

PROJECT ADMINISTRATION DATA SHEET



ORIGINAL



REVISION NO. _____

Project No. A-3584GTRI/~~OTF~~DATE 7 / 8 / 83Project Director: Phillip L. Williams~~School~~/Lab EDL/SHDSponsor: Fred S. James & Company of Georgia, Inc.Type Agreement: Standard Research Agreement No. A-3584Award Period: From 7/1/83 To 6/30/84 (Performance) 6/30/84 (Reports)

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This ChangeTotal to Date

Estimated: \$

\$

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Funded: \$

\$

0

Cost Sharing Amount: \$ _____ Cost Sharing No: _____

Title: Industrial Hygiene Services

ADMINISTRATIVE DATA

1) Sponsor Technical Contact:

OCA Contact Faith G. Costello

2) Sponsor Admin/Contractual Matters:

Nathan CrutchfieldDirector of Technical ServicesFred S. James Co. of GA, Inc.3333 Peachtree Road, N.E.Suite 500Atlanta, GA 30326

Defense Priority Rating: _____ Military Security Classification: _____

(or) Company/Industrial Proprietary: _____

RESTRICTIONS

See Attached NA Supplemental Information Sheet for Additional Requirements.

Travel: Foreign travel must have prior approval – Contact OCA in each case. Domestic travel requires sponsor approval where total will exceed greater of \$500 or 125% of approved proposal budget category.

Equipment: Title vests with NA

COMMENTS:

This project will be funded on a task by task basis. Each task will be established and funded in individual sub-budgets.

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SPONSORED PROJECT TERMINATION/CLOSEOUT SHEETDate 10/14/88Project No. A-3584 / R3584-000~~SENSE~~/Lab

EDL

Includes Subproject No.(s) N/AProject Director(s) P. L. WilliamsGTRC/~~STX~~Sponsor Fred S. James & Company of Georgia, Inc.Title Industrial Hygiene ServicesEffective Completion Date: 6/30/88 (Performance) 6/30/88 (Reports)

Grant/Contract Closeout Actions Remaining:

☐ None☒ Final Invoice or Copy of Last Invoice Serving as Final☐ Release and Assignment☒ Final Report of Inventions and/or Subcontract:
Patent and Subcontract Questionnaire
sent to Project Director ☒☐ Govt. Property Inventory & Related Certificate☐ Classified Material Certificate☐ Other _____

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INDUSTRIAL HYGIENE SERVICES
FOR GOLD KIST POULTRY GROUP
Leeds, Alabama

Prepared for:

FRED S. JAMES AND COMPANY OF GEORGIA, INC.

by

Phillip L. Williams, CIH
Research Scientist II

Environmental Health and Safety Division
Engineering Experiment Station
GEORGIA INSTITUTE OF TECHNOLOGY
Atlanta, Georgia 30332
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INTRODUCTION

At the request of Mr. Nathan Crutchfield, Director of Technical Services for Fred S. James and Company of Georgia, Inc., a certified industrial hygienist from Georgia Tech's Environmental Health and Safety Division evaluated formaldehyde exposure at the Gold Kist Hatchery in Leeds, Alabama. The survey was conducted on September 27, 1983.

Air sampling was performed in several locations during normal operating conditions. DuPont P-2500 Constant Flow Pumps were used to conduct the air sampling. All the air samples were returned to Georgia Tech's Environmental Laboratory for analysis by NIOSH approved methods. All the equipment was calibrated before use and checked after use to assure calibration.

EVALUATION OF FORMALDEHYDE EXPOSURE

DESCRIPTION OF PROCESS

The plant has two hatchery areas - a right-wing and a left-wing. Each wing contains eight individual hatcheries. On the day of the survey, the left-wing was being cleaned by employees and no formaldehyde was being used. The right-wing

was first loaded with eggs from the incubation area and then formaldehyde was placed inside of each hatchery.

The formaldehyde was in a 37% solution with water and stored in a 55 gallon drum. From the drum it was dispensed by hand into a small container and carried to the hatchery area. In the hatchery area, 4 ounce quantities were measured by hand and poured on small egg crates. The employee wore a respirator during this procedure.

One egg crate (with 4 ounces of formaldehyde) was placed inside each hatchery. Approximately 64 ounces of formaldehyde solution is used per week.

DISCUSSION OF THE SAMPLE RESULTS

Air sampling was performed on an employee prior to and during the application of formaldehyde. Additionally, area air samples were conducted in both hatchery areas and in a chick bus during loading and during driving to an unloading stop. The samples in the right-wing hatchery area were taken prior to the application of formaldehyde (background); during the application of formaldehyde; and following the application of formaldehyde. Since the left-wing hatchery area was not in use (on the day of the survey), sampling was conducted during the normal cleaning process.

The results of all the air samples collected with DuPont P-2500 pumps are enclosed in Appendix A. Appendix B contains a summary of the applicable occupational standards.

In addition, formaldehyde sampling was conducted using Gastec/Bendix Detector Tubes. This data is less reliable than the longer-term air sampling previously described, but the results should still be considered. Formaldehyde levels ranging from 1.0 to 2.0 parts per million (ppm) were found at the top of the doors of several hatchery units in the right-wing. Samples taken in the left-wing showed only traces of a formaldehyde exposure (<0.5 ppm).

The formaldehyde level was measured in a chick bus during two operations: the loading of the trucks and the normal driving of the bus to transport chicks. The levels of formaldehyde recorded were at or below detection limits. This is not surprising since the crates that housed the chicks were not used in the hatchery units and the only potential source would be residual levels from the chicks (and this is believed to be minimal).

As one will see from Appendix B, the sample results are within the OSHA permissible exposure limits and the American Conference of Governmental Industrial Hygienists (ACGIH) Threshold Limit Values (TLVs). However, it should be noted that both of these organizations have time-weighted averages for eight-or ten-hour work shifts. The sampling performed during the survey covered a period of five hours or less at any one sample site. Consequently, the level of exposure to formaldehyde cannot be guaranteed for other times during the shift.

It should be noted that the federal government's research agency - the National Institute for Occupational Safety and Health (NIOSH) - recommends that formaldehyde be handled as a potential occupational carcinogen and that exposure should be maintained at the "lowest feasible limits" through the use of engineering

controls. The ACGIH also lists formaldehyde as an industrial substance suspected of carcinogenic potential for man.

Historically, formaldehyde has been considered a primary irritant. Due to its high water solubility, it can cause severe irritation to the mucous membranes of the respiratory tract and eyes. Airborne concentrations of 0.5 to 1 ppm are detectable by odor; 2 to 3 ppm can produce mild irritation; and 4 to 5 ppm produce an intolerable reaction in most individuals.

The recommendation made by NIOSH to handle formaldehyde as a potential occupational carcinogen was based on two animal studies in which laboratory rats and mice developed nasal cancer. One was sponsored by the Chemical Industry Institute of Toxicology (CIIT) and the other was performed by New York University.

RECOMMENDATIONS

Based on the results from this survey several suggestions can be made.

1. **Respirator Usage.** Although the employee wore a respirator during the application of formaldehyde, many aspects of a minimum acceptable respirator program were not being followed. For example: the employee had never been fit-tested to assure a proper face seal; the respirator was not being stored in a designated location that was clean and sanitary; the respirator in use did not have a NIOSH/MESA Approved Number; and,

upon examination, the respirator was observed to be missing two diaphragms which indicated that it needed general maintenance.

It is recommended that a written respirator program be developed and implemented. An example of such a program is provided in Appendix C.

2. **Gloves and Goggles.** The formaldehyde was handled by the employee without the use of protective gloves or goggles. It is suggested that the appropriate rubber gloves and goggles be worn to prevent direct contact of formaldehyde with the skin and eyes.
3. **Ventilation System.** Each hatchery unit has an exhaust ventilation system. Air is pulled in the back of the unit and exhausted over the door in the front. The air inlet in the back of each unit is partially blocked by a large belt-driven pulley that turns a fan blade on the inside of each unit. The pulley creates turbulence in the air inlet area and disturbs air flow through the inlet. The exhaust ducts at the front of each unit were very small (from 4 to 6 inches in diameter) and in some cases are not connected directly to the unit. Instead there is a gap of several inches between the duct and the top of the unit. As a result, the volume of exhausted air is rather low and the duct velocity across the face was measured with a velometer at 100 to 400 feet per minute. It is suggested that these systems be redesigned. The entry of air in the back should be unimpeded and the exhaust out the top should be through a tapered hood as opposed to a straight 4 inch duct. Also, the volume of air should be increased.

Additionally, ventilation readings were taken at the debeaker. This area was vented by a three inch straight exhaust duct and the velocity across the face was 200 to 400 feet per minute.

The ventilation systems for both the debeakers and hatchery units were exhausted directly into the outside air without filtration. It was the view of this investigator that the overall ventilation system of the plant was poorly designed and inadequate.

4. **Poor Seals.** There appeared to be several openings in the hatchery units that would allow for the escape of formaldehyde. These were mainly around the doors with the most obvious being between the floor and the bottom of the door. Presently, foam rubber is inserted in this area after formaldehyde is added. It is suggested that the door construction be evaluated and changes be made to provide for tighter and more efficient sealing to prevent the escape of formaldehyde from the units.
5. **Air Sampling.** The air sampling performed during this survey was during the specified operations previously discussed. It is suggested that additional air monitoring for formaldehyde be conducted in the hatchery area during the three days following the formaldehyde application. Also, employee air monitoring should be done during the time when the newly hatched chicks are being removed from the hatchery units.
6. **Disposal of Egg Crates and Drums.** Presently, the egg crates that are removed from the hatchery units following the application of formaldehyde are discarded in the trash. Since the formaldehyde has probably completely evaporated from the egg crates, this may be

acceptable; however, a laboratory evaluation should be made to determine whether this material is classified as EPA hazardous waste. The emptied drums of formaldehyde are stored outside the building. As long as the volume of formaldehyde in the drum is less than one inch they can be discarded with regular trash.

SUMMARY

The results of all the air samples were within OSHA and ACGIH standards. However, there appear to be feasible engineering controls that should significantly lower the airborne formaldehyde level. It is suggested that the company study possible improvements to the ventilation system and implement them where feasible.

The most effective control would be the substitution of formaldehyde with a less toxic chemical. If this is not possible another alternative that should be explored is the installation of a closed-system that would eliminate the need for employees to deal directly with formaldehyde. Such a system could introduce the formaldehyde to each unit at set amounts through a system of pipes that would prevent employees being directly exposed.

In the interim period, the employees exposed to formaldehyde should be protected by the proper use of personal protective equipment. This would include the wearing of respirators, gloves, and goggles.

APPENDIX A
Results of Air Sampling

GEORGIA INSTITUTE OF TECHNOLOGY
Engineering Experiment Station
Safety & Health Services
INDUSTRIAL HYGIENE SAMPLING SUMMARY

Report No. A-3584-001

Plant Gold Kist - Hatchery
Leeds, Alabama

Materials DuPont P-2500 Constant Flow Pumps

Date	Sample Number	Description	Sampling Period		Sample Volume (Liters)	Sample Time (Min.)	Concentration	
			Start	Stop			Formaldehyde (ppm)*	
9/27/83	1	Roger Wathley - Incubator Area (Background)	9:41	10:03	22	22	<0.01	
9/27/83	3	Roger Wathley - Applying Formaldehyde	10:04	10:23	19	19	<0.01	
9/27/83	2	Top of Hatchery #2 - Background Level	9:38	10:05	27	27	<0.01	
9/27/83	4	Top of Hatchery #2 - Applying Formaldehyde	10:06	10:28	22	22	0.04	
9/27/83	7	Top of Hatchery #2 - After Formaldehyde Application	10:29	12:30	121	121	0.04	
9/27/83	8	Top of Hatchery #2 - After Formaldehyde Application	12:30	2:52	142	142	0.04	
9/27/83	5	Bus (Driver's Area), Being Loaded With Chicks	9:56	10:32	36	36	<0.01	
9/27/83	6	Bus (Driver's Area), Traveling To Delivery Point	10:33	11:35	62	62	<0.01	
9/27/83	9	Left Wing Hatchery Area During Cleaning Operation	12:36	2:56	140	140	<0.01	

*ppm - parts per million

APPENDIX B

Applicable Occupational Health Standards

APPLICABLE OCCUPATIONAL HEALTH STANDARDS FOR AIR CONTAMINANTS

Substance	Units	American Conference of Governmental Industrial Hygienists (ACGIH) (1984)			Occupational Safety and Health Administration (OSHA)			National Institute for Occupational Safety and Health (NIOSH) Proposed	
		8-hr ¹	Stel ²	Ceiling ³	8-hr ¹	Ceiling ⁴	Peak	10-hr ¹	Ceiling ⁵
Formaldehyde	ppm	1.0*	2.0*		3.0	5.0		S E E F O O T N O T E	

¹ 8-hr or 10-hr - The time weighted average for an 8- or 10-hour work shift in a 40-hour work week.

² Stel - ACGIH's standard maximum concentration to which workers can be exposed for a period up to 15 minutes.

³ Ceiling (ACGIH) - The concentration that should not be exceeded even instantaneously.

⁴ Ceiling (OSHA) - The concentration that should not be exceeded even instantaneously, except when the standard has a peak value (explanations will be given for chemicals with peak values).

⁵ Ceiling (NIOSH) - The average maximum concentration which cannot be exceeded for a short period (the time period varies from chemical to chemical but is usually from 5-15 minutes).

*It is listed as an industrial substance suspected of carcinogenic potential for man.

NOTE: NIOSH recommends that prudent health measures, such as engineering controls and stringent work practices, be employed to reduce occupational exposure to the lowest feasible level.

APPENDIX C

Example of a Written Respirator Program

According to the Occupational Safety and Health Administration's Safety and Health Standards (29 CFR 1910.134(b)(1), "written standard operating procedures governing the selection and use of respirators shall be established". This sample respirator program is designed to aid those industrial establishments which need a respirator program but do not have one. By following the outline presented in this program, a company should be able to prepare an acceptable respirator plan of its own. It is realized that no such general plan can completely cover all sorts of industry; therefore, each company is urged to modify this program as necessary to fit its own needs. It is also important to realize that the respirator program must be implemented and enforced and not merely exist on paper.

RESPIRATOR PROGRAM FOR _____

1. RESPONSIBILITIES

- (a) Overall supervision of the respirator program shall be the responsibility of _____.
- (b) Selection of respirators and training in their use shall be the responsibility of _____.
- (c) Storage, cleaning, and maintenance of respirators shall be the responsibility of _____.
- (d) Proper wearing and use of respirators shall be the responsibility of each employee assigned a respirator.

2. SELECTION

- (a) All respirators used shall be approved by the National Institute of Occupational Safety and Health and by the Mining Enforcement and Safety Administration (NIOSH/MESA).
- (b) Respirators shall be used for protection against only those air contaminants for which they are approved.
- (c) The following respirators must be used to provide protection to employees:

AREA-EMPLOYEES

RESPIRATOR TYPE

AIR CONTAMINANT

- (d) The following respirators may be used for the comfort and convenience of employees, at their option:

AREA-EMPLOYEESRESPIRATOR TYPEAIR CONTAMINANT

Following respirators are for emergency use only and are intended for routine use under normal conditions:

AREA-EMPLOYEESRESPIRATOR TYPEAIR CONTAMINANT

3. USE AND MAINTENANCE OF RESPIRATORS (GENERAL)

- (a) The manufacturer's instructions which come with each type of respirator are the guidelines to be used for proper wearing, use, maintenance and storage of respirator.
- (b) A copy of the manufacturer's instructions for each type of respirator is appended to this program and forms part of this program.
- (c) In addition to the general storage requirements detailed in the manufacturer's instructions, the following locations are to be used for storage:

<u>AREA-EMPLOYEE</u>	<u>TYPE OF RESPIRATOR</u>	<u>STORAGE LOCATION</u>
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4. USE OF RESPIRATORS IN HAZARDOUS AREAS

- (a) Special procedures shall be established for use of respirators in atmospheres which are immediately dangerous to life or health.
- (b) In general, rescue personnel shall be nearby with proper rescue equipment and in communication with the persons in the dangerous atmosphere.
- (c) Specific precautions and rescue procedures are as follows:

<u>AREA-EMPLOYEES</u>	<u>RESPIRATOR TYPE</u>	<u>PRECAUTIONS AND/OR RESCUE PROCEDURE</u>
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5. TRAINING

- (a) Supervisors and workers shall be instructed in the proper maintenance and usage of respirators.
- (b) The training session will inform potential users of respirators on:
 - 1. The limitations of respirators.
 - 2. Cleaning respirators or immediate disposal after using a throw-away type dust mask.
 - 3. The proper method of storing respirators out of the working environment.
 - 4. How to check the respirator for any defects that might need repairing.
- (c) Employees will sign a record and date it to show that they received instruction on how to handle and maintain a respirator required by the company or requested by them.

6. OTHER RESPIRATOR RULES

Program is to be reviewed as often as necessary to keep up to date, but as least annually.

(b)

(c)