C_5 to C_{12} MERCAPTANS
Materials of Construction

GENERAL PRECAUTIONS

Mercaptans may be irritating to the skin and especially to the eyes; however, mercaptans can be handled safely if appropriate precautions are taken. Synthetic, non-permeable gloves and chemical goggles should be worn to protect the skin and eyes when handling mercaptans. If mercaptan contacts the skin or eyes, flush the affected area immediately and thoroughly with water for at least 15 minutes (soap and water for skin). When handling mercaptans, avoid spills and leaks of liquid or vapor. If there is a liquid mercaptan leak, or mercaptan vapors escape into the atmosphere, follow the procedures outlined under the "Leak Testing" section of this bulletin.

AVOID PROLONGED BREATHING OF MERCAPTANS VAPORS. Although the odor of mercaptans will normally become extremely disagreeable before the vapors reach dangerous concentrations, the nose may become temporarily desensitized after exposure. A self-contained breathing apparatus (SCBA) approved by NIOSH is recommended when working in areas of high vapor concentration or for prolonged exposure to lower concentrations of vapor.

Mercaptan vapors are odorous and pose potential hazards; therefore, storage tanks should not be vented to the atmosphere. Venting should be to an absorption canister, chemical scrubber, or flare to remove the mercaptan.

Carbon absorption canisters (Calgon Carbon Corp., Pittsburgh, PA) can be used effectively to remove mercaptans from vented vapors. An alternative to carbon absorption has been offered by American Fuel Economy, Inc., Ottawa, Illinois. They claim to have an oxidizing vent that quickly absorbs and oxidizes mercaptans using potassium permanganate.

C_5 to C_8 MERCAPTANS ARE FLAMMABLE. Flares used to burn vapors in order to reduce pressure on a storage tank should be situated as far away from the general storage area as practical. The flare should have a suitable flame arrestor. All potential sources of fire, flame and sparks in the immediate area should be sought out and eliminated. **NO SMOKING.** To prevent accidental ignition of mercaptan vapors, employees working in handling and storage areas should not wear metal heel or toe plates on shoes. Non-sparking tools should be used when working on mercaptan equipment or containers.

Steel, stainless steel and copper-free steel alloys are the preferred materials of construction for mercaptan service. In particular, stainless steel should be used for any vessel or line which is to be opened and exposed to air frequently. Also, stainless steel should be used for equipment where minor corrosion could interfere with proper function, such as: liquid control valves, flame arrestors, pressure gauges,

metering pumps and associated feed lines.

Carbon steel is the most economical material for tanks and piping. However, steel equipment should be properly prepared before use. This entails thorough cleaning (removal of scale and oil from internal surface) and drying, followed by purging with inert gas (nitrogen is recommended). Steel equipment should be passivated before putting it into service to avoid discoloration of the product. Steel can be conditioned by allowing a small amount of mercaptan to stand in it for a period of time and subsequently keeping the equipment under a dry, inert atmosphere. The hazard in using iron or carbon steel is the formation of pyrophoric iron sulfides which, on exposure to air, can generate sufficient heat to ignite mercaptan vapors as well as other flammable materials. Any iron or carbon steel equipment in contact with mercaptans must be kept wet with water disassembly or cleaning. Pyrophoric iron sulfides are inactive when wetted.

DO NOT USE COPPER BASED ALLOYS such as brass and bronze. Mercaptans readily attack these metals and are contaminated by them.

STORAGE TANKS

Installing a Storage Tank

There are many factors to be considered when designing and installing a mercaptan storage tank. Local, state and insurance regulations must be known to determine any restrictions they may place on the facility.

Storage tanks should be carbon steel or stainless steel all-welded construction and fabricated in accordance with ASME Unfired Pressure Vessel Code. The recommended minimum design pressure is 35 psig. The tank can be installed above or below ground. This decision may have been made for your company by local regulations. If not, consideration should be given to advantages and disadvantages at each location.

Design of a Storage Tank

When designing mercaptan storage facilities, provide enough capacity to insure a continuing supply for the process. The storage tank should hold one tank truck (or tank car) plus enough additional material to allow time for reordering and delivery.

Following is a list of the recommended minimum accessories for a mercaptan storage tank:

1. Pressure relief valve(s) directly connected with the vapor space of the tank. The vent(s) should discharge to a flare or other suitable device to capture mercaptan vapors.

2. A liquid level gauge accurate " 1%. All outlets on gauges should be equipped with excess flow check valves.

3. A pressure gauge of proper range to conform with the design working pressure of the tank.

4. Liquid transfer valve coupled with a back flow check valve. For top unloading, the valve must be connected to a dip pipe.

5. Vapor transfer valve and/or vapor return line.

6. Proper electrical ground.

EQUIPMENT RECOMMENDATIONS

Pumps

Because of the odor of mercaptans, it is suggested only hermetically sealed pumps be used. A Model G chempump (Crane Company, Warrington, PA) or equivalent is recommended.

Pipe and Fittings

Seamless steel pipe is recommended for mercaptan transfer lines. Forged welded fittings with flanges are recommended for pipe over one inch. For smaller sizes, 2,000 lb. forged steel threaded fittings may be used.

Rigid Connections

Welded or flanged joints should be used. For flanged joints use 150 lb. forged steel, raised face, weld neck (or slip-on) flanges.

Liquid Transfer Hose

Titeflex R267 stainless steel overbraid, Convoluted Teflon Hose (Titeflex Corp., Springfield, MA) or equivalent is recommended.

Relief Valves

Relief valves should be either Farris type 2600 Series (Teledyne Farris Engineering Corp., Palisades Park, NJ) with stainless or aluminized steel spring; or Crosby JOS, Type A (Crosby Valve & Gauge Company, Wrentham, MA), full nozzle, disc type, closed bonnet carbon steel body, with 304 stainless steel trim and stainless or aluminized steel spring. (**NOTE:** The sizing of relief valves must be considered in accordance with individual requirements and local safety standards).

Transfer Valves

WKM ball valves type B136-CS02-S1 (Cooper Industries, Flow Control Div., Houston, TX) with fluoroplastic seats and 316 stainless steel trim or equivalent are recommended.

Gauge Valves

Jamesbury Type A22TT or A36TT (Jamesbury Corp., Worchester, MA) are recommended. An armored-type gauge glass is preferred.

Pressure Gauges

Crosby style ASO (Crosby Valve & Gauge Company, Wrentham, MA) cast aluminum case 316 stainless steel tube and socket or equivalent is recommended.

Liquid Level Gauges

Jerguson R-20 (Jerguson Gauge and Valve Company, Strongsville, OH) or Penberthy type reflex gauges with gauge glass valves, flanged connections and fluoroplastic gaskets are recommended. An armored-type gauge is preferred.

Gaskets

Fluoroplastic and non-asbestos fiber impregnated with fluoroplastic are satisfactory materials for gasketing.

Pipe Thread Compounds

Fluoroplastic paste or tape is recommended.

Vapor Return Hose

Synflex No. 3130 (Eaton Corp., Synflex Div., Mantua, OH) nylon hydraulic hose or equivalent is recommended.

Mercaptan Filter

Use chemically compatible materials Filter element: nylon, polypropylene and polyesters. Natural fibrous materials are also used.

LEAK TESTING

Mercaptan vapors are objectionable and could be dangerous. The odors are obnoxious to employees and those in the general vicinity of a leak. For this reason, storage systems should be leak tested and any leakage stopped. Materials should be readily available to destroy the vapor of escaping mercaptan as quickly as possible.

Before mercaptan is introduced to the system, all lines, valves, fittings and connections should be pressurized with nitrogen and tested for leaks with a soap solution. All leaks detected should be repaired and the system tested again until no leaks are detected. Once the system contains no leaks, mercaptan filling can begin.

In the event a leak is detected after the system is charged with mercaptan, immediately contain the mercaptan and eliminate the source of the leak. If the amount of mercaptan leaked is small, odor control is provided by neutralizing the malodor using either Basic Plus Odor Neutralizer (Basic Supply Company, Huntington, WV) or ORDINARY HOUSEHOLD BLEACH SOLUTION (5%). Either of these products may be sprayed or fogged over the mercaptan. Wash the area thoroughly with water. **CAUTION! NEVER ADD DRY BLEACHING POWDER OR ANY DRY OXIDANT TO A MERCAPTAN SPILL. A VIOLENT REACTION WILL OCCUR.**

Large mercaptan leaks should be contained immediately and the source of the leak should be eliminated. The mercaptan should be collected for proper disposal.

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