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
HE 77-114-529

THE STANDARD PRODUCTS COMPANY
510 HENRY CLAY BOULEVARD
LEXINGTON, KENTUCKY 40502

SEPTEMBER 1978

I. TOXICITY DETERMINATION

The following determinations have been made based on environmental air samples collected on February 28 - March 1, 1978, confidential employee interviews and medical examinations, available toxicity information, and evaluation of ventilation systems and work procedures. Employee exposures to potential airborne emissions from a styrene-butadiene rubber (SBR) extrusion process could not be detected. However, among the many chemicals in use at this plant, it would appear that exposure to polyester flock fibers is the cause of health hazards reported in the main text, with the exception of symptoms referable to the central nervous system. It is thought that the physical nature of the fibers, rather than the chemical nature, gives rise to their irritant qualities. Employees' exposures to concentrations of carbon monoxide, ozone, asbestos fibers, n-butyl acetate, lead, isopropyl acetate, acetone, methyl ethyl ketone, and toluene did not constitute a health hazard. However, certain exposures to petroleum naphtha (textile spirits) in a tape gluing operation in the Roll Form Department did constitute a potential health hazard. Concentrations of 442 and 534 milligrams of petroleum naphtha per cubic meter of air (mg/M^3) exceeded the NIOSH recommended standard of 350 mg/M^3.

The ventilation system for the plant is currently unbalanced, with the production area being under a negative pressure. Recommendations are given to improve or institute local exhaust and general ventilation systems, and to provide workers with hand protection from fiber exposure.

II. DISTRIBUTION AND AVAILABILITY OF DETERMINATION REPORT

Copies of this Determination Report are currently available upon request from NIOSH, Division of Technical Services, Information Resources 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, Publications Office at the Cincinnati address.

Copies of this report have been sent to:

a) The Standard Products Company, Lexington, Kentucky
b) Authorized Representative of Employees - United Auto Workers (UAW) Local 1681, Lexington, Kentucky
c) International Union, UAW, Detroit, Michigan
d) U.S. Department of Labor - Region IV
e) Kentucky Department of Labor, Frankfort, Kentucky
f) NIOSH - Region IV

For the purpose of informing the approximately 130 "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 employees of the United Auto Workers - Local 1681 to evaluate employee exposures to air contaminants from a styrene-butadiene (SBR) rubber extrusion process. Although previous compliance visits by the Kentucky Department of Labor did not result in any health standard violations, at least one employee experienced respiratory problems while at work. A preliminary NIOSH Report (SHEFS I) was sent to the union and management representatives in November, 1977.

IV. HEALTH HAZARD EVALUATION

A. Conditions of Use

Standard Products is involved in the production of belt weather strips for the automotive industry. The raw material is either curing or non-curing styrene butadiene rubber (SBR), which goes through an extrusion process to form the product. The plant began production in 1952 and now employs approximately 140 production, 40 administrative, and eight maintenance personnel. Of the production workers, approximately 70 are male and 60 are female. There are three basic work shifts: 7am - 3:30pm, 3:30pm - 12:00am, and 11:00pm - 7:00am. The production area measures approximately 550 feet long by 80 feet wide by 18-20 feet high.

The uncured SBR rubber is used in two identical "rubber lines." Rubber in either pellet or strip form is emptied into a hopper, falls into a screw extruder where, under pressure, is heated to approximately 200^{o}F.

Steel strip is unwound from a coil and first passes through a roll form and then underneath the extruder head. The hot rubber (200°F) is applied to the steel strip here at a pressure ranging from 3000-5000 pounds per square inch. Next, the rubber-coated strip passes into a glue cabinet where an adhesive is applied to the top of the strip. Following this, the strip passes into a flock cabinet, where polyester flock that has been sifted falls onto the moving strip. The flock fibers are applied to the glue in a vertical position (to give them a nap appearance) by passing them into a 30,000 volt (A.C.) electrical field. The temperature of the strip is approximately 100-125°F here. The strip passes into the curing oven where the rubber is cured at temperatures ranging from 400-550°F. The oven's heating system is isolated, i.e., exterior air is brought in from the roof into the center of the oven line, heated, and blown toward both ends of the oven. Hot emissions are exhausted to an electrostatic precipitator on one end and directly to the outside atmosphere at the other. The ovens are lined with an insulating material containing asbestos, and are approximately 180-200 feet long. Approximately 5,000 cubic feet of air per minute (cfm) is supplied to each oven. The strips are finally pulled through a cooling cabinet into a cut off press. The strips are cut here to desired lengths and placed in bins. Each line is manned by four employees:

(1) extruder operator - maintains the rubber and coiled steel supply and supervises the extruder unit.

(2) flock operator - supervises glue and flock application, and empties flock dust collection bag.

(3) tail off operator - receives the cut rubber strips into plastic tubs

(4) relief operator - relieves other operators during their breaks. When not doing this, assists the tail off operator.

The extruder and flock operators may have potential exposures to extrusion emissions, adhesive components (n-butyl acetate, ethyl alcohol, phenolic resins) and flock fibers. The tail cut operator may have potential exposures to asbestos fibers which may flake off the oven linings, while the relief operator may be exposed to all of these materials.

Another process (tuber line) involves the extrusion of uncured SBR rubber (containing no accelerator) onto a metal strip. After passing through the extruder head, the strip passes into a cabinet where a nitrocellulose solution is applied to the underside of the strip via an atomizer. This coating prevents the strip from sticking to the rollers it passes around next. Finally, the flexible continuous strip is fed into a bin to await more processing. The line is manned by two employees:

(1) tuber operator - supervises extrusion process

(2) tuber tail off operator - coils the flexible stripping (tubing) into figure "8" patterns into a mobile bin while standing on an elevated platform.

The operators may be exposed to extrusion emissions and to vapor components of the nitrocellulose solution - acetone, isopropyl acetate, isopropyl alcohol, and "textile spirits" - a low flash petroleum naphtha.

A third process involves pulling a continuous rubber strip through a glue application by hand. A roll form operator will sit at a table performing this and has potential exposures to the vapor components of the adhesive: methyl ethyl ketone (MEK), toluene, and textile spirits.

Other areas of the plant include roll form, punch press, machine shop, and packaging. Stick welding is done approximately one hour per shift in an area of the machine shop. At other times the employee assigned there may repair machines.

B. Evaluation Methods

1. Environmental

Atmospheric samples for asbestos fibers were collected on Millipore* AA membrane filters with a 0.8 micron (u) pore size. The filters were encased in three piece cassettes with the face cap removed, and air was drawn through the filters at a flow rate of 1.5 liters per minute (lpm) using a battery-powered sampling pump. The pumps and samples were placed near the breathing zone of employees and in the general work area of the curing ovens. The filters were analyzed by phase contrast microscopy. A bulk sample of the oven insulation was examined microscopically by phase contrast, polarizing, and dispersion - staining techniques and then the percentage of asbestos was estimated.

Atmospheric samples for organic vapors of methyl ethyl ketone, toluene, acetone, isopropyl acetate, textile spirits (naphtha), and n-butyl acetate were collected on activated charcoal tubes. Air was drawn through the tubes at a flow rate of 50 cubic centimeters per minute (cc/min) using a battery powered sampling pump. All samples were analyzed by gas chromatography followed by desorption of the charcoal tubes by carbon disulfide. The analytical limit of detection was 0.01 milligrams per sample. Two bulk samples of adhesives and one of a nitrocellulose solution were analyzed for the percentage of benzene by gas chromatography.

Bulk samples of the SBR rubber (pellets and strips) were analyzed by thermogravimetric analysis (TGA) and organic volatiles by gas chromatography. After heating the sample(s) to temperatures likely to be encountered during the extrusion/curing processes, solid sorbent samples

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*Mention of commercial names or products does not constitute endorsement by the National Institute for Occupational Safety and Health.

were generated and volatiles analyzed by gas chromatography (GC). Numerous high boiling components were found in an ethyl acetate rinse from an oil condensate collected at the end of the heating oven tubing. Insignificant amounts of styrene or butadiene (major raw materials of the rubber) were found on generated charcoal tube samples. A series of unresolved peaks found in these samples was attributed to the naphthenic-based oil, a component of the rubber, and this was confirmed after matching with a standard. Besides the oil, two major peaks were detected in the ethyl acetate rinse solutions. These were identified as a phthalate, molecular weight (MW) of 390, such as a di (ethyl hexyl) phthalate, $C_{24}H_{38}O_4$. The second peak was tentatively identified as a substituted diphenylamine, M.W. 296, $C_{20}H_{28}N_2$, such as 4-(1,5 dimethyl hexyl amino) diphenyl amine. This would indicate that a possible breakdown and rearrangement occurred involving the N, N'-dioctyl-p-phenylene diamine, used as an antioxidant in the rubber (Table I). On another set of generated solid sorbent samples, two to three peaks were found. A $C_6H_{11}NCS$, M.W. 141 compound was tentatively identified; a trace of benzothiazole, M.W. 135, may have been present but could not be confirmed; the last peak was identified as 2,2,4 trimethyldihydro-quinoline, M.W. 173. A polyester flock fiber sample was analyzed by TGA also.

Results of the TGA for the SBR rubbers are illustrated in Table II. Only a two - three percent weight loss was observed for either pellet or strip form of the rubber up to 617° F (325°C). After heating the flock fibers up to 653°F, no observable weight loss was seen.

The oily substance, phthalate, and possible amine had the highest concentrations in the bulk rubber analysis. Atmospheric samples for the amine and oil were collected on glass fiber filters enclosed in three piece plastic cassettes with the face cap on and the small plug removed. Breathing zone samples were collected and air was drawn through the filters at a flow rate of 1.5 lpm. Air samples for lead (from lead octoate in the MC89 adhesive) were also collected on two glass fiber filters. The analytical limit of detection was 4.5 micrograms of lead per filter. Atmospheric samples for the phthalate, and M.W. 135, 141, and 173 compounds were collected on Florisil tubes. Breathing zone samples were collected and air was drawn through the filters at a flow rate of 50 ml/min. A bulk sample of the adhesive used on the rubber lines was analyzed for organic composition (Table 7).

The filters, Florisil tubes, and bulk adhesive were analyzed by gas chromatography and/or mass spectrometry.

Direct measurements of carbon monoxide and ozone were taken using a hand held pump and length of stain indicator tubes.

Air velocity measurements were taken using a thermoanemometer.

2. Medical

The NIOSH physician reviewed the 30 health questionnaires received from the union representative. They had been freely completed by employees of Standard Products Company during the initial survey.

Eleven workers reported that they had no complaints of ill-health related to the working environment. Of the remaining 19 workers, the preponderance of complaints related to the respiratory system, with accompanying irritation of the eyes and/or mouth and throat. Five of these workers also complained of skin problems, and four others of symptoms referable to the central nervous system, variously described as "high", "woozy" or "dizzy".

Medical examination of these employees was thus indicated, and, accordingly, the medical officer visited the plant on February 28 and March 1, 1978. Of the 19 workers reporting adverse health effects, two were absent on these days. The remainder were interviewed, as were an additional four workers who had not completed the health questionnaire. Where indicated, a brief physical examination was performed.

C. Evaluation Criteria

1. Toxic Effects

Only substances whose atmospheric concentrations exceeded the evaluation criteria will be discussed here.

Petroleum naphtha - Petroleum naphtha is a liquid mixture of paraffin hydrocarbons, n-hexane, n-heptane, and n-octane, used in this plant in a tape-gluing operation.

Pharmacologically, these hydrocarbons can be grouped with the general anesthetics in the large class known as central nervous system depressants, if present in the environment in sufficiently high concentration.

In concentrations above the TLV, symptoms such as light-headedness and dizziness could well be noted.

The vapors of these hydrocarbons are mildly irritating to mucous membranes. They are fat solvents and primary skin irritants. Repeated or prolonged skin contact will dry and de-fat the skin resulting in dermatitis.

Direct contact of liquid hydrocarbons with lung tissue (aspiration) will result in chemical inflammation of the lungs.

2. Environmental Criteria

Airborne exposure limits for the protection of the health of workers have been recommended or promulgated by several sources. These limits are established at levels designed to protect workers occupationally exposed to a substance on an 8-hour per day, 40-hour per week basis over a normal working lifetime. For this investigation, the criteria used to assess the degree of health hazards to workers were selected from three sources:

1. NIOSH: Criteria for a Recommended Standard....Occupational Exposure to various substances.

2. Threshold Limit Values (TLV): Guidelines for Airborne Exposures to Chemical Substances and Physical Agents Recommended by the American Conference of Governmental Industrial Hygienists (ACGIH) for 1977.

3. OHSA Standard: The air contaminant standards enforced by the U.S. Department of Labor - Occupational Safety and Health Administration - as found in the Federal Register - 29 CFR 1910.1000 (Tables Z-1, Z-2).

Whenever possible, the NIOSH recommended standard will be the environmental standard applied since it represents the most recent knowledge concerning a substance. If one does not exist, the next most stringent recommended or legal standard will be used.

	SOURCE		
Substance	NIOSH	TLV -	OSHA
Asbestos	0.1 fibers/cc &* (0.5 fibers/cc)	5 fibers/cc	0.5 fibers/cc(proposed)
n-butyl acetate	--	150 ppm	150 ppm
Acetone	--	1000 ppm	1000 ppm
Isopropyl acetate	--	250 ppm	250 ppm
Methyl ethyl ketone	--	200 ppm	200 ppm
Toluene	100 ppm	100 ppm	200 ppm
Petroleum naphtha	350 mg/M^3	--	2000 mg/M^3
Carbon Monoxide	35 ppm	50 ppm	50 ppm
Lead	0.1 mg/M^3	0.15 mg/M^3	0.1 mg/M^3(proposed)

*Concentrations, in parts of substance per million parts of air (ppm), fibers per cubic centimeter (fibers/cc), or milligrams of substance per cubic meter of air (mg/M^3), are based on a time-weighted average exposure (TWA) of up to 10 hours. Values in parentheses represent concentrations which should not be exceeded even instantaneously as commonly measured in a 15-minute period.

D. Evaluation Results and Discussion

1. Environmental

The results of all atmospheric sampling are illustrated in Tables 3, 4, 5, and 6. Personal samples taken in Rubber Lines 1 and/or 2 during SBR pellet or sheet extrusion did not result in detection of any rubber breakdown products (Table 3). These would include the naphthenic-based oil, phthalate, and possible amine (Table 1) for which samples were obtained.

Atmospheric samples for asbestos fibers (ranging from non-detectable to 0.02 fibers per cubic centimeter (fibers/cc)) and for n-butyl acetate (ranging from non-detectable to 5 parts of vapor per million parts of air (ppm) were both below the most restrictive evaluation criteria of 0.1 fibers of asbestos/cc and 150 ppm of n-butyl acetate. Lead could not be detected in two samples.

Personal samples in the Tuber Line ranged from 2 ppm to 68 ppm of acetone, 0.3 ppm to 1 ppm of isopropyl acetate, and 61 milligrams per cubic meter (mg/M^3) to 321 mg/M^3 petroleum naphtha (Table 4). None of the samples exceeded the most restrictive evaluation criteria of 1000 ppm for acetone, 250 ppm for isopropyl acetate, and 350 mg/M^3 for petroleum naphtha. The Tuber Tail off operator normally stands on top of the tuber truck and makes a "Figure 8" pattern of the tape. The hot tape gives off an acrid odor in the employee's breathing zone. A fan suspended from the ceiling behind the truck blows contaminated air from the truck in warm weather. However, in cold weather the draft on the employee is unpleasant. If the operator would become dizzy or unconscious from breathing vapors, the fall might be injurious.

Personal samples in the Roll Form area during the tape gluing ranged from 6 ppm to 21 ppm of toluene, and 186 mg/M^3 to 524 mg/M^3 of petroleum naphtha (Table 5). These samples are below the most restrictive evaluation criteria of 100 ppm for toluene and 200 ppm for methyl ethyl ketone. However, on February 28, 1978, the roll form operator was exposed to concentrations of 534 and 442 mg/M^3 of petroleum naphtha, or an 8-hour time-weighted average concentration of approximately 410 mg/M^3 of petroleum naphtha. This exceeds the NIOSH recommended standard of 350 mg/M^3 of petroleum naphtha. On March 1, 1978, the average concentration to which the operator was exposed - 186 mg/M^3 - was within permissible levels. The operator sits a few feet from the adhesive source and there is no local exhaust ventilation to capture organic vapors. Since the survey, ventilation has been installed in this area.

Direct reading measurements of carbon monoxide (CO) and ozone (O_3) are illustrated in Table 6. One ozone measurement was non-detectable. Carbon monoxide measurements along the rubber lines ranged from 10-33 ppm, concentrations at or below the most restrictive evaluation criteria of 35 ppm. The highest concentrations were found near the gas-fired curing ovens and near the tail cut operator's working area. This could be possibly due to back drafting of CO from the furnaces due to the negative pressure conditions observed in the plant.

None of the adhesives in use in the Rubber Lines, Tuber Line, or Roll Form area were found to contain any benzene.

In the production area, natural ventilation occurs through structural cracks, loose seals, and opened doors. There are six ceiling exhaust fans placed between the two rubber lines, each exhausting about 4,000 cfm.

Along the one rubber line there are five wall fans which are boarded up currently. In the center of the roof, there are three - four ceiling fans which usually supply air to the production areas during the summer months but which were closed off during the February survey date. These also supply about 4,000 cfm.

The building housing all production of belt weather stripping is currently under a negative pressure. This is due to the operation of several exhaust fans and the lack of supply air except that entering through opened doors, cracks, etc. Whenever doors are opened to the building, the incoming rush of air is very noticeable. Another effect of this condition can be observed in the local exhaust hood for the spraying operation in the Tuber Line. When the exhaust fan is on, air is exhausted through ductwork to a roof stack as expected. However, when the fan is turned off, air from the roof sweeps down the ductwork into the hood. This condition was indicated by smoke tube measurements. Another observation may also indicate this condition: near the cooling cabinet of Rubber Line #1, dust was seen coming in from around a window on the side wall. Using smoke tubes, it appeared that emissions from the roof may have been pulled into the space between the double walls and then admitted to the interior. Finally, it was observed that the cabinet which contains the collection bag for excess flock fibers was at a positive pressure with respect to the room air. The positive pressure may be caused by an insufficient exhaust fan of the excess fiber collection system and/or the building's negative pressure.

Local exhaust ventilation is used by sections of both rubber lines and the tuber line. In each rubber line, a canopy hood measuring 14 inches wide, 6 inches deep is positioned 2 1/2 inches over the moving strip line between the extruder head and glue cabinet. Ventilation measurements were taken at the bottom edge of the hood during the survey. Velocities ranged from 10 - 400 feet per minute (fpm) along the section. Another section of hood is positioned above the line between the flock cabinet and the curing oven entrance. Velocity measurements here ranged from 10 - 60 fpm. The glue cabinet is equipped with a downdraft exhaust hood that collects vapors and particulates as they are sprayed with the adhesive from an atomizer above the strip. Particulate emissions are captured in a filter and vapors are emitted to a roof exhaust. Emissions from the flock cabinet are sent into a cyclone dust collector. The dust falls into bags which are replaced when full by the flock operator. The tuber line is equipped with local exhaust ventilation to capture vapors and particulates from the nitrocellulose solution spraying. The atomizer sprays the strip in a partially enclosed booth open at its bottom. Vapors are exhausted through ductwork to the roof.

A survey was made on the roof to evaluate the relative locations of exhaust and supply air ducts. Exhaust stacks for the rubber lines are located on the western side of the dome-shaped roof. On the center of the roof, a series of fans are located which normally supply air in the warm months. None of the exhaust stacks are any taller than the supply air inlets; one stack was broken in two and was lying on the roof. Since the normal

direction of wind flow is from west to east, it is possible that exhausted air may be readmitted to the building via the center roof fans when they are used. It is possible then to readmit contaminated air to different areas of the building given certain atmospheric conditions.

Drums of solvents are kept in a storage room for use in the Rubber and Tuber Lines, Roll Form area, and other areas of the building. One employee usually works four to five days per month at "reclaiming" used solvent. This involves transferring a solvent from one drum to another through a filter. It was observed that one stored drum was uncovered and had a few soiled rags immersed in the liquid. The rags could ignite spontaneously and cause an explosion. This room had no eyewash bottles or fire extinguisher. There is a wall exhaust fan.

The polyester fiber flock was observed to be on beams and other surfaces around the production area, indicating the need for better containment.

2. Medical

Of the five workers complaining of dermatitis, all gave histories of skin allergies to substances other than those encountered at work. Four currently exhibited eczematous lesions, consistent with contact dermatitis, on their hands, and in two cases also on their legs and feet. They all stated that this health problem was aggravated by contact with the flock, and one worker had a positive skin test to this substance. The fifth worker had skin problems at work only when employed on the flocking machine. All these workers also complained of lung problems, variously categorized as wheezing, tightness of chest, difficulty in breathing and coughing, sometimes associated with mucous membrane irritation.

Eight other employees complained of similar respiratory problems, and three of them incriminated flock exposure. However, only four men stated that they were suffering from these adverse health effects during the visit. Brief chest examinations were carried out on these men and asthma was diagnosed in three of them. The severity of their symptoms and signs increased over the work-shift. The personal physician treating two of these men confirmed that they were asthmatics whose respiratory problems were aggravated by work-exposure(s).

Six workers complained solely of mucous membrane irritation, and three of them stated that it was due to flock exposure.

One man exhibited a marked conjunctivitis, which he said cleared when not at work.

There were no complaints of symptoms referable to the central nervous system during the visit.

Of the many chemicals and agents in use in this plant, it would appear that flock-exposure is incriminated in the causation of the health hazards reported, with the exception of symptoms referable to the central nervous system. This substance is certainly an irritant. It may be a weak sensitizer as, although it has been in use for 10-11 years, most health problems have only developed within the past 6 years. No significant change of process, and/or materials occurred during the latter period.

When the ventilatory changes recommended in this report have been made, and good housekeeping instituted, flock-exposure should be minimized, and any currently existing health problems should remit. If, after an appropriate period of time, workers are still experiencing symptoms, then a further medical evaluation would be indicated. This could include spirometry and/or patch-testing.

V. RECOMMENDATIONS

1. Environmental

a. The air supply to the building should be increased to match the amount exhausted to (1) improve the efficiency of local exhaust systems, (2) eliminate cross drafts which may move contaminated air around a building, (3) prevent "back-drafting" of natural draft stacks.[1]

b. It is recommended that the exhaust stacks be elevated to conform with a design such as that illustrated in Figure 12.[1] This is to prevent the possible reentry of contaminated air due to building turbulence. Smoke candles can be used to determine actual air flow patterns over the roof.

c. Local exhaust ventilation should be considered for the tape gluing operation in the Roll Form Department. To control employee exposures to solvent vapors, a canopy hood could be placed over the glue applicator. To capture the vapors effectively, a velocity of 50-100 fpm is recommended at their generation point.

d. When hot Tuber tape is being fed into the mobile truck, general mechanical ventilation should be provided to control the tail off operator's exposure to organic vapors. In cold weather, heated air would be desirable so as not to cause discomfort to the operator.

e. An eyewash station and proper fire extinguisher should be installed in the solvent storage/reclaim room. Employees should wear eye protection when working in there. All drums should be covered when not in use. The storage room should be provided with at least six "air changes per hour."

f. It is recommended that a noise survey be conducted at two machines in the Roll Form Department and the cut-off presses in the Rubber lines. Machines RF 91 and 92 create impact and continuous noise, respectively,

and may be producing noise above acceptable levels. When it is found that employees are subjected to unacceptable noise levels, feasible administrative or engineering controls should be used. If controls fail in their purpose, personal protective equipment should be issued to, and worn by, workers in those areas.

g. Keep all curing oven covers in good condition to prohibit emissions into the general plant atmosphere.

h. The acetone storage can and metal cutting saw at the rubber line inspector's station should not be located as close together as they are presently. To prevent an explosion/fire hazard, the acetone can should be removed at least five to ten feet from the saw during cutting of the metal strip.

i. It is recommended that the company acquire a consultant with expertise in industrial/environmental ventilation.

2. Medical

a. Until the requisite ventilation changes have been made, single use, disposable respirators for protection against dusts should be afforded to, and worn by, all workers complaining of respiratory problems. These dust masks should be NIOSH-certified and be chosen on the basis of producing the least resistance to breathing. It should be noted that certain single use masks offer more resistance than some reusable masks.

b. Supply bland ointment in the women's rest room for them to apply to their hands, and exposed skin of arms prior to commencement of work, and after washing their hands. This will aid in preventing the penetration of skin by the flock fibers.

c. Supply impervious gloves to workers experiencing hand problems from the flock. These gloves must be maintained in a clean and satisfactory condition.

d. Supply loosely-fitting plastic boots to the workers with dermatitis on their legs and/or feet.

e. Employees in the Rubber Lines and Roll Form area exposed to potentially high noise levels should be audiometrically tested.

VI. REFERENCES

1. Industrial Ventilation - A manual of recommended practice, 13th ed., American Conference of Governmental Industrial Hygienists, Lansing, Michigan, 1974.

2. Patty, F.: Industrial Hygiene and Toxicology, Vol. II, 2nd Revised Ed.

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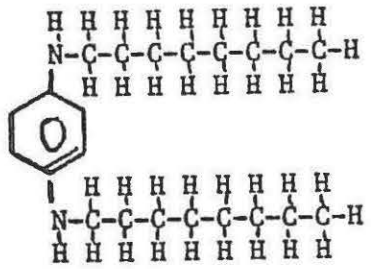
Table 1

Structural Formula of Antioxidant and Possible Breakdown Product

Standard Products Company
Lexington, Kentucky

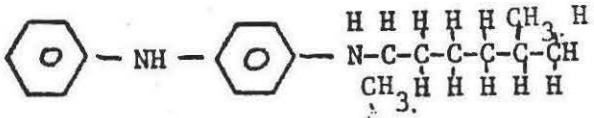
February 28, 1978

N,N'-dioctyl-p-phenylene diamine



$C_{22}H_{40}N_2$
M.W. 332

4 - (1,5 dimethyl hexyl amino) diphenyl amine



$C_{20}H_{28}N_2$
M.W. 296

Table 2

Results of Thermogravimetric Analysis

Standard Products Company
Lexington, Kentucky

February 28, 1978

TGA RESULTS

Sample	Lab. No.	Wt.	Temp. Range	% Wt. Loss
Tube	91718	88 mg	260°-355°C(500-635°F)	2.27
			335°-370°C	0
			370°-490°C	46.6
			490°-950°C	37.5
			Total Wt. Loss = 86.4%	
			(Sample still losing weight at 950°).	
			Wt Loss from RT to 260°C = 1.13% (500°F)	
			Weight loss begins at ca. 110°C (230°F)	
Sheet	91719	80 mg	270° -325°C(518-617°F)	2.5
			325° -370°C	0.1
			370° -460°C	43.8
			460° -950°C	43.1
			Total Wt. Loss = 89.5%	
			Wt Loss from RT to 270°C = 1.25% (518°F)	
			Weight loss begins at ca. 170°C(338°F)	

Table 3

Results of Air Sampling for Various Air Contaminants

Standard Products Company
Lexington, Kentucky
February 28 - March 1, 1978

Date	Job Title	Sample Number	Type[1] Sample	Sampling Period (hrs/min)	Concentration: SBR Breakdown Products	Concentration: n-butyl-acetate (ppm)[2]	Concentration: Asbestos (fibers/cc)[3]	Concentration: Lead[5] mg/M3
2/28	Line #1 Extruder Operator	FT1	P	7/20	N.D.[4]			
	Line #1 Extruder Operator	GF3	P	7/25	N.D.			
3/1	Line #1 Extruder Operator	GF5	P	6/25	N.D.			N.D.
	Line #2 Extruder Operator	GF7	P	7/20	N.D.			N.D.
2/28	Line #1 Flock Operator	CT1	P	6/25		3		
3/1	Line #1 Flock Operator	CT51	P	4/16		5		
	Line #1 Flock Operator	FT51	P	3/0	N.D.	N.D.		
3/1	Line #2 Flock Operator	CT50	P	4/09		2		
	Line #2 Flock Operator	FT50	P	3/0	N.D.	N.D.		
2/28	Line #1 Tail Cut Operator	GF1	P	7/20	N.D.			
3/1	Line #1 Tail Cut Operator	AA2	P	7/17			0.01	
3/1	Line #1 Tail Cut Operator	GF8	P	7/30	N.D.			
3/1	Line #2 Tail Cut Operator	GF6	P	7/15	N.D.			
2/28	Line #1 Relief Operator	GF2	P	7/20	N.D.			
3/1	Line #1 Relief Operator	AA1	P	7/15			0.01	
	Line #1 Relief Operator	AA159	P	7/30			N.D.	
2/28	Line #1 Curing Oven, near Packing Department	AA3	A	6/30			N.D.	
	Line #1 Curing Oven, near Fire Door	AA4	A	6/30			N.D.	
3/1	Line #1 Curing Oven, near Packing Department	AA158	A	7/15			0.01	
	Line #1 Curing Oven, near Fire Door	AA161	A	7/0			N.D.	
3/1	Line #2 Relief Operator	AA157	P	6/15			0.02	

1 - P = Personal; A = Area
2 - ppm = parts of n-butylacetate per million parts of air
3 - fibers/cc = fibers of asbestos per cubic centimeter of air
4 - N.D. - None detectable
5 - mg/M3 = milligrams of lead per cubic meter of air

Hygienic Standards				
OSHA	-	150 ppm	2 fibers/cc & (10 fibers/cc)	0.2
TLV	-	150 ppm	5 fibers/cc	0.15
NIOSH	-	--	0.1 fibers/cc & (0.5 fibers/cc)	0.1

Table 4

Results of Personal Air Sampling for Organic Vapors

Standard Products Company
Lexington, Kentucky

February 28 - March 1, 1978

Date	Job Title	Sample Number	Sampling Period	Concentration		
				Acetone	Isopropyl Acetate	Textile Spirits (Petroleum Naphtha)
2/28	Tuber Operator	CT2	3/40	11 ppm[1]	0.7 ppm	103 mg/M^3[2]
2/28	Tuber Operator	CT12	*	--	--	--
3/1	Tuber Operator	CT5	7/0	18 ppm	1 ppm	270 mg/M^3
2/28	Tuber Tail Off Operator	CT3	3/40	2 ppm	0.3 ppm	61 mg/M^3
2/28	Tuber Tail Off Operator	CT6	3/05	68 ppm	1 ppm	321 mg/M^3
3/1	Tuber Tail Off Operator	CT13	7/30	24 ppm	1 ppm	301 mg/M^3

* Sample media broke
1 - ppm = parts of vapor per million parts of air
2 - mg/M^3 = milligrams of substance per cubic meter of air

Hygienic Standards

OSHA	--	250 ppm	2000 mg/M^3
TLV	1000 ppm	250 ppm	--
NIOSH	1000 ppm	--	350 mg/M^3

Table 5

Results of Personal Air Sampling for Organic Vapors

Standard Products Company
Lexington, Kentucky

February 28 - March 1, 1978

Date	Job Title	Sample Number	Sampling Period	Concentration		
				Methyl Ethyl Ketone	Toluene	Textile Spirits (Petroleum Naphtha)
2/28	Roll Form Operator	CT4	3/35	21 ppm[1]	20 ppm	534 mg/M3[2]
2/28	Roll Form Operator	CT7	3/05	18 ppm	15 ppm	442 mg/M^3
3/1	Roll Form Operator	CT52	7/0	6 ppm	5 ppm	186 mg/M^3
Hygienic Standards						
OSHA				200 ppm	200 ppm	2000 mg/M^3
TLV				200 ppm	100 ppm	--
NIOSH				--	100 ppm	350 mg/M^3

1 - ppm = parts of vapor per million parts of air

2 - mg/M^3 = milligrams of substance per cubic meter of air

Table 6

Results of Air Sampling using Direct Reading Indicator Tubes

Standard Products Company
Lexington, Kentucky

February 28 - March 1, 1978

Date	Location	Time	Type Sample[1]	Concentration (ppm)[2] Carbon Monoxide	Ozone
2/28	Line #1 Extruder Operator	4:00pm	P	10	
3/1	Line #1 Extruder Operator	10:30am	P	10	
3/1	Line #2 Extruder Operator	11:15am	P	25	
2/28	Line #1 Near Flock Cabinet	11:00am	A		N.D.[3]
2/28	Line #1 Near Spare Parts Cabinet	10:50am	A	10	
3/1	Line #2 Between Extruder & Glue Cabinet	9:20am	A	30	
3/1	Between Lines 1 and 2 at Curing Ovens (adj. to packing area)	8:55am	A	35	
3/1	Between Lines 1 and 2 at Cooling Cabinet	9:05am	A	30	
3/1	Between Lines 1 and 2 at Cooling Cabinet	11:00am	A	15	
2/28	Line #1 Tail Cut Operator	11:10am	P	25-30	
2/28	Line #1 Tail Cut operator	4:15pm	P	20	
2/28	Roll Form Machine #92	10:45am	A	20	

1 - P = Personal: A = Area
2 - ppm = Parts of gas per million parts of air
3 - N.D. = Non detectable

Hygienic Standards:

OSHA	50	0.1
TLV	50	0.1

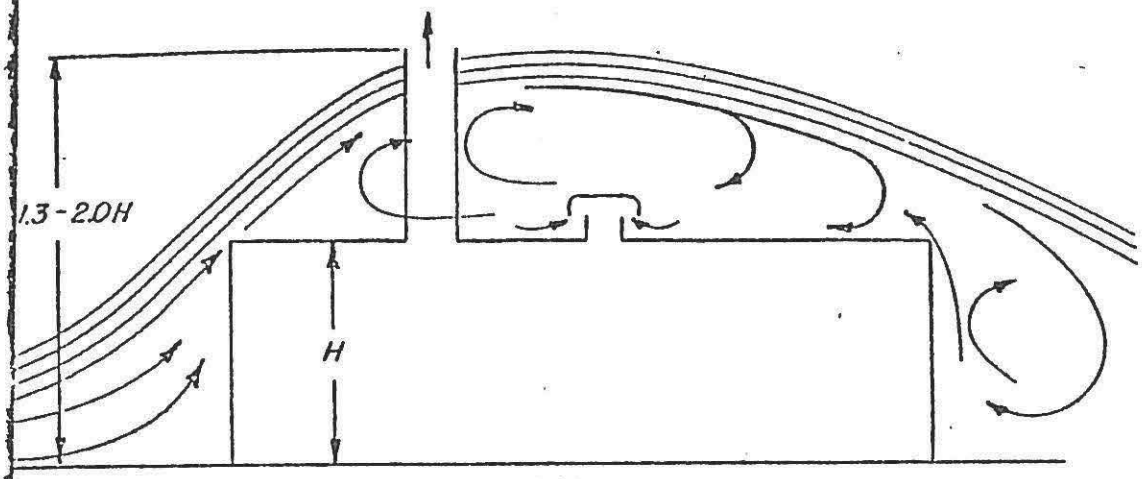
Table 7

Bulk Analysis of MC 89 Adhesive

Standard Products Company
Lexington, Kentucky

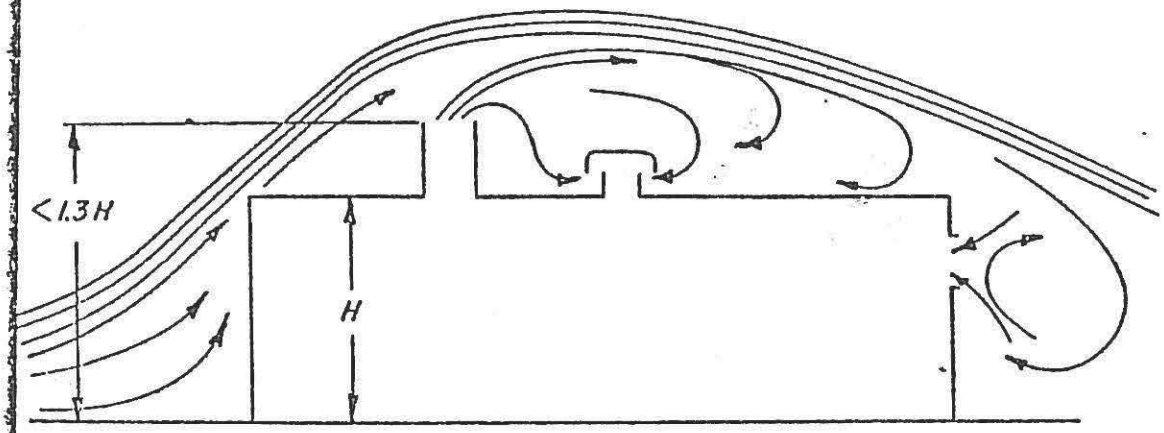
February 28 - March 1, 1978

Compound	Approximate % by Weight
N-butyl Acetate	24
Ethyl Alcohol	5
Chlorobenzene	1
Phenol	5
Xylene	5



GOOD

High discharge stack relative to building height, air inlet on roof.



POOR

Low discharge stack relative to building height, air inlet on roof and wall.

AMERICAN CONFERENCE OF
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BUILDING AIR INLETS AND OUTLETS

DATE 1-66 | Fig. 6-23

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