

**Request for Assistance in
Controlling Carbon Monoxide Hazard in
Aircraft Refueling Operations**

NIOSH Alert Bulletin

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Aircraft Refueling Operations Controlling Carbon Monoxide Hazard in Request for Assistance in

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REQUEST FOR ASSISTANCE IN CONTROLLING CARBON MONOXIDE HAZARD
IN AIRCRAFT REFUELING OPERATIONS

Investigators from the National Institute for Occupational Safety and Health (NIOSH) conducted an evaluation of the occupational health hazards to workers who fuel jet aircraft. During the investigation, we learned that two workers had died in or near their refueling vehicles. Although carbon monoxide (CO) poisoning was not suspected at the time of the deaths, a combination of the unusual location of the engine exhaust (under the front bumper), the deterioration of rubber seals (boots) around the gear shift lever and the pedals, and the fact that the workers spend a considerable amount of time sitting in idling vehicles (especially during poor weather), led us to measure CO levels in the truck cabs. Dangerous concentrations of CO were found. The company involved instituted maintenance procedures and work practice rules requiring that the windows be kept open whenever the truck is occupied. However, recent spot checks suggest that many operators of airport refueling services are unaware of the risk, and therefore have not taken precautions to prevent dangerous concentrations of CO.

Carbon monoxide is a colorless, odorless gas which limits the ability of the blood to carry oxygen to the tissues. Symptoms of acute CO poisoning include headaches, rapid breathing, nausea, weakness, dizziness, confusion, hallucinations, and discoloration of the lips or nail beds. If the exposure level is high, loss of consciousness may occur without other symptoms. Death may result from depression of the functions of the brain, or if there is underlying coronary artery disease, from heart attack. Because CO remains in the blood for several days, there may be a gradual increase in body levels of CO over the course of a work week. Effects of chronic exposure are not completely known.

The combination of methods used to control CO exposure may vary from one location to another, and care must be taken to assure that the principles and laws of fire safety are not violated; some recommendations by NIOSH for controlling dangers of CO are listed below.

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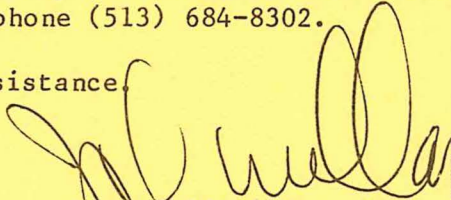
1. To minimize generation of CO, trucks should be converted to electric or diesel power. While generating less CO, the stronger odor of diesel exhaust also provides better warning properties than does the odor of gasoline exhaust.
2. Refueling trucks should be maintained so that entry of CO from beneath the cab is prevented. Rubber boots around pedals and levers should be intact, with tight fittings; grommets in holes through the firewall should fit snugly; rust holes in the floor pans or elsewhere should be closed; heater and fresh air intakes should be remote from the exhaust discharge; and exhaust systems should be checked regularly and tightened or replaced whenever leaks are suspected.
3. Engines should be well-tuned since proper fuel-to-air ratios will reduce the amount of CO produced.
4. There should be installed in the cab a continuous CO monitor with alarm to warn the operator before the concentration of CO becomes dangerous.
5. Workers should be provided access to waiting areas, which are as comfortable as the truck cabs; they should be required to vacate the cabs when not engaged in operating the vehicle.
6. Workers engaged in fueling operations should be encouraged to refrain from smoking because smoking elevates blood levels of CO enough to reduce margins of safety.
7. Interim work rules requiring that windows be kept open whenever the cab is occupied, and that vehicles be parked with the exhaust downwind from the air intake, while prudent, cannot be relied upon as long-term solutions. Under some circumstances, for example, CO concentrations could be higher with windows open, and positioning of the truck may be restricted by aircraft parking arrangements. Wiring the ventilation fan to operate whenever the engine is running, will usually build a positive pressure in a closed cab and minimize seepage-in of CO; however, in some circumstances such an arrangement might actually draw CO into the vehicle.

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We are requesting the assistance of airport managers and editors of appropriate trade journals in bringing this information to the attention of fueling service operators. Oil companies may, through their routine inspection services provided to operators, be especially effective in controlling the risk.

Suggestions, requests for information on control practices, or questions related to this announcement, should be directed to the Division of Standards Development and Technology Transfer, National Institute for Occupational Safety and Health, 4676 Columbia Parkway, Cincinnati, Ohio 45226, telephone (513) 684-8302.

We greatly appreciate your assistance.



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