

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 79-92-629

FRANCO AMERICAN NOVELTY COMPANY  
HEMPSTEAD, NEW YORK

NOVEMBER 1979

I. TOXICITY DETERMINATION

A Health Hazard Evaluation was conducted by the National Institute for Occupational Safety and Health (NIOSH) at the Franco American Novelty Company, Hempstead, New York on August 7-8, 1979. At the time of this evaluation, breathing zone and general area samples were collected for styrene monomer and methyl ethyl ketone peroxide (MEKO).

Levels of styrene ranged from 2 mg/M<sup>3</sup> to 13 mg/M<sup>3</sup> for both personal and general area samples. By comparison, the ACGIH recommends a TLV of 420 mg/M<sup>3</sup>. Four of the MEKO samples showed less than the limit of detection (13 µg sample). One sample for MEKO detected a concentration of 0.30 mg/M<sup>3</sup>. By comparison, the ACGIH recommends a TLV of 1.5 mg/M<sup>3</sup>.

Based on the results of the environmental evaluation it has been determined that a health hazard did not exist in the manufacturing of plastic ice cubes used as a novelty in mixed drinks.

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 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, Publication Office at the Cincinnati address.

Copies of this report have been sent to:

- a) Franco American Novelty Company, Hempstead, New York
- b) Authorized Representative of Employees - District 65, Distributive Workers of America
- c) U.S. Department of Labor - Region II
- d) NIOSH - Region II

For the purpose of informing the 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 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 an authorized representative of employees from District 65, Distributive Workers of America, regarding workers' exposure to styrene and methyl ethyl ketone peroxide in the manufacturing of plastic ice cubes.

### IV. HEALTH HAZARD EVALUATION

#### A. Plant Process

The Franco American Novelty is engaged in manufacturing and assembly of a variety of novelty items used for party jokes, etc. The company has been involved in this activity for the past five years, and currently has 13 employees; one shift per day, five days per week. Of the 13 employees, one employee (caster operator), may be exposed to the alleged potential health hazards in the manufacturing of plastic ice cubes.

The caster operator is potentially exposed to styrene monomer and methyl ethyl ketone peroxide. The potential exposure occurs while mixing MEKO, dimethyl phthalate, a proprietary aqueous solvent mixture and a styrenated unsaturated polyester resin. The mixture is poured into a tray filled with molds, heated to 140°F in a gas-fired

oven for 20 minutes and cooled for 30 minutes. The plastic cubes are then removed from the molds. The caster operator produces approximately 800 plastic ice cubes per shift.

#### B. Evaluation Design

An environmental survey was conducted on August 7-8, 1979. This survey included obtaining background information and conducting a walk-through survey of the area.

Aerometric sampling was performed during the initial survey. Airborne samples were collected for styrene monomer and methyl ethyl ketone peroxide.

An interim report was distributed on August 17, 1979, reporting the findings to date and the future action to be taken.

#### C. Environmental Evaluation Method

**Styrene Monomer:** Samples for determination of airborne concentration of styrene vapors were collected by absorbing the vapors onto charcoal contained in a glass sampling tube. Air was drawn through the tube at a flow rate of 200 cubic centimeters (cc) per minute, with a vacuum sampling pump. Personal samples were obtained by attaching the pump to the worker's belt with the charcoal sampling tube contained in a holder attached to the lapel of the worker. The sampling tubes were transmitted to the laboratory for analysis by gas chromatography. The limit of detection for styrene was 0.01 milligrams (mg).

**Methyl Ethyl Ketone Peroxide:** Air was drawn through a midget impinger containing 15 milliliters of dimethyl phthalate sampling solution at a flow rate of one liter/minute using a battery-operated vacuum pump. The samples were analyzed on site, utilizing a colorimetric method adapted for field use. The lower limit of quantitation in this evaluation was 13  $\mu\text{g}/\text{sample}$ .

#### D. Evaluation Criteria

##### 1. Environmental

The primary sources of environmental evaluation criteria considered in this report are (1) American Conference of Governmental Industrial Hygienists (ACGIH) Threshold Limit Values (TLV's) with Supporting Documentation, and (2) Federal Occupational Standards, promulgated

by the Occupational Safety and Health Administration, U.S. Department of Labor. No NIOSH criteria have been recommended for these substances. For the substances evaluated during this study, the primary environmental criteria used were:

<u>Substance</u>	<u>Standard or Guide</u>
methyl ethyl ketone peroxide	1.5 mg/M <sup>3</sup> ceiling (1)*
styrene	100 ppm (1,2)** (420 mg/M <sup>3</sup> )

\* Reference numbers in parentheses refer to the source(s) from the above discussion from which the standard or guide was obtained.

\*\* The OSHA Standard includes a ceiling concentration of 200 ppm not to be exceeded for 5 minutes in any 3 hours with a maximum peak of 600 ppm.

mg/M<sup>3</sup> - Milligrams of substance per cubic meter of air

ppm - Parts of organic vapor per million parts of air by volume

Occupational health exposure limits for individual substances are generally established at levels designed to protect workers occupationally exposed on an 8-hour per day, 40-hour per week basis over a normal working lifetime.

Although sources other than the Federal Standard were considered in this study for arriving at a toxicity determination, the only legally enforceable standard is the Federal Standard which is administered by the Occupational Safety and Health Administration of the Department of Labor.

## 2. Physiological Effects

### a. Styrene

Styrene vapor at concentrations of 200 to 400 ppm were found to have transient irritant effects on the eyes.<sup>1</sup> Styrene sickness characterized by symptoms of headache, sleepiness, nausea, vomiting, general weakness, and loss of appetite has occurred among workers exposed to styrene vapor.<sup>2</sup> Exposure to level around 200 ppm did not affect the hemopoietic system.<sup>3</sup> It has been reported that chronically exposed workers have prolonged single reaction time.

b. Methyl Ethyl Ketone Peroxide (MEKO)

Little human data is available but animal studies suggest that it is moderately toxic. Exposed animals show liver and kidney damage at moderate to high levels. Animal experiments also show that it is less toxic than benzoyl peroxide which has a TLV of 5 mg/M<sup>3</sup> as compared to the 1.5 mg/M<sup>3</sup> recommendation for MEKO.<sup>4</sup>

E. Evaluation Results and Discussion

Results of environmental samples collected for styrene and MEKO are given in Table I. Levels of styrene ranged from 2 mg/M<sup>3</sup> to 13 mg/M<sup>3</sup> for both personal and general area samples during the one day of normal operations involving the manufacturing of plastic ice cubes. All levels were below the recommended environmental criteria within the worksite area.

Field analysis of five (MEKO) samples was completed by a NIOSH chemist. Four of the samples showed an airborne concentration of MEKO less than the limit of detection (13 µg/sample). Except one, this sample showed a concentration of 0.30 mg/M<sup>3</sup>. By comparison, the ACGIH recommends a TLV of 1.5 mg/M<sup>3</sup>.

Based on the results of environmental evaluation conducted on August 7-8, 1979, it does not appear that the present degree of operations utilizing styrene and MEKO creates a health hazard to the caster operator.

V. RECOMMENDATIONS

1. Management is encouraged to develop a detailed written health and safety program and instruct all employees of the hazards associated with the chemicals used in the facility, even though this investigation did not document a specific problem.
2. Good personal hygiene and work practice should be observed by all employees. Washing of hands before smoking, eating and drinking will help reduce possible contamination.
3. Better housekeeping is needed throughout the area.

VI. REFERENCES

1. Patty, F. A. (ed.): Industrial Hygiene and Toxicology, Vol. II, 2nd Ed., Interscience Publishers, New York, 1963.
2. Rogers, J., Arch. of Ind. Health, 12: pp. 470, 1955.
3. Parmeggain, L. and C. Sassi: Occupational Risk and Pathology in the Production and Manipulation of Some Plastic Material.
4. American Conference of Governmental Industrial Hygienists, Documentation of the Threshold Limit Values, 3rd Ed., 1971.

VII. AUTHORSHIP AND ACKNOWLEDGEMENTS

Report Prepared By: Raymond L. Ruhe  
Industrial Hygienist  
Industrial Hygiene Section  
Hazard Evaluations and  
Technical Assistance Branch  
Cincinnati, Ohio

Originating Office: Jerome P. Flesch  
Acting Chief  
Hazard Evaluations and  
Technical Assistance Branch  
Cincinnati, Ohio

Laboratory Analyses: David Smith  
Chemist  
Measurement Support Branch  
Cincinnati, Ohio

Utah Biomedical Test Laboratory  
Salt Lake City, Utah

Report Typed By: Sandra L. Kerdolff  
Clerk-Typist  
Industrial Hygiene Section  
Hazard Evaluations and  
Technical Assistance Branch  
Cincinnati, Ohio

TABLE I

RESULTS OF BREATHING ZONE AND AREA SAMPLES FOR STYRENE AND  
METHYL ETHYL KETONE PEROXIDE (MEKO)FRANCO AMERICAN NOVELTY COMPANY  
HEMPSTEAD, NEW YORK

August 8, 1979

<u>JOB AND/OR LOCATION</u>	<u>SAMPLING PERIOD</u>	<u>SAMPLE VOLUME (Liters)</u>	<u>STYRENE *mg/M<sup>3</sup></u>	<u>METHYL ETHYL KETONE PEROXIDE mg/M<sup>3</sup></u>
Caster Operator	0825-1144	62	3	--
Caster General Area	0825-1144	62	3	--
Caster Operator	1245-1545	55	3	--
Caster General Area	1245-1545	55	13	--
Pump on Mixing Table	1245-1545	55	2	--
Caster Operator	0825-1144	199	--	--
Caster General Area	0825-1144	199	--	**LD
Caster General Area	0825-1144	199	--	LD
Caster Operator	1245-1540	175	--	LD
Caster General Area	1245-1540	175	--	LD
Pump on Mixing Table	1245-1540	175	--	0.3
Environmental Criteria			420	1.5

\* mg/M<sup>3</sup> - Milligrams of substance per cubic meter of air

\*\* LD - Less than detectable limits

Methyl Ethyl Ketone Peroxide - Limit of detection 13 µg/sample

Styrene - Limit of detection 0.01 mg/sample