U.S. DEPARTMENT OF HEALTH, EDUCATION, AND WELFARE
CENTER FOR DISEASE CONTROL
NATIONAL INSTITUTE FOR OCCUPATIONAL SAFETY AND HEALTH
CINCINNATI, OHIO 45226

HEALTH HAZARD EVALUATION DETERMINATION
REPORT NO. 77-12-418

AIRTEX PRODUCTS
FAIRFIELD, ILLINOIS

SEPTEMBER 1977

I. TOXICITY DETERMINATION

The following determinations have been made based upon environmental air samples collected on March 2-3, 1977, confidential employee interviews, evaluation of ventilation systems and available toxicity information:

1. Employee exposures to monochlorobenzene, isopropyl alcohol, methyl ethyl ketone (MEK), toluene, trichloroethylene, sodium hydroxide, phosgene, hexavalent chromium, zinc oxide, cadmium, fluorides, hydrochloric acid and oil mist did not pose a health hazard at the concentrations measured at the time of this evaluation.

2. Many discrepancies were found in the design and installation of the ventilation system.

3. The health problems at Airtex appear to affect relatively few workers in rather restricted areas. The majority of complaints appear to center in Departments 47 and 92. The symptomatology of the two departments is distinctly different and do not suggest any known, occupational illness compatible with the chemical substances found in the plant. The removal of the affected employees from the work area usually results in complete resolution of the majority of the symptoms.

4. The employees seem to lack knowledge about materials used in the plant, have a basic fear or anxiety about certain operations conducted in the plant, such as the brake shoe operation, and a basic air of mistrust appears to exist between the employees and the company.

It is felt that the causes of the problems at Airtex is a multifactorial one. There is presently an inefficient, inadequate ventilation system which may lead to unnecessary exposure of employees to various air contaminants. This, in combination with the employees lack of knowledge of the materials with which they work and fear or anxiety can cause the types of problems reported.

II. DISTRIBUTION AND AVAILABILITY OF DETERMINATION REPORT

Copies of this Determination Report are currently available upon request from NIOSH, Division of Technical Service, Information and Dissemination Section, 4676 Columbia Parkway, Cincinnati, Ohio 45226. After 90 days, the report will be available through the National Technical Information Service (NTIS), Springfield, Virginia. Information regarding its availability through NTIS can be obtained from NIOSH, Publication Office, at the Cincinnati address. Copies of this report have been sent to:

a) Airtex Products, Fairfield, Illinois
b) Authorized representatives of employees - Local 543-UAW
c) United Auto Workers International - Detroit, Michigan
d) U.S. Department of Labor - Region V
e) NIOSH - Region V

For the purpose of informing the approximately "200" affected employees, the employer shall promptly "post" for a period of 30 calendar days, the Determination Report in a prominent place(s) near where exposed employees work.

III. INTRODUCTION

Section 20 (a)(6) of the Occupational Safety and Health Act of 1970, 29 U.S.C. 669 (a)(6), authorizes the Secretary of Health, Education, and Welfare, following a written request by an employer or authorized representative of employees, to determine whether any substance normally found in the place of employment has potentially toxic effects in such concentrations as used or found.

The National Institute for Occupational Safety and Health (NIOSH), received such a request from an authorized representative of Local 543 of the United Automobile Workers regarding employees exposure to solvents. Reported symptoms included nausea, dizziness, headaches, weakness, throat irritation, breathing difficulties and nose bleeds.

IV. HEALTH HAZARD EVALUATION

A. Conditions of Use

Airtex Products is engaged in the production of automobile replacement parts which include brake shoes, fuel pumps and water pumps. The plant contains ten departments, four departments of which were selected by the investigators as possible problem areas based on the operations conducted within the departments. Environmental sampling was limited to these four areas. An additional area, Department 92 was also emphasized in the study based on the number of health complaints originating in that area.

1. Department 53 - Disassembly and Brake Shoe

Department 53 has been producing brake shoes for approximately eight years. There is no set schedule for production with activity being based on the number of orders. Operations in the area include the application of an adhesive, Plastilock, to the brake linings, which is followed by a drying period. The brake shoes are also dipped in Denflex, a solvent mixture. During the procedure, the brake shoes are also passed through a bonding oven on a conveyor system. Only two or three employees are involved in these operations. All aspects of the operation are provided with local ventilation. A brake shoe grinder is used in the grinding of the brake shoes prior to packaging resulting in the release of asbestos. The operation has local ventilation. (This operation was not being conducted at the time of the survey.)

In addition to the brake shoe operation, disassembly and cleaning of used fuel pumps and water pumps also takes place in Department 53. A trichloroethylene degreaser is used in this area. This degreaser is equipped with cooling coils for vapor control. In addition to the trichloroethylene degreaser, there are several tanks containing various cleaning, degreasing and derusting materials. Some of the tanks are seldom used. Those used more frequently have local ventilation.

2. Department 47 - Fuel Pump Assembly

Department 47 contains the fuel pump assembly operations. Most of the operations in this area are of a mechanical nature. Use of chemicals is limited to the brazing oven. A paste is applied to small parts which, when heated in the brazing oven, bond to the larger metal pump components. The parts, after the paste is applied, are placed on a conveyor belt which carries them through the oven. A part of this procedure includes spraying the parts with a coolant. The water based spray contains a chromium-based rust inhibitor. The parts, prior to entering the brazing oven are cleaned in the trichloroethylene degreaser. The parts, however, are dry when they enter the oven.

3. Department 48 - Water Pump Assembly

Department 48 contains the water pump assembly operations. As is the case in Department 47, most of the operations in this area are of a mechanical nature. One operation in the area deals with the construction of seals in which a glue, Pliobond is used. The Pliobond contains MEK. In this procedure one employee applies the glue to one piece of the seal and another employee places the two parts of the seal together. The operation is conducted intermittently and does have local exhaust ventilation.

4. Department 54 - Die Cast

Zinc and aluminum die casting is performed in Department 54. The metal is added to furnaces where it is melted. Depending on the metal and desired properties, various fluxes may be added. The molten metal is then placed in machines to cast pieces needed in production. Prior to each cast, the dies are blown out using high pressure air. In some cases, the dies are sprayed with a mold release agent. The machine is closed and the molten metal injected. In addition to the die casting, the area contains several drill presses. Most of the drill presses use oil for lubrication and cooling purposes. In all, approximately 25 employees work in the department.

5. Department 92 - Inspection

Department 92 is the inspection area. Various parts or products produced in the plant are brought to this area to be inspected for defects. The employees work one to an inspection table but have no permanently assigned inspection site. The parts are clean and dry when entering the inspection area and no chemicals are used in the department.

B. Evaluation Methods

1. Environmental

An initial survey was conducted on January 25 and 26, 1977. On January 25, a review of the OSHA records on Airtex Products was conducted at the OSHA Belleville Office. On January 26, a walk-through survey of the plant was performed and information obtained on the various processes and on the ventilation systems. Work practices were observed and photographs were taken.

A follow-up survey was conducted on March 2-3, 1977. In Department 53, area impinger samples for sodium hydroxide were collected over the cleaning tanks. Samples were collected in hydrochloric acid at a flow rate of 1 lpm and analyzed by atomic emission spectrometry. Also collected were area charcoal tubes samples for 1,1,1 trichloroethylene. Eight hour samples were collected at a flow rate of 50 cc/minute. The samples were analyzed by a gas chromatographic method. Personal breathing zone and area charcoal tube samples were taken on the brake shoe line for MEK, monochlorobenzene, isopropyl alcohol and toluene. Long term samples were collected at 50 cc/min. and short term samples at 200 cc/min. All samples were analyzed by gas chromatographic procedures.

At the brazing oven in Department 47, area charcoal tube samples were collected at 50 cc/min for 1,1,1 trichloroethylene. Treated filter paper strips were taped at various locations around the oven to determine if phosgene was being produced. Swipe samples were taken on employees hands and work surfaces to determine the presence of hexavalent chromium from the coolant used in the brazing furnace.

In Department 48, personal breathing zone samples for the MEK in the Pliobond were collected using charcoal tubes at 200 cc/min. Gas chromatographic procedures were used to analyze the samples.

Personal breathing zone and area filter samples were collected on closed faced DM-800 filters at 1 lpm in the die casting area for zinc oxide. The samples were analyzed by x-ray powder diffraction. The presence of hydrochloric acid and fluorides from the fluxes was determined by taking area impinger samples at a flow rate of 1 lpm. The hydrochloric acid samples were collected in sodium acetate and analyzed by a turbidimetric method. Fluoride samples were taken in sodium acetate and analyzed using a specific ion electrode. Also collected were area samples for cadmium using closed faced AA filters at a flow rate of 1 lpm. Samples were analyzed by flame atomic absorption spectroscopy. Oil mist from the zinc die casting mold release spray and the drill presses were measured by collecting personal breathing zone samples on closed faced AA filters at a flow rate of 1.5 lpm. Samples were analyzed by fluorescence spectrophotometry.

As part of the environmental evaluation, an extensive study of the plant's ventilation system was conducted. This study included local and general exhaust ventilation systems.

2. Medical

Medical questionnaires were administered to 21% of the workers on the day shift on March 2 and 3, 1977. 33% of the workers in Department 47 and 59% of the workers in Department 92 were surveyed. Numerous workers in five other departments (23, 48, 49, 53 and 54) were also interviewed.

C. Evaluation Criteria

1. Physiological Effects

Sodium Hydroxide - Characteristic irritation of nasal tissue frequently causes sneezing. The greatest hazard is that of rapid destruction of any tissue upon contact with concentrated solutions. Dermatitis may result from contact with dilute solutions.

Trichloroethylene - The predominant physiological response from exposure to trichloroethylene is one of central nervous system depression. Visual disturbances, mental confusion, fatigue and sometimes nausea and vomiting are observed. Recent studies by the National Cancer Institute have related trichloroethylene exposure to liver cancer in animals.

Zinc Oxide - Exposure to zinc oxide may result in zinc fume fever. Symptoms include dryness and irritation of the throat with coughing and dyspnea, feelings of weakness, fatigue, and pains in the muscles and joints. A fever develops, typically associated with the sensation of chills. Chills and profuse sweating may be associated with convulsions. Recovery is usually complete in 24-48 hours.

Hydrochloric Acid - Hydrochloric acid is seldom inhaled in concentrations high enough to cause serious intoxication because of its irritant nature.

Fluorides - The inhalation of fluoride fumes and gases may produce respiratory and eye irritation. Nose bleeds also may occur at higher concentrations.

Oil Mist - Exposure to oil mists will cause mucous membrane irritation and a chemical pneumonitis from direct contact of the liquid or aerosol with pulmonary tissue. Frequent and prolonged contact with the skin will lead to skin irritation and dermatitis. Due to the low order of toxicity, the standard is recommended as a good industrial practice as well as to prevent the relatively minor changes in the lungs that may occur from exposure.

Methyl Ethyl Ketone (MEK) - Industrial exposures to MEK are mainly those of inhalation and skin and eye contact. Skin absorption, while it may occur, is not considered to present a problem. Exposure to vapors of this agent may produce mucous membrane irritation, skin irritation, and dermatitis,. More prolonged exposure may result in nausea, vomiting, headache, paresthesia, and narcosis.

Monochlorobenzene - Monochloroenzene is a central nervous system depressant and will cause symptoms typical of its anesthetic effect. Degeneration of the liver and kidney may be observed at increased concentrations or as the time of exposure is lengthened.

Isopropyl Alcohol - Isopropyl alcohol causes mild irritation of the eyes, nose and throat. The most important toxic action of isopropyl alcohol is narcosis.

Phosgene - Phosgene is a severe lung irritant. Phosgene exposure produces a dryness or burning sensation in the throat, numbness, vomiting, pains in the chest, bronchitis and possibly dyspnea.

Toluene - Prolonged excessive exposure to this agent may acutely cause headache, weakness, fatigue, unconsciousness, loss of coordination, nausea, vomiting, anorexia, acute dermatitis and irritation of skin and mucous membranes.

2. Environmental Standards

To assess the concentrations of air contaminants found in the place of employment, three primary sources of criteria were used: (1) NIOSH criteria for recommended standards for occupational exposure to substances (Criteria Documents): (2) recommended and proposed threshold limit values (TLV's) and their supporting documentation as set forth by the American Conference of Governmental Industrial Hygienists (ACGIH) (1976); and (3) occupational health standards as promulgated by the U.S. Department of Labor (29 CFR Part 1910.1000).

In the following tabulation of criteria appropriate values are presented with references.

Substances	Permissible Exposures (8-hour Time Weighted Average)
[1]Sodium Hydroxide	2 mg/M^3*
[2]Trichloroethylene	100 ppm
[3]MEK	200 ppm
[3]Monochlorobenzene	75 ppm
[3]Hydrochloric Acid	7 mg/M^3
[3]Fluorides	2.5 mg/M^3
[3]Oil Mist	5 mg/M^3
[4]Isopropyl Alcohol	400 ppm
[5]Zinc Oxide	5 mg/M^3
[6]Phosgene	0.1 ppm
[7]Toluene	100 ppm

[1]Reference: The NIOSH 1975 criteria document the 1976 ACGIH TLV and the current OSHA standard.
[2]Reference: The NIOSH 1973 criteria document, the 1976 ACGIH TLV and the current OSHA standard. Present proposed standard is 50 ppm.
[3]Reference: The 1976 ACGIH TLV and the current OSHA standard.
[4]Reference: The NIOSH 1976 criteria document, the 1976 ACGIH TLV and the current OSHA standard.
[5]Reference: The NIOSH 1975 criteria document, the 1976 ACGIH TLV and the current OSHA standard.
[6]Reference: The NIOSH 1976 criteria document, the 1976 ACGIH TLV and the current OSHA standard.
[7]Reference: The NIOSH 1973 criteria document, the 1976 ACGIH TLV and the current OSHA standard.

*Ceiling value - the concentration that should not be exceeded even instantaneously.

D. Evaluation Results and Discussion

A review of the OSHA records on Airtex Products established the broad details of the health problems at the plant. Incidents of group illness dated back to May 13, 1974. There appeared to have been five serious outbreaks which occurred on an average of eight months apart. The health problems in most cases affected a small group of workers. Symptoms were variable and included headaches, nausea, inability to get a deep breath, a burning sensation of the face and in some cases, profound weakness. The hospital summaries of three patients who were admitted were obtained from OSHA. Review of these cases showed brief hospital stays that did not result in establishing a definitive diagnosis.

The results of environmental samples collected by OSHA were also reviewed. No excessive levels of any solvents or other chemicals used in the plant were found. Samples had been collected on several different occasions and all results indicated no significant levels of any air contaminants.

On the walk-through survey conducted on January 26, various plant processes were observed, aspects of the ventilation system were noted and work practices and use of materials were observed. Based on this information, the NIOSH study which was conducted covered three areas; environmental sampling for air contaminants, a study of local and general ventilation systems and medical questionnaires to determine symptoms and health problems. A discussion of each aspect of the study follows.

Medical

Detailed medical questionnaires were administered on March 2,3, 1977 to 60 employees on the day shift. Thirty-three percent of Department 47 and 59% of Department 92 were surveyed, these being the areas of the majority of health complaints. Five other departments were surveyed to afford comparison. These departments were selected on the basis of the likelihood of exposure to toxic substances.

The questionnaire documents the population characteristics of the plant. It was found that all respondents were white, the majority of each department was over forty years old and each department had a majority of employees with more than ten years experience in the department. Departments 47, 49 and 92 were comprised of a majority of female employees. Alcohol use varied between departments with essentially no usage reported in Department 47. Smoking prevalence was high among all respondents (60% smoked) but lower in Departments 47 and 92. The general educational level in the plant showed a high proportion reaching grade 12 or greater.

The reactions to the questionnaire concerning health status showed the following: no excess days lost in the affected departments and generally few complaints of weight loss or work related hospitalizations. When asked about 15 symptoms related to possible solvent exposure a high percentage of positive responses were found in Department 47 with Department 92 next in frequency. If one defined the health problems at Airtex

to include any symptom to which 50% or more of a department answered positively, then two syndromes can be described for the two affected departments. Department 47 appears to be affected by complaints of tiredness, photophobia, watery eyes and swollen hands while Department 92 is affected by tiredness, tingling and numbness, sleep disturbances and burning face. There are then two distinct syndromes present (Table I).

Environmental

The results of the charcoal tube samples collected in Department 53, Disassembly and Brake Shoe, for monochlorobenzens, isopropyl alcohol and MEK are given in Table II. Both short and long term samples were collected at various sites and, as the results indicate, concentrations were all below the respective standards for the three substances. Charcoal tube samples for tolueue, the main component of Denflex were also collected. Table III shows that concentrations ranged from 0.2 to 36.2 ppm. All were well below the 100 ppm standard for toluene. An area sample for 1,1,1-trichloroethylene was collected beside the degreaser located in this department. The concentration measured was only 0.44 ppm compared to the standard of 100 ppm for 1,1,1-trichloroethylene. Two area samples for sodium hydroxide were collected adjacent to the Compound #10 cleaning tank. Measured concentrations were 0.25 and 0.46 mg/M^3. The standard for sodium hydroxide is 2 mg/M^3 (Table IV).

In Department 48, personal breathing zone samples for MEK were taken on employees applying Pliobond. Measured concentrations were 1.7 ppm and 1.2 ppm. The standard for MEK is 200 ppm (Table V).

In Department 47, Fuel Pump Assembly area charcoal tube samples for 1,1,1-trichloroethylene were collected at the entrance and exit of the furnace to determine if any residual 1,1,1-trichloroethylene was present in the area from the parts that had been cleaned in the solvent prior to entering the furnace. No detectable levels of 1,1,1-trichloroethylene were found. The filter strip used to detect the presence of phosgene also failed to show any detectable levels of that substance. Swipe samples done on employee's hands and work areas also failed to show the presence of any hexavalent chromium.

In Department 54, Die Casting, four area samples were collected for zinc oxide. No detectable levels were found. Three area samples for cadmium, a possible contaminant in the metal, also showed no detectable levels. The samples taken for fluorides and hydrochloric acid, substances produced by the fluxes, showed concentration respectively of 0.3 to 0.8 ppm and 0.1 mg/M^3 (Table VI). All concentrations were below present standards. Two personal breathing zone samples for oil mist collected on the die cast operators showed concentrations of 2.1 mg/M^3 and 0.8 mg/M^3. (The standard for oil mist is 5 mg/M^3). The personal samples collected on three drill press operators showed concentrations of 0.8, 0.8 and 0.7 mg/M^3 for oil mist (Table VII).

Ventilation

There were many discrepancies in the design and installation of the ventilation system at Airtex Products. For example, the following discrepancies were noted in the general system.

1. Although there are 300,000 cubic feet (design values) of air per minute (cfm) of makeup air (3-50,000 cfm and 2-75,000 cfm units) entering the plant, there are many stagnant areas, such as Department 47-48 and 49. The reasons for these stagnant areas may be many; however the most important is the placement of the intake ducts.

2. The intake ducts are located at ceiling height in the plant. The exhaust fans are also located in the ceiling. This is causing a "short-circuiting" of the system. The intake ducts should be placed next to the floor.

3. Another important factor that may be causing the stagnant spaces, is the placement of additional exhaust hoods on the original equipment. When additional equipment is added compensation must be made in the makeup unit.

4. The discharge or exhaust ducts are too low relative to the height of the building. This is causing the discharged air to be reintrained in the intake unit and being discharged into the work area. Properly designed discharge stacks should be 1.3 to 2 times the height of the building.

During the comprehensive survey an inspection was conducted of other areas in the plant that may be concerned with ventilation problems. These areas are as follows:

1. Die Cast Area - Department 54.

Zinc Furnace-Zinc metal is dumped into this furnace and melted. When the metal is dumped, large amounts of smoke and fumes are discharged. Some of the smoke and fumes are emitted into the work area because the ductwork is open next to the exhaust fan in the ceiling. Extending the ductwork to the floor and enclosing three sides of the furnace would eliminate this problem.

2. Zinc Die Casting Machines - Department 54

Molten zinc is placed in the machine to cast pieces of metal needed in production. Prior to each cast the die is blown out using high pressure air. The machine is closed, and the molten metal injected. This causes smoke and fumes to be emitted. Movable hoods could be placed over each machine and exhausted by the exhaust fans already located in the ceiling.

3. Aluminum Die Casting - Department 54

A similar type process takes place in the areas in the Zinc Die Casting area. In this area there are seven machines that are currently being exhausted by two "smoke-hogs." Smoke hogs when used in proper situations can be beneficial. However, their usefulness in this area is limited. Too many contaminants are being released and the smoke hogs become overloaded, allowing contaminants to pass through rather than being collected.

If the smoke hogs are to be used on a continuing basis a rigorous maintenance schedule must be set up to properly service the equipment. However it is recommended that each machine be exhausted into a wet type dust collector (scrubber system) and be placed on the outside of the building.

4. Maintenance Area - Department 80

In the maintenance area there is a welding operation that has a relatively new exhaust hood. The dimensions of the hood are approximately six feet by six feet. It is open on all sides and has a smoke-hog attached. The hood has a face velocity at the work area of only 50 feet per minute (fpm). It is recommended that the smoke-hog be removed and the entire operation be vented directly to the outside atmosphere. It is also recommended that the hood be enclosed on at least three sides and the face velocity of the hood at the work area be increased to 100 to 150 fpm.

5. Pliobond Operation - Department 48

A plexiglass hood should be placed over the entire work bench of this operation and once the materials are assembled they should remain under the hood for additional drying. The plexiglass hood will allow the operator and the helper to observe the operation.

6. Bonding Oven - Plastilock Application - Department 53

The hood in which the plastilock is applied should maintain a face velocity of at least 100-150 fpm. During this survey it was found that a blast gate had been partially closed which did not permit the proper air flow. This blast gate should be locked into position that will maintain 100-150 fpm.

7. Brake Shoe Grinder - Department 53

This operation involves the grinding of brake shoes prior to packaging. The ventilation on this operation is good. However the asbestos that is being exhausted is collected in bags that are located inside the plant next to the grinding operation. These bags must be placed on the outside of the building because in the event of an accident such as a tear in the bags, everyone in the area could be contaminated.

E. Summary

The health problems at Airtex appear to affect relatively few workers in rather restricted areas. The majority of complaints appear to center in Departments 47 and 92. The symptomatology of the two affected departments is distinctly different and does not support the concept that they are exposed to a single toxic substance. The symptoms of Department 47 and 92 do not suggest any known occupational illness compatible with the chemical substances found in the plant. In addition the unaffected areas of the plant are contiguous with Department 47 and 92. There do not appear to be barriers preventing the exposure of other departments to whatever agents might be causing symptoms in Department 47 and 92, yet these departments are relatively unaffected after some three years of intermittent illness episodes.

Environmental sampling also has failed to reveal any excessive levels of air contaminants anywhere in the plant. Sampling has been conducted on numerous occasions by various groups for substances which are known to be present as well as substances which could possibly be produced from those present or present as contaminants.

It is very difficult to pinpoint the cause or causes of the health problems at Airtex Products. The unusual variety of symptoms, the lack or high levels of any offending agents and the rapidity with which most symptoms clear after workers are removed from the work area suggests a fear-anxiety state. Although the symptoms occur mainly in females and are non-specific, the illness lacks many characteristics of hysterical industrial illness, namely, hyperventilation, dramatic person to person spread of symptoms and inciting events such as odor. The affected employees, however, do appear to be depressed by their symptoms and very concerned about long term health effects. The employees also seem to lack knowledge of materials used in the plant, have a basic fear or anxiety about certain operations conducted in the plant, such as the brake shoe operation, and a basic air of mistrust appears to exist between the employees and the company.

In addition to this there is presently the ineffective and inadequate general and local exhaust ventilation system which may lead on occasion to inappropriate worker exposure to air contaminants. The importance of clean uncontaminated air in the industrial environment is well documented. Today's industry, with its complexity of operations and processes uses an increased number of old and new chemicals, many of which can be highly toxic. The use of these chemicals can produce gases, fumes, vapors and mists which may be emitted into the working environment in the absence of properly designed ventilation systems. Effective, and <u>properly</u> designed ventilation systems will offer a solution where protection of workers is needed. The word "properly" is underscored because in many cases little attention is given to installation and maintenance procedures. This is the case at Airtex Products.

It is therefore the belief of the authors that the cause of the problems at Airtex is a multifactorial one. The present ineffective general and local ventilation system may lead to inappropriate worker exposure to either known or unknown substances. This in combination with employees' fear or anxiety can cause the type of symptom complex which is present.

It is felt that if the following recommenations are followed, the problems at Airtex will be greatly reduced or eliminated.

V. RECOMMENDATIONS

1. There are many discrepancies in the design and installation of the ventilation system. A number of specific recommendations are given in Section IV-D of this report but a complete check of the system should be conducted by a qualified ventilation engineer and appropriate corrections made.

2. Employees should be educated in regards to the kinds of substances they work with and good work practices to use when working with these compounds.

3. Employees and management should utilize the plant nurse in the safety and health program. Carefully kept medical records of employees symptoms, complaints or accidents can be a great aid in locating problem areas.

4. The company and union representatives should work together to create an atmosphere of trust and mutual goals in the area of safety and health. The atmosphere created by this group of people, the degree to which they work together and the effort they make to keep the employees informed of their efforts and accomplishments, will be greatly reflected in the workers attitudes about the safety of the environment they work in.

VI. AUTHORSHIP AND ACKNOWLEDGMENT

Report Prepared By:

Dawn Gilles
Industrial Hygienist
Industrial Hygiene Section
Hazard Evaluations and
Technical Assistance Branch
Cincinnati, Ohio

Thomas L. Anania
Assistant Section Chief
Industrial Hygiene Section
Hazard Evaluations and Technical
Assistance Branch
Cincinnati, Ohio

Richard Ilka, M.D.
University of Cincinnati Medical Center
Cincinnati, Ohio

Originating Office:

Jerome P. Flesch
Acting Chief
Hazard Evaluations and
Technical Assistance Branch
Cincinnati, Ohio

Acknowledgments

Environmental-Medical Evaluation:

Norbert Schutte
Student Trainee
Industrial Hygiene Section
Hazard Evaluations and
Technical Assistance Branch
Cincinnati, Ohio

Sandra Langenbrunner
Medical Radiation Technician
Medical Services Section
Support Services Branch
Cincinnati, Ohio

Dorothy Nurre
Medical Radiation Technician
Medical Services Section
Support Services Branch
Cincinnati, Ohio

Analytical Laboratory Services:

Utah Biomedical Test Laboratory
Salt Lake City, Utah

Report Typed By:

Marie A. Holthaus
Clerk Typist
Industrial Hygiene Section
Hazard Evaluations and
Technical Assistance Branch
Cincinnati, Ohio

Table I

Airtex Products
Fairfield, Illinois

March 2, 1977

Symptoms by History

Symptom	Percentage of Positive Responses	
	Dept. 47	Dept. 92
Excessive tiredness	50	50
Feelings of confusion	25	20
Tingling or numbness	38	50
Abdominal pain	25	10
Frequent nosebleeds	19	10
Double vision	10	0
Blurred vision	20	30
Does light hurt your eyes	50	20
Do you stagger when you walk	20	20
Do you have disturbed sleep	30	50
Do you have abdominal swelling	20	0
Do you have a burning face	40	50
Do you have watery eyes	60	40
Do you have swollen hands	60	30
Do you have weak jaws	0	10

TABLE II

Airtex Products
Fairfield, Illinois
March 2, 1977

Brake Shoe Area - Department 53

Sample Location	Sample Number	Sampling Period	Sample Volume (liters)	MEK (ppm)	Monchlorobenzene (ppm)	Isopropyl Alcohol (ppm)
Employee applying plastilock	CT-1	8:52-10:50	5.4	15	2.0	3.0
" " "	CT-2	8:52- 9:27	7.5	N.D.	0.6	N.D
" " "	CT-5	9:28- 9:47	3.9	8	2.2	2.0
" " "	CT-7	9:48-10:25	7.6	3	1.3	1.1
" " "	CT-9	10:26-10:50	4.9	27	1.8	N.D.
" " "	CT-15	14:42-15:45	13.5	9	0.5	N.D.
" " "	CT-16	14:42-15:12	6.8	3	N.D.	N.D.
" " "	CT-18	15:14-15:34	4.2	5	N.D.	N.D.
Helper for applying plastilock	CT-4	9:06-10:50	22.2	22	2.2	3.3
" " "	CT-6	9:28- 9:50	4.3	15	5.0	4.7
" " "	CT-8	9:51-10:25	8.0	9	2.7	3.1
" " "	CT-10	10:26-10:50	5.2	63	5.0	4.7
" " "	CT-13	14:40-15:44	13.6	5	1.3	1.2
" " "	CT-14	14:44-15:10	5.4	6	2.0	1.5
" " "	CT-17	15:11-15:31	3.7	6	2.9	2.2
Area entrance to Bonding Oven	CT-35	9:03-11:45	33.7	N.D.	N.D.	N.D.
" " "	CT-45	13:12-14:20	13.3	N.D.	N.D.	N.D.
Area exit from Bonding Oven	CT-36	9:05-11:45	36.2	N.D.	N.D.	N.D.
" " "	CT-46	13:12-14:20	11.9	N.D.	N.D.	N.D.

Table III

Airtex Products
Fairfield, Illinois

March 2, 1977

Brake Shoe Area - Department 53

Sample Location	Sample Number	Sampling Period	Sample Volume (liters)	Toluene (ppm)
Area Above Denflex Tank	CT-37	10:38-11:48	15.5	0.2
" " " "	CT-43	13:08-13:40	5.2	4.6
Employee Applying Denflex	CT-38	10:40-11:47	14.8	2.9
" " "	CT-40	10:52-11:15	5.5	0.6
" " "	CT-41	11:18-11:33	3.0	3.5
" " "	CT-42	13:05-13:40	6.5	2.1
Parts Drop Off Point	CT-39	10:41-11:48	14.8	36.2
" " " "	CT-44	13:08-13:40	5.2	4.6

Table IV

Airtex Products
Fairfield, Illinois

March 2, 1977

Brake Shoe Area - Department 53

Sample Location	Sample Number	Sampling Period	Sample Volume (liters)	1,1,1 Trichloroethylene (ppm)
Area Beside Trichloroethylene Degreaser	CT-32	07:42-16:51	93.9	0.44

Sample Location	Sample Number	Sampling Period	Sample Volume (liters)	Sodium Hydroxide (mg/M^3)
Compound #10 Tank Area	NaOH-1	09:05-15:53	408	0.25
" " " "	NaOH-2	09:05-15:53	408	0.46

TABLE V

Airtex Products
Fairfield, Illinois
March 2, 1977

Department 48

Sample Location	Sample Number	Sampling Period	Sample Volume (liters)	MEK (ppm)
Employee Appying Pliobond (A)	CT-11	13:58-14:40	7.8	1.7
" " " (B)	CT-12	13:58-14:40	8.3	1.2

TABLE VI

Airtex Products
Fairfield, Illinois
March 2, 1977

Department 54

Sample Location	Sample Number	Sampling Period	Sample Volume (liters)	Fluorides (ppm)	Hydrochloric Acid (mg/M^3)
Aluminum Furnace Area	HCl-1	9:13-15:58	405		N.D.
" " "	F-1	9:22-15:58	406	0.8	
Zinc Furance Area (A)	HCl-2	9:28-16:04	396		N.D.
" " "	F-2	9:32-16:03	391	0.5	
Zinc Furnace Area (B)	HCl-3	9:35-16:03	388		0.1
" " "	F-3	9:35-16:03	388	0.3	

Table VII

Airtex Products
Fairfield, Illinois

March 2, 1977

Department 54

Sampling Location	Sampling Number	Sampling Period	Sample Volume (liters)	Oil Mist (mg/M^3)
Zinc Die Cast Operator (A)	AA-1	08:25-11:52 13:08-15:50	552	2.1
Zinc Die Cast Operator (B)	AA-2	08:31-11:53	303	0.8
Drill Press 594 Operator	AA-5	10:10-13:12	273	0.8
Drill Press 781 Operator	AA-6	10:05-16:23	567	0.8
Drill Press 4743 Operator	AA-7	10:12-16:23	444	0.7