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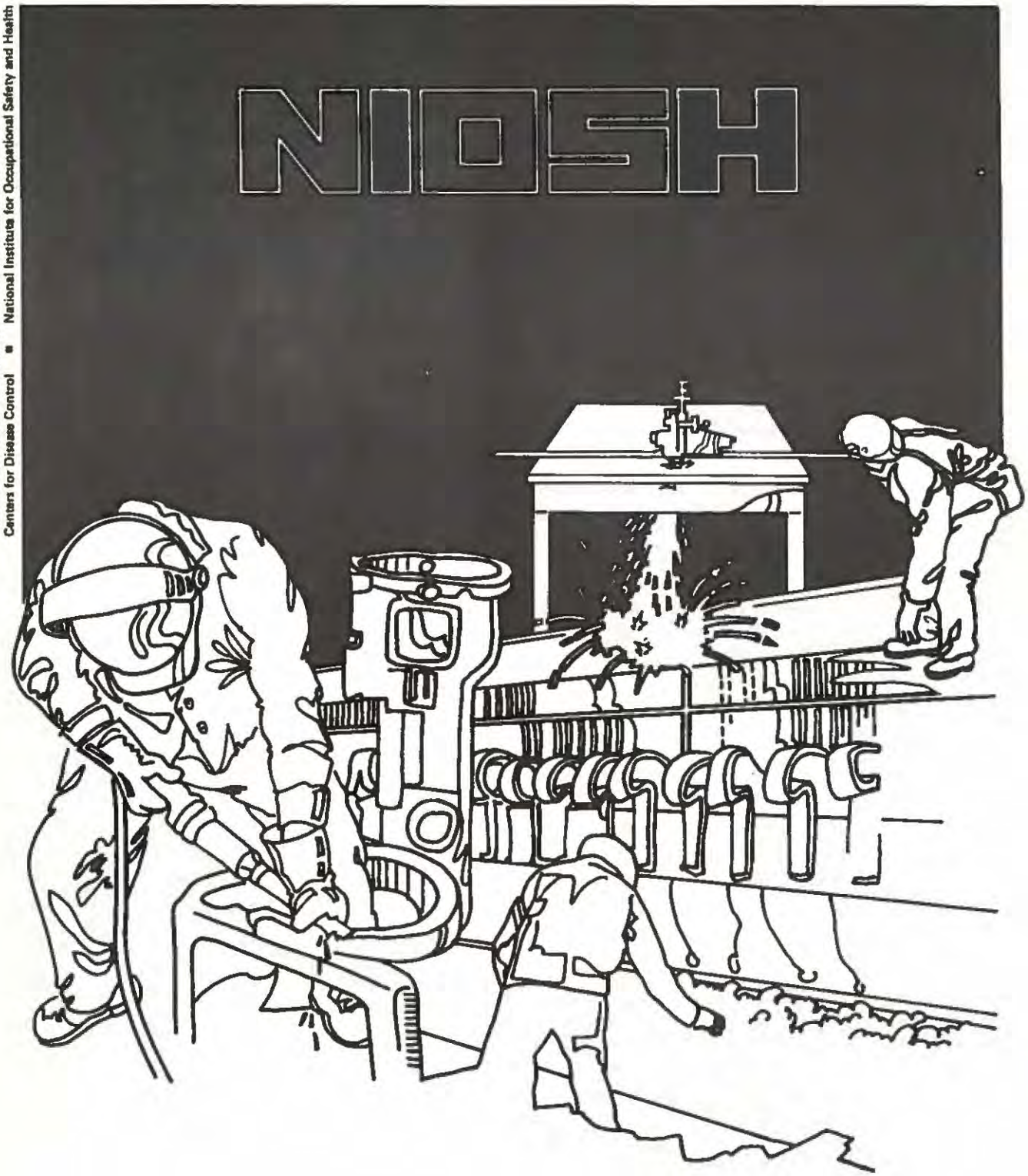


Health Hazard Evaluation Report

HHE 80-160-897
EMERY INDUSTRIES, INC.
LOS ANGELES, CALIFORNIA

PREFACE

The Hazard Evaluations and Technical Assistance Branch of NIOSH conducts field investigations of possible health hazards in the workplace. These investigations are conducted under the authority of Section 20(a)(6) of the Occupational Safety and Health Act of 1970, 29 U.S.C. 669(a)(6) which authorizes the Secretary of Health and Human Services, following a written request from 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 Hazard Evaluations and Technical Assistance Branch also provides, upon request, medical, nursing, and industrial hygiene technical and consultative assistance (TA) to Federal, state, and local agencies; labor; industry and other groups or individuals to control occupational health hazards and to prevent related trauma and disease.

Mention of company names or products does not constitute endorsement by the National Institute for Occupational Safety and Health.

HE-80-160-897
June, 1981
Emery Industries, Inc.
Los Angeles, California

NIOSH Investigators:
Arvin G. Apol, I.H.
Theodore Thoburn, M.D.

I SUMMARY

In July 1980, the National Institute for Occupational Safety and Health (NIOSH) received a request from the International Chemical Workers Union Local 11 to determine if a potential health hazard existed to seven (7) employees from exposure to lauric acid during the flaking and bagging operations at Emery Industries, Inc., Los Angeles, California.

Twenty six of the 27 area and breathing zone airborne total particulate sample concentrations ranged from 0.04 to 0.24 milligrams per cubic meter mg/M^3, and the other was 0.56 mg/M^3. The bagger operators' 8-hour time weighted average exposures to lauric acid were low (0.11, 0.14, 0.19 and 0.56 mg/M^3), however, during the work shift he may receive higher short term (eg 1-3 minutes) exposure while conducting various jobs. These higher concentrations, when inhaled may produce irritation of the nose and throat. One bagger operator developed a severe cough when he dumped scrap lauric acid into the remelt tank. During the shift his average exposure was 0.14 mg/M^3. Currently there is no specific standard for lauric acid. Because of its irritating properties neither the OSHA nuisance dust standard, 15 mg/M^3, or the American Conference of Governmental Industrial Hygienists' "Threshold Limit Value" of 10 mg/M^3 would be applicable.

Interviews indicated that the lauric acid was irritating to the skin, eyes, nose and throat and sometimes caused difficulty in breathing. The purer lauric acid caused the most problems, and warm weather caused the material to be more sticky and cause more symptoms (probably due to increased sweating and low melting points of lauric acid).

No significant decreases in pulmonary function were found over the shift for the six (6) warehouse workers tested. One worker with a history of cigarette smoking and probably chronic bronchitis showed significant impairment of both his FVC and FEV_1.

From the general complaints about skin and mucous membrane irritation and the lack of a reduction in pulmonary functions, it appears the workers at Emery Industries are suffering from local irritation of moist body surfaces (eyes, throat, sweaty skin, etc.) from exposure to lauric acid. Although the time weighted average exposure to airborne concentrations of lauric acid are low, it is possible that irritation of the eyes, nose and throat and of the skin results from high short term exposures during certain jobs. This is evidenced by the symptoms experienced by the bagger operators. Recommendations that will aid in reducing these exposures are included in the report.

Keywords: SIC 2869 (Industrial Organic Chemicals) Lauric Acid.

II. INTRODUCTION

In July 1980, NIOSH received a request from the authorized representative of the International Chemical Workers Union, Local 11, to determine if a potential health hazard existed to lauric acid during the flaking and bagging operations at Emery Industries Inc., Los Angeles, California. An initial survey was conducted on August 20, and an environmental/medical survey on November 12 & 13, 1980. An interim report including environmental/medical results and recommendations was submitted to the company and the requester on March 13, 1981.

III. BACKGROUND

Emery Industries' Fatty Acid Division produces and packages a variety of fatty acids. This evaluation involves only the lauric acid flaking and bagging operation, which is only conducted several days a month. Flaking and bagging of lauric acid is performed in the main warehouse. Melted acid is pumped to the flaker pan where it is picked up in a thin film on a cold roll. As the roll rotates, the acid solidifies, is removed by a flaker blade and the flakes fall into a hopper. The hopper is vibrated periodically to prevent bridging of the flaked material. If bridging occurs, the operator leans over the hopper and breaks the bridge with a long pole. The lauric acid drops from the hopper to a weighing scale and then to the bagger where the bags are automatically filled. The filled bags drop onto a conveyor and are conveyed to the operator who stacks the bags on pallets. Next to the bagger is a remelt tank where scrap acid is dumped for reclamation.

There is a large ceiling fan above the flaker deck, and there is local exhaust ventilation at the point where the bags are filled. There is no ventilation on the remelt tank. During the evaluation, the large loading dock door was open, and a large floor fan near the automatic bagger was blowing air toward it.

There are seven (7) employees in the main warehouse. Three employees work the day shift, two the second shift and two the third shift. One of the three day-time employees is classified as a shipping clerk. The remainder of the employees perform packing, shipping, and receiving operations. These employees rotate shifts. The employees working with and around the lauric acid reportedly experienced irritation of the eyes, nose and upper respiratory system. These effects are reportedly more severe during hot weather.

IV. EVALUATION DESIGN AND METHODS

A. Environmental - Breathing zone and area samples were collected for total particulate on 37 mm polyvinyl chloride filters at a flow rate of 1.7 liters per minute. The samples were weighed before and after sample collection. This method is the same as the company sampling program and as that used by Cal-OSHA during their inspections.

B. Medical - All workers working in the warehouse while lauric acid was being run were tested pre-and post-shift for pulmonary function using an Ohio Medical Products Model 822 Spirometer and were given a limited physical examination. A questionnaire was administered which included questions about chronic respiratory disease symptoms.

V. EVALUATION CRITERIA

A. Toxicity

Lauric acid is one of a group of organic acids known as fatty acids as they are usually obtained by hydrolyzing fats. In general, solubility in water and the ability to damage the skin decreases as the length of the carbon atom chain in the fatty acid molecule increases. Lauric acid, a shorter chained fatty acid, can irritate the skin and mucous membranes. The longer chained fatty acids are nearly insoluble in water and so have only very slight acidity and ability to irritate the skin. Lauric acid is the shortest fatty acid which can be readily handled as a solid at outdoor temperatures.

Lauric acid will cause irritation of the skin and mucous membranes. This can result in reddening of the skin; general discomfort; stinging and watering of the eyes; nasal and upper respiratory irritations resulting in coughing and sneezing. Removal from the exposure and washing the affected body areas with water will relieve the symptoms. Individual susceptability will vary due to allergies and other respiratory problems.

B. Environmental - Currently there is no Federal OSHA or Cal-OSHA standard for lauric acid. Because of its irritating properties neither the OSHA nuisance dust standard of 15 mg/M^3 nor the American Conference of Governmental Industrial Hygienists' "Threshold Limit Value" for nuisance dust of 10 mg/M^3 would be applicable. At this time there is insufficient data for NIOSH to suggest a recommended standard.

C. Medical - The forced vital capacity (FVC) measures the total amount of air that can rapidly force out of his lungs after breathing in as deeply as possible. The one-second forced expiratory volume (FEV_1) measures the amount of air one can breath out in the first second. The FVC can be impaired by restrictive lung disease, such as pulmonary fibrosis. FEV_1 can be impaired by cigarette-related lung damage or some other conditions causing obstruction to air flow. Any condition that impairs FVC also impairs FEV_1, but conditions that impair FEV_1 do not necessarily impair FVC. The FEV_1/FVC ratio is also used to help evaluate obstructive lung disease. Some exposures to substances that irritate the lungs and bronchi will cause a temporary decrease in pulmonary function over the work shift.

In interpreting the results, the best test results are used. They are compared to "predicated values" which take into account age, height, sex, and race[1,2]. Pulmonary function is considered "normal" if the best FEV_1 and FVC results are each 80 percent or more of their respective predicted values, and the FEV_1/FVC ratio is 70 percent or more. It is expected that a person's test results will vary somewhat from time to time. A drop in results over shift of less than 10 percent in FVC or FEV_1 and of less than 6 percent for FEV_1/FVC is considered within normal variation A drop greater than this may indicate a problem with exposures to noxious substances in the work place.

VI. RESULTS AND DISCUSSION

A. Environmental Results

The environmental results are shown in (Table 1). A schematic of the area, the operations, and the sample locations are shown in Figure 1. Twenty-six of the 27 airborne total particulate sample concentrations ranged from 0.04 to 0.24 mg/M^3. The other was 0.56 mg/M^3. Background total particulate air concentrations just outside the warehouse office were from 0.04 to 0.11 mg/M^3. The bagger operators' 8-hour TWA exposures were 0.11, 0.14, 0.19 and 0.56 mg/M^3. Although exposures to lauric acid are low, during the work shift the bagger operators may receive higher very short (eg 1-3 min.) exposures, such as when he is making adjustments to the bag filler, hand feeding bags on the filler nozzle, and dumping lauric acid into the remelt tank. These higher concentrations, when inhaled, may produce irritation on moist surfaces such as in the nose and throat. The graveyard shift bagger operator developed a severe cough after dumping scrap lauric acid into the remelt tank. The cough for a period of time after the job was completed. During that shift his average exposure was 0.14 mg/M^3.

The individuals doing the warehouseman-forklift driver job were exposed to total airborne particulate concentrations of 0.12, 0.19, and 0.24 mg/M^3. It is estimated that very little of these particulates are lauric acid since the majority of his time is not spent in the bagging area.

The presence of the acid on the skin as a result of direct contact, especially moist skin due to sweat, will cause irritation. Physical contact with the acid may occur during the stacking of the filled bags on pallets, adjusting the bag filler, or dumping lauric acid into the remelt tank, etc. Airborne concentrations will have little effect on this exposure. Work practices and personal protective devices will reduce this exposure.

The local exhaust ventilation system on the bag filling nozzle became disconnected during one shift. Also the exhaust ventilation slot around the filling nozzle was partially plugged reducing the effectiveness of the system. These systems need to be checked periodically throughout the day to ensure proper operation. The ceiling fan over the flaker deck acts as a general exhaust system. It draws air from a large area near the ceiling. If the air can be directed to the fan by use of shrouding capture of the dusts, vapors and aerosols emmitted from the flaker and hopper will be more effective.

B. Medical Results

Six men were tested pre-and post-shift for pulmonary function. Two men on the day shift were tested on 2 days; one ran the forklift, the other bagged lauric acid with jobs being switched from one day to the next.

No significant decreases in pulmonary function was found over the shift. One worker with a history of cigarette smoking and probably chronic bronchitis showed significant impairment of both his FVC and FEV_1.

Information from interviews indicated that the exposure to lauric acid was irritating to the skin, eyes, nose and throat, and sometimes caused difficulty in breathing. The 99% lauric acid gave the most symptoms which were worse in the warm weather when the material was sticky. Conditions were relatively good at the time of this study. Although most workers did not have skin problems, one found gloves helped and another worker reported developing severe irritation when lauric acid got on moist covered skin areas.

VII. CONCLUSIONS

From the general complaints about skin and mucous membrane irritation and the lack of a reduction in pulmonary functions, it appears the workers at Emery Industries are suffering from local irritation of moist body surfaces (eyes, throat, sweaty skin, etc.) from exposure to lauric acid without long term health effects. Although the time weighted average exposure to airborne concentrations of lauric acid are low, it is possible that irritation of the eyes, nose and throat results from high short term exposures during certain jobs (e.g. when breaking bridges in the hopper, dumping scrap lauric acid into the remelt tank, adjusting the bagger, etc). This is evidenced by the symptoms experienced by the bagger operators while being exposed to airborne lauric acid concentration of 0.56 mg/M^3 or less. Irritation of the skin results from direct skin contact with the acid while handling filled bags, making adjustments to the bagger, etc.

VIII. RECOMMENDATIONS

1. A shroud could be constructed around the flaker. It should extend down to at least the deck. By doing this all the air currently being exhausted out of the ceiling fan over the flaker would have to pass by the flaker, thereby reducing the vapor and particulate airborne concentrations on the flaker deck.

2. A high short term exposure can occur when breaking up "bridges" in the hopper. The worker is at the edge of the hopper and at times his head is over the hopper. A battery-powered supplied air helmet and face shield that blows filtered air past the eyes and face would reduce eye and inhalation exposure. This same unit could also be used when dumping lauric acid into the remelt tank. A unit such as this is preferred to a half face respirator for these times, since any lauric acid contamination on the inside of the respirator would contact the face. Since moisture developes under the respirator the irritation potential would be increased.

3. The bag filling machine has local exhaust around where the bag fits over the spout. During the sampling period the hose became disconnected for a period of time and the ventilation slot was partially plugged. Lauric acid particles could be seen escaping into the atmosphere. The ventilation system must be attached at all times, and the slots and ducts kept clean. A slot velocity of 1000 to 2000 fpm and a wider slot will reduce plugging. A flange around the slot will permit better capture of the acid.

4. Avoid if possible having bags fall when being released from the filler and avoid dropping the bags while stacking them on the pallets.

5. Install ventilation on, or close off, the air vent port on the bottom of the hopper where it feeds into the scale. At the end of each scale filling a puff of fine acid dust is released; it remains suspended due to the smaller particle size.

6. On days when lauric acid is being bagged, the bagger operator should put on a clean coverall at the start of the shift, shower and change to a clean coverall just prior to the lunch period and shower and change to street clothes just prior to the end of the shift. He should also wash his face when he experiences severe eye irritation.

7. A wash basin should be available in the warehouse near the automatic bagger.

8. The remelt tank should be covered. It should also be vented to the outside. Since a fan blade would plug up, a duct vent utilizing the draft effect from the heated air in the tank might work adequately. Basically the tank should be kept under negative pressure. Another solution would be to move the remelt tank outside.

9. The temperature in the remelt tank should be finely regulated to just above the lauric acid melting point. Avoid overheating the acid.

IX. REFERENCES

1. Morris, J.F., Koski, A., and Johnson, L.C. "Spirometric Standards for Health Non-smoking Adults." Am. Rev. Resp. Dis. 103:57-67 (1971)

2. Lapp, M.L., Amandus, H.E., Hall, R., and Morgan, W.K.C. "Lung Volumes and Flow Rates in Black and White Subjects". Thorax 9:185 (1974).

3. Patty, F.A. (ed.) Industrial Hygiene and Toxicology. Interscience Publishers: New York, 1963 pp. 1771-1773, 1789-1790.

X. DISTRIBUTION AND AVAILABILITY OF DETERMINATION REPORT

Copies of this complete 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 NIOSH Publications Office at the Cincinnati address.

Copies of this report have been sent to:

1. Emery Industries, Inc., Los Angeles, California.

2. International Chemical Workers Local 11, Norwalk, California.

3. U.S. Department of Labor, Occupational Safety and Health Administration, Region IX, San Francisco, California.

4. California Occupational Safety and Health Administration, San Francisco, California.

For the purpose of informing the 7 affected employees, the employer shall promptly post this Determination Report in a prominent place(s) near the work area of the affected employees for a period of thirty (30) calendar days.

XI. ACKNOWLEDGMENTS

Report prepared and survey conducted by:

Arvin G. Apol
Industrial Hygienist
Region X/NIOSH
Seattle, Washington

Theodore Thoburn, M.D.
Medical Officer
Region VIII/NIOSH
Denver, Colorado

Originating Office:

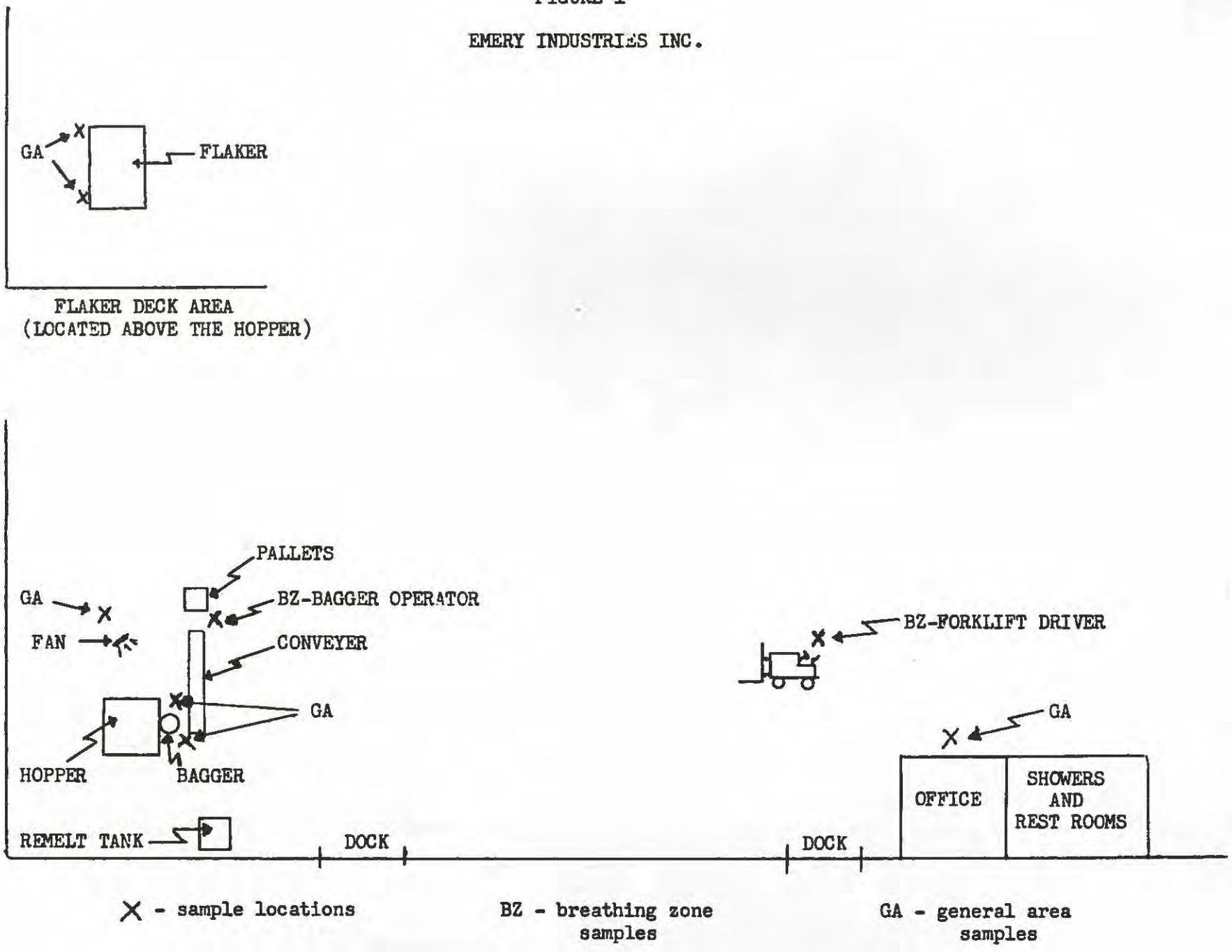
Hazard Evaluation and Technical
Assistance Branch
DSHEFS/NIOSH

TABLE I
TOTAL AIRBORNE PARTICULATE CONCENTRATIONS
EMERY INDUSTRIES
LOS ANGELES, CALIFORNIA
HHE 80-160

JOB OR LOCATION	DATE	SHIFT	SAMPLE NUMBER	SAMPLE TIME MIN	SAMPLE VOLUME LITERS	LAURIC ACID PRODUCT # BAGGED	CONCENTRATION AIRBORNE PARTICULATES mg/cu m
Bagger operator & bag stacker (BZ)	11-12-80	Day	2629	442	751	#651	0.11
"	11-12-80	Swing	2638	185	Void*	hose came off the pump during sample period	
"	11-12-80	Swing	2643	240	408	#651	0.56
"	11-13-80	Graveyard	2644	240	Void*	cassette broke during sample period	
"	11-13-80	Graveyard	2650	210	357	#651	0.14
"	11-13-80	Day	2652	442	751	#651	0.19
Area sample 2 ft South of automatic Bag filler (up wind-fan blowing toward bag filler)	11-12-80	Day	2630	431	733	#651	0.19
" Fan on	11-12-80	Swing	2640	430	731	#651	0.04
" Fan off	11-13-80	Graveyard	2647	455	773	#652	0.05
" Fan on	11-13-80	Day	2655	459	780	#652	0.13
Area sample-3 to 5 ft N.W. of automatic bag filler downwind fan blowing toward bag filler)	11-12-80	Day	2636	340	578	#651	0.10
Same as sample 2636 except only during bag filling (379 bags filled)	11-12-80	Day	2637	229	389	#651	0.18
3-5 Ft N.W. of automatic filler - fan on	11-12-80	Swing	2641	430	731	#651	0.12
" - fan off	11-13-80	Graveyard	2648	455	773	#652	0.10
" - fan on	11-13-80	Day	2654	459	785	#652	0.14
Same as sample 2654 except only during bag filling,(313 bags filled)	11-13-80	Day	2340	150	255	#652	0.16
Area sample near bag stacking	11-12-80	Day	2635	410	697	#651	0.11
Area sample on flaker deck 3-5 ft. S.E. of flaker	11-12-80	Day	2631	428	727	#651	0.14
3 ft. N.E. of flaker	11-12-80	Swing	2639	445	756	#651	0.12
"	11-13-80	Graveyard	2646	468	795	#652	0.08
"	11-13-80	Day	2653	446	758	#652	0.16
Forklift driver, warehouse operator etc. (BZ)	11-12-80	Day	2632	432	734	#651	0.19
"	11-13-80	Graveyard	2645	458	778	#652	0.12
"	11-13-80	Day	2651	449	763	#652	0.24
Area sample by office	11-12-80	Day	2629	442	751	#651	0.11
"	11-12-80	Swing	2642	435	739	#651	0.09
"	11-13-80	Graveyard	2649	455	773	#652	0.05
"	11-13-80	Day	2335	462	785	#652	0.09
BZ-Foreman	11-12-80	Day	2634	408	694	#651	0.19

FIGURE 1

EMERY INDUSTRIES INC.



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