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LOUISIANA DIVISION

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PLAQUEMINE, LOUISIANA 70764-0180

INDUSTRIAL HYGIENE REPORT

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ETHANOLAMINE EXPOSURE SURVEY IN THE LOUISIANA DIVISION
DOWANOL/ETHANOLAMINE PLANT

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SUMMARY

An extensive survey of ethanolamine exposures was conducted in the Dowanol/Ethanolamine Plant during the second half of 1982 and first half of 1983. The samples included 16 6-8 hour time-weighted average and 16 short-term excursions covering nearly all routine potential exposure tasks.

Exposures were found to be very low with most below the detection limit. The only sample above the acceptable exposure guideline was a short-term exposure while loading an open dome MEA rail car. The 6-8 hour exposure data is listed in Table 1 and the short-term excursion data is in Table 2.

The employees have been informed of the results of the survey.

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Introduction

This report is a summary of sampling for ethanolamine during the second half of 1982 and the first half of 1983. The sampling strategy was developed from the results of a comprehensive industrial hygiene audit in December, 1981 and from the Goals and Plans formulated for the Annual Review of the I.H. program in the Dowanol/Ethanolamine Plant in the first quarter of 1982. Several specific tasks were identified and prioritized for exposure monitoring and a monitoring schedule was developed.

A special acknowledgement is in order for Gary Reise, Industrial Hygiene Contact in the Dowanol/Ethanolamine Plant. Gary had major input in developing the sampling schedule as well as actually catching most of the samples. This enabled the entire survey to proceed very smoothly.

Discussion

The results of the survey are located in Tables 1 and 2 of this report. All 6-8 hour TWA exposures were well below current exposure guidelines. Of the short-term exposures, only one was excessive. That was a 38-minute sample taken while loading an open dome MEA tank car. In open dome loading, a large volume of vapor is displaced out into the work area as the car is filled. When loading MEA, this vapor is usually a highly visible plume. Because the operator can see the vapor, it is usually possible to avoid any significant exposure. However, due to such things as shifting wind directions and operator inattentiveness occasional brief high peak exposures can occur. A review of the proper techniques for open dome loading and sampling would be a good topic to cover routinely in the industrial hygiene education meetings in the plant.

In general, the very low exposure levels confirm that good industrial hygiene work practices are adhered to and that plant supervision has a definite commitment to maintaining an effective program.

Sampling and Analytical

Sampling was conducted using portable battery-powered constant flow pumps and 600 mg alumina sampling tubes. A flow rate of approximately 100 cc/min was used for 4-8 hour samples while some of the short-term samples were collected at a flow rate of 500 cc/min. The samples were stored in a freezer after being collected. The samples including spikes and standard solution were shipped to Leo Nauer in the Midland Analytical Laboratory for analysis. The analytical procedure is described in Analytical Report ML-AL-79-50337 by P. W. Langvardt and R. G. Melcher. Results were reported in Analytical Reports AL-82-50429 and AL-83-50150 by L. Nauer.

Evaluation Criteria

Industrial Hygiene Guides (IHGs) are concentrations of airborne substances to which nearly all employees may be repeatedly exposed throughout a working life-time without adverse effect. IHGs are established by the health professionals of the Dow Industrial Health Board for chemicals (raw materials, intermediates, by-products, wastes, and products) handled within The Dow Chemical Company. Published exposure criteria are available for many industrial chemicals; examples include the Threshold Limit Values (TLVs) of the the ACGIH (American Conference of Governmental Industrial Hygienists), the ANSI standards of the American National Standards Institute, Workplan Environmental Exposure Level (WEELS) by the American Industrial Hygiene Association (AIHA) and the OSHA standards of the Occupational Safety and Health Administration of the United States Department of Labor. For most of these chemicals, the Industrial Health Board has adopted the published exposure criteria as the Dow IHGs. In a few instances, the IHG set by the Industrial Health Board differs from the published exposure criteria. In establishing IHGs for chemicals which lack published exposure criteria, the Industrial Health Board considers toxicological information, occupational exposure data and medical experience.

Industrial Hygiene Guides do not represent fine lines between safe and dangerous exposures. As the name indicates, IHGs are properly used as guides for plant design and for evaluating occupational exposures. IHGs for gases and vapors are usually expressed in parts per million (ppm, volume/volume); for dusts, fumes, aerosols, and mists, IHGs are usually expressed in milligrams of contaminant per cubic meter of air (mg/m^3).

Most IHGs are time-weighted average (TWA) concentrations for a 8-12 hour work day and a 40 hour work week. Limited excursion exposures to concentrations exceeding the IHG are permitted, provided that the TWA exposure for the entire work day is acceptable and the consequences of exposures, within the excursion limit, are minimal and reversible. For most chemicals, excursion limits are calculated from the IHGs and the excursions factors recommended by the ACGIH. Ceiling IHGs are assigned to those materials which caused significant or irreversible effects at concentrations exceeding the IHG. For these chemicals, no excursion exposures are allowed. The following exposure criteria currently apply to the airborne contaminants measured during this survey:

	<u>Exposure Limit</u>		
	<u>TWA</u>	<u>Excursion</u>	<u>Source</u>
Monoethanolamine (MEA)	3 ppm	6 ppm	ACGIH
Diethanolamine (DEA)	3 ppm	N.E.	Dow
Triethanolamine (TEA)	N.E.	N.E.	----

N.E. = Not established (evaluation based on compounds of similar biological activity).

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TABLE 1
6-8 HOUR TWA SAMPLES

<u>Date</u>	<u>Sample Description</u>	<u>Amines Concentration, ppm v/v</u>		
		<u>MEA</u>	<u>DEA</u>	<u>TEA</u>
6/14/82	Operations Technician, amines lab and outside rounds, 480 min.	<0.10	<0.06	<0.04
6/24/82	Operations Technician, fire watch by TEA storage tank, 350 min.	<0.14	<0.08	<0.06
6/16/82	Operations Technician, amines outside rounds and samples NH ₃ car, 495 min.	<0.10	<0.06	<0.04
9/13/82	Operations Specialist, amines lab and outside rounds, 465 min.	<0.10	<0.06	<0.04
10/21/82	Operations Technician, amines lab rounds, 480 min.	<0.10	<0.06	<0.04
11/9/82	Operations Technician, pulling amines bottoms pump, 470 min.	<0.09	<0.06	<0.06
11/17/82	Operations Technician, amines sample rounds, 485 min.	<0.08	<0.06	<0.06
1/5/83	Senior Operations Technician, drumming DEA, 465 min.	---	<0.06	---
1/12/83	Operations Technician, amines outside rounds, 495 min.	<0.08	<0.06	<0.06
1/19/83	Operations Technician, pulled TEA loading pump, 475 min.	<0.08	0.06	<0.06
1/25/83	Operations Specialist, pulled amines pump P-270B, 460 min.	<0.09	<0.06	<0.06
1/26/83	Senior Operations Technician, drumming DEA, 435 min.	---	<0.06	---
1/26/83	Shift Supervisor, typical day, 510 min.	<0.08	<0.05	<0.05
2/4/83	Operations Technician, amines lab and outside rounds, 475 min.	<0.08	<0.05	<0.05
2/25/83	Senior Operations Technician, drumming MEA, 340 min.	0.59	---	---
3/28/83	Operations Technician, loaded DEA tank cars, 510 min.	---	<0.05	---

NOTE: Values preceded by a "less than" sign were below the detection limit. The value listed was calculated from the sample volume and the analytical methods limit of determination.

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TABLE 2
SHORT-TERM (EXCURSION) SAMPLES

<u>Date</u>	<u>Sample Description</u>	<u>Amines Concentration, ppm v/v</u>		
		<u>MEA</u>	<u>DEA</u>	<u>TEA</u>
6/18/82	Operations Technician, loading DEA tank car, 120 min.	---	<0.05	---
6/3/82	Operations Technician Trainee, afternoon lab round with amines, 50 min.	<0.2	<0.1	<0.08
5/26/82	Operations Specialist, recharging sodium borohydride pot, 10 min.	---	---	<0.4
6/4/82	Operations Technician Trainee, loading tank cars, 135 min.	0.3	<0.04	<0.03
6/25/82	Senior Operations Technician, recharging sodium borohydride pot on TEA tank, 15 min.	---	---	<0.3
9/15/82	Operations Technician, loading DEA tank cars, 210 min.	---	<0.15	---
10/4/82	Senior Operations Technicians, removed and cleaned amines feed filters, 35 min.	<0.3	<0.17	<0.12
10/15/82	Operations Technician Trainee, loading tank cars, 285 min.	<0.18	<0.10	<0.07
10/22/82	Operations Technician, amines outside rounds, 35 min.	<0.3	<0.17	<0.12
11/3/82	Senior Operations Technician, removing and cleaning amines feed filters, 24 min.	<0.33	<0.23	<0.23
11/29/82	Senior Operations Technician, removing and cleaning amines feed filters, 30 min.	<0.27	<0.19	<0.19
2/28/83	Senior Operations Technician, removing and cleaning amines feed filters, 33 min.	<0.24	<0.17	<0.17
3/18/83	Operations Technician, loading MEA tank car, 38 min.	405.0	---	---
3/23/83	Operations Specialist, pulling MEA pump, 35 min.	<0.23	---	---

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TABLE 2
SHORT-TERM (EXCURSION) SAMPLES
(Continued)

<u>Date</u>	<u>Sample Description</u>	<u>Amines Concentration, ppm v/v</u>		
		<u>MEA</u>	<u>DEA</u>	<u>TEA</u>
3/29/83	Operations Specialist, loading marine vessel, 260 min.	---	<0.1	<0.1
4/13/83	Senior Operations Technician, removed and cleaned amines feed filters, 40 min.	<0.20	<0.14	<0.14

NOTE: Values preceded by a "less than" sign were below the detection level.
The value listed was calculated from the sample volume and the analytical
methods limit of determination.

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