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

HEALTH HAZARD EVALUATION DETERMINATION
REPORT NO. 79-55-600

RAVEN INDUSTRIES, INC.
PARKSTON, SOUTH DAKOTA

JUNE 1979

I. TOXICITY DETERMINATION

A health hazard evaluation was conducted by the National Institute for Occupational Safety and Health (NIOSH) on March 15, 1979, at the Raven Industries plant in Parkston, South Dakota. Breathing zone and general area atmospheric samples were taken for total particulates, respirable particulates, qualitative and quantitative inorganic analyses (down feather's are sometimes disinfected with inorganic substances), and a bulk sample of down feathers to be desorbed with organic solvent and analyzed for any organic substances that might be present (organic deodorizers are sometimes sprayed on down feathers). All of the total and respirable particulate samples were below the evaluation criteria. The qualitative analysis of samples revealed no inorganic disinfecting agents or organic deodorizers. Thus a health hazard to the workers did not exist at the time of this evaluation.

II. 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 ninety (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 the NIOSH Publications Office at the Cincinnati, Ohio address.

Copies of this report have been sent to:

a) Safety Director, Raven Industries

b) U. S. Department of Labor - Region VIII

c) NIOSH - Region VIII

For the purpose of informing the 3 - 5 affected employees, copies of the report shall be posted in a prominent place accessible to the employees 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 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 received a request from an authorized representative of management regarding exposure to down feathers at the Raven Industries, Inc. plant in Parkston, South Dakota.

IV. HEALTH HAZARD EVALUATION

A. Plant Process

The Raven Plant at Parkston, South Dakota, manufactures down-filled garments such as coats and vests. The area of concern within the plant is the down insertion room. Basically this is a screen wire enclosed area in which two employees inject down feathers, by air pressure, into garments and then sew them closed. The down-insertion apparatus is not totally enclosed and some manual handling of down feathers is required, both of which result in residual down feathers and dust in the air.

B. Evaluation Design

An initial and environmental survey was conducted on March 15, 1979. The NIOSH Regional Industrial Hygienist and Regional Consultant made a complete walk through of the plant, accompanied by management representatives. Five employees were given non-directed medical interviews. Three of the employees had no health problems related to their work, while two employees have experienced problems which they attribute to their exposure to residual down feathers.

Breathing zone and general area atmospheric samples were taken for total particulates, respirable particulates, qualitative and quantitative inorganic analyses (down feathers are sometimes disinfected with inorganic substances; especially arsenic, tin, antimony, and chromates), and a bulk sample of down feathers to be desorbed with organic solvent and analyzed for any organic substances that might be present (organic deodorizers are sometimes sprayed on down feathers).

A closing conference was held to inform the management representatives of future actions (interim reports, final report, etc.) to be taken

by the NIOSH investigators.

Interim Report #1 was submitted to the requester (Corporate Safety Director) on March 21, 1979, to provide him with information concerning actions taken to date, preliminary results, future actions, and recommendations.

C. Evaluation Methods

Total particulate and inorganic substance samples were collected on 37mm diameter polyvinyl chloride copolymer filters held in closed-face cassettes and attached via tygon tubing to battery powered air sampling pumps operating at flow rates of approximately 1.5 liters per minute. The weights of the samples were determined by subtracting the pre-sampling weight from the post-sampling weight of the filter. Inorganic samples were analyzed by X-ray Fluorescence Spectrometry.

Respirable particulates were collected on 37mm diameter polyvinyl chloride copolymer filters. The sampling train consisted of a filter, 10 millimeter nylon cyclone size selective sampler, and a battery powered air sampling pump operating at 1.7 liters per minute. The weights of the samples were determined by subtracting the pre-sampling weight from the post-sampling weight of the filter.

A bulk sample of down feathers were also submitted to be desorbed with organic solvent and analyzed by gas chromatography for any organic deodorizers that might have been sprayed on the feathers.

D. Evaluation Criteria

Epidermal Allergens -- This category includes animal emanations; danders, hair, feathers and saliva. It is well-known that animals are a common cause of nasobronchial allergy. Feathers are epidermal appendages that may be significant allergens. Pulverization of goose and duck down during manufacture increases the access of particles to the respiratory track. Commercial processing does not remove the soluble portions responsible for allergy (1). There are no environmental limits relating specifically to occupational exposure to down feathers. The evaluation criteria for total and respirable particulates (nuisance particulates) will be used to assess employee exposure to down feathers.

Total Particulates (Nuisance Particulates) -- The American Conference of Governmental Industrial Hygienists (ACGIH) recommends a Threshold Limit Value (TLV) of 10 milligrams per cubic meter of air, determined as a time-weighted average concentration for a normal 8-hour workday or 40-hour workweek, to which nearly all workers may be repeatedly exposed day after day, without adverse effect (2). Excessive concentrations of nuisance dusts in the workroom air may seriously reduce visibility, may cause unpleasant deposits in the eyes, ears and nasal passages, or cause injury to the skin or mucous membranes by chemical or mechanical action (3).

The OSHA standard is 15 milligrams per cubic meter of air (4).

Respirable Particulates (Nuisance Particulates) -- The ACGIH recommends a TLV of 5 milligrams per cubic meter of air, determined as a time weighted average concentration for a normal 8-hour workday or 40-hour workweek (2). The OSHA standard is also 5 milligrams per cubic meter of air (4).

E. Evaluation Results and Discussion

Results from the personal breathing zone and area samples, which were collected for total and respirable particulates, are shown in Tables 1-2. All of the samples collected produced results which were below the evaluation criteria. The qualitative analysis of samples revealed no inorganic disinfecting agents or organic deodorizers.

In view of the previously stated effects of nuisance particulates and feathers, it is possible that some workers have become sensitive to these substances. The results of the five confidential employee interviews revealed two complaints related to exposure to the feathers. One complaint involved the existance of a rash around the oral-nasal area where a dust-mask was worn. It should be noted that this individual had a history of allergy prior to employment at this facility. The other complaint involved labored breathing, especially upon exertion.

The greatest contamination of the air would occur when the seams of the garment would "blow out" in the process of the air pressure down-insertion. Both symptomatic workers were "down fillers" and therefore had the greatest contact with the feathers and both have been removed from the down-room itself.

It should be noted that the plant manager informed the NIOSH investigators that "new" down-insertion machines had been ordered and they were to be installed within one or two months of this evaluation. The new machines are supposedly vastly improved in their capability to contain the down; however, the "blow-out" problem would not be eliminated by the "new" machines.

F. RECOMMENDATIONS

Although the results of the environmental sampling at the time of this survey were below evaluation criteria, it is conceivable that other workers in or near the down-insertion room may become sensitive to down feathers. In the event that other workers exhibit allergic symptomatology, management should consider the installation of local exhaust ventilation designed to exhaust from the point of generation as a means of control.

If respirators are used as a means of control, management should evaluate and modify the respiratory protection program to assure that it is in compliance with the requirements described in the Occupational Safety and

Health General Industry Standards, Title 29 of the Code of Federal Regulations, Part 1910, Section 134. The standard outlines eleven criteria for a "minimal acceptable" respiratory protection program including a provision for training the worker in the use of respirators.

V. REFERENCES

(1) Patterson, R., editor, Allergic Diseases - Diagnosis and Management. J. B. Lippincott Co., Philadelphia, 1972, page 111.

(2) American Conference of Governmental Industrial Hygienists: Threshold Limit Values for Chemical Substances and Physical Agents in the Workroom Environment with Intended changes for 1978, Cincinnati, Ohio, (1978).

(3) American Conference of Governmental Industrial Hygienists: Documentation of the Threshold Limit Values for Substances in Workroom Air, third edition, 1971, page 190.

(4) Federal Register, Volume 39, No. 125, Title 29, Code of Federal Regulations, Part 1910, July 1977.

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TABLE 1
RESULTS OF ENVIRONMENTAL SAMPLING ON MARCH 15, 1979
FOR TOTAL PARTICULATES

Job/Location	Sample Number	Time of Sample	Total Particulates (mg/M^3)	Type of Sample
Over Storage Bin	DM-2	07:41 - 12:38	0.04	GA
Supervisor	DM-3	07:45 - 12:37	1.6	BZ
Outside Down Room	DM-4	07:46 - 12:40	0.11	GA
Between Hoppers	DM-5	07:42 - 12:39	0.34	GA

NIOSH Limit of Detection(mg/sample) 0.01

Evaluation Criteria 10.0

mg/M^3 = milligrams of substance per cubic meter of air
BZ = breathing zone
GA = general area

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TABLE 2
RESULTS OF ENVIRONMENTAL SAMPLING ON MARCH 15, 1979
FOR RESPIRABLE PARTICULATES

Job/Location	Sample Number	Time of Sample	Respirable Particulates (mg/M^3)	Type of Sample
Down Inserter	DM-1	07:38 - 12:35	1.6	BZ
Down Inserter	DM-8	07:40 - 12:36	3.2	BZ
NIOSH Limit of Detection (mg/sample)			0.01	
Evaluation Criteria (mg/M^3)			5.0	

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

BZ = breathing zone