

U.S. DEPARTMENT OF HEALTH, EDUCATION, AND WELFARE
NATIONAL INSTITUTE FOR OCCUPATIONAL SAFETY AND HEALTH
CINCINNATI, OHIO 45202

HEALTH HAZARD EVALUATION DETERMINATION
REPORT NO. 73-194-153

GOODYEAR AEROSPACE CORPORATION
COMMERCIAL PLASTICS DIVISION
JACKSON, OHIO
NOVEMBER 1974

I. TOXICITY DETERMINATION

An evaluation of the Goodyear Aerospace Corporation, Commercial Plastics Division plant in Jackson, Ohio with regard to employee exposure to xylol (xylene) vapors and fiberglass reinforced plastic (FRP) dust has been made by the National Institute for Occupational Safety and Health (NIOSH). From data gathered during the evaluation it has been determined that:

- 1) Xylol (xylene) vapor concentrations normally found at the spray painter's work stations and in the vicinity of the plant's three painting systems are not toxic to employees.
- 2) Airborne FRP dust generated by sanding, deburring, etc. of FRP products does not present a significant inhalation hazard to employees.
- 3) FRP dust is the probable cause for active cases of dermatitis among employees in the plant and is thus judged to be potentially toxic via direct skin contact.

These determinations are based on results of airborne dust measurements, employee interviews and cutaneous examinations, ventilation measurements, examination of materials and work practices in use, and on sensory (olfactory) response to xylol vapor concentrations.

II. DISTRIBUTION AND AVAILABILITY OF THE DETERMINATION REPORT

Copies of this Determination Report are available upon request from the Hazard Evaluation Services Branch, U.S. Post Office Building, Room 508, 5th and Walnut Streets, Cincinnati, Ohio 45202. Copies have been sent to:

- a) Goodyear Aerospace Corporation - Jackson, Ohio
- b) Authorized Representative of Employees
- c) U.S. Department of Labor - Region V
- d) NIOSH - Region V

For the purposes of informing the approximately 150 "affected employees" the employer will promptly "post" the Determination Report in prominent places near where affected employees work for a period of 30 calendar days.

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 any 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 employees regarding exposure to fibrous glass and vapors from volatile solvents in use at the Goodyear Aerospace Corporation plant in Jackson, Ohio. The request was precipitated by incidents involving malfunction of one of the plant's painting systems, and by recurrent cases of employee skin irritation from contact with fibrous glass.

IV. HEALTH HAZARD EVALUATION

A. Evaluation Progress

The Goodyear Aerospace Corporation - Commercial Plastics Division plant in Jackson, Ohio was visited on March 12 and 13, 1974 by NIOSH investigators, Mr. Robert Vandervort, and Drs. Theodore Thoburn and Steven R. Cohen. A preliminary meeting was held with union and management representatives to explain the nature of the Health Hazard Evaluation Request and to obtain background information. Following this meeting, a walk-through survey of the plant was made. Both union and management representatives were helpful in explaining processes and highlighting areas of concern.

Prior to this visit, the evaluation requester had supplied NIOSH with a list of employees allegedly affected by adverse conditions within the plant. Working from this list, Drs. Thoburn and Cohen conducted employee interviews. Care was taken to interview persons whose names appeared on the list, as well as, other employees. The plant nurse and on-call physician were also interviewed.

While NIOSH physicians conducted the medical portion of the evaluation, Mr. Vandervort obtained information regarding materials in use, plant processes and control, and work practices. Ventilation and air sampling measurements were made in the specific areas of the request.

B. Description of Process - Conditions of Use

The Goodyear Aerospace Corporation - Jackson, Ohio plant is engaged in the manufacture of sheet molded fiberglass reinforced plastic (FRP) parts and assemblies for cars, trucks, buses, tractors, mobile homes, campers, boats, snowmobiles, power mowers, air-conditioners, and materials handling equipment.

The manufacturing process involves the blending of polyester resins and filler; the combination of resin and fiberglass roving into continuous sheets; the cutting and press-molding of sheets into FRP parts; and the sanding, finishing, painting, and packaging of finished FRP products.

Of central interest to this hazard evaluation were employee exposures to fibrous glass and xylene. Employees are exposed to particles of glass in the deburring and sanding operations of the Pressline, Pre-finish, and Repair departments. Xylene exposures were reported to have occurred in connection with Paint System No. 2.

C. Evaluation Methods

1. Ventilation Measurements

All ventilation measurements were made with a calibrated Alnor Velometer Jr.

2. Airborne Dust Measurements

Both total and respirable mass airborne dust measurements were made using a Model RDM-101 Respirable Dust Monitor manufactured by the Technology Division of GCA Corporation. Dust concentrations obtained with this instrument are reported by its manufacturer to be within $\pm 25\%$ of the true concentration at the 95% confidence level. Using known concentrations of airborne coal dust, NIOSH has recently confirmed the advertised accuracy of this instrument.¹

3. Medical Interviews and Examinations

A medical questionnaire was administered to each of the interviewed employees. Where appropriate, detailed questions regarding work history, symptoms, work practices, protective equipment, etc. were asked. Persons exposed to particles of fibrous glass were given a brief cutaneous examination.

D. Evaluation Criteria

The occupational health standards promulgated by the U.S. Department of Labor (Federal Register, October 18, 1972, Title 29, Chapter XVII, Subpart G, Tables G-1 and G-3) applicable to the individual substances of this evaluation are as follows:

<u>Substance</u>	<u>8-hour Time-Weighted-Average Exposure Standard</u>	
	<u>ppm^b</u>	<u>mg/M³^c</u>
Inert or Nuisance Dust ^a		
Respirable Fraction		5
Total Dust		15
Xylene (xylol)	100	

^aTo date, no specific occupational health standard has been assigned to fiberglass or fiberglass reinforced plastic (FRP) dusts. The American Conference of Governmental Industrial Hygienists (ACGIH) has categorized fiberglass dust (containing no toxic impurities, e.g. silica) as a nuisance dust, but recommends that time-weighted-average exposures to total nuisance particulate not exceed 10 mg/M³. In the absence of evidence to the contrary, the FRP dust encountered in this plant is considered to be of nuisance character.

^bParts of vapor or gas per million parts of contaminated air by volume.

^cApproximate milligrams of particulate per cubic meter of air.

Occupational health standards for individual substances are established at levels designed to protect workers occupationally exposed on an 8-hour per day, 40-hour per week basis over a working lifetime.

The odor threshold for mixed isomers of xylene has been reported to range from approximately 0.5 to 20 ppm, depending upon the isomers present and their relative concentrations.²

E. Evaluation Results

1. Environmental Evaluation

a. Paint Systems/Xylol (xylene)

Although no quantitative measurements of employee exposure to paint solvents were made, this potential health hazard was evaluated by examining materials in use, performance of ventilation control equipment, and by qualitative, olfactory (sensory) evaluation of solvent vapor concentrations.

Xylol (xylene) is the solvent used with all paints utilized in the finishing of FRP products. Most paint formulations include 15 to 20% xylol. A bulk sample of xylol was obtained from the plant and analyzed by NIOSH in Cincinnati. The xylol in use during this evaluation was found to be essentially pure xylene with a combined presence of benzene and toluene of less than 1% by volume.

Air flow measurements were made in painting systems Nos. 1, 2 and 3. In each case air velocities were measured at the position where the painter performed the painting and describe air flow away from the painter; in the direction of paint spraying; and toward the system exhaust. At the time these measurements were made, painting was being conducted in systems Nos. 1 and 2 but not in No. 3.

<u>Paint System No.</u>	<u>Air Velocity at Painter - fpm*</u>	<u>Range of Air Velocities to the Left and Right of Painter</u>
1	200-300	50-150
2	50-100	50-100
3	200-300	200-300

*fpm = feet per minute

Paint overspray or smoke from a ventilation smoke tube was observed to insure capture of contamination by each exhaust system. All three systems showed efficient capture and only a faint odor of xylene was detectable in systems Nos. 1 and 2 while painting was being performed.

b. FRP Dust

Measurements of airborne dust concentrations were made in the pressline, prefinish, and repair work areas. Each measurement was of four minutes duration taken while dust was being generated. Both breathing zone and work area samples were obtained. Two respirable mass samples were taken. The results of this air sampling follows:

<u>Department</u>	<u>Operation/ Location</u>	<u>Type BZ/WA*</u>	<u>Total Mass mg/M³**</u>	<u>Respirable Mass mg/M³</u>
Pressline	Press 300-1 Next to Aisle	WA	0.5	
Pressline	Press 300-1 Sanding Meat Bins	BZ		0.7
Pressline	Between Presses 700 & 800: Hand Deburring	WA	0.5	
Pressline	"	BZ	0.9	
Pre-Finish	Sanding FRP Part	BZ	4.3	
Pre-Finish	"	BZ	2.9	
Pre-Finish	Sanding FRP Part	BZ		0.4
Repair	Sanding FRP Fan Housing	BZ	1.7	
<u>Nuisance Dust Occup. Health Standard</u>			<u>15</u>	<u>5</u>

*BZ/WA: BZ = Breathing Zone; WA = Work Area

**mg/M³ = milligrams of airborne dust per cubic meter of air.

As can be seen from the sampling data, relatively small quantities of airborne dust were found. Each of the operations evaluated did generate visible dust, however, it appears that most of the dust generated was of such large particle size that it was not truly airborne dust. These large particles of dust, although not deeply inhaled, can be deposited in the nose and throat which may result in irritation of these tissues.

2. Medical Evaluation

Following a conference with representatives of labor and management which provided a chronological review of health problems at the plant, an initial walk-through survey was made. First shift workers in the vicinity of paint system No. 2 were interviewed and the plant medical staff was questioned regarding occupational health problems at the plant. During the second shift, interviewing was continued in the vicinity of paint system No. 2 and in the Pressline work area. It was decided that only a sample of the persons on the list provided by the requester would be interviewed, and that only the two individuals on the list would be interviewed from the third workshift. On the second day of this evaluation every fifth first shift employee was interviewed. A total of 43 employees were interviewed during this survey.

Discussions with the plant nurse and on-call physician failed to reveal any recurrent health problem other than fiberglas dermatitis for which a lotion was administered by the company as needed. During November, 1973 a hydrochloric acid spill in the vicinity of paint system No. 2 resulted in several employees being overcome by fumes. Most affected workers were able to return to work in a day or two but some were off considerably longer.

Paint system No. 2 was reported to have caused episodic problems. Approximately six months prior to this evaluation, 15 to 18 first shift workers were taken out of the No. 2 paint system area because they were experiencing the following symptoms: nausea, burning of the eyes and throat. One of the affected employees was the system spray painter. Approximately one month later a second episode occurred involving 25 to 30 first shift employees. Following a third such episode, OSHA and state inspectors were called in. The source of the problem was finally pin-pointed to a malfunctioning butterfly valve in the exhaust structure of the paint system. The butterfly valve was repaired and only one minor incident has since occurred which coincided with the failure of a system fan belt.

Interviews conducted with employees working in the vicinity of paint system No. 2 indicated that they were not experiencing symptoms attributable to paint system operations on the days of this evaluation.

Several cases of active fiberglas-induced dermatosis were identified. Most (14 of 17) of the workers interviewed in the Pressline work area have been affected by skin rashes at one time or another. This problem was reported to be exacerbated by hot weather.

F. Conclusions and Recommendations

The data collected during this evaluation suggest that concentrations of xylol (xylene) normally found in association with plant painting systems are not toxic to employees. Past incidents of employee symptomatology appear to have been related to ventilation system malfunctions.

Although it has been demonstrated that both the total mass and respirable mass concentrations of airborne FRP dust in this plant are relatively low, the FRP dust appears to be the agent responsible for active cases of dermatitis observed during this evaluation. It is thus concluded that, FRP dust does not present a significant inhalation hazard to employees at the concentrations found, but that the FRP dust is potentially toxic to employees, producing dermatitis in some employees, via contact with exposed skin surfaces.

The following recommendations, which were discussed with labor and management representatives during the exit conference at the plant, are made in the interest of improving the health and safety of employees:

- 1) Persons engaged in sanding, deburring, etc. of FRP parts should wear protective clothing which will minimize skin contact with FRP dust.
- 2) Pedestal fans should be directed so that dust generated by one operation will not be propelled into the breathing zones of adjacent workers.
- 3) Employees electing to wear respiratory protection should be instructed in the proper use, fitting and maintenance of respirators.
- 4) A general program of employee education should be implemented so that employees will fully appreciate the potential toxicity, safety procedures, etc. associated with all materials used in the plant. This is especially important with regard to urethane foam materials and epoxy resins.

V. REFERENCES

1. Solomon, M., B.P. Almich, and G.A. Carson, Ph.D., A Theoretical and Laboratory Evaluation of a Portable Direct Reading Particulate Mass Concentration Instrument. Paper presented at the May, 1974 American Industrial Hygiene Conference, Miami, Florida.
2. Staub-Reinholt, Luft, 32 (No. 10), pp. 28-31 (1972).

VI. AUTHORSHIP AND ACKNOWLEDGMENT

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