

An Explosive Situation

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Ethylene oxide sterilization facilities, which sterilize most of the medical equipment sold to doctor's offices and hospitals, face some inherent dangers from the ethylene oxide (EtO)-based cleaning process they use. An increased incidence of explosions at these facilities has brought safety concerns to the forefront in this industry.

Between 1994 and 1998, 10 EtO-related explosions occurred at industrial sterilization facilities; the most serious of those explosions resulted in one death and 59 injuries. All the explosions resulted in damaged buildings and equipment.

Pinpointing the Problem

EtO, a colorless gas with an ether-like odor, is a safe and effective industrial sterilant if used properly. The health care and food industries, in particular, depend on EtO sterilization to control infection and prevent transmission of disease. It is a popular sterilization method, a fact backed by its ranking in the top three percent of high-volume chemicals in terms of production in the United States.

At most EtO sterilization facilities, the products to be sterilized are placed in a large chamber. The chamber is flooded with EtO in its gas form, and then the EtO is flushed out of the chamber and the newly-sterilized products are removed.

When using EtO, a number of precautions must be taken to ensure safety. EtO vapors are highly flammable and can easily form explosive mixtures during sterilization procedures.

Explosions result from improper venting of EtO into oxidizing emission control devices (OECs). OECs remove or destroy, through oxidation or burning, small amounts of EtO remaining in a vent stream.

Nearly all explosions are associated with "overfeeding" a system. The potentially-deadly chain-of-events happens like this:

1. EtO is fed into an OEC at a rate that exceeds the manufacturer's recommendation.
2. The concentration of EtO in the vent that leads to the OEC builds up to its lower flammability limit (LFL), which is 3 percent concentration.
3. When the LFL for the chemical is reached or exceeded, the OEC can act as an ignition device, causing an explosion within the vent system.

Solutions

The National Institute for Occupational Safety and Health (NIOSH) and the Ethylene Oxide Sterilization Association (EOSA) have identified engineering controls and safety procedures workers at sterilization facilities can take to reduce this serious safety risk. These recommendations include:

- Conduct a process hazard analysis that emphasizes safety procedures for the entire sterilization system. A process hazard analysis is a step-by-step analysis of a given process (in this case, EtO sterilization) that is designed to identify and minimize potential hazards.

- Establish written procedures to cover all steps of EtO sterilization operation.
- Take steps to prevent overfeeding the system. Comply with manufacturer's guidelines.
- Periodically wash or vent sterilized products that sit idle in a sterilizer or aeration room.
- Use redundant control valves and other safeguards on all EtO lines.
- Install real-time, electronic area monitors to alert employees when unsafe EtO concentrations exist.
- Provide employee training that includes safe use of equipment, spill control and emergency procedures.

Facility managers, safety personnel, and others involved with EtO sterilization are urged to obtain and use information about preventing these explosions. For more information, see "NIOSH Alert: Preventing Worker Injuries and Deaths from Explosions in Industrial Ethylene Oxide Sterilization Facilities." To request this document contact NIOSH at 1-800-35-NIOSH or visit www.cdc.gov/niosh ■

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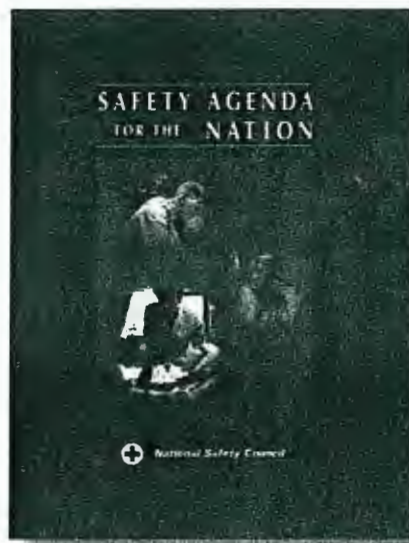
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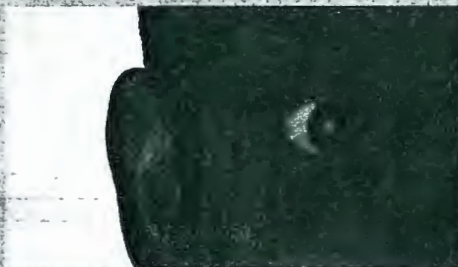
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