

6. Publication of a final report.

With this outline accepted, a walk-through survey was conducted on March 12, 13, and 14, 1973 by the following NIOSH personnel from various disciplines:

Marshall E. LaNier, Regional Program Director, Region V, NIOSH
Richard Kramkowski, Sr. Regional Industrial Hygienist, Region V, NIOSH
Robert Mahon, NIOSH-DOL Liaison
Jane A. Lee, Nurse Consultant
Robert Ligo, M.D.
James Walters, Safety Specialist
David Sundin, Industrial Hygienist

Description of Operations

The George Banta Printing Company operates at two locations in Wisconsin: The Menasha Plant and the Midway Plant. Initial engraving is contracted out to its wholly owned subsidiary, The Northwestern Engraving Company. Letterpress and lithography are largely conducted at the Menasha Plant. The majority of their textbook printing, collating, and binding and shipping operations are at this location. The Midway plant operations largely involve the color printing of educational workbooks and tests or Gravure, storage, shipping, paper preparation, and waste baling and shipping. Each operation at the three locations was included in the walk-through survey.

Regular letterpress inks used for general and color printing dry as a result of an oxidation/polymerization reaction which occurs at normal temperatures. These inks are based essentially on a pigmented drying oil varnish to which a drier is added, usually salts of lead, cobalt or manganese. These encourage the absorption of oxygen from the air which oxidizes the drying oil and stimulates polymerization. A second kind of letterpress ink used for high-speed magazine production, dries by heating and consists of a pigmented resin dissolved in a high-boiling solvent such as petroleum fractions boiling between 250 and 300 degrees Centrigrade. After printing, the paper, usually in web form, passes through an oven containing open gas flames where the solvent is burned off leaving the pigmented resin to solidify when cool. Inks used in offset litho are similar to those in letterpress printing except they must always be water repellent.

Inks used in Gravure printing are quite different. They are fluid, whereas letterpress and lithography inks are stiff and tacky. They consist of a pigmented resin which is dissolved in a low-boiling solvent such as xylene, an aliphatic hydrocarbon, alcohol, or other organic solvent, and they rely for their drying on evaporation of the solvent. After the paper has been printed and it is passed through a drying unit where hot air is blown over it to evaporate the solvent, precautions have to be taken to retain the solvent within the system.

All inks used at the George Banta Printing Company are purchased from a subcontractor who maintains a mixing room, storeroom, and supply center at the Midway plant. Inks are mixed at the plant to the specifications requested.

Airborne concentrations of the inks are minimal. Therefore, industrial hygiene sampling was to be confined to the evaluation of solvent and noise exposure. Bulk samples were secured and analyzed at the NIOSH Cincinnati laboratory to determine which solvents might present the greatest hazard potential. These solvents contained approximately 150 different components. In light of the amount found and the expected hazard those starred in the attached Table A were evaluated at a later visit. None of the solvents evaluated were found in concentrations approaching a tenth of the recommended Hygienic Standards. Noise exposure will be discussed later in the report.

PROFILE OF EMPLOYEES

Banta is generally known as a good place to work. The work force is highly stable due to the fact that it has been for many years a family-owned company and has a paternalistic attitude.

The plant population ethnically is composed of many German and Polish groups. It was stated that they are "hale and hearty" beer drinkers, evidenced by observing many obese men both young and old.

About 4-5 % are known to be problem drinkers but drug users were not identified. There is no planned program to identify or assist the alcoholic or other addicts.

A breakdown of personnel by age and sex at the Menasha Plant and Midway Plant indicating totals of a statistical analysis, by age, of production employees, as of January 1, 1973 is as follows (excluding Northwestern Engraving employees):

	Nos. of Employees	Average Age
All Employees	1110	37.3
Supervisors	58	48.6
Hourly	1052	36.7

HEALTH SERVICES AVAILABLE, IN-PLANT AND OUT-OF-PLANT

The health and medical services now being utilized by Banta are:

In-plant

First aid and primary care is performed by supervisors who have received a two-day training course at the local general hospital. Some have received the American Red Cross first aid training course. There is some attempt to provide refresher training.

Out-of-plant

Pre-employment physical examinations are done by a local physician in general practice. This examination is routine and includes a blood pressure measurement, examination of head and neck; eye, ear, nose and throat, chest and heart ausculation, abdomen, hernia, varicosities and range of motion. (See Appendix) No history is obtained.

There are no biological tests or measurements performed. There is no vision or hearing testing done.

Periodic health examinations for health and disease monitoring are not performed.

A State Health Department mobile screening unit was invited to Banta to provide preventive health screening tests to employees. Diabetes detection tests were among the tests performed. Results were sent to the worker's local family doctor.

The Pheda Clark Memorial Hospital located in Neenah, Wisconsin, is a 354 bed hospital offering general medical and surgical services. It is an accredited hospital, and offers Blue Cross coverage. Many employees are admitted for in-patient care. It is one mile from Menasha Plant I.

The St. Elizabeth's Hospital located in Appleton, Wisconsin, is a 293 bed hospital offering general medical and surgical services. It is an accredited hospital, and offers Blue Cross coverage. Some employees are admitted here because it is closer to the Midway Plant.

OCCUPATIONAL RECORD SYSTEM FOR INJURY, AND ILLNESS

The following report forms are used to constitute Banta's injury and illness system.

1. #162A - FOREMAN'S ACCIDENT REPORT

Supervisor completes this form with routine information as to date,

time, place, name, I.D.#, including the who, where, what, how, when, and disposition. (See Appendix)

2. #200A - MEDICAL SERVICE REFERRAL SLIP

This is a control form for the examining or attending physician's use, and is returned with the employee or mailed to the Personnel Office. (See Appendix)

3. EMERGENCY TAXICAB CHARGE SLIP

This form authorizes transportation via taxi to and from outside care facility for medical attention and is used for minor complaints only. (Note: "Per conversation" the union officials are not happy with this service as the sick or injured employee is usually not accompanied on his trip to the hospital, and feels insecure in taxi especially at night. Furthermore, this service is not prompt or adequate.)

4. OSHA #100 - LOG OF OCCUPATIONAL INJURY AND ILLNESS

This log is completed daily by the Safety Department. A review of the completed 1972 list of reportable conditions indicates the following types of occupational injuries were most frequently listed under Code 10: lacerations, bruises, muscle pulls, hernia, puncture wounds, sprains, back strain, eye (such as foreign bodies in eyes), broken blood vessel, strain to groin, chemical burns (to feet). Tenosynovitis was listed under Code 10 as an injury. One case of dermatitis was listed under Code 22.

5. OSHA #102 - SUMMARY

This form was completed at the end of 1972 and was posted in an accessible place to the employees, for the required length of time.

THE SAFETY PROGRAM

Mr. Bob Pack is the Banta Printing Company's full-time Safety Coordinator. He is responsible for the Menasha Plant No. I and the Midway Plant II. The Safety Coordinator organized and assumed the following responsibilities:

1. Records - maintains occupational injury and illness records and maintains OSHA records, Workmen's Compensation forms, et al.

2. Personal Protective Equipment and Clothing Apparel - maintains safety equipment and supplies.

3. Fire Brigade - maintains comprehensive fire control system throughout both plants.

4. First Aid Training - provides for supervisory training in first aid, and handling of all on-job injuries and illness

5. Medical (Physician) Follow-up and Referral - keeps in daily touch with hospitals, clinics, and physicians caring for Banta employees.

6. Environmental Consultation - seeks assistance from State Health Department, Section of Occupational Health, to perform tests, measurements, industrial hygiene survey - with special attention to the noise problem.

7. Keeps Safety Fact and Statistics - in 1972 Banta injury frequency rate was 16.9. The frequency rate for the printing industry in 1971, in general, as documented by the National Safety Council Accident Facts, 1972, is 9.86.

8. Safety Education - all safety education is done through the Safety Coordinator who encourages the foreman to individually handle and provide counseling on each employee incidence or happening, especially because the foreman must provide the first aid and "primary care."

9. Transportation of the Injured or Ill - each foreman is required to make some disposition on his employee after injury or illness which means that supervision must give first aid, complete the injury forms, call for transportation and complete the safety investigation form.

PERSONAL PROTECTIVE EQUIPMENT AND CLOTHING

1. Shoes, safety toed - employer pays $4.00, employee pays the rest, this expense can be under payroll deduction. Eighty-five percent of the workers wear safety shoes.

2. Plano Safety Glasses - given by employer to employee for certain jobs, as required.

3. Prescription Safety Glasses - can be purchased from the local American Optical (AO) house at reduced costs to employee (not mandatory).

4. Ear Defenders - provided by company

5. Ear Muff - provided for certain noise areas only (Midway press room requires mandatory wearing of ear protection).

6. Hard Hats - furnished by employer, compulsory in Shipping and Warehouse, only.

Gloves - furnished by company where required

FRINGE BENEFITS

Group hospital insurance for major medical coverage is paid by the employer. The cost to the employer is approximately $53.57 per month for an employee with dependents, and $23.00 per month for a single employee.

Sick leave is paid by the employer; the cut off point is determined by length of disability and longevity of employee.

Vacation - employees get five weeks after one year employment.

Retirement - employees have a pension plan with the company as the sole contributor.

Holidays - there are eight paid holidays per year.

Hourly wages and benefits - all hourly employees work a thirty-seven and one-half hour week. Overtime is paid after seven and one-half hours a day. Overtime for work on Saturday is based at one and one-half hourly overtime rate. Overtime for work on Sunday is based on two times the hourly overtime rate. Holiday time is based at two and one-half hourly overtime rate.

Mr. Pack stated that the costs of all fringe benefits was placed at $1.26 an hour per each employee.

RECREATION

Vending machines are placed in many areas of the plant, near work sites. Machines are also placed in open areas for breaks, lunches, snacks. (There is no plant cafeteria.) Monies collected from the vending machines are used for company-wide recreation, as:

Dances
Bowling Team
Dinners
Picnic, annual, family
Soft Ball
Fishing Contests
Thanksgiving Turkey to each employee
Christmas Party for children of employees.

MORTALITY STUDIES

The National Institute for Occupational Safety and Health was asked to examine mortality data to determine if the incidence of leukemia was abnormal at this plant. The results of this investigation follow.

The data were drawn from a cohort of 421 individuals hired by the Banta-Printing Company prior to 1955 and still employed as of 1965. The mortality data were obtained from life insurance claims filed by the Company on behalf of insured former employees and this information source was individual death certificates, i.e., the Company has no employee health program, no health records are available. In fact, essentially the only other source of employee information is an index file giving name, address, age, dates of hiring and termination, and date of death if that information was known to the Company. This file contains the name of every employee since the Company was founded in 1901, e.g., about 6,000 names. Of the large cohort defined above, 250 persons are still employed, 113 are retired and living, 46 are known to have died, and the fate of 22 others is unknown but they are presumed to be alive. Crude tabulation of the mortality data produced the following breakdown:

Cause of Death	Number of Cases
Heart and Great Vessels	31
Cancer	9
Metabolic	1
Cerebral vascular accident	1
Trauma	1
Leukemia	3
	46

This number consisted of 10 females and 36 males and the average age of death was 64.4 and 62.9 years, respectively, for the sexes.

A tabulation of the cancer deaths including the three cases of leukemia follows:

Type of Cancer	Number of Cases
Leukemia	
(1) Acute Myelogenous	2
(2) Chronic Lymphatic	1
Lung	
(1) Left Pleura	1
(2) Adenocarcinoma	1
Malignant Lymphoma	1
Lymphosarcoma	1
Esophageal	1
Brain	1
Laryngeal	1
Colon	1
Carcinomatosis	1
	12

Following this tabulation the names and addresses of the next of kin were determined. This was also done for the lymphoma and lymphosarcoma cases since these conditions are sometimes considered allied to the leukemic group of diseases and confusion in diagnosis is not rare. Obtaining permission of the next of kin is an essential step in gaining access to medical/hospital records which might be useful in verifying the death certificate information.

Prior to beginning the verification process, we were able to obtain similar mortality data on 30 more employees who had died since 1960, but who were not included in the survey data. While many were shorter term employees, this sample also contained 20 individuals with 15 or more years service at Banta (including 12 with over 25 years service). Since the previous sample was small it was thought appropriate to broaden the sample size and look for additional leukemia cases. No usable death data were available for nine of the 30, but we were able to obtain this information from the local health department. Tabulation of these cases was as follows:

Cause of Death	Number of Cases
Heart and Great Vessels	8
Cancer	8
Trauma	7
Pulmcnary	2
Gastrointestinal	3
CVA	2
	30

The eight malignancy deaths break down as follows:

Type of Cancer	Number of Cases
Lung	2
Colon	1
Kidney	1
Bladder	1
Stomach	1
Teratoma	1
Lymphoblastic Lymphoma	1
	8

Omitting the deaths due to trauma, this group consisted of two females and 21 males and the average age at death was 71 and 67.2 years, respectively. Again, permission to obtain further information on the case of lymphoblastic lymphoma was obtained.

Record reviews were hindered by a general reticence and suspicion on the part of many next of kin necessitating repeated pleas and visitations. In several instances Company management was invaluable in interceding in our behalf. In addition, several hospitals serve the general area. Permission was finally obtained in each instance where we deemed it necessary with the exception of one case of leukemia. In this case the patient was a 43-year-old woman who had been employed as a book binder for 24 years. Available information indicated that death was due to cerebral hemorrhage and acute leukemia. The fulminating nature of her

illness is apparent from the fact that she worked up to 11 days prior to her death. The husband in this case has since remarried and the new wife was effectively frustrated over our contacting him. The Company is still trying to obtain permission for us. In any event, we were unable to further verify the diagnosis in this instance.

Complete hospital records were reviewed for the two remaining suspected leukemics. We were favorably impressed by the excellence of the records and quality of medical care available in the area. In fact, over 90% of the physician population are specialists.

One case, a 67-year-old female bindery worker, was confirmed as being that of acute myelogenous leukemia. In this instance the symptoms first appeared approximately one and one-half years after retiring from the plant. While this in no way mitigates against occupational causation, it likewise should not be construed as supporting it since the cause of leukemia remains cryptic.

The remaining case was that of a 72-year-old man whose death certificate reported acute congestive heart failure and chronic lymphocytic leukemia. He had worked in the warehouse shipping department and had retired four years prior to death. He had suffered for many years with severe rheumatoid arthritis. Following the terminal event an autopsy was performed. This examination completely failed to substantiate the clinical diagnosis of leukemia. In fact, through review of the numerous past hospital admission records, it was revealed that the leukemic diagnosis had only been tentative and never confirmed. It had been based on occasional elevated white blood counts which had been noted through the years. As pointed out in

the pathologist's discussion of the post-mortem findings, these elevated counts were probably "in response to the severe stress of his rheumatoid arthritis." In fact, very high white cell counts are not infrequently seen as part of the presenting features in rheumatoid arthritis. Thus, this case may be reliably discounted as one of leukemia.

The case of lymphosarcoma and two of lymphoma were confirmed. There is no suggestion that these might have been actually leukemias. Interestingly, one terminal lymphoma occurred in an employee of only six months duration. Judging from the large size of the tumor at diagnosis, it would have undoubtedly been detectable by pre-employment chest x-ray had that been a plant requirement. Unfortunately, the pre-employment examination emphasizes mainly a range-of-motion test designed to detect previous back injury.

We have contacted the Traveler's Insurance Company and requested their assistance in further enlarging the scope of mortality data. To date no reply has been received.

In summary, we were able to discount one of the three alleged cases of leukemia as earlier reported. One case was confirmed. The final case could neither be confirmed or refuted. Both these cases, if the one is eventually confirmed, occurred in women employed in bindery operations which utilize water soluble animal glues almost exclusively. The bindery employs 363 persons, mainly women, which represent almost exactly one-third of the large work force. This would not seem to be a remarkable incidence of leukemia in a group of this size.

Thirty additional mortality reports were also examined and revealed no further cases of leukemia.

The average death of all the Banta employees studied was 64.7 years. This compares favorably with the national average age of death which was calculated to be 64.9 years for the year 1970. It seems unlikely that Banta employees are experiencing any significant unusual mortality.

INDUSTRIAL HYGIENE SAMPLING LOCATIONS

Environmental samples for airborne solvent vapors were collected at the Midway Plant and the Main Plant in areas where inks and solvents were used, mixed, or stored, either as part of the production operation or as a part of associated support activities such as press cleanup, equipment maintenance, and so on.

Samples for solvent vapors were of two types; personal samples, collected in the employee's breathing zone, and area samples collected at certain specific locations, regardless of employee behavior within that area. The area samples were generally collected over a longer time period than the personal samples, and could therefore be utilized as "bulk air" samples for the purpose of clarifying which components of the solvent vapor mixture were of importance in personal exposures.

Personal samples were confined to the individuals at each of the two plants whose stated job activities involved close contact with inks and solvents. This sampled population included:

1. ink men
2. pressmen and helpers
3. plate tenders
4. ink mixers

Samples were also collected at locations which demonstrated a potential for employee exposure to airborne lead dust and/or fumes. These areas included operations where lead stock was being shaped, milled, sawed and ground, as well as locations where molten lead was in use, such as stereotype and linotype machines, and in the lead remelt and casting area.

SAMPLING METHODS:

Personal and area samples for solvent vapors were collected using activated charcoal as a collection media in conjunction with a Sipin* and MSA* Model G portable, battery-powered pumps. Samples for airborne lead were collected on AA cellulose membrane filters, 0.8μ pore size, with MSA Model G pump operating at a flow rate of 1.7 liters per minute.

Analysis of the lead samples was accomplished by digesting the filter and using atomic absorption to determine total lead content.

The charcoal tube samples were analyzed chromatographically, following desorbtion from the charcoal media with carbon disulfide. Mass spectroscopy permitted identification of the various compounds present in the complex solvent mixture.

Since most commercial solvents in use in the printing industry consist of a mixture of compounds, usually of low toxicity, employee exposures to the vapors of these solvents are difficult to resolve in terms of individual components of the original mixture. The printing plant evaluated in this investigation, for instance uses ordinary white gas, or kerosene for routine lithographic plate cleaning. White gas is an unresolved petroleum distillate, known to contain upwards of 100 components. The task, therefore, of identifying each element of the employee's total exposure to this type of solvent vapor is of monumental proportions.

The approach which was taken, therefore, utilized the area samples collected in a specific location to indicate what solvent vapors would possibly be seen on the personal samples of employees working at that location. Additionally, if the chromatographic analysis of any personal sample revealed the presence of a compound not portrayed in the area

sample, a mass spectrograph was used to identify the unknown compound. This procedure yielded the employee's actual exposure to the compounds of the solvent vapor mixture which were present as major components at his particular location during the sampling period. Although the components of the vapor mixture were not identical at each location throughout the plant, according to which type of solvent was being used in the area, the major constituents of each vapor mixture tended to remain fairly constant throughout the plant. Table A lists major and minor compounds detected in the personal samples.

Several bulk samples of inks used in the plant were collected and analyzed for chlorodiphenyl content. Isomers of interest were those containing 42% chlorine (Aroclor 1242) and 54% chlorine (Aroclor 1254). No chlorodiphenyls were detected. Personal communication with several ink manufacturers indicate chlorodiphenyls are no longer used as germicides.

DISCUSSION OF RESULTS AND CONCLUSIONS

Table B lists concentrations of organic solvent vapors measured in personal samples at various job locations throughout the plant. The job categories which were surveyed can be subdivided as follows;

A. Midway Plant

1. Roll-fed web offset presses

a) two-color

b) four-color

2. Sheet-fed offset presses

B. Main Plant

1. Sheet-fed offset presses

None of the samples showed levels of solvent vapors indicative of exposures endangering the health of the employees. Concentrations of the individual compounds of interest in the personal samples did not approach their respective acceptable upper limits, nor did the calculated additive effects factor indicate the presence of a dangerous mixture of low concentration solvent vapors.

This result is predictable and was anticipated in view of the work routines of the employees, the type of solvent in use, the method in which they were handled, and the ventilation in the area.

The population which showed the lowest level of exposure to solvent vapors was the roll-fed web offset pressmen and helpers. Slightly higher exposure levels were registered by pressmen in the sheet-fed offset area. The highest levels of exposure to solvent vapors was recorded by plate tenders in the sheet-fed offset area.

The explanation for this variation is straightforward:

1. The roll-fed presses are in a much larger room than the sheet-fed presses, enhancing the effects of dilution and dispersal of solvent fumes.

2. The sheet-fed press area centralizes the plant-cleaning function in one corner of the room. One employee (the plate tender) is responsible for cleaning plates from all presses in the area. In contrast, the roll-fed pressman is responsible for cleaning the plates on his own press.

3. The action involved in printing a sheet of paper as opposed to a roll appears to have a higher potential for fume generation during the printing cycle due to the "fan" effect of stacking and unloading sheets.

4. Presses in the sheet-fed area are generally closer together, and there appeared to be more open containers of solvent in the area.

It is interesting to note that the personal samples collected at the Main Plant showed higher concentrations of xylene in all cases than those collected at the Midway Plant. This is due to the fact that a slightly different set of chemicals are in use at each plant. On the day the Midway Plant was sampled, a plastic coating was being applied to pre-printed sheets. The process utilized a special solvent carrier which was composed mainly of xylene.

Ten samples were collected and analyzed for airborne lead dust and fumes. Of these ten, only one demonstrated a detectable concentration. This sample was an area sample, collected in the lead remelting furnace room, and registered an average concentration over the sampling period of 0.006 mg/M3 lead.

The apparent lack of a health problem associated with the usage of lead is due primarily to well-designed ventilation and good housekeeping in all areas where lead is melted, sawed, or machined.

INDUSTRIAL HYGIENE RECOMMENDATIONS:

1. Employee exposures to solvent vapors are most severe during plate cleaning operations. While it seems unlikely, based upon the results of personal sampling, that eight-hour time-weighted average employee exposures would exceed hazardous levels during normal operation, employees should be alerted to the fact that short-term high-level exposures during plate tending activities could cause effects tending to interfere with normal performance of their duties. Employees must be educated concerning early physiological signs of incapacitating exposure to solvents such as headaches, dizziness, or nausea, and instructed concerning the proper course of ameliorative action. This recommended practice is especially urgent in the case of the plate tender in the sheet-fed press area, who spends a significant share of each workday cleaning plates.

2. Insofar as possible, the total quantity of solvents at the workplace should be minimized. Bulk solvents should be confined to a storage area specifically designed for the purpose. Solvents used at the worksite must be kept in covered containers of an approved metal construction.

3. Solvent-soaked rags must always be contained in metal containers with tight-fitting metal lids.

4. Spills of solvent must be promptly cleaned up.

5. No food or beverage should be stored or consumed in an area where lead is stored, machined, or melted.

6. Chemical substances should be properly labeled, in order to avoid confusion.

TABLE A: Organic Vapor Compounds Identified In Air Samples Collected At George Banta Co, Inc.

MARCH 1974

MAJOR COMPONENTS:

n-nonane
n-decane
n-undecane
n-dodecane
xylene
1,3,5-trimethylbenzene
1,2,4-trimethylbenzene
1,2,3-trimethylbenzene
n-tetradecane

MINOR COMPONENTS:

isopropyl benzene
2-methyl nonane
1-methyl,1-ethylcyclohexane
1,2-dipropylethylene glycol
n-propyl benzene
benzene
1-methyl,2-ethyl benzene
n-tridecane
2-methyl decane
n-pentadecane
n-octyl isobutyrate
3,4,4-trimethyl,2-hexane
n-octyl ether
2,6-dimethyl undecane
n-propyl cyclohexane
p-ethyl toluene
2-ethoxyethanol
1-methyl,3-ethylbenzene
n-decylcyclohexane

HYGIENIC STANDARDS FOR NOISE EXPOSURE:

The recommended limits for safe exposure to noise are primarily designed to conserve hearing since this is recognized as the most serious physical problem that noise may cause in humans. For other disturbances connected with noise such as stress related illness and performance losses, there is insufficient or inconclusive evidence upon which to base a standard. The proven effects of occupational noise exposures include the following:

1. Temporary and permanent losses in hearing sensitivity
2. Interference with speech communications
3. Disruption of job performance

The U.S. Department of Labor standard limits the noise exposure an employee may receive during a workday. Time related limits are established for exposure at each level of noise intensity from 90 dBA to 115 dBA. The standard also states that protection against the effect of noise shall be provided when the sound level exceeds the existing standard as shown in the following Table, when measured on the A scale of a standard sound level meter at slow response. When employees are subjected to noise levels exceeding those listed in the Table, feasible engineering and administrative controls shall be utilized. If such controls fail to reduce the exposure to permissible levels as shown in the Table, personal protective equipment shall be provided and used.

PERMISSIBLE NOISE EXPOSURE

Duration/Day(hrs.)	Sound Level (dBA)*
8	90
6	92
4	95
2	97
1 1/2	100
1	102
3/4	105
1/2	107
1/4	115**

*Sound level in decibels as measured on a standard level meter operating on the A-weighting network with slow meter response.

**Ceiling Value: No exposure in excess of 115 dBA.

These values apply to total time of exposure per working day regardless of whether this is one continuous exposure or a number of short-term exposures but does not apply to impact or impulsive type of noises.

When the daily noise exposure is composed of two or more periods of noise exposure of different levels, their combined effect should be considered, rather than the individual effect of each. If the sum of the following fractions,

$$\frac{C_1}{T_1} + \frac{C_2}{T_2} + \cdots\cdots \frac{C_n}{T_n}$$

exceeds unity, then, the mixed exposure should be considered to exceed the threshold limit value, C_1, indicates the total time of exposure at a specified noise level, and T_1, indicates the total time of exposure permitted at that level. Noise exposures of less than 90 dBA do not enter into the above calculations.

ENVIRONMENTAL STUDY PROCEDURES AND INSTRUMENTATION

Sound pressure measurements were taken using a Bruel and Kjaer (B&K) sound level meter, Model 22045, operating on the A-weighted network and slow response. All measurements were taken at or near the ear of the worker.

The noise measurements were taken at potential trouble spot locations, but were spot checks only. Although many of the measurements taken exceeded the Department of Labor standard of 90 dBA, a time and exposure study must be conducted to substantiate the findings and evaluate worker exposures. (See Tables 1 and 2)

DISCUSSION AND CONCLUSION

The results of the noise survey conducted at the Banta Printing Company at the Main Plant and at the Midway Plant show that the 90 dBA level was often exceeded. These results indicate that a health hazard would exist if the employees were continuously exposed over an eight-hour day.

RECOMMENDATIONS

1. Have a complete noise survey conducted including time and exposure study.

2. If workers are overly exposed according to Department of Labor standards an effective hearing conservation program should be instituted including audiometric testing of all employees in noise areas.

3. All workers should be apprised of the hazards of noise and the precautions that must be taken.

SAFETY SURVEY

The injury record at Banta suggests an area for careful consideration. Their present frequency/severity index of 16.9 exceeds the national average for similar operations by 7 (9.86). It was indicated that the poor safety record at Midway boosted Banta's overall safety record above the national average. The bulk of Banta's employees are located at Midway, and the complexity of tasks might also be a factor. It was mentioned that 58% of Banta's injuries were sustained by the 21-30 age group.

The composition of the safety committee at Banta is contrary to the recommendations of both the National Safety Council and the Department of Labor--no employee representation on the committee. The present committee is composed of plant supervisors and management representatives. The committee meets monthly to discuss such things as the frequency/severity index and plan prevention activities directed at high risk areas.

RECOMMENDATIONS

Listed by facility location are some of the safety hazards from the walk-through survey which should be corrected:

BANTA PLANT

Cathrode Ray Tube Room - stated as being out of bounds except to authorized persons; should be identified accordingly; cord running across doorway constitutes tripping hazard.

Monotype Area - six fans, all improperly guarded; gasoline used to clean rollers has accounted for at least three fires, according to persons interviewed. It was thought that fires originating from sparks created by the rapid insertion of the metal clutch ignited accumulated vapors in the lower unit of the press.

Monotype Caster Room - same problems; gasoline hazards, unguarded fans, and no fire extinguisher in the immediate area.

Maintenance Shop - Craftsman saw, blade not fully enclosed; chip guards on grinders dirty.

Press Pool Storage - no toe boards on walkway above where employees must pass; unattended forklift truck - fuel on with keys in ignition.

Fourth Floor Storage - no posted storage capacity of floor; aisles cluttered; storage disorganized; exits should be identified.

Third Floor Storage - chip guard on grinder very dirty; aisles not designated.

Speed Punch Area - guards removed from two speed punches exposing chain drive.

MIDWAY PLANT

Film Developing and Mixing Room - unguarded equipment.

Lay-Out Storage - power truck - no overhead protection; no intermediate rail; pinch points; no toe boards on lifting platform; electrical junction boxes uncovered.

Developing and Etching Area - no eye wash facility; fans within seven feet of floor not guarded within the allowable one-half inch opening; eye protection not being used; no inspection date on two fire extinguishers; chain drive on vacuum frame not guarded.

Drying and Cooling Room - unguarded pulleys and shafts; one guard removed and lying on floor; no safety latches on hoists.

Outside Ink Mixing and Storage - skids in aisles, also various containers; no toe boards on walkway over aisle; guard removed from Lawson automatic flatbed trimmer, guard lying under sign reading "Put That Guard On"; exits unmarked, not illuminated.

Shipping Room - LP truck, gas not turned off or keys removed.

Liquid Petroleum Refueling Area - no designation between empty and full containers; metal scale in LP refueling area creates an explosion hazard (sparks from sliding metal tanks) and defeats one of the purposes of the storage area; eye protection should be worn to prevent freezing of the eyes in the event of contact; platform attached to building should be equipped with railing.

Dock Area - wheels of trucks not checked when being boarded by forklift trucks.

Maintenance and Carpentry Area - mezzanine, no handrails on stairs going to balcony; swing saw extends beyond edge of table, does not automatically return; no exhaust ventilation on circular saw; exits not marked; defective ladder, broken metal spreader, no safety shoes on extension ladder going to small balcony.

NORTHWESTERN ENGRAVING (Subsidiary of Banta Printing Company)

Photo Lab - inadequate fire protection.

Color Department - fire extinguisher blocked; tag not visible; no exit signs or signs indicating route to exits.

Automated Processing Room - fan within seven feet of floor not properly guarded; storage in aisles constitutes tripping hazard; various doors should be identified; white gasoline used to clean rollers is at best very risky, constitutes a fire and explosion hazard and is contrary to long-accepted safety practices.

Four-Color Press Room - fire extinguisher not mounted or tagged; unguarded pulley on compressor.

Zinc Etching Area - eye protection dirty and shows signs of nonuse; no eye wash fountain; "No Smoking Sign," "Don't mean a lot" according to one employee as he lit his cigarette; accumulated waste constituting a fire hazard should be removed; ladder not properly stored; extinguisher blocked behind a stack of five-gallon containers - another lying on the floor; metal chopper-guard exceeds the allowable 1/4 inch.

Basement Area - wet, poor and unkept walking surface; hoist unlabeled; appears to have about two-tone capacity; however, it is secured to a metal overhead beam with a small chain having far less lifting capacity.

SAFETY SUMMARY AND RECOMMENDATIONS

It would be impossible to notice, list, or make recommendations on all of the situations at Banta because of the time limits of the survey. Certainly, many things could have been missed, and of those observed, some could be considered minor but nevertheless come under the umbrella of the Occupational Safety and Health Act. Based on the walk-through survey, several recommendations can be made for improving the safety of workers at Banta and also to bring them closer to compliance with OSHA standards.

General

1. Review OSHA standards relating to recordkeeping and posting requirements.

2. Consider supplementing the membership of the safety committee with employees representing various operational functions of the plant.

3. Consider making available to designated employees first-aid training courses to supplement the supervisory staff.

Specific

Banta management personnel and especially plant supervisors should become knowledgeable of the subparts of the federal standards relating to their specific operations. Special emphasis should be placed on subparts pertaining to:

1. Walking and working surfaces
2. Means of egress
3. Power platforms, forklifts, hoists, etc.
4. Hazardous materials
5. Fire protection
6. Machine guarding and electrical requirements
7. Hand and portable power tools
8. Medical and first aid
9. Personal protective equipment
10. Environmental controls

In addition, supervisors should take advantage of the many OSHA voluntary compliance courses offered free in various parts of the country; be aware that interpretation of certain standards can be clarified without penalty by making arrangements to visit the OSHA Area Director's office for this purpose; have copies of the latest federal standards and subscription service for obtaining copies of any new or modified federal standards.

MEDICAL SUMMARY AND RECOMMENDATIONS

Administratively, physicians and nurses should report to personnel but professionally the occupational health nurse must receive directions for employee care from the plant physician, either in writing or by phone and/or written medical direction. The physician determines his own scope of occupational medical practice which conforms to the company policy and needs.

An occupational health and safety program having a full-time nurse working with a physician part-time or on call is effective only when the "on call" physician is aware of the plant processes, the hazards of the environment, and knows and understands the control of the existing hazards. A part-time physician must spend at least several hours a day each week in the plant he serves.

The above staffing patterns are universally accepted. Therefore, the following recommendations are suggested:

1. Personnel
   1 full-time, qualified occupational health nurse (plants employing 250 or more)
   1 part-time, qualified occupational health physician

2. Occupational Health Program for Banta Employees to consist of:

   a. Physical Examination Program. A complete medical examination which will include the preplacement examinations (on all new employees to include:

      — a personal and occupational history
      — a 14 x 17 chest x-ray
      — a complete urinalysis
      — a complete blood count and hematocrit
      — vision screening for visual acuity, color discrimination, periphenal vision, muscle balance and depth perception (with and with Rx glasses)
      — tonometry
      — base line audiograms
      — height, weight, blood pressure
      — adequate immunizations for tetanus and typhoid.

b. Periodic Physical Examination for employees exposed to hazardous conditions, for employees exposed to excessive noise, to lead; for repeat audiograms and visual tests as necessary or as required by law; and routinely for employees over 40 years of age.

c. Return from Illness Examination to insure that the employee has recovered from illness or injury and can safely return to the job. Disability should be evaluated.

d. Care for Occupational Injury and Illness, to be performed by the occupational health physician and the occupational health nurse, with the physician providing medical directives for employees care in his absence. The nurse should determine how and where employees should be transported for emergency care if she cannot provide initial and/or adequate care and whether this care can be given at the local hospital emergency room or the local "industrial clinic."

Rationale

It is unrealistic to delegate the responsibility for first aid or primary care to Banta supervision. It is an additional burden for supervisors to become sufficiently prepared to give adequate first aid care to injured or ill workers, to become familiar with the types of injuries which occur in heavy industry (as printing), and to know and understand basic principles of handling emergency problems.

It is also an additional burden on supervision to be responsible for medical and surgical supplies and equipment, to make judgments about first aid care while on a production schedule, to determine degrees of injuries and illnesses that must receive simple, prompt, involved, or complex transferral to a local hospital emergency room.

If there is no established occupational health program in the industry, management, in general, does not utilize supervision as "first aiders" but delegates hourly workers to become trained first aiders and places at least two trained first aiders per department or unit, for each work shift.

Also, management is responsible for completing accident/injury reports, for completing accident investigation forms and records, and for promoting, teaching and supervising the safe working habits of its employees.

And, management is also responsible for providing the means for prompt, safe and adequate transportation of the ill or injured worker, but, in general, delegates this authority to hourly workers, when there are no health professionals in the industry.

e. Record System - Individual health records should be kept on all the employees and should be maintained by the occupational health nurse to insure confidentiality of health information.

A system of record keeping according to OSHA regulations must be maintained and copies of all occupational injuries and illnesses should be filed in the employees' health record. Other medical information will be filed into the record, as compensation, group insurance, etc.

f. Health and Safety Education - A planned health and safety education program should become an integral part of the employee health and safety program to constantly teach safe work practices, good health practices, use of personal protective clothing and/or equipment.

Health education for non-occupational conditions is basic to good employee relations. Use of outside agency services should be encouraged to teach preventive health, as for example, the diabetes screening program, or skin testing for TB done by the local TB agency for Banta employees. Safety and health films, brochures, posters, etc. can be used to reinforce the learning process for employees.

g. Health Counseling Service - Counseling should be provided by the occupational health nurse or the occupational health physician for employees with personal problems, for employees who are emotionally disturbed as the alcoholic, the drug user, the obese employee, etc. A referral system should be used to assist any employee in need of community services to seek help and guidance.

TABLE 1

NOISE SURVEY

GEORGE BANTA PUBLISHING COMPANY
MINOSHA, WISCONSIN

"MAIN PLANT"

LOCATION	NOISE LEVEL (dBA)
W. R. Grace & Co. Letterflex 'I System 31' from front of ultrasonic cleaning unit.	94
Belt Press - Up Console	91
Belt Press - collator	94
Cutting Saw - Position 1	98
Cutting Saw - Position 2	98
Fast Speed Press #45 - 1st Printing Unit	100
Fast Speed Press #45 - Automatic Splicer	97
Fast Speed Press #45 - Tension Control	98
Fast Speed Press #45 - 2nd Printing Unit	101
Fast Speed Press #45 - 3re Printing Unit	100
Fast Speed Press #45 - 4th Printing Unit	100
Fast Speed Press #45 - Platform Between 3 & 4	103
Fast Speed Press #45 - Offen Air Jet Drying Unit	99
Fast Speed Press #45 - Cutting Unit	105
Fast Speed Press #45 - Supervisors Section	99
Fast Speed Press #45 - Binding Unit	98

TABLE 2

NOISE SURVEY

GEORGE BANTA PUBLISHING COMPANY
MINOSHA, WISCONSIN

"MIDWAY PLANT"

LOCATION	NOISE LEVEL dBA
Between Presses #45 & 44, both operating slow,	
- 1st Printing Unit	98
- Automatic Splicer	95
- Tension Control	96
- 2nd Printing Unit	99
- 3rd Printing Unit	99
- 4th Printing Unit	98
- Platform between 3 & 4	101
- Offen Air Jet Drying	98
- Cutting Unit	103
- Supervisors Station	98
- Binding Unit	98
Doctor Machine Rewinder by Stanford, Operator Control Unit, Bar Level,	
- with machine on	89
- with machine off	84
Five-color Miller Sheet Fed Press,	
- Feeder Control Unit	91
- 1st Press	87
- 2nd Press	86
- 3rd Press	86
- 4th Press	85
- 5th Press	85
- Delivery	85
ATF Webb Press,	
- Operator Position at Control Panel	100
Harris Sheridan Trimmer Saw	93

TABLE B

SOLVENT VAPOR CONCENTRATIONS, PERSONAL SAMPLES

GEORGE BANTA, INC.

MARCH 1974

Job Title Location	Field No.	A	B	C	D	E	F	G	H	J	K
four-color pressman press 42-midway	38	nd*	2.6	nd	29.0	nd	nd	nd	nd	nd	2.
four-color helper press 43-midway	36	2.0	1.5	nd	nd	nd	nd	0.5	nd	0.5	nd
four-color helper press 46-midway	49	3.0	3.0	0.8	nd	1.5	0.8	1.5	2.3	nd	0.
two-color pressman press 10-midway	42	0.8	6.4	0.8	nd	1.6	nd	0.8	nd	nd	nd
four-color helper press 42-midway	41	2.6	8.7	2.6	nd	1.3	0.4	0.9	nd	0.4	0.
two-color helper press 2-midway	57	0.9	5.0	1.4	nd	0.9	4.0	2.2	4.5	0.4	3.
two-color roll tender press 25-midway	52	2.7	1.8	nd	nd	1.8	2.7	nd	nd	nd	nd
two-color helper press 25-midway	39	1.0	2.0	1.0	nd	1.5	1.5	3.0	0.5	0.5	1.
four-color helper press 44-midway	48	1.1	2.2	1.1	nd	1.1	nd	0.6	nd	nd	1.
two-color helper press 10-midway	53	1.1	1.6	0.5	nd	1.1	0.5	1.1	nd	nd	0.
four-color helper press 47-midway	51	2.4	1.2	0.6	nd	1.2	0.6	0.6	nd	nd	nd
four-color helper press 42-midway	58	1.0	2.4	1.0	nd	0.7	0.4	1.0	0.7	nd	nd
four-color pressman press 42-midway	37	1.9	1.3	0.6	nd	nd	nd	0.6	nd	nd	nd
two-color pressman press 1-midway	45	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd

TABLE B (Continued)

Job Title Location	Field No.	A	B	C	D	E	F	G	H	J	K
four-color helper press 46-midway	59	1.5	0.4	nd	nd	6.6	0.2	0.7	0.3	0.4	0.
four-color helper press 46-midway	64	2.2	3.8	1.2	nd	2.1	1.3	2.5	0.2	0.7	0.
four-color helper press 43-midway	62	0.8	0.7	0.3	nd	0.7	0.3	0.8	0.7	0.2	0.
2nd pressman, sheet fed press 83-midway	50	3.3	4.7	1.1	nd	1.4	0.7	1.8	nd	0.7	nd
plate tender, sheet fed midway	40	3.4	6.1	4.1	nd	3.4	0.7	2.0	0.7	0.7	nd
2nd pressman, sheet fed press 83-midway	55	2.4	3.4	1.9	nd	1.0	1.0	1.5	0.5	0.5	nd
2nd pressman, sheet fed press 85-midway	56	3.6	3.6	2.1	nd	1.4	0.7	2.1	nd	nd	nd
plate tender, sheet fed midway	66	7.8	4.4	1.7	nd	nd	nd	0.9	nd	nd	nd
pressman press 10-main	70	1.1	nd	nd	nd	21.1	nd	0.7	nd	0.7	0.
pressman job press-main	74	3.7	1.5	nd	nd	6.7	nd	nd	nd	nd	nd
pressman press 16-main	69	nd	nd	nd	nd	9.0	nd	nd	nd	nd	nd

*nd=none detected
A: n-nonane (mg/M^3)
B: n-decane (mg/M^3)
C: n-undecane (mg/M^3)
D: benzene (mg/M^3)
E: xylene (mg/M^3)
F: 1,3,5 trimethyl benzene (mg/M^3)
G: 1,2,4 trimethyl benzene (mg/M^3)
H: 1,2,3 trimethyl benzene (mg/M^3)
J: n-dodecane (mg/M^3)
K: n-tetradecane (mg/M^3)

Form No. 85 GPCo.

GILBERT PAPER COMPANY

PHYSICAL EXAMINATION

Name Pre-Employment Re-Examination

General Appearance

Height Weight Temp. Resp.

Pulse (Rate and Character) Blood Pressure

Eyes	Without Correction R.	L.	With Correction R.	L.	Color Blind
Ears	Audiogram R.	L.	Examination Drums		Canals

Examination of:	Defects
Head	
Nose	
Mouth	
Teeth and Gums	
Throat	
Neck	
Chest	
Breasts	
Heart	
Lungs	
Upper Extremities	
Abdomen	
Back	
Genito-Urinary	
Rectum	
Lower Extremities	
Skin	
Nervous System	

Are There Any Enlarged Glands?

Identifying Scars

Laboratory Work:

Urine Analysis Sp. Gr. Reaction Alb. Sugar

Blood Work

Further Notes or Suggestions

USE CLASSIFICATION--

1. Physically fit for employment.
2. Physically fit but below par in development or other condition.
3. Persons fit only for certain employment specifically approved for it by examining physician.
4. Persons physically unfit for any employment.

CLASSIFICATION:

DATE

SIGNED

Examining Physician

G.B.Co. Form 162-A

PLEASE PRINT OR WRITE CLEARLY

GEORGE BANTA COMPANY INCORPORATED

FOREMAN'S ACCIDENT REPORT

1. Name of Injured. _____ 2. Dept. _____
3. Accident date. _____ 4. Time _____ am./pm. 5. Plant _____
6. Injured part of body. _____ 7. Nature of Injury. _____
_____ 8. Age _____
9. Occupation when injured. _____
10. Regular Occupation. _____
11. Exact location of accident. _____
12. What job was being done. _____

13. WHAT HAPPENED? (Describe in sequence (a) the man's relationship to his physical surroundings, (b) how he was doing what he was doing, (c) what happened that resulted in the accident. Include, in addition, any other facts necessary to clarify what happened.)

14. What did the person fail to do that Contributed to His Accident?

15. What did some Person other than the injured do or fail to do that contributed to the accident?

16. What Conditions of the Man's Environment (tools, machines, structures, materials, etc.) Contributed to the accident? _____

17. Had the injured been instructed on the safe methods of performing this job? YES _____ NO _____
18. Was First Aid Administered? YES _____ NO _____
19. By whom? _____ Was Injured sent to a doctor or hospital?
YES _____ NO _____ Doctor's Name. _____
20. Names and Clock Numbers of Witnesses.

21. What action have you taken and/or Do You Plan to Take to Prevent Recurrence? _____

Signed _____ (Supervisor). Date _____

MEDICAL SERVICE REFERRAL SLIP

NAME_____ CLOCK NO._____

DEPARTMENT_____ OCCUPATION_____

WAS INJURED ON_____ 19____ AT_____ A.M. P.M.

DOCTOR: This person has been referred to you for medical attention. Should this person be unable to return to work, notify our Personnel Office (phone 722-7771, extension 210)

TREATED FOR: _____

This person may return to work immediately_____

OR

This person has been instructed to remain away from work from_____ 19____

to approximately_____ 19____.
(return date)

Personnel Department
George Banta Company, Inc.
Curtis Reed Plaza
Menasha, Wisconsin 54952

Dr._____

See Other Side

50272-101

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15. Supplementary Notes

16. Abstract (Limit: 200 words)

On several occasions, Sheldon Samuels, Industrial Union Department, AFL-CIO, and William Schroeder, Vice-President of the Graphic Arts International Union, proposed the possibility of developing a cooperative project addressed at a specific work population, namely, the printing industry. The National Institute for Occupational Safety and Health (NIOSH) recognized the potential value of such a pilot effort and thus the Banta study was conceived.

Ideally, such a study should be designed in such a manner that, after studying a select population, the findings could be disseminated across the nation to all like exposed employers and employees. The George Banta Printing Co., employing 1400, was selected as an excellent setting for this project for the following reasons: (1) it was a large plant with examples of all types of printing operations present; (2) management was cooperative; (3) the union had excellent relationship with management and was willing to cooperate in correcting safety and health problems. The National Institute for Occupational Safety and Health was asked to provide its support to the project by assisting in: (1) identifying health and safety problems within the plant; (2) developing recommendations for the control of identified health and safety hazards; (3) assisting in the design of a training course for workers to be conducted by the unions; (4) defining hazards which were probably typical for the industry and should be included in a fact sheet or pamphlet for the industry.

17. Document Analysis a. Descriptors

printing, solvents, inks, xylene, alcohols, chlorine, alkanes, benzene, trimethylbenzene, noise

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