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

HEALTH HAZARD EVALUATION DETERMINATION  
REPORT NO. 73-39-166

JOS. E. SEAGRAM AND SONS DISTILLERY  
LAWRENCEBURG, INDIANA  
JANUARY 1975

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I. TOXICITY DETERMINATION

On the basis of the medical and environmental data collected during the period of this evaluation (April 1973-January 1974) it may be concluded that a definite toxic exposure to hot melt adhesive emissions could not be identified. However, it does seem apparent that on occasions and particularly when the older formulation was in use that such emissions may result in eye and upper respiratory tract irritation among a minority of operators of Federal excise stamp machines and that the irritation may be sufficient to aggravate pre-existing conditions. Such occasions are likely to occur during periods when ambient air pollution in the community is increased; when the air conditioning system or other room ventilation is curtailed, and during the second shift when room air levels may have previously built up. Such eye and upper respiratory tract irritation is temporary and there is no evidence that it leads to permanent health problems. It is also possible that ethanol vapor and vapor from the solvent used in cleaning may contribute to the irritative effects of hot melt adhesive. A mortality study failed to demonstrate any decrease in life expectancy or unusual disease incidence among the former employees of this work place.

II. DISTRIBUTION AND AVAILABILITY OF DETERMINATION REPORT

Copies of this Determination Report 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 have been sent to:

- a) Jos. E. Seagram and Sons Distillery, Lawrenceburg, Indiana
- b) Authorized Representative of Employees
- c) U.S. Department of Labor - Region V
- d) NIOSH - Region V

For the purposes of informing the approximately 300 "affected employees" the employer shall promptly "post" the Determination Report in a prominent place(s) near where exposed employees work 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 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 received such a request from an authorized representative of employees regarding exposure of workers to solvent vapors and fumes produced during the application of a hot melt glue.

The request stated that the symptoms experienced by the workers were "burning of eyes, similar to head cold or sinus, severe sore throat, and burning, irritation of trachea and bronchial tubes." Concern was also expressed regarding chronic pulmonary effects and possible carcinogenic properties.

### IV. HEALTH HAZARD EVALUATION

#### A. Plant Process - Conditions of Use

The products manufactured at the plant represent a wide range of distilled beverage spirits. There are two rooms in which liquor is bottled and packed, one room contains eight lines, the other six. Following automatic filling, capping and inspection, the bottles proceed along an automatic conveyor and pass through a labeling machine and a stamp machine which affixes the Federal excise stamp. The stamps are applied with a hot melt glue which is received in block form and placed in a heated reservoir, normally maintained at a temperature of 300-325°F. The glue is then automatically fed to the brush applicator of the stamp machine. The formulation of the hot melt glue had been changed approximately 8 months prior to our initial visit in April 1973. There was general agreement that the former glue possessed a much greater capacity for irritation than the glue in use during the survey. Hot melt adhesives are complex, organic mixtures and it is known that the product formerly used consisted principally of a constituent which was not present in the newer formulation. The reservoir is not hooded and vapors can be noted rising above it. Condensed glue was noted on overhead duct work. During normal operations the operator sits or stands within two to three feet of the heated glue reservoir. Other personnel work some distance away and their exposures are essentially to the components of the general room air.

Periodically the stamp machine head is cleaned with a commercial solvent to remove excessive glue deposits which might foul the mechanism. This solvent was determined to be a mixture of commonly

used organic solvents; the composition is considered proprietary information by the manufacturer. The cleaning operation which requires between 5 and 10 minutes is performed approximately twice a shift. Only a very small volume is utilized and this is applied with a small brush.

The brand labels are automatically attached using a water based, non-heated adhesive. Filled bottles not infrequently break, especially if the line jams. Such spills are quickly mopped up resulting in a high level of housekeeping. Ethyl alcohol evaporating from such spills produces a substantial liquor odor in the environment.

#### B. Evaluation Design

Two separate potential hazards were considered during this investigation. The majority of the effort was directed toward evaluating worker exposure to substance(s) which were causing irritation to operators of the Federal stamp machines. The initial concern was to identify the substance(s), evolved from the hot melt glue with gas chromatographic and mass spectrographic analytical techniques. Area samples were collected at locations where the highest levels of the substance(s) were suspected to exist for analysis by the above methods. Operator exposure was then evaluated by measuring air concentrations with breathing zone samples. A concurrent medical evaluation of the exposed workers was also conducted.

The exposure of maintenance workers during cleanup stamp machine was determined by measuring worker exposure with "breathing zone" charcoal tube samples analyzed by gas chromatography.

#### C. Evaluation Methods

##### 1. Organic vapor sampling

Employee exposures to a commercial solvent were measured using personal air sampling equipment. The amount of each substance was determined by adsorbing the organic vapors onto charcoal air sampling tubes and analyzing the tubes by the gas chromatographic procedure of White et al.<sup>1</sup> Concentrations were then calculated from the amount of substance adsorbed and the corresponding air volume.

##### 2. Hot melt glue fume/vapor sampling

Area samples were collected in midget impingers containing 15 ml of cyclohexane for qualitative identification of organic substances released during the application of the hot melt glue. These samples were then qualitatively analyzed using mass spectrographic-gas chromatographic techniques.



Employee breathing zone samples were obtained using charcoal air sampling tubes and analyzed using the analytical method described above for organic vapor sampling.

### 3. Medical evaluation

Two basic types of medical investigations were utilized in this survey: (1) worker interviews (in some instances, limited physical examinations were carried out) and (2) mortality records were examined. The latter step was felt necessary in view of an allegation that an excessive number of workers had died of cancer.

### D. Evaluation Criteria

Brief discussion of known Pathophysiologic Effects of suspected Agents: Impinger area samples collected near the top of the hot melt glue reservoir were analyzed by gas chromatography and only two substances were identified; (1) di-2-ethylhexyl (dioctyl) phthalate (DOP) and (2) butylated hydroxytoluene.

DOP is a common plasticizer. About 1 billion pounds are industrially consumed the United States each year. It, along with closely related phthalates, has been of considerable interest to environmental ecologists because of non-biodegradability which leads to accumulation within biologic systems. The ultimate effects of such accumulation are as yet controversial. Toxicologically, the substance is almost inert orally and by injection. It is approved by the FDA for use in human food wrapping. Conventional testing has also not found the compound to be an eye or skin irritant. It is not a carcinogen and has undergone extensive animal testing throughout the years. An OSHA standard of 5 mg/M<sup>3</sup> has been adopted for it.

Butylated hydroxytoluene (BHT) is a common food additive used to reduce rancidity and improve stability by virtue of its antioxidant properties. Except for the ability to cause allergic contact dermatitis in a few individuals, it is considered practically devoid of toxic properties. An OSHA standard has not been adopted for this substance.

While DOP and BHT were the only components identified in the samples taken, hot melt adhesives are complex mixtures of plasticizers, polymers, and modifying resins. Natural resins of the terpene polymer series are common ingredients. Under the conditions of use these or even new pyrolysis products might be capable of irritation. In fact, decomposition products of di-2-ethylhexyl sebacate at 700° F, a substance similar to DOP, has been shown to produce irritation of the mucous membranes and shortness of breath in test animals.

Three common solvents were identified in the commercial product used for cleaning the stamp machines. In view of their well known properties, the very limited quantity used, and the brief exposure, these can be dismissed as potential health hazards.



Ethyl alcohol vapor at levels well above the OSHA standard (1,000 ppm) can cause headache, numbness, and nasal and conjunctival irritation, dizziness, fatigue, nausea, and narcosis. The chances of a hazardous exposure occurring from ordinary industrial exposure to ethyl alcohol is very low.

## E. Evaluation Results and Discussions

### Environmental

Several visits were made to the plant and environmental samples collected. During the first visit on April 12, 1973, air samples were obtained in the breathing zone of a worker cleaning two machines at separate times after use. The composition of the solvent used is considered proprietary by the supplier so the results are reported as decimal fraction of the appropriate Federal standard. Three substances were identified in the breathing zone of the maintenance man performing the task; for the first substance 0.08 and 0.17 of the standard, for the second 0.01 and 0.01, and for the third 0.04 and 0.07. The combined exposure for these two sampling periods is 0.13 and 0.25. These results are quite low especially when the short duration of 5-10 minutes necessary to clean a machine is considered. A sample of one-half hour duration was obtained in the breathing zone of an operator working at the Federal stamp machine who used solvent for cleanup while the machine was operating. These results for the same three solvents were also quite low 0.04, 0.01, and 0.04 with a combined exposure of 0.09. Two other charcoal tube samples were obtained near two of the Federal stamp machines which were of 45 and 73 minutes duration. No other substances beside the components of the solvent could be qualitatively identified.

A second visit was made on June 8, 1973 in an attempt to obtain samples of the substances being emitted from the hot melt glue reservoir. Four air samples were obtained in midget impingers containing 15 ml of cyclohexane using a flow rate of one liter of air per minute. These samples were obtained at the points where a fume was visible arising from the glue reservoirs. The impinger solution was analyzed on a mass spectrometer-gas chromatograph to identify substances collected. Two substances were identified by this technique: BHT and DOP.

A third visit was made on January 29, 1974 to sample the Federal stamp machine operators for exposure to BHT and DOP. Breathing zone samples for all Federal stamp machine operators working on bottling lines were obtained. All results for BHT and DOP were less than the detectable limits of the gas chromatographic analytical method. The glass fiber filter plugs used to contain the charcoal in the tubes were also desorbed since it was possible that particulates could be trapped there during sampling.

Three silver membrane filter samples were collected near the Federal stamp machines. One of these filters was desorbed with carbon disulfide and the other two with cyclohexane. Analysis by gas chromatography did not reveal detectable levels of BHT or DOP for any of these samples. For the thirteen breathing zone samples obtained for Federal stamp machine operators, the concentration of BHT and DOP was 0.4 mg/M<sup>3</sup> or less based upon the minimum detectable level of the analytical technique.

Detector tube measurements were made on several bottling lines at various locations to determine ethanol vapor concentrations. Locations were selected which were thought to represent the highest potential concentrations; the results are contained in the following Table.

Concentration of Ethanol in the Bottling Area

<u>Line</u>	<u>Operating Area</u>	<u>Concentration (ppm)*</u>
V	Bottling Machine	400
P	" "	400
N	Stamp Machine	400
N	Packing Area	200
K	Bottling Area	300
K	Stamp Machine	150
Federal Standard		1000

\* PPM = parts of vapor per million parts of contaminated air.

Medical

Twenty-four employees were interviewed on two shifts on April 17, 1973. Of these, all were stamp operators or relief operators with the exception of two women employees engaged in relabeling.

Six complained of slight to moderate eye irritation manifested by burning. One of these also complained of hoarseness and headaches and two had the additional complaint of sore throats. One individual was a life-long asthmatic. Only one of the six noted the development of symptoms daily. In the others it was periodic in occurrence with a variable frequency. Complaints of irritative symptoms were more common among second shift employees.



One person complained of sinus problems and one of chest tightness and weakness. Another complained solely of hoarseness. Two individuals with pre-existing chest problems were encountered. In each of these instances the development of chest pathology was clearly not occupational, but it was felt possible that the work environment, or for that matter, any irritation could aggravate their symptoms.

Four workers commented that the old glue formulation was considerably more irritating than the one now in use. Several machine operators commented that symptoms tended to develop when the glue temperature was allowed to exceed the usual optimum range of 300-325°F. In several instances where higher running temperatures were observed, increased emissions were visibly apparent.

During the visit on January 29, 1974, nine operators were interviewed. Production was deemed to have been less on this visit and only one shift was working. Operators were also noted to shift to other bottling lines, as needed, varying their source of exposure to various glue reservoirs. Emissions appeared to be less than during the former visit. Only one individual noted any eye or mucous membrane symptoms during the day and this workman habitually uses "Visine"(R) to control his eye discomfort. One individual, a chronic asthmatic, noted some shortness of breath during the shift. The group was otherwise asymptomatic.

Data on the mortality experience of Seagram's Bottling Department employees were obtained through the cooperation of Local 13, Distillery, Rectifying, Wine and Allied Workers' International Union of America. Information on 27 deaths occurring between August 1, 1968 and July 31, 1973 was examined and compared with 1970 mortality data for the the United States. Non-violent deaths for persons 15 years and over were used as the United States comparison group. No significant difference in deaths by age group was found. The comparison by cause is presented in the following Table:

Seagram Employee Death Data (1968-1973)  
 Compared with U.S. Non-violent Deaths (1970)  
 For Persons Aged 15 and Over

Cause	U.S. Percent	Seagram Percent	No. Found at Seagram	Number Expected Based on U.S. Data
Cardiovascular	60.1	59.3	16	16.2
Cancer	19.6	22.2	6	5.3
Liver	1.9	7.4	2	0.5
Other	18.4	11.1	3	5.0
TOTAL	100.0	100.0	27	27.0

A comparison of the expected number of deaths from each cause and the number recorded for Seagram's employees using the Chi-square test showed no significant differences, i.e.,  $P \leq .05$ . When violent deaths (6) are added to the Table, this category was also not significantly higher than expected.

When the data for six cancer deaths (for women and two men) were examined for the type of cancer involved, no unusual pattern was discernible. Two women died of breast cancer (the leading cause in women); one woman and one man died of lung cancer (the leading cause in men); and one woman died of sarcoma of the neck. The primary site was not determined in the final case.

In summary, although the numbers available are small, there is no evidence from these data that Seagram's employees are dying younger or of causes not representative of the Nation as a whole. While the numbers are very small and not significant, there is a suggestion that liver disease deaths (2) and deaths due to homicide (3) may be increased in this population. It is entirely possible that alcoholism may play an underlying role in these types of mortalities. For example, bartenders are known to have five times the national incidence of cirrhosis.

#### V. REFERENCES

1. White, W.D., Taylor, D.B., Maurer, P.A., and R.E. Kupel, A Convenient Optimized Method for the Analysis of Selected Solvent Vapors in the Industrial Atmosphere. Am. Ind. Hyg. Assoc. J., Vol. 31, Mar-Apr 1970.
2. Treon, Joseph F., et.al., The Toxicity of Certain Lubricants, Engine Oils, and Certain of Their Constituents, with Particular Reference to the Products of Their Thermal Decomposition, Kettering Laboratory, University of Cincinnati, Aero Medical Laboratory Contract No. AF 33(038)-26456, November, 1954.

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