U.S. DEPARTMENT OF HEALTH AND HUMAN SERVICES
CENTER FOR DISEASE CONTROL
NATIONAL INSTITUTE FOR OCCUPATIONAL SAFETY AND HEALTH
CINCINNATI, OHIO

HEALTH HAZARD EVALUATION DETERMINATION REPORT
HE 80-2-727

CONTINENTAL PLASTIC CONTAINERS
SPRINGDALE, OHIO

August 1980

I. SUMMARY

The National Institute for Occupational Safety and Health (NIOSH) received a request on October 15, 1979 from the president of Local 127 - Glass Bottle Blowers Association (GBBA) to identify and evaluate irritant chemical exposures occurring in the Orbet Module area of Continental Plastic Containers (SIC 3070), Springdale, Ohio.

An evaluation of all the raw materials used in the process was conducted to identify potential irritants initially present as well as sampling in the production area for irritants generated during the process itself. Bulk samples of the polypropylene and high temperature synthetic lubricant, both used in the module ovens, were analyzed for release of irritant chemicals at operating temperatures. Area sampling for acetaldehyde, butyraldehyde, formaldehyde, propionaldehyde, valeraldehyde, aromatic amines (aniline), and phenol was conducted above the module oven lids where maximum concentrations were expected. Environmental samples indicated only formaldehyde to be present, in concentrations ranging from 0.72 - 0.90 mg/M^3 measured over an eight hour shift. None of the environmental values exceeded applicable evaluation criteria. Accumulations of silicone on discharge chutes indicated potential exposure to silicone mist during module operation. Toxicity data on the silicones indicated that they can cause transient eye irritation in the liquid state but do not produce any chronic health effects.

Medical questionnaires were completed for 17 employees during the initial survey. About 70 people were identified as working in the Orbet Module area. Medical questionnaire work indicated that eye irritation was the major complaint (94% of those interviewed). Some minor upper respiratory irritation was also noted (65%).

On the basis of the data obtained in this investigation, NIOSH determined that the only airborne irritant detected, formaldehyde, was present in concentrations below applicable criteria. A silicone mold release agent, released as a mist at the exit chute of the modules may be responsible for the eye irritation of the operators in the immediate vicinity. Other than the transient episodes of eye ittitation, there was no evidence of exposure to any substance(s) known to cause either acute or chronic health effects. Recommendations to reduce exposures to the silicone mist are presented on page 9 .

II. INTRODUCTION

On October 15, 1979, the Hazard Evaluations and Technical Assistance Branch of NIOSH received a request* for a Health Hazard Evaluation from the president of Local 127 - Glass Bottle Blowers Association to be conducted at Continential Plastic Containers (SIC 3070), Springdale, Ohio. The purpose of the investigation was to identify and evaluate irritant chemical exposures of unknown origin in the Orbet Module section of the plant. The investigation was limited to the Orbet and pipeline areas, focusing on the raw materials used and their release of chemical vapors at process temperatures. On November 8, 1979 an initial walk-through survey including industrial hygiene and medical was conducted. Followup industrial hygiene surveys were conducted March 30 and April 7, 1980. Lab analyses of bulk samples had been completed prior to each followup survey and were used to direct sampling efforts.

III. BACKGROUND

A. Company Background

Continental Plastic Containers, Springdale, Ohio, is a division of the Continental Container Corporation and produces a variety of custom plastic containers for the food and household cleaning product industry. The Springdale, Ohio facility is 18 years old. The Orbet Process, a blow molding process using polypropylene, was installed in 1975. It was at this time the problems of eye and upper respiratory irritation reportedly began. Two previous investigations of this problem were conducted by private consulting firms at the company's request. Both recommended the installation of a local exhaust system above the oven lid after detecting small amounts of total aldehydes, evaluated as formaldehyde, present in the Orbet area. No local exhaust system has yet been installed and plans to do so are doubtful. The plant operates three eight-hour shifts per day, five days a week. The work force is fairly stable, with most people averaging between 5 and 15 years with the company. The Orbet area is run by a 22 member crew on each shift. This includes module operators (1 for each 2 machines), a maintainer (to do trouble-shooting), packers, and supply personnel.

B. Process Description

Orbet Parison Production: Polypropylene in pellet form is mixed with reground scrap and conveyed by a pneumatic system to a hopper above a single screw extruder. The extruder, through the input of mechanical and thermal energy, melts and mixes the plastic and forces it through a die forming a hollow, molten plastic tube. A small stream of silicone emulsion is poured onto this tube as it is drawn through a sizing sleeve. The tube is then chilled as it passes through a series of water filled cooling tanks. The solidified tube then passes through a puller to a cutter and is cut to the appropriate length. These tube pieces (called parisons) are stored in large steel containers until needed.

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*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 and Human Services, 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 raw materials used for parison production are virgin and regrind polypropylene and an anionic silicone emulsion (Dow Corning HV-490*).

Orbet Bottle Process: Parisons are pushed, end-to-end, from a feed hopper through a tube to a gravity feeder where they are dropped onto vertically projecting pins which are part of a continuously moving carrier chain. The carrier chain conveys the parisons through the electrically fired conditioning oven as their temperature is raised to orientation temperature (orientation temperature is that temperature at which the molecular structure is still crystalline but the plastic is pliable so it may be molded). This heating process takes 45 minutes for the two head modules and 23 minutes for the three head modules.

At the oven exit the parisous are removed vertically from the carrier chain by picker fingers, transported horizontally to the molding station and with a downward vertical motion placed into the molding station. Prior to insertion of each set of parisons the molds are sprayed automatically with a dimethyl siloxane polymer used to ensure proper mold release. In the molding station a mandrel (inside metal collar) rises into the interior of the parison as a pair of thread forming dies compress the lower end of the parison against the mandrel. This action forms the completed bottle neck and anchors the parison. The picker finger rise rapidly, stretching the parison, and the mold halves close on the stretched parisons. Air is blown through the mandrel into the parison conforming the plastic to the shape of the molds. The plastic is cooled in the molds, the molds and dies open, and the bottle is ejected from the machine by a pulse of air.

The bottles are conveyed from the module by a chute to a conveyor belt and over to a packing area where they are flame treated and boxed. Flame treatment involves passing bottles through a gas flame which oxidizes the bottle surface, allowing it to accept inks and label glues.

Raw materials used in the Orbet Process are polypropylene parisons and a dimethylsiloxane polymer (Dow Corning 200 Fluid*). The possibility of combustion products from bottle jams during flame treatment also exists.

IV. METHODS AND MATERIALS

A. Environmental

The evaluation of thermal decomposition products from the materials used in the Orbet modules was obtained from bulk sample, indicator tube, and area air sample analyses. Bulk samples were analyzed for decomposition products at operating temperatures. Area samples in the module area were taken on the traverse assembly, located about two feet above the oven and between the oven lid and chain entry port. These two openings to the oven appeared to be the major release points of any vapors occurring in the ovens. One set of samples was taken on the far side of the plant, opposite the Orbet side and blanks were submitted with all air samples. All air samples were run for a full workshift.

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*Mention of company name or product does not constitute endorsement by the National Institute for Occupational Safety and Health.

1. Bulk Samples

Polypropylene: A polypropylene tube (parison) used in the modules was submitted for thermogravimetric and gas chromatography/mass spectroscopy (GC/MS) analysis. Thermogravimetric analysis (TGA) was conducted on a 90 milligram (mg) sample placed in the furnace of a Mettler TA-1 Thermoanalyzer*. The furnace was heated from 15-600^{0}C (60 - 1112^{0}F) at a rate of 10^0/min.

Gas chromatography/mass spectroscopy analysis provided a qualitative analysis of decomposition products released when the plastic was heated to 149-154^{0}C (300-310^{0}F). Portions of the tubing were cut up, put into sealed vials, and then placed in a hot wax bath heated to approximately 150-160^{0}C (302-320^{0}F). Vapors generated in the vials were sampled with a gas tight syringe and injected into the GC/MS system for analysis using SP2100 columns.

High-Temperature Synthetic Chain Lubricant: A bulk oil sample, DuBois CDL-2848*, was analyzed qualitatively by GC/MS for vapors produced at oven temperatures of 170-182^{0}C (340-360^{0}F). Portions of the oil were put into sealed vials and heated for several hours in a hot wax bath at 180^{0}C (356^{0}F). Air samples withdrawn from the vials with a gas tight syringe were injected into a gas chromatograph (GC) and GC/MS system for analysis. A SP2100 column was used for all analyses. A GC analysis of the oil bulk itself as well as an infrared (IR) scan, was done to determine major oil components.

2. Area Air Samples

Indicator Tubes: Draeger* indicator tubes for phenol and acetaldehyde and a Draeger hand pump were used as screening devices in the Orbet area of the plant. Samples were taken at the oven lids where maximum concentrations of vapors would be expected to escape as the lid opened. Indicator tubes were also used to sample a plume on the pipeline at the point of silicone lubricant application.

Aromatic Amines (analyzed as aniline): Standard silica gel tubes connected to low flow sampling pumps calibrated at a flow rate of 200 cubic centimeters (cc)/min were used for collecting aromatic amines. The samples were analyzed by GC according to NIOSH Method P&CAM 168. The limit of detection was 0.01 mg per sample.

Acetaldehyde, Propionaldehyde, n-Butyraldehyde, and n-Valeraldehyde: Acetaldehyde and several other low molecular weight aldehydes were sampled for by using a midget impinger containing 15 milliliters (ml) of sodium bisulfate solution connected to a pump calibrated at a flow rate of one liter/min (lpm). The impinger solutions were analyzed for the above aldehydes using a Hewlett-Packard 5731A GC* equipped with a flame ionization detector. The limit of detection was 0.03 mg/ml for acetaldehyde, propionaldehyde, butyraldehyde and valeraldehyde.

Formaldehyde: Samples for formaldehyde were collected on solid sorbent tubes containing impregnated charcoal and connected to a low flow sampling pump calibrated at a flow rate of 50 cc/min. The impregnated charcoal converts formaldehyde to formic acid. Each section of charcoal was analyzed by ion chromatography for formic acid using a new NIOSH method for formaldehyde collection and analysis (see Kim et. al. AIHAJ #5, 1980). Fifteen micrograms (ug) of formaldehyde was the reported limit of detection.

B. Medical

Medical interviews were conducted during the initial survey. Seventeen individuals from the Orbit area were interviewed with questions asked in both an indirect as well as a direct manner. Initially each worker was asked if they had any current work related health problems. If they did, the next question asked for identification of the problems followed by a number of specific questions concerning involvement of the skin, eyes, nose and throat and lungs.

V. ENVIRONMENTAL EVALUATION CRITERIA

The criteria used to evaluate the potential hazards associated with toxic substances found in the employees' work environment are obtained from three major sources: NIOSH Recommended Occupational Health Standards; the Occupational Health Standards as promulgated by the U.S. Department of Labor; and the Threshold Limit Values (TLV's) of the American Conference of Governmental Industrial Hygienists (ACGIH). Other sources are used in addition to those mentioned, when appropriate.

The values for each contaminant are designed to permit an occupational exposure over an 8 to 10-hour workday, 40-hour work week, throughout an individual's normal worklife without adverse health effects. These exposure limits have been derived from existing human and animal data and industrial experience. Because of wide variations in individual susceptibility, a small percentage of workers may experience discomfort from some substances at or below the applicable criteria. For some contaminants a Time-Weighted Average (TWA) is inappropriate due to irritant or toxic properties of the material. Consequently a Ceiling Value is applied which must not be exceeded even briefly. Contributions to the overall exposure by the cutaneous (skin absorption) route are not included in the criteria, zero cutaneous conbribution being assumed.

Chemical contaminants sampled for in the module area and for which evaluation criteria exist are presented in Table I. The table includes a brief notation of potential health effects resulting from the exposure to each compound listed. No NIOSH, OSHA or TLVs were found for butyraldehyde or propionaldehyde (both low molecular weight aldehydes). Aromatic amines were analyzed for aniline and compared to the aniline standard.

All of the compounds sampled are generally considered to have irritant properties. Existing occupational standards for these compounds have been set at levels generally considered sufficiently low to prevent the general working population from experiencing eye and mucous membrane irritation. The exception is the value for aniline, which has been set at a level intended to prevent formation of methemoglobinemia - a disorder which reduces the oxygen carrying capacity of the blood.

VI. RESULTS

A. Bulk Samples

Polypropylene: The TGA of a polypropylene bulk sample for release of vapors at operating temperatures revealed no observable weight loss (which would indicate production of gases or vapors) up to a temperature of 245^0C (473^0F). From 245^0C to 430^0C (806^0F) a rapid weight loss was observed indicating an exothermic reaction (sample burning) at 395^0C (743^0F). At 430^0C essentially the entire sample was burned.

GC/MS analysis of vapors generated in sealed vials containing polypropylene and heated to operating temperatures revealed compounds which where mainly identified as aliphatic hydrocarbons -- alkanes, cycloalkanes and/or alkenes in the C_4 - C_{10} range. A small peak on the ion chromatogram was identified as acetaldehyde. It is important to note that the sensitivity of these two analyses, GC/MS and TGA, varies markedly with GC/MS able to detect quantities of material which if given off during TGA would go unnoticed.

High Temperature Synthetic Chain Lubricant: An IR scan of the oil bulk indicated that it was a vegetable-type oil rather than a mineral or petroleum based oil.

GC/MS analysis revealed constituents to be a few light hydrocarbons (C_4 - C_6 compounds) and a fatty acid. Other minor components indicated were toluene, phenol, a couple of siloxanes, a C_{12} alkene or cycloalkane, and a whole series of higher boiling components that were not identified. The loss of a water molecule in the mass spectra of these last compounds indicate that they may be other fatty acids or fatty acid esters.

B. Area Air Samples

Indicator Tube Results: Indicator tube grab samples were taken during start-up in the Orbet and pipeline areas. Tubes used to detect phenol and acetaldehyde were used. Neither phenol nor acetaldehyde was detected in the plume generated at the extruder on pipeline B. Sampling at the oven lid of module numbers 4 and 7 was also negative (none detected).

Acetaldehyde, n-Butyraldehyde, Propionaldehyde, n-Valeraldehyde, and Aromatic Amines (analyzed as aniline): Sampling results for these compounds are presented in Table II. Concentrations of these compounds were all below the limits of detection for the samples taken.

Formaldehyde: The three area samples mounted above the modules in the Orbet area demonstrated the presence of formaldehyde, the concentrations ranging from 0.72 mg/M^3 to 0.90 mg/M^3. The sample taken at the opposite end of the plant (Drop Test Area) was below the limits of detection. Results are presented in Table III.

B. Medical

Of the 17 individuals interviewed by the medical officer, 16 responded "yes" to the question concerning work-related problems (or were not sure whether their health problems were work-related). Fourteen were definite, while two were not sure; one denied any work related problems. Of the individuals interviewed, duration of employment ranged between one and 19 years.

All but one individual (16 of 17 or 94%) complained of eye irritation. Four (23%) reported skin problems, 11 (65%) had complaints of nose or throat irritation (including hoarseness or dry, irritated throat). There were eight individuals (47%) with pulmonary complaints; three (18%) complained of wheezing (one stated that wheezing occurred only with respiratory infections). Two individuals appeared to have an asthmalike syndrome. Most of the pulmonary symptoms were cough and in some cases with shortness of breath. Most of the health problems appeared to be irritant in nature, with eye irritation as the most common complaint.

VII. DISCUSSION AND CONCLUSIONS

Data from previous industrial hygiene surveys, conducted for the company by outside consultants in January 1976 and May 1979, indicated that low molecular weight aldehydes, and specifically formaldehyde, may be present in the Orbet process area. Formaldehyde gas, as well as some other aldehydes, are known irritants of the eyes and respiratory tract. The silicone mist, although not addressed by previous consultants, is also capable of causing the reported eye irritation. This investigation attempted to identify irritants that may be present in the Orbet process due to the raw materials used or resulting from the process itself and to measure the levels of these irritants.

Four materials are used in the process: polypropylene pellets to make the parisons; Dow Corning HV490* in the production of parisons; a high temperature synthetic lubricating oil used on the chains in the module ovens; and Dow Corning 200 Fluid* used as a mold release.

The qualitative analysis of a polypropylene parison, obtained from the pipeline and ready for use in the module, indicated the presence of a small quantity of acetaldehyde at temperatures similar to those in the oven. The thermogravimetric analysis didn't show any appreciable sample loss until sample burning began at a temperature of 245^0C (473^0F). This is about 125^0F higher than the temperatures at which the oven is operated.

Communication with the manufacturer of the two silicone compounds indicated that eye irritation could occur if these materials got into the eye and that these effects were of a temporary nature.

The evaluation of the high temperature lubricant bulk sample did not reveal any apparent irritants being generated at temperatures approximating those in the Orbet Module ovens.

Environmental sampling was conducted by locating the samplers on the traverse assemblies above the ovens in the plumes which rose from the oven lid and parison entry port. Concentrations of contaminants generated during the heating process and escaping into the work area were expected to be highest at the oven openings. On the day sampling was conducted, 11 of the 14 modules were operating and main oven temperatures were between 339 and 365^{0}F. Parisons are heated in the oven for 45 minutes. A set of samples were also taken at the opposite end of the plant.

No local exhaust was present over the ovens. Six large ceiling fans above the east aisle of the orbet area were operating (although the louvers of one were shut) and two sets of wall louvers on the south wall and one set on the north wall were open.

No employees work above the modules during an ordinary shift. Operators monitor two modules and spend most of their time down by the conveyor and regularly check the chutes where the completed bottles are blown from the dies. It is reasonable to assume that worker exposures to compounds escaping from the ovens would be lower at their work stations than in the plumes.

Environmental samples did not reveal detectable levels of any of the selected irritants except formaldehyde. Formaldehyde samples located directly above the modules indicated levels of 0.72 mg/M^3, 0.90 mg/M^3, and 0.81 mg/M^3 for modules #5, 9, and 14 respectively. These levels were determined over a full 8-hour shift. It is suspected that 30-minute samples would have been below the analytical method's limit of detection. None of the applicable criteria for the selected irritants was exceeded.

A potential for operator exposure to silicone mist generated during the air ejection of bottles from the dies exists and is supported by the silicone build-up present on the sides of the plastic chutes. Operators had hung a rag over the opening of some of the chutes in an attempt to reduce the mist.

The only two eye irritants which were found in the area are the formaldehyde and the silicone. The concentration of formaldehyde is low and is assumed to be lower than the measured levels, at the operator locations. The origin of the formaldehyde is uncertain since it is not present in any materials used in the process. A possible explanation for its presence is that it is generated in the ovens during the parison heating process. A visible blue plume is released from the ovens and contributed to a haze hanging over the module area.

The silicone lubricant, Dow Corning 200 Fluid, used as a mold release has been identified as an eye irritant and this material is used in an unaltered state during the last step of production on the modules. The proximity of the operator to the chutes, the length of time near them, and personal hygiene (e.g., rubbing the eyes after handling the chute or bottles) can influence exposure to the silicone.

It is possible that operation of the equipment during the cooler seasons of the year, at which time the building is closed up, the irritant levels would increase and make irritant effects more noticeable. The location of fans, louvers, etc. from the modules is great enough, however that the results of all measurements are considered representative of normal operating conditions.

No evidence obtained from this investigation indicates that employees are being exposed to irritants above acceptable levels or to levels capable of causing chronic health problems.

VIII. RECOMMENDATIONS

Temporary issuance of goggles to module operators is suggested to determine if subsequent reduction in eye irritation occurs. Positive results would suggest further enclosure of the module discharge chutes to reduce the amount of silicone mist released into the operator area.

Installation of a local exhaust system above the module oven lids can't be justified solely on the environmental levels measured during this investigation. A local exhaust system would reduce visible emissions and the amount of air exhausted from the plant during cold weather (compared to the large ceiling fans); however, the impact this system would have on reducing the eye irritation currently experienced is unknown.

IX. AUTHORSHIP/ACKNOWLEDGEMENTS

Evaluation Conducted and Report Prepared by:	Steven Ahrenholz, M.S. Industrial Hygienist Industrial Hygiene Section Hazard Evaluations and Technical Assistance Branch Cincinnati, Ohio Richard Gorman, M.S., C.I.H. Industrial Hygienist Industrial Hygiene Section Hazard Evaluations and Technical Assistance Branch Cincinnati, Ohio
Medical Assistance:	Stuart M. Brooks, M.D. Department of Environmental Health Division of Clinical Studies University of Cincinnati Medical Center
Originating Office:	Hazard Evaluations and Technical Assistance Branch Division of Surveillance, Hazard Evaluations and Field Studies Cincinnati, Ohio
Report Typed by:	Jackie Woodruff Clerk/Typist Industrial Hygiene Section

X. DISTRIBUTION AND AVAILABILITY

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 Services (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 the following:

a. Continental Plastic Cortainers, Springdale, Ohio.
b. Authorized representative of Local 127, Glass Bottle Blowers Association.
c. International representative of the Glass Bottle Blowers Association.
d. Ohio Department of Health, Division of Occupational Health.
e. U.S. Department of Labor - Region V.
f. NIOSH - Region V.

For the purpose of informing the approximately 70 "affected employees" the employer shall promptly "post" for a period of 30 calender days, the Determination Report in a prominent place(s) near where the exposed employees work.

XI. REFERENCES

1. NIOSH Method P&CAM 168. Aromatic Amines in Air. NIOSH Manual of Analytical Methods, 2nd ed., Vol. 1, DHEW (NIOSH) Pub. No. 77-157-A, 1977.

2. Kim, W. S., Geraci, C. L., Kupel, R. E. Solid Sorbent Tube Sampling and Ion Chromatographic Analysis of Formaldehyde, AIHAJ Vol. 41, No. 5, pp 334-339, 1980.

3. Grote, A. A., Kim, W. S., Kupel, R. E. Establishing a Protocol from Laboratory Studies to be Used in Field Sampling Operations. American Industrial Hygiene Association Journal, Vol. 39, pp 880-884, 1978.

4. Price, J. H., Thoburn, T. W. Hayes-Albion Corporation Wolverine Plastics Division. Health Hazard Evaluation Determination Report No. 76-60-398, DHEW, CDC, NIOSH, Cincinnati, Ohio, 1977.

5. Threshold Limit Values for Chemical Substances and Physical Agents in the Workroom Environment with Intended Changes for 1979. ACGIH, Cincinnati, Ohio, 1979.

6. NIOSH Criteria for a Recommended Standard . . . Occupational Exposure to Formaldehyde. U.S. Department Health and Human Services, CDC, NIOSH, DHEW (NIOSH) Publication No. 77-126, 1976.

7. NIOSH Criteria for a Recommended Standard . . . Occupational Exposure to Phenol. U.S. Department of Health and Human Services, CDC, NIOSH, DHEW (NIOSH) Publication No. 76-196, 1976.

8. Documentation of the Threshold Limit Values. 3rd ed., ACGIH, Cincinnati, Ohio, 1977.

9. OSHA Safety and Health Standards (29 CFR 1910) U.S. Department of Labor, OSHA 2206, 1978.

10. The Merck Index, 9th ed., Merck and Company, Inc., Rahway, New Jersey, 1976.

11. Proctor, N. H., Hughes, J. P. Chemical Hazards of the Workplace. J. B. Lippincott Company, Philadelphia, Pennsylvania, 1978.

Table I

ENVIRONMENTAL EVALUATION CRITERIA

CONTINENTAL PLASTIC CONTAINERS
SPRINGDALE, OHIO

April 7, 1980

Chemical	Standard (mg/M^3)[a]	Source	Health Effects	OSHA Standard[b] (mg/M^3)[a]
Acetaldehyde	180	ACGIH[c]	Eye, mucous membrane irritant.[f]	360
Formaldehyde	1.2 (ceiling)[d]	NIOSH[e]	Eye, respiratory trace irritant.[f]	3.7
Phenol	20	NIOSH[e]	Eye, mucous membrane, skin irritant.[f]	19 (skin)
Valeraldehyde	175	ACGIH[c]	Eye, skin irritant.[g]	-
Aniline and Homologues	10	ACGIH[c]	Skin absorption, formation of methemoglobin.[f]	19 (skin)

a. All values are given for an 8 to 10-hour time weighted average (TWA) unless otherwise noted. Values given only in parts per million (ppm) have been converted to milligrams per cubic meter (mg/M^3). Skin notation accompanying values indicates skin absorption can contribute to overall exposure.

b. Values from OSHA General Industry Safety and Health Standards (29 CFR 1910), revised 11/78. Provided for comparison only.

c. Threshold Limit Values (TLV's) for Chemical Substances. American Conference of Governmental Industrial Hygienists, 1979.

d. Exposure to formaldehyde shall be controlled so that no employee is exposed to a concentration greater than 1.2 mg/M^3 for any 30-minute sampling period.

e. NIOSH Criteria for a Recommended Standard . . . Occupational Exposure to

f. Proctor, N. H., Hughes, J. P., Chemical Hazards of the Workplace.

g. Documentation of the Threshold Limit Values

Table II

SAMPLING RESULTS FOR ACETALDEHYDE, n-BUTYRALDEHYDE, PROPIONALDEHYDE, n-VALERALDEHYDE, AND AROMATIC AMINES

CONTINENTAL GROUP INC.
SPRINGDALE, OHIO

April 7, 1980

Low Molecular Weight Aldehydes Sample Description			Environmental Concentrations (mg/M3)			
Sample Location	Duration (min)	Total Volume (liters)	Acetaldehyde	n-Butyraldehyde	Propionaldehyde	n-Valeraldehyde
Drop Test Area, East Plant Wall	479	466	ND[a]	ND	ND	ND
Module #5, Traverse Assembly Above Oven Lid	480	471	ND	ND	ND	ND
Module #9, Traverse Assembly Above Oven Lid	478	471	ND	ND	ND	ND
Module #14, Traverse Assembly Above Oven Lid	481	470	ND	ND	ND	ND
Blank	-	-	ND	ND	ND	ND

Aromatic Amines			Aniline
Drop Test Area, East Plant Wall	466	90.6	ND
Module #5, Traverse Assembly Above Oven Lid	472	95.7	ND
Module #9, Traverse Assembly Above Oven Lid	472	94.8	ND
Module #14, Traverse Assembly Above Oven Lid	472	94.2	ND
Blank	-	-	ND

Table III

SAMPLING RESULTS FOR FORMALDEHYDE

CONTINENTAL GROUP INC.
SPRINGDALE, OHIO

April 7, 1980

Sample Description			Airborne Formaldehyde Concentration[a]	
Sample Location	Duration (min)	Total Volume (liters)	(mg/M^3)	(ppm)
Drop Test Area, East Plant Wall	466	24.6	ND[b]	ND
Module #5, Traverse Assembly Above Oven Lid	472	27.9	.72	.59
Module #9, Traverse Assembly Above Oven Lid	472	22.2	.90	.74
Module #14, Traverse Assembly Above Oven Lid	472	25.6	.81	.66
Blank	-	-	ND	ND

a. Values are given both in mg/M^3 and parts per million (ppm) and represent an 8-hour time weighted average.

b. ND = None Detected. Amounts of formaldehyde, if present, were below the detection limits of the method used. (Section IV A. 2.)