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I. SUMMARY

A Health Hazard Evaluation (HHE) was conducted at the Hagaman Finishing following a request by the Amalgamated Clothing and Textile Workers Union. The request was made in response to a report published by Levin et al in Lancet documenting a cluster of three men with testicular cancer who worked in another tannery, on the same shift, in the same department and during the same time period. Area air samples were taken for dimethylformamide, glycol ethers, lead, trace metals, nitrosamines, benzidine, and formaldehyde/aldehyde. The major components in the air samples were identified as triethylamine, cellosolve, butyl cellosolve acetate, 2-propoxyethanol, methyl isoamyl ketone, 2-ethylhexyl acetate, isoamyl acetate, MIBK, toluene, and diacetone alcohol. All the analytical results were below the current OHSA PEL's with the exception of one personal sample of chromium on the feeder operator. Asbestos was found (20-60% amosite) in the insulation material around the dryers in the finishing department. Dimethylformamide, no longer used at the tannery, was not detected in any of the air samples.

Based on environmental data, the NIOSH investigators concluded that at the time of this investigation there was not a health hazard to solvent exposure but that there was a potential health hazard to the finishing department workers who are potentially exposed to asbestos. Recommendations for an asbestos abatement program were made to the company in an interim letter. A medical surveillance program was recommended based on the cluster of testicular cancer in a leather finishing department in Fulton County, New York. Further details on these recommendations are included in Section X.

Key Words: SIC 3111 (Leather Tanning and Finishing), dimethylformamide, testicular cancer, glycol ethers, asbestos, lead, cancer clusters.

II. INTRODUCTION

In December 1987, NIOSH received a request from the Amalgamated Clothing and Textile Workers Union (ACTWU) to conduct an investigation of an outbreak of cancer in leather tannery workers in Gloversville, New York. This request came soon after a report published by Levin et al[1] in Lancet documenting a cluster of three men with testicular cancer who worked at the same tannery, on the same shift, in the same department, and during the same time period. In response to this request, NIOSH, in February 1988, conducted a walk-through industrial hygiene survey and a standardized incidence ratio study of finishing department workers at the tannery, the site of the reported cluster. The ACTWU filed a formal Health Hazard Evaluation (HHE) request for 6 tanneries in Fulton County, New York. The request was for the evaluation of the potential for occupational exposure to hazardous chemicals in the finishing department of tanneries in Fulton County that had used dimethylformamide. Hagaman was one of the tanneries included in the request to NIOSH in January, 1989.

Soon after Levin et al[1] reported the cluster of testicular cancer at the Pan American Tannery, the New York Department of Health conducted a case-referent study to determine the risk of testicular cancer in Fulton County, New York.[2] Gloversville is located in Fulton County. Using New York State Cancer Registry Data, occupation was determined for all male residents aged 20-54 residing in Fulton County who developed testicular cancer between 1974 and March, 1987. Occupation was also determined for a control group consisting of men of similar age living in Fulton County who developed any other type of cancer between 1977 and March, 1987. Ten cases of testicular cancer were identified and matched with 115 controls. Five of the 10 cases and 17 of the 115 controls were found to have been employed in leather related occupations. This represents an odds ratio of 5.76 (95% CI 1.50-22.05). Three of the five cases employed in leather related occupations were the men who worked in the finishing department of the tannery with the cluster. One of the two remaining men with tannery-associated testicular cancer had testicular problems as a child, which can be a risk factor for developing testicular cancer. Although this individual never worked at the tannery with the cluster, 11 years before his diagnosis he had worked for one year in the finishing department of another tannery. The other individual with tannery employment and testicular cancer never worked at the tannery; however, he worked for 21 years in other tanneries, although never in a finishing department.

This cluster of cases of testicular cancer is cause for concern because these workers were exposed to glycol ethers, a known testicular toxin, and to dimethylformamide (DMF), which has been cited in some studies as the possible agent responsible for the observed elevations in testicular cancer.

In a cross-sectional study by Ducatman et al, an elevation of testicular cancer among workers at two of three Navy aircraft maintenance sites was reported.[3] The authors proposed that DMF may be responsible for testicular cancer. This study was undertaken when investigators were informed that at one Navy F-4 aircraft maintenance site, three workers had testicular cancer. The investigators next surveyed another Navy F-4 aircraft maintenance site with exposures similar to the first facility. Four cases of testicular cancer were detected. Finally, the investigators surveyed an F-15 aircraft maintenance facility having similar exposures as the first two facilities, except that DMF had never been used. No testicular cancer was detected at this facility. Although the investigators speculated that DMF may have been responsible for the elevated risk of testicular cancer at the first two facilities, workers at all three facilities were exposed to numerous chemicals. It is possible that chemical exposures other than DMF may also have been unique to the first two facilities and that the actual exposure responsible for the elevation in testicular cancer was not identified by the investigators.

Citing the study by Ducatman et al[3], Levin et al[1] proposed that DMF may have been responsible for the three cases of testicular cancer at the tannery. However, like the workers at the aircraft maintenance sites investigated by Ducatman, workers at the tannery were exposed to a large number of chemicals including DMF.

One month before the study by Ducatman et al[3] was published, a standardized incidence ratio study was completed by DuPont on 2430 current or pensioned DMF-exposed employees. At this plant, DMF was used as a spinning solvent in the production of acrylic fiber. No elevation of testicular cancer was found.[4,18] Limitations of the study included a limited exposure assessment, no reference to latency or length of exposure in their analysis of testicular cancer, and the use of the cancer registry which had limitations for epidemiologic research.

DuPont also conducted an unpublished case-control study for cancer among DMF-exposed workers at four plants.[5] Because of the study by Ducatman et al[3], testicular cancer was chosen as one of the outcomes to be investigated. Exposure estimates, based on DMF air measurements and monomethylformamide (MMF) urinary metabolite sampling, were made for each job category. Sixty-four percent of the workers had no DMF exposure, 20% had DMF exposures below 10 ppm, the Occupational Safety and Health Administration's Permissible Exposure Limit (OSHA PEL), and 16% had exposures greater than 10 ppm. No worker had exposure greater than 50 ppm. Only three of the 11 individuals with testicular cancer had DMF exposure. Latency ranged from 3 to 16 years for these three cases. Odds ratios were calculated for all plants combined and for each individual plant. The summary odds ratio for all plants was 0.99 (90% CI 0.22,4.44). Workers with DMF exposures greater than 10 ppm had a statistically non-significant elevation in risk for testicular cancer (logistic adjusted O.R.=11.6, 90% CI= 0.47,286). In only one plant were DMF exposed workers found to have an elevated risk for testicular cancer, although the risk was not statistically significant (cases - 1 exposed, 3 unexposed; controls - 0 exposed, 8 unexposed; O.R. 15.0, 90% C.I. 0.37,608). The major limitations of the study are low DMF exposure among employees, a statistical power too low to detect a statistically significant excess of testicular cancer, and possible overmatching of cases and controls on DMF exposure.

NIOSH conducted a standardized incidence ratio study (SIR) of finishing department workers at the tannery in Gloversville, New York with the testicular cancer cluster.[22] An SIR is a ratio in which the rate of disease of interest in an exposed population is in the numerator, and the rate of a disease of interest in an unexposed population is in the denominator. Eighty individuals identified from yearly seniority lists for 1975-1988 had worked in the finishing department of the tannery. No records exist to identify workers employed in the finishing department before 1975. Data on year of first employment in the finishing department and age were used to calculate person-years at risk. Expected numbers of cases of testicular cancer were determined by applying age specific incidence rates for all males from upstate New York to the person-years at risk. Although all cases at the tannery were white, race-specific incidence rates are not available for upstate New York. In addition to a crude SIR, separate SIR calculations were made by examining risk by years of latency and by years of exposure in the finishing department. A latency period of three years was chosen. This agrees with the latency period used in two other reports that examined the association between testicular cancer and occupation.[2,23]

Three cases of testicular cancer among the finishing department workers represents a crude SIR of 40.5 (95% CI 8.15, 118.45). A statistically significant SIR was found for those finishing department workers with 1 to 5 years of exposure (SIR=55.5, 95% CI 6.24, 200.6), with greater than 5 years of exposure (SIR=76.9, 95% CI 1.01, 427.99), and with greater than 5 years of latency (SIR=76.9, 95% CI 15.5, 224.76).

III. BACKGROUND

The Hagaman Finishing Company is located in Hagaman, New York. It is a wholly owned subsidiary of Wood & Hyde Leather Company, Inc. in Gloversville, New York. Both companies were owned by Genesco since 1968, however, in 1987 both companies were sold by Genesco. The Wood & Hyde Tannery processes cow hides and sheep, goat, and lamb skins. Figure 1 describes the typical tanning process. After the hides and skins are tanned they are shipped over to the Hagaman facility for finishing. The finished hides are once again shipped back to the Wood & Hyde plant for sorting and final shipment.

The finishing department at Hagaman is located on the second floor of a large stone and wood frame building. The finish process begins when the feeder places a skin on the conveyor line. There are two spray lines at the plant. The skins first pass through an automated airless rotary spray booth and a base coat is applied. The skin then is conveyed through a drying oven of direct fired gas heaters. A series of base coats, an antiquing coat, and a top coat are applied by the automated airless rotary sprayers. The spray booths are ventilated. After each spray application the skins are conveyed through a drying over. The hides are finally manually transferred, by a "take off" employee, to a drying hook.

A. Major Job Categories:

The department has the following job descriptions:

1) Feeder - Transfers the hide or skin onto the conveyor belt. The worker is approximately 4 feet from the first ventilated spray booth. One employee per spray line.

2) Take off - Transfers the hides or skins from the finish line to a drying hook. One employee per spray line.

3) Lineman - Responsible for setting up the finish line and maintaining a proper supply of finish material. Does some mixing of the preformulated material. One employee is responsible for this job.

4) Swabber - The four swabbers smooth and evenly distribute the finish material on the hide with a hand held felt applicator. The job is done once per week.

5) Color Match - Responsible for the amount and quality of the finish material being applied to the leather. One employee is responsible for this job.

6) Take Off Operator - Takes the leather down from the over head hanger. One employee per spray line.

7) Coordinator - Maintains the finish line with the proper supply of leather to be finished. One employee is responsible for this job.

8) Foreman - Responsible for the finishing department.

IV. MATERIALS AND METHODS

At the lower range of an analytical method, it may not be possible to confidently attribute an instrument response to the substance in question. The point at which instrument response can confidently be attributed to the contaminant being measured is called the "limit of detection" (LOD). If an instrument response is attributed to the contaminant, it may be present at such low levels that the confidence interval for the results reported may be excessive. The point at which the range of possible values are within acceptable limits is called the "limit of quantitation" (LOQ).

A. Dimethylformamide

Airborne concentrations of DMF were evaluated by drawing air at a rate of 100 cc/minute through a series of silica gel tubes (150 mg/75 mg). Sections A (150 mg) and B (75 mg) were separated and analyzed by gas chromatography according to NIOSH Method 2004.[19] The calculated limit of detection for DMF was 0.01 mg/sample.

B. Glycol Ethers

Airborne concentrations of glycol ethers were evaluated by drawing air at a rate of 50 cc/minute through SKC charcoal tubes. The samples were analyzed according to NIOSH Method 1403.[19] They were extracted with 1 ml of 5% methanol/methylene chloride and analyzed by gas chromatography using an HP 5890A gas chromatograph equipped with a 30-meter DB-1 fused silica capillary column and flame ionization detector (FID). The calculated limit of detection was 0.1 mg/sample.

C. Lead

Airborne concentrations of lead were evaluated by drawing air at a rate of 3 liters per minute through a 0.8 um cellulose ester membrane filter. The filters were analyzed by atomic absorption according to NIOSH Method 7082.[19] The calculated limit of detection was 2.0 ug/sample.

D. N-nitroso Compounds

Airborne concentrations of N-nitroso compounds were evaluated by drawing air at a rate of 1 liter/minute through a Thermosorb/N-sorbent tube. Four Thermosorb/N-sorbent tubes were collected in the finishing department. The tubes were eluted with a mixture of 25% methanol and 75% dichloromethane. The samples were analyzed by gas chromatography with a Thermal Energy Analyzer in the nitrosamine mode, using a 10 ft. stainless steel Carbowax 20M + 2% KOH packed column. The calculated limit of detection was 0.1 ug/sample.

E. Minerals and Metals

Airborne concentrations of minerals and metals were evaluated by drawing air through a 0.8 um cellulose ester membrane filter at a rate of 1 Lpm. The filters were analyzed by inductively coupled argon plasma, atomic emission spectroscopy.

F. Qualitative Analyses of Organic Compounds

Three charcoal tubes and three ORBO-24 tubes were submitted for qualitative analysis of volatile organic compounds. The ORBO-24 tubes were also submitted for qualitative aldehyde screening.

The charcoal samples were desorbed with 1 ml of carbon disulfide and the bulk liquid was extracted with carbon disulfide. All were screened by gas chromatography using a 30-meter DB-1 fused silica capillary column (splitless mode) and a flame ionization detector. Since the chromatograms from all the charcoal samples were similar, one representative sample (charcoal tube numbered CT-3) was chosen for further analysis by GC-MS to identify specific contaminants. The CS_2 extract from the bulk liquid was also analyzed by GC-MS. Appendix 1 is the reconstructed total ion chromatograms from the GC-MS analysis of the charcoal tube.

The ORBO-24 tubes were desorbed with 1 ml toluene in an ultrasonic bath for 6 minutes, then screened for aldehydes by GC-FID using a 15-meter DB-1301 fused silica capillary column (splitless mode). Formaldehyde spikes of 1-2 ug were prepared and analyzed with the samples for comparison.

G. Organic Solvents

Airborne concentrations of methylamyl alcohol, methyl isoamyl ketone, isoamyl acetate, methyl amyl ketone, diisobutyl ketone, 2-ethyl hexyl acetate, and acetone were evaluated by drawing air at a rate of 100 cc/min through a coconut shell charcoal tube (100 mg/50 mg). The A and B sections of the charcoal tubes were separated and analyzed by gas chromatography according to NIOSH Methods 1300, 1301, 1401, 1402, and 1450, respectively. The calculated limit of detection for all analytes was either 0.01 or 0.02 mg/sample.

H. Asbestos

Three bulk insulation samples were submitted for asbestos analysis by polarized light microscropy. The samples were analyzed at 100x magnification via NIOSH Method 9002 with dispersion staining.

V. EXPOSURE EVALUATION CRITERIA

As a guide to the evaluation of the hazards posed by workplace exposures, NIOSH field staff employed several environmental evaluation criteria for assessment of a number of chemical and physical agents. These criteria are intended to suggest levels of exposure to which most workers may be exposed up to 10 hours per day, 40 hours per week for a working lifetime without experiencing adverse health effects. It is, however, important to note that not all workers will be protected from adverse health effects if their exposures are maintained below these levels. A small percentage may experience adverse health effects because of individual susceptibility, a pre-existing medical condition, and/or a hypersensitivity (allergy).

In addition, some hazardous substances may act in combination with other workplace exposures, the general environment, or with medications or personal habits of the worker to produce health effects even if the occupational exposures are controlled at the level set by the evaluation criteria. Also, some substances are absorbed by direct contact with the skin and mucous membranes, and thus potentially increase the overall exposure. Finally, evaluation criteria may change over the years as new information on the toxic effects of any agent become available.

The primary sources of environmental evaluation criteria for the workplace are 1) NIOSH Criteria Documents and recommendations, 2) The American Conference of Governmental Industrial Hygienists' (ACGIH) Threshold Limit Values (TLV's), and 3) The U.S. Department of Labor's Permissible Exposure Limits (PEL's). Often, the NIOSH recommendations and ACGIH TLV's are lower than the corresponding OSHA standards. The OSHA standards also may be required to take into account the feasibility of controlling exposures in various industries where the agents are used; the NIOSH recommended standards, by contrast, are based primarily on concerns relating to the prevention of occupational disease. In reviewing the exposure levels and the recommendations for reducing those levels found in this report, it should be noted that industry is required by the OSHA Act of 1970 to meet those levels specified by OSHA standards.

Evaluation Criteria used in this report are present in Table 1. The following is a discussion of the toxicity of the compounds that the workers are potentially exposed to at the plant. DMF, although no longer used at the plant, was sampled for because it was part of the HHE request.

A. Dimethylformamide

DMF as a liquid is readily absorbed through the skin, or via inhalation or oral exposure.[6] It is rapidly metabolized and excreted in the urine, in the form of N-hydroxymethyl-N-methylformamide and, to a small extent, N-methylformamide, N-hydroxymethylformamide and unmetabolized dimethylformamide.[7]

Liver toxicity has been observed in persons occupationally exposed to DMF.[7] DMF does not appear to be a mutagen in animals.[8] Only one animal species (rat) has developed cancer after exposure to DMF.[9] This finding was made in a study undertaken to assess the carcinogenic effects of aflatoxins. DMF was used as the solvent vehicle for the aflatoxin. Eighteen male rats were given 0.1 ml intraperitoneal injections of gas chromatography grade DMF weekly for 10 weeks. One rat developed a testicular tumor (embryoral cell carcinoma). Two of the remaining 17 rats developed malignant tumors (one developed stomach cancer and one developed a sarcoma of the colon.)

Using different methods of administration and different doses, other investigators have not found DMF to be tumorogenic. No increase in tumors was observed in rats fed daily oral doses of 75 or 150 mg/kg of DMF for 250 to 500 days and observed for 750 days.[10] Another study found no tumors in rats fed a single dose of 0.1 ml of DMF and observed for 13 to 34 months. No tumors were observed in rats, with or without partial hepatectomy, given a single i.p. dose of 0.5 mg/kg/DMF[11]. No tumors were detected in hamsters given weekly intraperitoneal injections of 0.1 ml of a 50% solution of DMF.[12]

Occupational exposure to DMF followed by consumption of alcohol has resulted in dermal flushing (especially of the face), severe headache, dizziness, anxiety, and blurred vision, indicating alcohol intolerance [13,14].

B. Glycol Ethers

2-Ethoxyethanol (2EE) caused a significant increase in diverse reproductive effects in experimental animals of both sexes. In females 2EE was teratogenic and embryotoxic when administered to pregnant rats and rabbits.[15,16] In non-pregnant female rats, exposure to 2EE did not affect fertility.[16] In males, 2EE produced testicular atrophy in mice and microscopic testicular changes in mice, rats, and dogs.[17] In animals 2EE has caused liver, kidney, and lung damage and anemia as well as eye irritation.

The limited information that is available on the toxic effects of the individual compounds that are structurally related to 2EE (e.g. 2-ethyoxyethylacetate and 2-butoxyethanol) is consistent with the reproductive effects caused by 2EE.[17]

C. Asbestos

Increased health risk resulting from occupational exposure to asbestos has been well documented in the scientific literature. Initially, asbestos was associated with a chronic and debilitating lung disease called asbestosis which normally occurred following long-term exposures to high levels of asbestos fibers. Asbestos has also been linked to several types of cancer, including mesothelioma (a rare cancer of the chest and abdominal lining) and cancers of the lung, esophagus, stomach, and colon. These cancers usually appear many years after the initial contact with asbestos, and sometimes result from short-term and/or low level exposures. This indicates that there may not be a "safe" level of exposure to asbestos for the elimination of all cancer risk. Additionally, cigarette smoking in combination with asbestos exposure greatly increases the risk of developing lung cancer.

NIOSH recommends as a goal the elimination of asbestos exposure in the workplace; where it cannot be eliminated, the occupational exposure to asbestos should be limited to the lowest possible concentration.[22] This recommendation is based on the proven carcinogenicity of asbestos in humans and on the absence of a known safe threshold concentration.

NIOSH contends that there is no safe concentration for asbestos exposure. Virtually all studies of workers exposed to asbestos have demonstrated an excess of asbestos-related disease. NIOSH investigators therefore believe that any detectable concentration of asbestos in the workplace warrants further evaluation and, if necessary, the implementation of measures to reduce exposures.

NIOSH investigators use phase contrast microscopy (NIOSH Method 7400[23]) to determine airborne asbestos exposures, and electron microscopy (NIOSH Method 7402[23]) to confirm them. The limits of detection and quantitation depend on sample volume and quantity of interfering dust. The limit of detection is 0.01 fiber/cc in a 1,000-liter air sample for atmospheres free of interferences. The quantitative working range is 0.04 to 0.5 fiber/cc in a 1000-liter air sample.

The Occupational Safety and Health Administration (OSHA) permissible exposure limit (PEL) for asbestos limits exposure to 0.2 fiber/cc as an 8-hour TWA.[24] OSHA has also established an asbestos excursion limit for the construction industry that restricts worker exposures to 1.0 fiber/cc averaged over a 30-minute exposure period.[25]

VI. MEDICAL, SAFETY, AND INDUSTRIAL HYGIENE PROGRAMS

A. Medical

Hagaman Finishing does not normally offer a pre-employment or annual physical. However, a pre-employment physical may be required at the company's request. Annual audiograms are required for specific jobs. The company has participated in First Aid/CPR training. Arrangements have been made with the local hospital for acute medical care.

B. Safety

A safety committee was established in April, 1988. The committee is comprised of representatives from labor and management and they meet the last Tuesday of each month. Minutes of the meeting are prepared by the Company President, Mr. Nickerson.

The purpose of the meeting is to evaluate the safety concerns within the plant. They have an established fire drill program.

C. Industrial Hygiene

The company has retained the services of an industrial hygiene consulting firm. Genesco, the former parent company has retained all the historical records on Hagaman. They have the records of all the noise measurements taken at the plant. Federal OSHA has conducted industrial hygiene surveys at the plant for formaldehyde. Personal protective equipment are available to the workers. Hearing protection, respirators, gloves, and goggles are provided, but there was no formal program of fit testing or maintenance on the equipment at the plant.

VII. RESULTS AND DISCUSSION

A. Industrial Hygiene

On April 19, 1989, NIOSH conducted an industrial hygiene survey of the finishing department at Hagaman Finishing. Personal breathing zone and area air samples were taken for DMF, glycol ethers, lead, formaldehyde/aldehydes, trace metals, and nitrosamines. Bulk samples were taken for asbestos analysis. The process area air samples were qualitatively analyzed by gas chromatography/mass spectroscopy to identify the major contaminants of the plant air.

Bulk samples were taken of the insulation surrounding the enclosed dryers on the spray line. The three samples were analyzed for asbestos and other fibrous constituents. The levels of amosite ranged from 20 - 60%. The results of the analysis can be found in Table 2.

DMF, no longer used at Hagaman, was non-detectable in the 2 air samples (LOD = 0.01 mg/sample). The company discontinued the use of DMF in 1987 because of the possible association with testicular cancer.

Air levels of glycol ethers (see Table 3) ranged from non-detectable to 0.6 mg/m^3 with an average of 0.3 mg/m^3 for cellosolve, 0.4-1.6 mg/m^3 with an average of 0.8 mg/m^3 for butyl cellosolve acetate, 1.8-4.8 mg/m^3 with an average of 3.0 mg/m^3 for butyl cellosolve and 0.8-1.8 mg/m^3 with an average of 1.3 mg/m^3 for propyl cellosolve.

The ACGIH recommends a TLV of 19 mg/m^3 and 121 mg/m^3, respectively for cellosolve, and butyl cellosolve. The OSHA PEL for butyl cellosolve is 240 mg/m^3. The OSHA PEL and the NIOSH REL for cellosolve is 740 mg/m^3 mg/m^3 and the "lowest feasible limit, respectively. There are no air standards for propyl cellosolve and butyl cellosolve acetate.

No detectable air levels were found in the 2 lead air samples (LOD = 2.0 ug/sample), 2 nitrosamine air samples (LOD = 1 ug/sample), 2 filter samples for metals (LOD = from 1.0 to 20.0 ug/filter), and the 3 samples for formaldehyde/aldehydes.

A copy of the reconstructed total ion chromatogram from GC-MS analysis of charcoal tube sample number CT-21 (both front and back sections) can be found in Appendix 1. Major components found on the sample was triethylamine, cellosolve, butyl cellosolve acetate, 2-propoxyethanol, methyl isoamy ketone (MIAK), diisobutylketone 2-ethylhexyl acetate, isoamyl acetate, MIBK, toluene, diacetone alcohol, various C_{10}-C_{12} alkanes, several C_9-C_{11} type ketones, and possibly trace amouns of valeraldehyde and ethyl isothiocyanate. The only additional compound found on the backup section was a $C_8H_{16}O_2$ ester most probably isobutyl isobutyrate (IBIB).

The results of the personal breathing zone air samples for organic solvent vapors can be found in Table 4. The levels found in the finishing department were well below the OHSA PELs, NIOSH RELs, and the ACGIH TLVs air standards. The highest level was 3.7 ppm for diisobutylketone on a spray line operator.

Lead air levels were evaluated along with other metals. Table 5 shows the results of the analysis of personal breathing zone samples for metals. Table 6 shows the results of the area air samples analysis for lead. Chromium was found in one sample at the detection level of 0.7 ug/m^3. Lead was detected in 2 of the 3 samples at 2.9 ug/m^3 for the take down operator and 2.1 ug/m^3 for the feeder operator. Lead was also detected in an area air sample between sprayer 2 and 3. The level was 6.1 ug/m^3 (Table 6). The OSHA permissible exposure level for lead is 50 ug/m^3, NIOSH recommended exposure limit is 100 ug/m^3 for a 10 hr-time weighted average and the ACGIH TLV is 150 ug/m^3.

VIII. CONCLUSIONS

Hagaman has a large inventory of chemicals which are used in the manufacture of finished leather. However, the air monitoring results indicate that exposure to chemicals in the finishing department is minimal to non-existent via inhalation. The ventilation system is adequate to control the spraying operations. The dryers are enclosed which increases the efficiency of the dryers and reduces the potential for exposure. The areas that need more review at the plant are the work practices, housekeeping, and personal protective equipment. The Recommendations Section of this report addresses these areas of concern.

During the course of the survey it became apparent that asbestos was used to insulate the heaters in the finishing department. Because of the scheduled maintenance shutdown in July, 1989 to do routine cleaning and maintenance at the facility it was necessary to notify the company immediately of the results of the asbestos analysis. Appendix 2 is a copy of the interim letter which was sent to the parent company, Wood & Hyde Leather Company and other concerned parties. In a subsequent telephone discussion with Mr. Nickerson, President of Wood & Hyde, we were told that no maintenance work would be performed on the heaters in the finishing department until the asbestos had been removed by a licensed asbestos removal contractor.

IX. RECOMMENDATIONS

Even though the current environmental air levels were low, there are a number of conditions within the plant that need to be improved to reduce skin contact, potential for ingestion, and to comply with existing OSHA regulations. The following is a list of recommendations or observations:

1. It is recommended that an active medical surveillance program be established to monitor the health of employees at Hagaman Finishing. The program should include an annual examination of the testicles. Also, the employee should receive instructions in testicular self-examination and be advised to perform this exam monthly. Employees should be encouraged to seek medical advice if they notice a swelling or lump in the scrotum.

2. The drums that contain flammable materials should be grounded.

3. The workers did not practice proper personal hygiene. Their clothes were contaminated with chemicals from the process. Appropriate personal protective equipment would reduce potential for dermatologic problems resulting from repeated contact with the materials being used.

4. The containers used to mix the formulations were not labeled according to the OSHA Hazard Communication Standard. The containers were also reused and the material in the drum did not necessarily match the hazard code on the drum. The drums should be properly labeled and used according to the OSHA Hazard Communication Standard.

5. Smoking and eating in the work areas should be strongly prohibited and enforced.

6. The asbestos abatement program should be in place so that the potential for exposure to asbestos is minimized.

X. REFERENCES

1. Levin, SM, Baker DB, Landrigan PJ et al. Testicular cancer in leather tanners exposed to dimethylformamide (letter). Lancet: 2:1153, 1987.

2. New York State Department of Health. Testicular cancer in Fulton County. 1988. Unpublished

3 Ducatman AM, Conwill DE, Crawl J. Germ cell tumors of the testicle among aircraft repairmen. J Urol: 136:834-836, 1986.

4. Chen JL, Kennedy GL. Dimethylformamide and testicular cancer (letter). Lancet: 1:55;1988.

5. Walrath J, Fayerweather WE, Gilby PG. A case-control study of cancer among DuPont employees with potential for exposure to dimethylformamide. May 10, 1988. Unpublished.

6. Maxfield, ME, Barnes, JR, Azar, A. Trochimowiez, HT. Urinary excretion of metabolite following experimental human exposure to dimethylformamide or to dimethylacetamide. J Occup Med: 506-511, 1975.

7. Vsil'eva, VN & Sukharevskaya, TM. Hepatotropic action of N-methylformamide. Gig Tr prof Zabol: 10: 53, 1966.

8. Kennedy GL. Biological effects of acetamide, formamide and their monomethyl and dimethyl derivatives. CRC Critical Reviews in Toxicology; 17:129-182, 1986.

9. Kommeneni C. Pathological studies on aflatoxin fractions and dimethyl formamide in MRC rats. Diss Abstr Intr B Sci Eng 1973.

10. Druckrey H, Preussman R, Ivankovic S, Schmahl D. Organotrophic carcinogenic effects of 65 different N-nitroso compounds in BD rats. Z Krebsforsh: 69:103, 1967.

11. Craddock VW. Liver carcinomas induced in rats by a single administration of dimethyl nitrosamine after partial hepatectomy. J Nat Cancer Inst: 47: 899, 1971.

12. Herrold KM. Aflatoxin induced lesions in Syrian hamsters. Br J Cancer: 23:655, 1969.

13. Reinl, W. & Urban HJ Erkrankungen durch Dimethylformamide. Int Arch Gewerbepathol Gewerbehyg: 21: 333-346, 1965.

14. Lyle, WH, Spence, TWM, McKinneley WM & Duckers, K. Dimethylformamide and alcohol intolerance. Br J Ind Med: 36: 63-66, 1979.

15. Stenger EC, Aeppli L, Muller D, Peheim E, and Thomann P.: The toxicology of ethylene glycol monoethylether. Arzneim Forsch: 21: 880-885, 1971.

16. Andrew, FD. Buschbom, RL, Cannon, WC, Miller, RA, Montgomery, LF, Phelps, DW, and Sikov MR: Teratologic assessment of ethylbenzene and 2-ethoxyethanol. Submitted to NIOSH under contract No. 210-79-0037. Battelle Pacific Northwest Laboratory, Richland, WA, 99 pp, 1981.

17. Nagano K, Nakayama E, Koyano M. Oobayaski H, Adachi H, and Yamada T.: Mouse testicular atrophy induced by ethylene glycol monoalkyl ethers. Jap J Ind Health: 21: 29-35, 1979.

18. Chen SL, Fayerweather WE, Pell S. Cancer incidence of workers exposed to dimethylformamide and/or acrylonitrile. J Occup Med: 30: 813-818, 1988.

19. Eller P. Dimethylformamide (Method 2004). NIOSH Manual of Analytical Methods, 3rd ed. U.S. Department of Health and Human Services, National Institute for Occupational Safety and Health Publ. No. 84-10, Cincinnati, Ohio, 1986.

20. Rothman, KJ Modern epidemiology. Little, Brown, Boston, MA: pp 45-49, 1986

21. Rose, LI, Weiss, W, Gilby, CW, Borowski, G, Levy, RA. Carcinoma of the testes in podiatrists. Annals Int Med: 99: 636-637, 1983.

22. NIOSH [1984] NIOSH testimony to the U.S. Department of Labor: statement of the National Institute for Occupational Safety and Health, at the hearings on occupational exposure to asbestos. June 21, 1984. NIOSH policy statements. Cincinnati, OH: U.S. Department of Health and Human Services, Public Health Service, Centers fo disease Control, National Institute for Occupational Safety and Health.

23. NIOSH [1984]. Manual of analytical methods: Fibers, Method 7400 (Revision #3; May 15, 1989); asbestos fibers, Method 7402 (Revision #1, May 15, 1989), 3rd ed., Vol. 1. Cincinnati, OH: U.S. Department of Health and Human Services, Public Health Service, Centers fo disease Control, National Institute for Occupational Safety and Health, DHHS (NIOSH) Publication No. 84-100.

24. 29 CFR 1910.1001 [1986]. Code of federal regulations. Washington, DC: U.S. Government Printing Office of the Federal Register.

25. 29 CFR 1910.1001 [1988]. Code of federal regulations. Washington, DC: U.S. Government Printing Office of the Federal Register.

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XII. DISTRIBUTION AND AVAILABILITY OF REPORT

Copies of this report are currently available upon request from NIOSH, Hazard Evaluations and Technical Assistance Branch, 4676 Columbia Parkway, Cincinnati, Ohio 45226. After 90 days, the report will be available through the National Technical Information Service (NTIS), 5285 Port Royal, Springfield, Virginia 22161. Information regarding its availability through NTIS can be obtained from NIOSH Publications Office at the Cincinnati address. Copies of this report have been sent to:

1. Pan American Tannery, Gloversville, New York.
2. Amalgamated Clothing and Textile Workers Union, Local 1712, Gloversville, New York
3. The Occupational Safety and Health Administration (OSHA) Region I.

Table 1
Evaluation Criteria and Health Effects Summary
Hagaman Finishing Company
Hagaman, New York

Contaminant	Recommended Exposure Limit[1]	Source	Health Effects: Symptom or Specific Effects	Target Organ
Dimethylformamide	30 mg/m³ 10 ppm	NIOSH[2]	Nausea, vomiting, liver damage, hepatomegaly; high blood pressure, face flush, dermatitis	Liver, Kidneys cardiovascular system, skin
	10 ppm (skin)	ACGIH[3]		
	10 ppm	OSHA[4]		
Lead	<0.1 mg/m³ 10-hr TWA	NIOSH	Lassitude, insomnia; pallor, anorexia, weight loss, malnutrition; constipation, abdominal pain, colic; anemia, gingival lead line; tremors, paresis	Gastrointestinal tract, Central nervous system kidneys, blood, gingival tissue, reproductive system
	0.15 mg/m³	ACGIH		
	0.05 mg/m³	OSHA		
Glycol Ethers 2-ethoxyethanol	Lowest feasible limit	NIOSH	In animals: Hematologic effects; liver damage, kidney damage, liver damage, eye irritant	In animals: lungs, eyes, blood, liver, kidneys
	19 mg/m³ 5 ppm	ACGIH		
	740 mg/m³ 200 ppm	OSHA		

Table 1 (cont.)
Evaluation Criteria and Health Effects Summary
Hagaman Finishing Company
Hagaman, New York

Contaminant	Recommended Exposure Limit[1]	Source	Health Effects: Symptom or Specific Effects	Target Organ
2-ethoxyethyl-acetate	540 mg/m^3 100 ppm	OSHA	Eye & nose irritant, vomitting, kidney damage, paralysis	Respiratory system, eyes, gastrointestinal tract
	27 mg/m^3 5 ppm	ACGIH		
2-butoxyethanol (skin)	240 mg/m^3 50 ppm	OSHA	Eyes, nose, throat irritant; hemolysis, hemoglobinuria	Liver, kidneys, lymphoid system, skin, blood, eyes, respiratory system
	120 mg/m^3 25 ppm	ACGIH		
Diisobutylketone	290 mg/m^3 50 ppm	OSHA	Eyes, nose, throat irritant, dizziness, dermatitis, loss of consciousness	Respiratory system, skin, and eyes
	25 ppm 10 hr TWA	NIOSH		
	25 ppm	ACGIH		
Asbestos	0.1 fiber/cc	NIOSH	Restricted pulmonary function	Lung
	0.5 fiber/cc (amosite)	ACGIH		
	0.2 fiber/cc	OSHA		

1. Exposure limits are given in milligrams per cubic meter (mg/m^3) and parts per million (ppm) where applicable
2. National Institute for Occupational Safety and Health
3. American Conference of Governmental Industrial Hygienists
4. Occupational Safety and Health Administration

Table 2
Asbestos
Hagaman Finishing Company
Hagaman, New York
April 19, 1989

Sample Number	Type	Asbestos Present Percent	Type	Other Constituents Percent
A-1	Amosite	20-30	$CaCO_3$	70-80
A-2	Amosite	30-40	$CaCO_3$	60-70
			Cellulose	Trace
A-3	Amosite	50-60	$CaCO_3$	40-59
			Cellulose	<1

Table 3
Glycol Ethers
Hagaman Finishing
Hagaman, New York
April 19, 1989

					Concentration mg/m^3			
Sample # /Job	Min.	L/min.	Flow m^3	Volume Cellosolve	Cellosolve	Butyl Butyl Acetate	Cellosolve Cellosolve	Propyl
GE-21 Lineman		453	.2	.091	ND	4.8	0.5	1.8
GE-22 Manager		470	.2	.094	ND	2.6	1.6	1.2
GE-24 Lineman		476	.2	.095	0.3	2.6	0.4	0.1
GE-23* Area		446	.2	.089	0.6	1.8	0.7	1.2
Limit of Detection (LOD) [mg/sample]					0.1	0.1	0.1	0.1
Limit of Quantitation (LOQ) [mg/sample]					0.3	0.3	0.3	0.3

* #5 Sprayer

Table 4
Organic Solvents
Personal Samples
Hagaman Finishing
Hagaman, New York
April 19, 1989

Sample # /Job	Flow Min.	Volume L/min.	m^3	n-Butanol	Methyl Methylamyl Alcohol	Isoamyl Ketone	Isoamyl Acetate	Methyl Amyl Ketone	Diisobutyl Ketone	2-Ethylhexyl Acetate	Acetone
					Concentration mg/m³						
OS-21 Finishing Technician	289	.5	.146	0.4	0.01	0.07	0.03	1.4	1.1	0.42	(0.03)
OS-22 Spray Line Operator	477	.5	0.239	0.66	ND	0.09	0.10	1.7	3.7	0.45	(0.05)
A-2 Feeder	321	.05	.016	ND	ND	ND	0.6	ND	1.9	ND	ND
Limit of Detection (LOD) [mg/sample]				0.02	0.01	0.01	0.01	0.01	0.01	0.02	0.02
Limit of Quantitation (LOQ) [mg/sample]				0.05	0.03	0.03	0.03	0.03	0.03	0.04	0.05

Table 5
Metals
Personal Samples
Hagaman Finishing
Hagaman, New York
April 19, 1989

Sample # /Job	Min.	Flow L/min.	Volume m^3	Concentration ug/m³				
				Chromium	Iron	Magnesium	Lead	Zinc
E-11-Take Down Operator	467	3	1.392	0.7	5.0	ND	2.9	ND
E-12-Area Sprayer #5	452	3	1.356	ND	2.2	ND	ND	ND
E-13 Feeder	465	3	1.396	ND	3.6	ND	2.1	ND
Limit of Detection (LOD) [mg/sample]				1.0	1.0	2.0	2.0	1.0

ND = Nondetectable

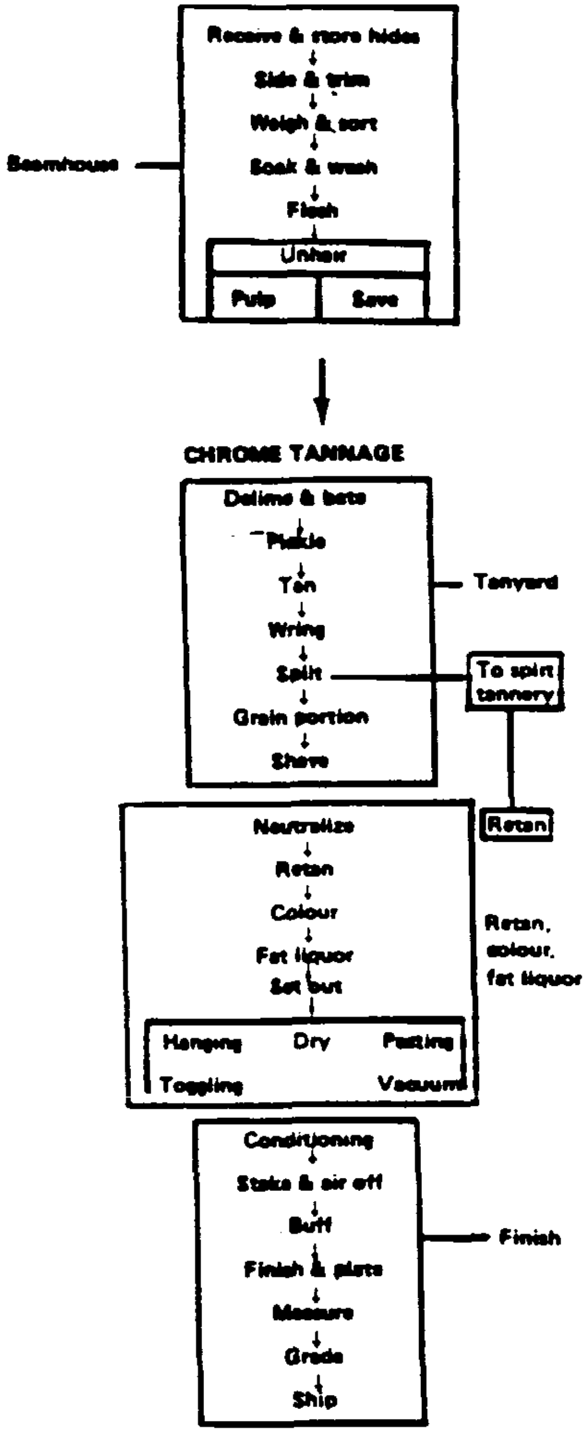
Table 6
Lead Area Samples
Personal Samples
Hagaman Finishing
Hagaman, New York
April 19, 1989

Sample Number	Area	Time Min.	Flow L/min	Volume m^3	ug/m^3 Lead
L-11	On sprayer No. 5	450	3	1.35	ND
L-12	Between spray 2 &3	453	3	1.36	6.1

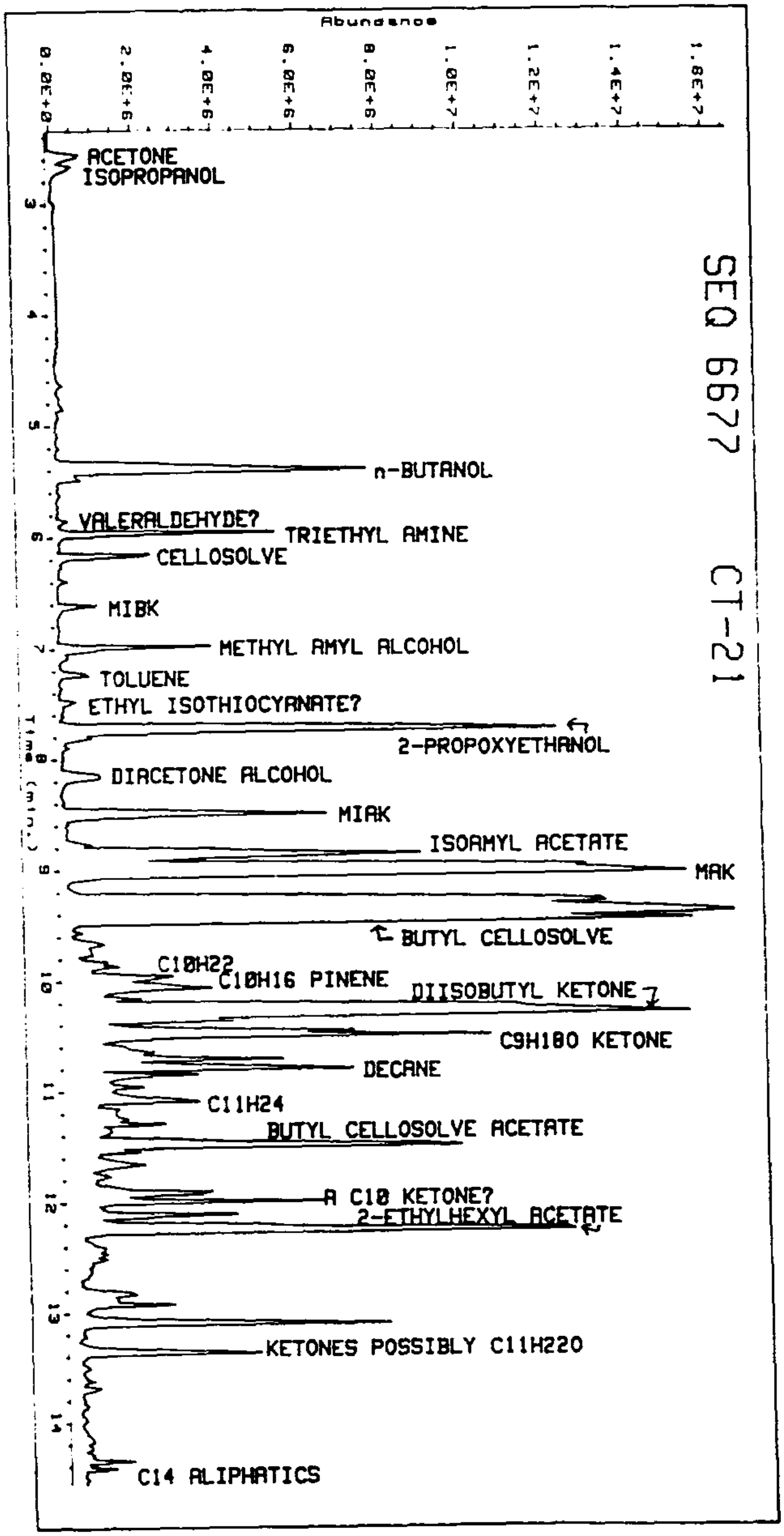
Limit of detection (LOD) 2 ug/sample
Limit of Quanitation (LOQ) 3.7 ug/sample
ND = Nondetectable
Standards
OSHA - PEL 0.05 mg/m^3
NIOSH-REL < 0.1 mg/m^3
ACGIH-TLV 0.15 mg/m^3

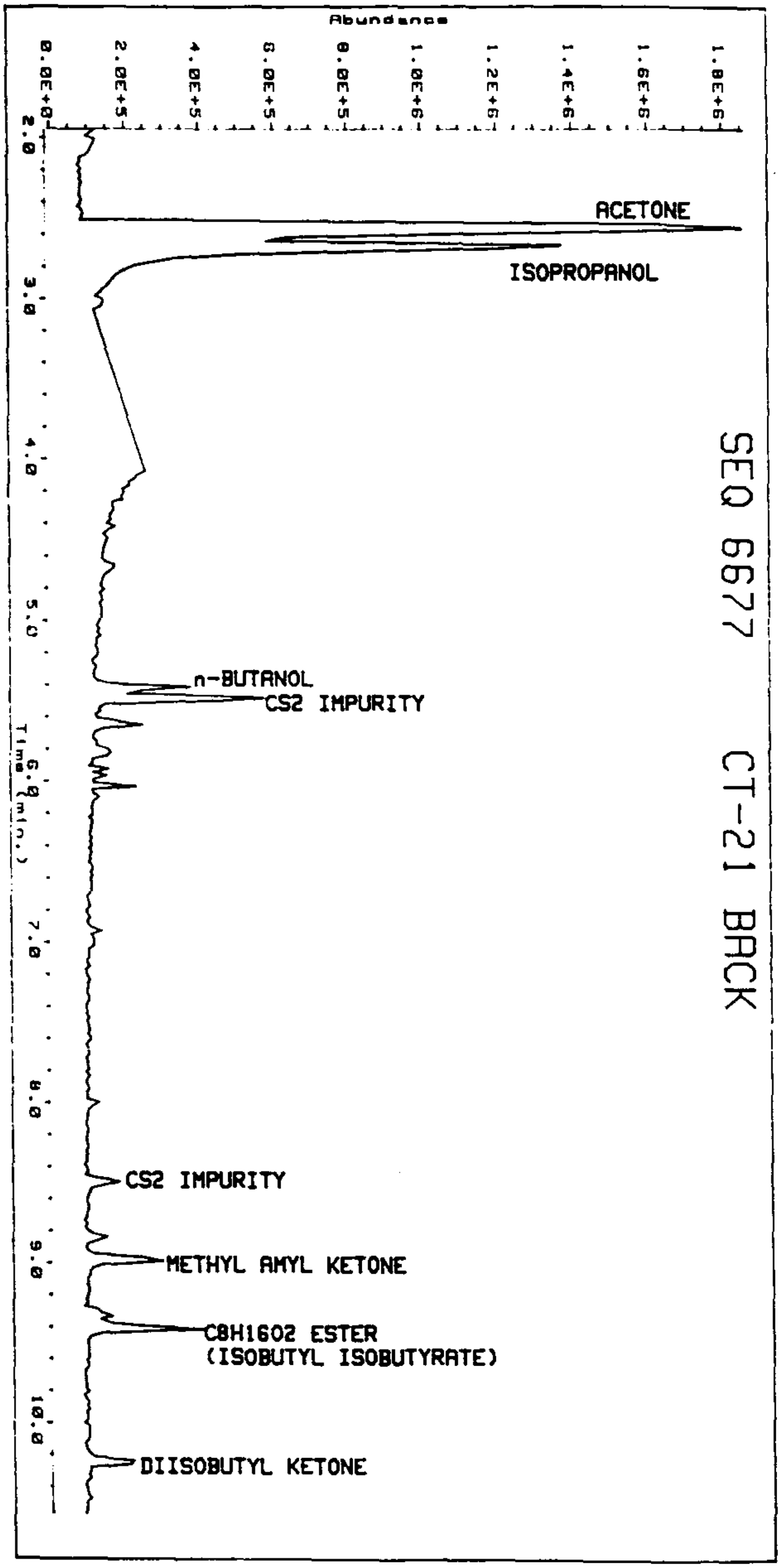
Figure 1

Typical process routes for leather tanning and finishing



Appendix 1
Qualitative Analysis
by GC-MS of Charcoal Tubes


Abundance
Time (min.)
ACETONE
ISOPROPANOL
SEQ 6677
n-BUTANOL
VALERALDEHYDE?
TRIETHYL AMINE
CELLOSOLVE
CT-21
MIBK
METHYL AMYL ALCOHOL
TOLUENE
ETHYL ISOTHIOCYANATE?
2-PROPOXYETHANOL
DIACETONE ALCOHOL
MIAK
ISOAMYL ACETATE
MAK
BUTYL CELLOSOLVE
C10H22
C10H16 PINENE
DIISOBUTYL KETONE
C9H18O KETONE
DECANE
C11H24
BUTYL CELLOSOLVE ACETATE
A C10 KETONE?
2-ETHYLHEXYL ACETATE
KETONES POSSIBLY C11H22O
C14 ALIPHATICS


Abundance
0.0E+0
2.0E+5
4.0E+5
6.0E+5
8.0E+5
1.0E+6
1.2E+6
1.4E+6
1.6E+6
1.8E+6
2.0
3.0
4.0
5.0
6.0
7.0
8.0
9.0
10.0
Time (min.)
ACETONE
ISOPROPANOL
n-BUTANOL
CS2 IMPURITY
CS2 IMPURITY
METHYL AMYL KETONE
C8H16O2 ESTER
(ISOBUTYL ISOBUTYRATE)
DIISOBUTYL KETONE
SEQ 6677 CT-21 BACK

Appendix 2
Interim Letter to Wood & Hyde Leather Co.
Re: Asbestos Results

June 19, 1989

As per our telephone conversation on June 12, 1989, I have enclosed the analytical results on the asbestos bulk samples that were taken during the NIOSH health Hazard Evaluation conducted at the Hagaman Finishing plant on April 19, 1989. Bulk samples A-1 and A-2 are from the drying ovens and contain 20-30% amosite and 30-40% amosite, respectively. Bulk sample A-3 was obtained from the hot water pipe and contained 40-50% amosite. All samples were analyzed using polarized light microscopy. I am communicating these results to you prior to development of a formal industrial hygiene report, because of the serious nature of these results and the fact that Hagaman has a shut-down in early July for maintenance of the facility.

I am recommending that you develop an Asbestos Abatement Program at Hagaman Finishing. Before developing this program a survey must first be conducted to identify all of the asbestos-containing material that is located in the facility. Upon positive laboratory identification of the material, an assessment should be conducted to classify the physical condition of the asbestos-containing material and prioritize each area according to the friability of the material. Following the classification, a decision must be made on how to manage the asbestos containing material at Hagaman.

NIOSH has already analyzed three bulk samples but there may be other areas of concern at the plant. However, no air levels were taken for asbestos during the survey. Following positive identification of the asbestos-containing material in all applicable areas, an assessment must be made to determine if the material is friable. The Environmental Protection Agency defines friable asbestos material as any material containing more than one percent asbestos by weight that hand pressure can crumble, pulverize, or reduce to powder when dry. Two methods to determine if the asbestos is friable or generating airborne asbestos fibers are by a visual assessment and/or air monitoring. The visual assessment by the NIOSH industrial hygienists conducting the Health Hazard Evaluation at the Hagaman plant is that the material is friable.

During our phone conversation on June 12, 1989, you mentioned the fact that you have looked into having the asbestos removed from the plant and have found a replacement material. There are four choices for managing the asbestos containing material; encapsulation, enclosure, surveillance of the material, or removal. The decision is dependent upon the visual assessment and air monitoring results. If an area is found to be extremely friable during the visual assessment and the airborne fiber level is elevated above background, some type of corrective action should be taken. On the other hand, if an area is found not to be friable and the fiber level is not elevated, it is probably best to leave the material intact and establish a periodic surveillance program, because the material does not represent an increased risk for exposure. Whatever the condition of the material, it is essential that you prioritize your results and establish a plan of action for all areas where asbestos-containing material have been identified. Below is a brief discussion of each of the four options.

Encapsulation is one approach for controlling asbestos fiber release from damaged material. Encapsulation entails covering the asbestos-containing material with a penetrating material to lockdown the asbestos fibers. Encapsulation is generally used on sprayed-on acoustical or decorative ceilings and may be highly recommended for small areas or damaged material. Keep in mind that this is only a temporary solution and that it does not remove the asbestos source.

Enclosure is a second approach for controlling asbestos fiber release from damaged material. Enclosure entails constructing a barrier around the absbestos-containing insulation to confine the asbestos fibers. Enclosures are generally used in very small areas such as a pipe chase that is exposed to the interior of a room. Once again, this is only a temporary solution for controlling the asbestos fibers, since the asbestos is still present.

The third approach for managing the asbestos-containing material is to leave the material intact and establish a periodic surveillance program to assess its condition. A surveillance approach is recommended for all material that is determined to be in very good condition and represents no excess risk for potential asbestos exposure to the worker.

For those areas that are found to be extremely damaged or to have a high potential for fiber release, removal of the material is the least expensive and the most recommended plan of action in the long run. By safely removing the material from the area the source of asbestos fibers has been completely eliminated and there is no longer concern for a future exposure to asbestos in the area. I feel this is the approach that needs to be taken at Hagaman. However, it is fair to state that if an asbestos program is not properly established prior to removal activities, the removal operation could create a worse condition in the area than was present prior to the removal of the asbestos-containing material.

If the decision is to remove the asbestos containing material from the plant, it is recommended that you as the employer obtain each of the following regulations and become familiar with their contents. The list is as follows:

1. Occupational Safety and Health Regulations (OSHA), Asbestos Regulations [Code of Federal Regulations (CFR), Section 1926.58], pertaining to the construction industry.

2. Occupational Safety and Health Rules and Regulations (OSHA), Asbestos Regulations (Code of Federal Regulations (CFR), Section 1910.1001), pertaining to general industry.

3. Environmental Protection Agency, Asbestos Hazard Emergency Response Act, (40 CFR Part 763).

4. Environmental Protection Agency, National Emission Standards for Hazardous Pollutants, Asbestos Regulations, (40 CFR Part 61, Subpart M).

5. Any state regulations that have been promulgated by a State OSHA program or by a state health department that would have jurisdiction over the project.

6. Any local health department's regulations (city or county) that have been promulgated that would have jurisdiction over the project.

7. Any miscellaneous standards that may apply to the project, for instance; if supply air is to be used, you may want to reference the American National Standards Institute (Z86.1-1973), Commodity Specifications for Air.

The above discussion was intended to give some direction in obtaining information on the necessary components of an effective in-house asbestos abatement program. Depending on the final complexity of the problem, it may be necessary to call in expert help, such as a qualified industrial hygiene consulting firm. Keep in mind, that if removal of the asbestos-containing material is the method of choice, that the establishment of an effective job specification will assist in removing the material in the safest, most efficient manner.

In summary:
1. Document the location of the asbestos-containing material.

2. Document the condition of the material.

3. Determine a plan of action for managing the material.

4. Establish an inclusive set of job specifications, if removal of the material is the plan of action.

5. Select a qualified asbestos removal contractor.

6. Closely monitor and supervise the removal activities.

If further assistance is needed to provide technical expertise, on-site assistance is available from the following sources:

1. Local or State Health Departments or Consulting Programs. (Availability and expertise vary with locality and state)

2. Regional Asbestos Coordinator for the Environmental Protection Agency is available from the EPA:

TSCA Assistance Office
EPA, TS-799
401 M Street, SW
Washington, DC 20460

3. State OSHA Office or State Consulting Program.

4. NIOSH - Health Hazard Evaluation Program

National Institute for Occupational Safety and Health
Hazard Evaluation and Technical Assistance Branch
4676 Columbia Parkway
Cincinnati, Ohio 45226

5. Federal Employee Occupational Health Program.

6. Private consultants (A list of industrial hygiene consultants who are members of the American Industrial Hygiene Association (AIHA) and AIHA accredited laboratories can be obtained from the following address):

American Industrial Hygiene Association
475 Wolf Ledges Parkway
Akron, Ohio 44311-1087

If you have any questions about the analytical results or you would like to discuss your abatement program, I can be reached at 513/841-4314. However, you must be advised not to proceed with any maintenance work during your July shutdown until the asbestos abatement program is completed. For your information this letter is being copied to the local and national offices of the Amalgamated Clothing and Textile Workers Union as well as to the state and national offices of OSHA.

Sincerely yours,

John M. Fajen
Industrial Hygienist
Industrial Hygiene Section
Industrywide Studies Branch
Division of Surveillance, Hazard
Evaluations and Field Studies

Enclosure
cc:
B. Towne
E. Frumin
New York OSHA
OSHA
New York State Health Dept.
D. Tharr
HETA 89-
B. Hills

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