

Occupational Health Guideline for Mineral Oil Mist

INTRODUCTION

This guideline is intended as a source of information for employees, employers, physicians, industrial hygienists, and other occupational health professionals who may have a need for such information. It does not attempt to present all data; rather, it presents pertinent information and data in summary form.

SUBSTANCE IDENTIFICATION

- Formula: C_nH_{2n-2} , where $n = 16$ and up
- Synonyms: The mist of petroleum-based: white mineral oil; cutting oils; heat-treating oils; hydraulic oils; cable oil; transformer oil; lubricating oils; drawing oils
- Appearance and odor: Mist with an odor like burned lube oil generated from petroleum-base or white mineral petroleum oil.

PERMISSIBLE EXPOSURE LIMIT (PEL)

The current OSHA standard for mineral oil mist is 5 milligrams of mineral oil mist per cubic meter of air (mg/m^3) averaged over an eight-hour work shift.

HEALTH HAZARD INFORMATION

- **Routes of exposure**
Mineral oil mist can affect the body if it is inhaled.
- **Effects of overexposure**
Inhalation of mineral oil mist may cause adverse respiratory effects.
- **Reporting signs and symptoms**
A physician should be contacted if anyone develops any signs or symptoms and suspects that they are caused by exposure to mineral oil mist.
- **Recommended medical surveillance**
The following medical procedures should be made available to each employee who is exposed to mineral oil mist at potentially hazardous levels:
 1. **Initial Medical Screening:** Employees should be screened for history of certain medical conditions

(listed below) which might place the employee at increased risk from mineral oil mist exposure.

—Chronic respiratory disease: In persons with impaired pulmonary function, especially those with obstructive airway diseases, the breathing of mineral oil mist might cause exacerbation of symptoms due to its irritant properties.

—Skin disease: Prolonged exposure to mineral oil mist may cause a dermatitis. Persons with pre-existing skin disorders may be more susceptible to the effects of this agent.

2. **Periodic Medical Examination:** Any employee developing the above-listed conditions should be referred for further medical examination.

• Summary of toxicology

Inhalation of mineral oil mist in high concentrations may cause pulmonary effects, although this has rarely been reported. A single case of lipoid pneumonitis suspected to have been caused by exposure to very high concentrations of oil mist was reported in 1950; this occurred in a cash register serviceman, whose heavy exposure occurred over 17 years of employment; no other cases have been recorded. Experimental animal exposure studies to white mineral oil mist (untreated, and with no additions) for repeated daily 6-hour exposures for 1 year at $5 mg/m^3$ were entirely negative in all criteria used for measuring response. A similar study at $100 mg/m^3$ resulted in some slight changes in some but not all species exposed; no histologic changes of significance were noted. Exposure to oil mist did not appear to accelerate the production of lung tumors in a lung-tumor-susceptible strain of mice. A second parallel study of sulfurized, solvent-extracted naphthenic-base oil to which animals were exposed daily at $50 mg/m^3$ for 18 months failed to reveal a single animal with any sort of injury or indisposition as a result of the oil mist inhalation. A review of exposures to mineral oil mist averaging $15 mg/m^3$ (but often higher) in several industries disclosed a striking lack of reported cases of illness related to these exposures. A study of oil mist

These recommendations reflect good industrial hygiene and medical surveillance practices and their implementation will assist in achieving an effective occupational health program. However, they may not be sufficient to achieve compliance with all requirements of OSHA regulations.

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exposures in machine shops, at mean concentrations of 3.7 mg/m³ and maximum of 110 mg/m³, showed no increase in respiratory symptoms or decrement in respiratory performance attributable to oil mist inhalation among men employed for many years. There is no evidence to suggest any relation between inhalation of oil mist and lung cancer. On the other hand, there are some reported cases of skin cancer from contact with certain oils. Contact with liquid oils may cause dermatitis.

CHEMICAL AND PHYSICAL PROPERTIES

• Physical data

1. Molecular weight: Not pertinent
2. Boiling point (760 mm Hg): 360 C (680 F)
3. Specific gravity (water = 1): 0.8–0.9
4. Vapor density (air = 1 at boiling point of mineral oil mist): Not applicable
5. Melting point: Very low
6. Vapor pressure at 20 C (68 F): Very low
7. Solubility in water, g/100 g water at 20 C (68 F): Insoluble

8. Evaporation rate (butyl acetate = 1): Not applicable

• Reactivity

1. Conditions contributing to instability: None
2. Incompatibilities: None
3. Hazardous decomposition products: None
4. Special precautions: None

• Flammability

1. Flash point: 135 C (275 F) (closed cup)
2. Autoignition temperature: 260–371 C (500–700 F)
3. Flammable limits in air, % by volume: Not applicable
4. Extinguishant: Dry chemical, foam, carbon dioxide

• Warning properties

Mineral oil mist is not known to be an eye irritant.

MONITORING AND MEASUREMENT PROCEDURES

• General

Measurements to determine employee exposure are best taken so that the average eight-hour exposure is based on a single eight-hour sample or on two four-hour samples. Several short-time interval samples (up to 30 minutes) may also be used to determine the average exposure level. Air samples should be taken in the employee's breathing zone (air that would most nearly represent that inhaled by the employee).

• Method

Sampling and analyses may be performed by collection of mineral oil mist on a filter, followed by treatment with chloroform and analysis by fluorescence spectrophotometry. An analytical method for mineral oil mist is in the *NIOSH Manual of Analytical Methods*, 2nd Ed..

Vol. 4, 1978, available from the Government Printing Office, Washington, D.C. 20402 (GPO No. 017-033-00317-3).

RESPIRATORS

- Good industrial hygiene practices recommend that engineering controls be used to reduce environmental concentrations to the permissible exposure level. However, there are some exceptions where respirators may be used to control exposure. Respirators may be used when engineering and work practice controls are not technically feasible, when such controls are in the process of being installed, or when they fail and need to be supplemented. Respirators may also be used for operations which require entry into tanks or closed vessels, and in emergency situations. If the use of respirators is necessary, the only respirators permitted are those that have been approved by the Mine Safety and Health Administration (formerly Mining Enforcement and Safety Administration) or by the National Institute for Occupational Safety and Health.
- In addition to respirator selection, a complete respiratory protection program should be instituted which includes regular training, maintenance, inspection, cleaning, and evaluation.

PERSONAL PROTECTIVE EQUIPMENT

- Employees should be provided with and required to use impervious clothing, gloves, face shields (eight-inch minimum), and other appropriate protective clothing necessary to prevent repeated or prolonged skin contact with liquid mineral oil.
- Non-impervious clothing which becomes wet with liquid mineral oil should be removed promptly and not reworn until the mineral oil mist is removed from the clothing.

SANITATION

- Skin that becomes wet with liquid mineral oil should be promptly washed or showered with soap or mild detergent and water to remove any mineral oil mist.

COMMON OPERATIONS AND CONTROLS

The following list includes some common operations in which exposure to mineral oil mist may occur and control methods which may be effective in each case:

Operation

Use as a coolant or quenching agent in machine shop operations and metal fabrication; during coating and cleaning in foundry operations

Use in steel rolling operations; use in lubricating and cleaning of machinery

Use in pressroom operations in printing

Use in mine drilling operations

Use as an insecticide

Controls

Process enclosure; local exhaust ventilation; general mechanical ventilation

Process enclosure; local exhaust ventilation; general mechanical ventilation

Mist suppression; local exhaust ventilation; general mechanical ventilation

Process enclosure; local exhaust ventilation; general mechanical ventilation

General dilution ventilation

EMERGENCY FIRST AID PROCEDURES

In the event of an emergency, institute first aid procedures and send for first aid or medical assistance.

• Skin Exposure

If skin becomes wet with mineral oil mist, wash the contaminated skin using soap or mild detergent and water. If mineral oil mist penetrates through the clothing, remove the clothing and wash the skin using soap or mild detergent and water.

• Breathing

If a person breathes in large amounts of mineral oil mist, move the exposed person to fresh air at once.

SPILL, LEAK, AND DISPOSAL PROCEDURES

• Persons not wearing protective equipment and clothing should be restricted from areas of spills or releases until cleanup has been completed.

• If mineral oil mist is released in hazardous concentrations, ventilate area of release to disperse the mist.

• If mineral oil mist is spilled or leaked, the following steps should be taken:

1. Ventilate area of spill or leak.

2. For small quantities, absorb on paper towels. Evaporate in a safe place (such as a fume hood). Allow sufficient time for evaporating vapors to completely

clear the hood ductwork. Burn the paper in a suitable location away from combustible materials. Large quantities can be collected and atomized in a suitable combustion chamber.

• Waste disposal methods:

Mineral oil mist may be disposed of:

1. By absorbing it in vermiculite, dry sand, earth or a similar material and disposing in a secured sanitary landfill.

2. By atomizing in a suitable combustion chamber.

REFERENCES

- American Conference of Governmental Industrial Hygienists: "Oil Mist (Mineral)," *Documentation of the Threshold Limit Values for Substances in Workroom Air* (3rd ed., 2nd printing), Cincinnati, 1974.
- Deichmann, W. B., and Gerarde, H. W.: *Toxicology of Drugs and Chemicals*, Academic Press, New York, 1969.
- Ely, T. S., et al.: "A Study of Mortality, Symptoms, and Respiratory Function in Humans Occupationally Exposed to Oil Mist," *Journal of Occupational Medicine*, 12:253-261, 1970.
- Goldstein, D. H., et al.: "An Epidemiologic Study of an Oil Mist Exposure," *Archives of Environmental Health*, 21:600-603, 1970.
- Grant, W. M.: *Toxicology of the Eye* (2nd ed.), C. C. Thomas, Springfield, Illinois, 1974.
- Hendricks, N. V., et al.: "A Review of Exposures to Oil Mist," *Archives of Environmental Health*, 4:139-145, 1962.
- Lippmann, M., and Goldstein, D. H.: "Oil-Mist Studies, Environmental Evaluation and Control," *Archives of Environmental Health*, 21:591-599, 1970.
- Proudfit, J. P., et al.: "Chronic Lipid Pneumonia Following Occupational Exposure," *A.M.A. Archives of Industrial Hygiene and Occupational Medicine*, 1:105-111, 1950.
- Stauden, A. (exec. ed.): *Kirk-Othmer Encyclopedia of Chemical Technology* (2nd ed.), Interscience, New York, 1972.

RESPIRATORY PROTECTION FOR MINERAL OIL MIST

Condition	Minimum Respiratory Protection* Required Above 5 mg/m³
Particulate Concentration	
25 mg/m ³ or less	Any mist respirator, except single-use.
50 mg/m ³ or less	Any mist respirator, except single-use or quarter-mask respirator. Any fume respirator or high efficiency particulate filter respirator. Any supplied-air respirator. Any self-contained breathing apparatus.
250 mg/m ³ or less	A high efficiency particulate filter respirator with a full facepiece. Any supplied-air respirator with a full facepiece, helmet, or hood. Any self-contained breathing apparatus with a full facepiece. A Type C supplied-air respirator operated in pressure-demand or other positive pressure or continuous-flow mode.
2,500 mg/m ³ or less	A powered air-purifying respirator with a high efficiency particulate filter. A Type C supplied-air respirator operated in pressure-demand or other positive pressure or continuous-flow mode.
Greater than 2,500 mg/m ³ or entry and escape from unknown concentrations	Self-contained breathing apparatus with a full facepiece operated in pressure-demand or other positive pressure mode. A combination respirator which includes a Type C supplied-air respirator with a full facepiece operated in pressure-demand or other positive pressure or continuous-flow mode and an auxiliary self-contained breathing apparatus operated in pressure-demand or other positive pressure mode.
Fire Fighting	Self-contained breathing apparatus with a full facepiece operated in pressure-demand or other positive pressure mode.

*Only NIOSH-approved or MSHA-approved equipment should be used.