OREGON OCCUPATIONAL SAFETY AND HEALTH DIVISION
DEPARTMENT OF INSURANCE AND FINANCE

INDEXED MEMO

Indexed Memo IM-94-11

Issued(PD) April 1, 1981

Issued(IM) March 21, 199

SUBJECT: Carbon Monoxide Gas Formation in Closed Dairy Equipment

AFFECTED CODES/
DIRECTIVES: Division 2/E - 437-02-050 through 437-02-053

(1) PURPOSE: To inform compliance officers of carbon monoxide (CO) build up in closed dairy equipment during cleaning operations.

(2) BACKGROUND: Federal OSHA reports that a death occurred during the cleaning of closed dairy equipment which was attributed to the formation of CO from the reaction of certain reducing sugars and oxygen in the presence of hydroxide ions. Alkaline solutions used for cleaning purposes (such as sodium hydroxide, sodium orthosilicate, and sodium metasilicate at concentrations of 5% and higher) at 850 C and higher temperatures may react with reducing sugars (2% and higher solutions of fructose, galactose, arabinose, levulose, lactose maltose, as well as dry whey solids) in the presence of air to produce CO. The reaction will occur at lower temperatures, but the reactions are slower. This reaction based on current information does not occur in the presence of sucrose. Furthermore, no CO is formed with lactose or whey when other. reagents such as sodium hypochlorite, calcium hypochlorite, phosphoric acid, or nitric acid are used in place of the alkaline solutions.

(3) ACTION: While it is rarely necessary to enter enclosed or semi enclosed equipment to remove adherent residue by direct hand scrubbing, compliance officers should carefully evaluate any confined space entry. Before entry, these requirements need to be taken:
(a) Vent the equipment before allowing personnel to be exposed.
(b) Measure equipment atmospheres for CO, CO_2' and O_2 before entering.

(c) Follow other customary tank and equipment entry and occupancy procedures designed to ensure the safety of personnel involved (see Chapter 2, Section 6). Pending further information, similar precautions should be take.n in any operation involving potential entry into enclosed or semi-enclosed equipment that has contained reducing sugars (or possibly other carbohydrates) and any alkaline solution.