Ethylene Oxide Gas (EtO)

Ethylene Oxide (EtO) possesses several physical and health hazards that merit special attention. EtO is a colorless liquid below 51.7°F, or a gas that has an ether-like odor at concentrations above 700 parts per million (ppm) and is both flammable and highly reactive. The current OSHA Permissible Exposure Limit (PEL) for EtO is 1 ppm for an 8hr time weighted average with a 5ppm excursion level

Potential Hazard

EtO is used within central supply as a sterilant for items that can not be exposed to steam sterilization. Exposure usually results from improper aeration of the ethylene oxide chamber after the sterilizing process or during off-gassing of sterilized items or poor gas-line connections. It can also occur in outpatient surgery clinics, cardiac catheterization laboratories, operating rooms, dental labs, autopsy labs and other areas.

Health Effects

- In liquid form, Ethylene oxide can cause eye irritation and injury to the cornea, frostbite, and severe irritation and blistering of the skin upon prolonged or confined contact.

- Ingesting EtO can cause gastric irritation and liver injury. Acute effects from inhaling EtO vapors include respiratory irritation and lung injury, headache, nausea, vomiting, diarrhea, shortness of breath, and cyanosis.

- Exposure has also been associated with the occurrence of cancer, reproductive effects, mutagenic changes, neurotoxicity, and sensitization. Ethylene oxide has been shown to cause cancer in laboratory animals and has been associated with higher incidences of cancer in humans. Adverse reproductive effects and chromosome damage may also occur from EtO exposure.

Possible Solutions

- Substitute other cold sterilants for EtO. However, use extreme care when selecting possible substitutes. It is necessary to fully evaluate possible health effects and exposure potentials of alternatives to EtO before making a selection.

- Registered Antimicrobial Products Registered with the EPA as Sterilizers (PDF). Environmental Protection Agency (EPA), (2014).

- Use proper ventilation with EtO gas.

- Typical operations that could cause worker exposure to EtO are removing sterilized items from the EtO sterilizer, moving items from the EtO sterilizer to the

aerator unit, and changing bottles of EtO gas. You can control airborne concentrations of EtO most effectively at the source of contamination by enclosing the operation and/or using local exhaust ventilation.

- Reduce exposure to EtO during the sterilization process.

- Do not occupy the sterilizer loading and mechanical rooms while operating the sterilizer unit.

- Operators should crack the door no more than two inches and allow the load to "off gas" before moving to transfer carts. A ventilated exhaust hood should be installed above the sterilizer door.

- Operators should avoid close contact with newly sterilized unaerated loads.

- Vent ethylene oxide through a non-recycled or dedicated ventilation system. For a discussion of ventilation of aeration units, sterilizer door areas, sterilizer relief valves, and ventilation during cylinder changes, see the appendix of 29 CFR 1910.1047 (Ethylene Oxide).

- To detect inadequate ventilation and cause automatic shutdown have machine alarms in place. Air pressure in laboratories and isolation rooms should be negative so that contaminated air is drawn through the exhaust vents rather than circulating throughout the rest of the building.

- Use appropriate PPE when changing cylinders including butyl apron, gloves, and a canister respirator.

- Use EtO detector systems and room monitors to signal any leakage of gas, and passive dosimeters for personal exposure monitoring.

- Use specialized gas-line connections to minimize EtO leakage during use and during change out of EtO cylinders.

- Conduct periodic personal monitoring, as well as, monitoring for leaks at gas-line connectors.

- Keep a written log for any detected leak and any service done on an ethylene oxide chamber. Replace sterilizer/aerator door gaskets, valves, and fittings when necessary. See OSHA Technical Manual, Section VI: Chapter 1 - Hospital Investigations: Health Hazards.