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

HEALTH HAZARD EVALUATION REPORT 72-33-129
BARKER GREETING CARD COMPANY
CINCINNATI, OHIO

MARCH 1974

I. SUMMARY DETERMINATION

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 the receipt of a written request from any employer or authorized representative of employees, to determine whether any substance found in the place of employment has potentially toxic effects in such concentrations as used or found.

The National Institute for Occupational Safety and Health (NIOSH) received such a request from an authorized representative of employees regarding exposures to airborne dust at the Barker Greeting Card Company plant in Cincinnati, Ohio.

NIOSH investigators conducted an observational survey of the associated operation on June 16, 1972. Based on information obtained at that time, it was concluded that appropriate evaluations should be made of employee exposures to both the total and respirable fraction of inert/nuisance dust (dyed rayon tow) and solvents. Medical interviews revealed the existence of mechanical skin irritation and upper respiratory tract problems.

During a follow-up environmental survey, conducted on May 23, 1973, eight (8) personal and thirteen (13) general area air samples were collected to obtain appropriate analytical determinations. (Note: Samples collected during an earlier environmental survey on September 14, 1972, were deemed to be invalid). The associated health standards, promulgated by the U. S. Department of Labor (Federal Register, Part II, §1910.93, Tables G-1 and G-3), on an 8-hour time-weighted average basis, for nuisance dust (total - 15.0 milligrams per cubic meter; respirable fraction - 5.0 milligrams per cubic meter) and Stoddard solvent (2,950 milligrams per cubic meter) were exceeded in only one instance.

Medical interviews/examinations conducted in the flocking department revealed that four out of six women expressed/displayed symptoms related either to the skin or the respiratory tract. No evidence was found of narcosis conditions among employees working with glues containing a type of Stoddard solvent.

Based upon the results of the environmental/medical study reported above, it was determined that, under conditions found at the time of the survey, concentrations of airborne dust (flocking material-dyed rayon tow) and a type of Stoddard solvent were not toxic and do not, under normal conditions, constitute a hazard to the health of workers in the flocking department.

It is, however, felt that: (1) airborne flock does result in minor mechanical irritation from the deposition of fibers on the body -- particularly skin creases, and (2) a few individuals with chronic or pre-existing throat and sinus conditions are made worse by the constant deposition of flock high in oral and nasal passages.

Recommendations which will improve the working environment, and thus minimize conditions described above, have been made to management.

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

a) Barker Greeting Card Company, Cincinnati, Ohio

b) Authorized Representative of Employees

c) U. S. Department of Labor - Region V

For purposes of informing the six (6) "affected employees", the employer will promptly "post" the Summary Determination in a prominent place(s), near where affected employees work, for a period of thirty (30) calendar days.

II. INTRODUCTION

Section 20(a)(6) of the Occupational Safety and Health Act of 1970, 29 U.S.C. 669 (a)(6) authorizes the Secretary of Health, Education, and Welfare, following a written request by any employer or authorized representative of employees, to determine whether any substance normally found in the place of employment has potentially toxic effects in such concentrations as used or found.

The National Institute for Occupational Safety and Health (NIOSH) received such a request from a representative of employees of Barker Greeting Card Company, Cincinnati, Ohio.

The alleged hazard involved six (6) persons employed in the flocking department, with concern directed primarily to certain dermatitis and respiratory problems. Flattened greeting cards are initially inserted beneath silk screens containing a pre-selected patterned mesh. An appropriate colored glue is squeezed through the silk screen onto the card, which is then dipped into the matching color flocking compound (dyed rayon tow). The card is then vibrated on a beating bar to allow flock to adhere only to the glued areas. After being stacked vertically in wooden shelves to dry overnight, the cards are folded and packed into boxes the following day. Persons flocking the cards are also responsible for the cleaning of the silk screens. The cleaning operation is conducted for approximately five minutes daily, and utilizes a mineral spirits solution.

Based on a personal communication with Dr. H. E. Stokinger, Chief, Toxicology Branch, Division of Laboratories and Criteria Development, National Institute for Occupational Safety and Health, it was concluded that documented studies reveal no toxicity from rayon, nylon or other synthetic fibers. The flocking material encountered during this Health Hazard Evaluation was, therefore, classified as an "inert/nuisance" dust.

III. BACKGROUND HAZARD INFORMATION

A. Standards

The Occupational Health Standards, as promulgated by the U. S. Department of Labor (Title 29, Code of Federal Regulations, Chapter XVII, Part 1910, Subpart G, §1910.93, entitled Air Contaminants), applicable to substances of this evaluation are as follows:

Substance	Standard (8-hour time weighted average)
Inert or Nuisance Dust (dyed rayon tow)	
Respirable fraction	5 mg/M^3*
Total dust	15 mg/M^3*
Stoddard Solvent	2,950 mg/M^3*

*mg/M^3 -- milligrams of substance per cubic meter of air sampled

B. Toxic Effects

In contrast to fibrogenic dusts, which cause scar tissue to be formed in the lungs when inhaled in excessive amounts, so-called "nuisance" dusts have little adverse effect on lungs and do not produce significant organic disease or toxic effect when exposures are kept under reasonable control.

Total particulates, as described in the current Department of Labor standards (15 mg/M^3), include the air-suspended particulates greater than respirable diameter. If only particles of respirable diameter are present, or are collected, a limit of 5 mg/M^3 is to be used.

The most prominent effects from exposure to products designated as "Stoddard solvents" are irritation of the mucous membranes and narcosis. Standards and threshold limit values represent those to prevent narcotic and irritant action. Lower limits may be necessary for naphthas with flash points above 110°F.

IV. HEALTH HAZARD EVALUATION

A. Initial Visit -Observational Survey

The initial observational survey of the Barker Greeting Card Company, Cincinnati, Ohio, was performed on June 16, 1972, by NIOSH representatives Harry L. Markel, Jr., and Edward Shmunes, M.D. The function of the National Institute for Occupational Safety and Health, its relation to Section 20(a)(6) of the Occupational Safety and Health Act of 1970, and the purpose of the visit were explained to the Building Manager, and the Personnel Manager. The National Surveillance Network Questionnaire, Part I, was completed with their assistance.

The plant is unionized by Local Number 11 -- Printing Pressmen Union and Local Number 19 -- Book Binders Union, and following the initial conference with management representatives, contact was made with the Union Steward for the Book Binders Local Number 19.

As a result of this initial visit, it was determined that environmental measurements for inert/nuisance dust were needed to adequately evaluate exposure levels to alleged/potential hazards involved in the flocking operation. Although no complaints were received relative to the use of glues containing a type of Stoddard solvent, it was decided to similarly evaluate airborne levels of the solvent in question.

B. Environmental Evaluation

1. Procedure and Methods

On September 14, 1972, a follow-up environmental survey was conducted by NIOSH representatives, Messrs. H. L. Markel, Jr., and Henry Ramos, to determine environmental levels of inert/nuisance dust and Stoddard solvent.

(Note: Due to unavoidable problems in obtaining accurate weights of filters used for the above-mentioned environmental survey, results of the analyses were deemed to be "invalid", and methods/ procedures for sampling/analysis are not shown).

For reasons stated above, a decision was made to revisit the plant in question for purposes of obtaining additional environmental samples within the flocking department. A second follow-up environmental survey was conducted by Mr. Harry L. Markel, Jr., on May 23, 1973.

Eight (8) personal breathing-zone samples (4 respirable, 4 total dust) and two (2) general area samples were collected for the inert/nuisance dust analyses. Eleven valid (11) general area samples were similarly collected for the Stoddard solvent analyses.

Dust samples were collected by using the MSA Model G, battery-operated vacuum pumps, with MSA pre-weighted PVC, 5.0 u pore size, 37 mm filters at a sampling rate of 1.7 liters per minute. "Respirable" dust samples utilized a Dorr-Oliver 10 mm cyclone pre-sampler, while "total dust samples were collected by use of the 3-piece cassette, attached with tygon tubing to the vacuum pump.

It was decided to perform appropriate particle size determinations to assist in the evaluation of the potential dust hazard. Samples were collected and submitted to the NIOSH Division of Field Studies and Clinical Investigations for proper evaluation. The same method used for asbestos counting was utilized for these samples -- along with a "Leitz" phase contrast microscope at 400X magnification.

Samples obtained for solvent determination were collected by using MSA Model G, battery-operated vacuum pumps with MSA Organic Vapor sampling tubes (Part No. 459004) at a sampling rate of 1.0 liter per minute.

Gravimetric methods were used for the analysis of total and respirable dust, utilizing a minimum detection limit of 0.1 mg/filter. Gas chromatography methods were used for the analysis of Stoddard solvent with a sensitivity of 0.05 mg/tube.

2. Results and Discussion

A total of twenty-two (22) air samples were collected during the survey, with all analytical determinations being performed by the Division of Laboratories and Criteria Development, NIOSH, Cincinnati, Ohio.

Table I shows the air concentrations of inert/nuisance dust for both the personal breathing-zone and general area samples collected during the survey. The established standards for inert/nuisance dust (Federal Register, Part II, § 1910.93, Table (G-3), as promulgated by the U. S. Department of Labor, are 5 mg/M^3 (respirable fraction) and 15 mg/M^3 (total dust). From Table I, it can be seen that these values were exceeded in only one (1) instance.

Table II shows the air concentrations of Stoddard solvent for general area samples collected during the survey. The established standard for this solvent (Federal Register, Part II, § 1910.93, Table G-3), as promulgated by the U. S. Department of Labor, is 2950 mg/M^3. Values in Table II show that this value was not exceeded.

Table III represents a summary of all environmental samples collected during the survey.

Table IV, relating to particle-size data, shows that almost all of the particulate was of a respirable nature. This basically is in conflict with information received in a letter furnished by the manufacturer from whom Barker Greeting Card orders (General Manager, Cellusuede Products, Inc., Rockford, Illinois). This supplier of flock stated that he buys rayon tow from three (3) different companies and it is precision-cut into short lengths of 0.020 inches, 0.025 inches and 0.03 inches. These lengths of flock are then dyed into many different colors to fit the needs of the various industries that they serve. Some flocks are "direct dyed" for use in the greeting card industry, while others are "vat dyed" for use in the textile print industry. The diameter of the flock was identified as being consistently 0.9 mils in diameter or 23 microns wide. The shortest length, in microns, would accordingly be 507 microns.

C. Medical Evaluation

1. Procedure and Methods

On June 16, 1972, a preliminary medical survey was conducted by Edward Shmunes, M. D., NIOSH physician. It was determined that there is no health facility within the plant, although first aid kits are located throughout the building, and one (1) person has had first aid training. A local physician, whose office is located near the plant, is employed on a fee-for-service basis, with ill or injured employees going to his office for examination and/or treatment.

Pre-employment physical examinations are given only to administrative personnel and thus do not apply to the women employed in the flocking department. There is no post-employment examination or testing of employees. An OSHA Log and Summary are maintained on the premises, but did not reveal any history of dermatitis or illnesses, and reflected only accidents. Management was unaware of any dermatitis or upper respiratory tract problems in the flocking area.

A total of six of the seven women employed in the flocking department were interviewed and questioned about health problems encountered. An attempt was made to later question the seventh employee, who had been terminated, had no telephone, and failed to respond to a letter. Four of the six women expressed symptoms related either to the skin (4 instances) or the respiratory tract (4 instances).

2. Results

One individual had developed a rather obvious wide spread thickening and mottling of her skin as well as wide spread flat warts. She had visited her dermatologist who doubted any association with her employment in flocking. In addition to the above-described conditions, the employee also had a history of acrocyanosis and Raynaud's disease.

The second symptomatic worker interviewed had a history of bronchitis and calcium on the lungs, which she claimed was not present prior to her commencing employment at the plant. This employee's personal physician commented that she had pharyngitis, deep coughing and wheezing, which antedated her employment. He did not feel employment had changed her clinical picture. An examination at the plant revealed the employee to have a very mild erythema on the lateral portions of her neck in the flexure lines.

The third symptomatic worker gave a history of developing, from time to time, a slight rash in her antecubical fossae but had mainly been troubled with an aggravating throat condition. She complained of a chronic sore throat and also contended that she suffered from asthmatic bronchitis. An examination at the plant revealed the employee to have a very minimal erythematous patch in the nasal crease on either side of her nose. This employee's private physician felt that flocking particles would certainly tend to aggravate conditions such as her chronic nose or throat problem.

The last symptomatic worker interviewed revealed that she had developed an itchy erythematous rash on her wrist since becoming an employee at the plant, and that a pre-existing sinus condition had been aggravated.

Two of the six women had no complaints relating to dermatologic or upper respiratory conditions. Paper face masks are provided for the women, although several of the symptomatic workers elect not to wear them because it makes breathing more difficult. No complaints were received or evidence found to indicate that a narcosis problem existed among employees working with glues containing a type of Stoddard solvent.

D. Conclusions

Complaints relating to skin disorders, as voiced by four of the six women interviewed, do not clinically fit an allergic response. The most vivid dermatosis present in an employee (skin thickening and flat warts) has no logical or known interaction with the flocking process.

In two of the four instances of skin complaints, flexures (neck, nasal crease and elbow crease) were involved. The most likely explanation is mechanical irritation from the rubbing caused by movement of the fibers in the body creases. The nasal area was involved in a "mask wearer" in which flocking material is probably trapped under the mask.

In summary, and based on the medical/environmental findings, it is our conclusion that substances found in this plant had no <u>proven</u> toxic effects in such concentrations as were used or found at the time of the survey.

It is, however, felt that: (1) airborne flock does result in minor mechanical irritation from the deposition of fibers on the body -- particularly skin creases, and (2) a few individuals with chronic or preexisting throat and sinus conditions are made worse by the constant deposition of flock high in the oral and nasal passages.

V. RECOMMENDATIONS

1. Improve dust collection to assist in eliminating the mechanical skin irritation and upper respiratory tract conditions witnessed by persons employed in the flocking department.

2. Improvement of current housekeeping practices should definitely be made. Dust on overhead ledges, floors, etc., can readily be dispersed to the in-plant atmosphere by traffic, vibration and random air currents. Maintenance housekeeping is mandatory, and employees should be informed of the need for those measures. Consideration should be given to increasing the frequency of the current practice of vacuuming floors 2-3 times each day.

3. Discontinue the present practice of using compressed air to "blow" dust off employees' uniforms. Dust concentrations are increased considerably by this practice.

4. The "screening" out of future potential employees with preexisting chronic sinus and throat illness is recommended.

5. Wearing of long sleeve uniforms in the flocking area is recommended to prevent deposition of airborne flock in elbow creases. In addition, a clean, change of uniform should be provided daily.

6. Encourage the use of paper face masks by all persons in the flocking area, including management,upon entering the area.

7. Insure that filters on current A/C systems are adequately maintained.

VI. REFERENCES

1. Handbook of Organic Industrial Solvents, American Mutual Insurance Alliance, page 58.

VIII TABLES

Table 1
Concentrations of Inert/Nuisance Dust
Barker Greeting Card Company-Flocking Department
Cincinnati, Ohio
May 23, 1973

Sample No.	Type of* Sample	Job Title	Sample Volume (M^3)	Dust Concentration (mg/M^3)*
070436	P	Supervisor	0.501	0.5
070437	P	Finisher	0.515	20.0
070438	P	Finisher	0.529	3.9
070439	P	Finisher	0.495	0.5
070440	P(R)	Finisher	0.529	0.6
070441	P(R)	Finisher	0.495	0.0
070442	P(R)	Finisher	0.515	0.4
070443	P(R)	Supervisor	0.501	0.5
070444	GA	X	0.361	1.1
070445	GA	X	0.418	0.5

*P - Personal-Breathing Zone
P(R) = Personal-Breathing Zone (Respirable)
GA = General Area

** mg/M^3 = Milligrams of substance per cubic meter of air sampled

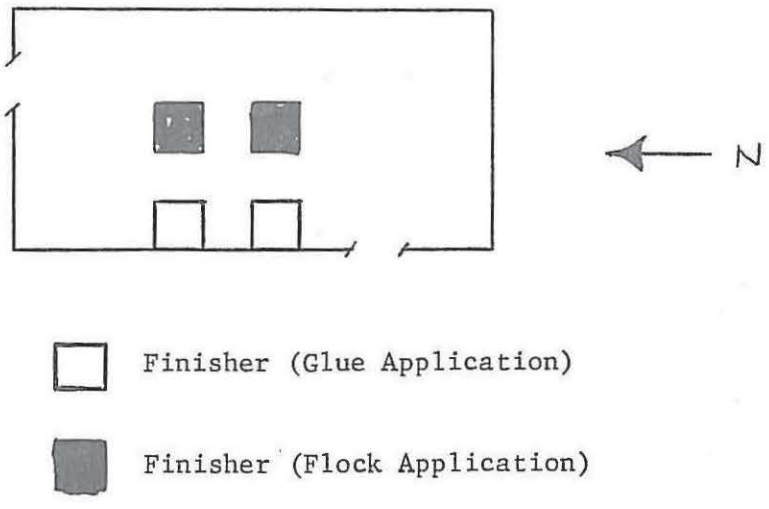

Table II
Concentrations of STODDARD Solvent
Barker Greeting Card Company-Flocking Department
Cincinnati, Ohio
May 23, 1973

Sample No.	Type of* Sample	Location of Sample (See diagram below)	Sample Volume (M^3)	Solvent Concentration (mg/M^3)**
070446	GA	Sta. 1	0.01	225
070447	GA	2	0.01	197
070448	GA	1	0.01	566
070449	GA	2	0.01	99
070450	GA	1	0.01	485
070451	GA	2	0.01	145
070452	GA	2	0.01	1906
070453***	GA	1	0.01	43,800 (discard)
070454	GA	2	0.01	151
070455	GA	1	0.01	524
070456	GA	2	0.01	134
070457	GA	1	0.01	923

*GA = General Area
**mg/M^3 = Milligrams of substance per cubic meter of air sampled
***Sample physically came into contact with glue containing Stoddard solvent; it was, therefore, deemed to be invalid and not included as part of this evaluation.

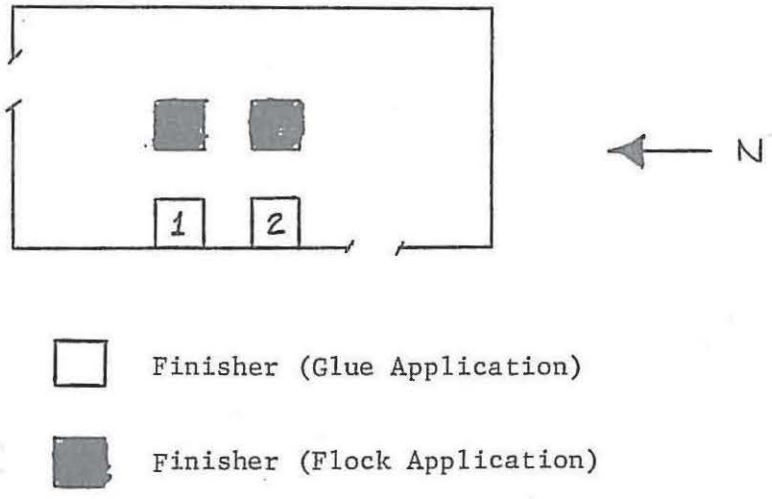

Table III

Summary of Average Dust/Stoddard Solvent Concentrations

Baker Greeting Card Company
Cincinnati, Ohio
(Flocking Department-May 23, 1973)

I. Inert/Nuisance Dust

	No. of Samples	Concentration (mg/M^3)* Min.	Ave.	Max.	Applicable Standard (mg/M^3)*
A. General					
1. Total	2	0.5	0.8	1.1	15.0
B. Personal					
1. Total	4	0.5	6.2	20.0	15.0
2. Respirable	4	-0-	0.4	0.6	5.0

II. Stoddard Solvent

	No. of Samples	Concentration (mg/M^3) Min.	Ave.	Max.	Applicable Standard (mg/M^3)
A. General Area	11	99	438	1,906	2,950

*mg/M^3 = Milligrams of substance per cubic meter of air sampled

Table IV

Particle Size Data
Barker Greeting Card Company
Cincinnati, Ohio
Flocking Department-May 23, 1973

Circle Number	Particle Size (Microns)	Number of Particles	Cumulative Total	Cumulative Percent
1	0.93	61	61	53
2	1.30	19	80	70
3	1.86	11	91	79
4	2.60	9	100	87
5	3.72	7	107	93
6	5.20	3	110	96
7	7.44	1	111	97
8	10.40	2	113	98
9	14.88	0	-	-
10	20.80	1	114	99
11	29.76	1	115	100
12	41.60	0	-	-
13	59.52	0	-	-

VII FIGURES

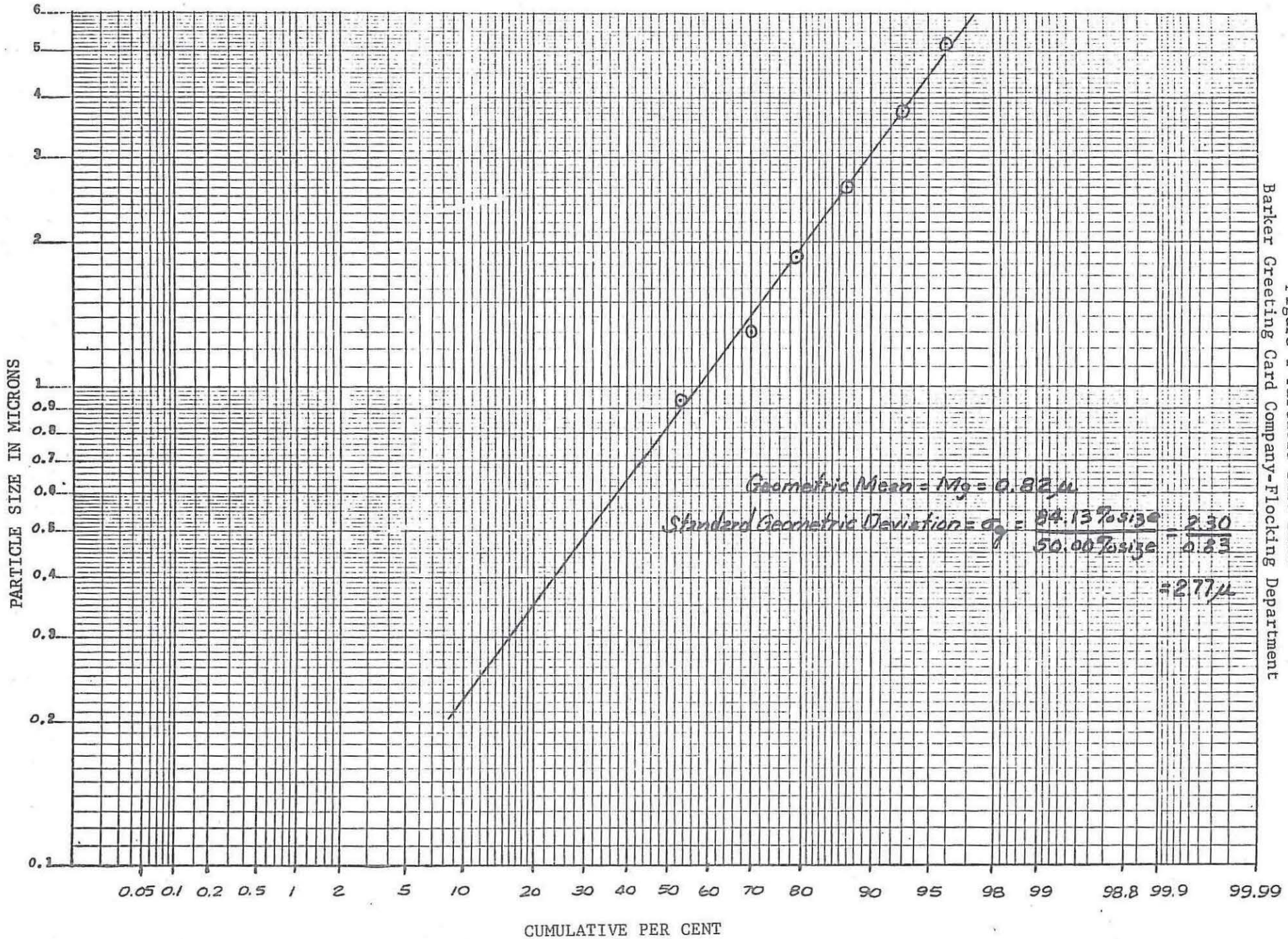

Figure 1-Particle Size Data
Barker Greeting Card Company-Flocking Department

HEALTH HAZARD EVALUATION REPORT 72-33-129
HAZARD EVALUATION SERVICES BRANCH
DIVISION OF TECHNICAL SERVICES

Establishment	:	Barker Greeting Card Company Cincinnati, Ohio
Report Prepared By	:	Harry L. Markel, Jr., Industrial Hygienist, NIOSH Region VI, Dallas, Texas Edward Shmunes, M. D. Medical Services Branch, NIOSH, Cincinnati, Ohio
Field Evaluation	:	Harry L. Markel, Jr. Henry Ramos Edward Shmunes, M. D.
Laboratory Analyses	:	Ralph D. Zumwalde, Engineering Technician Robert W. Kurimo, Chemist Martha J. Seymour, Chemist Ceola H. Moore, Physical Science Aide
Originating Office	:	Jerome P. Flesch, Chief Hazard Evaluation Services Branch Cincinnati, Ohio

MARCH 1974

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