6.2b General Design

Introduction

The information presented in this section is a general composite of best practices and current information about design considerations for phosgene processes. It also contains information about containment of spills, trenches and drains and vessel design.

The information provided in this section should not be considered as a directive or as an industry standard that readers must adopt or follow. Instead, the information is intended to provide helpful ideas and guidance that users may wish to consider in a general sense (See Section 1.1 *Preface and Legal Notice*). Also included is a reference list of useful resources.

Contents

6.2b General Design

In this section, the design of phosgene process equipment is discussed. Unless otherwise specified, the information provided below generally applies to the design of storage and non-storage vessels.

6.2b.1 General Design Considerations

Phosgene processing equipment has been sited either above or below ground depending on local conditions. Influencing factors can include, but are not limited to:

- Consequence of a major spill on the locality (*e.g.,* the local population and the weather conditions).

- Venting, draining, etc. of the immediate area if a major spill occurs.

- Risk from falling objects and accidental damage from other sources (*e.g.,* traffic).

- Risks from external vessel corrosion (*e.g.,* environment and ground conditions if sited in a buried storage).

- Accessibility for vessel inspection (external as well as internal)

- Approachability to the vessel from all directions to allow access during emergency conditions

- Impact of below grade installation including confined space and potential of accumulation of heavier than air phosgene vapors,

Above-ground vessels may, however, be a desirable choice for future installations unless special environmental conditions dictate otherwise.

6.2b.2 Containment of Spills

Development of a containment area around phosgene processing equipment can be used to help prevent an uncontrollable spread should a leak occur. This area might be bounded by retaining walls with facilities for the addition of absorbing chemicals, or be fitted with special drains leading to vessels containing neutralization facilities and fume extraction or any other measure that addresses potential conditions. The size of any equipment for this duty depends on the maximum release considered possible before the system could be safeguarded (i.e., contents transferred to another vessel, a temporary repair made which controls the spill, etc.). The area might also be fitted with a storm water drainage system that could be manually controlled to lift water out of the containment area. The purpose of this arrangement is to keep inadvertently released chemicals out of the effluent system. (Refer to Section 6.7 Secondary Containment).

6.2b.3 Trenches and Drains

To help prevent the spread of fire into a phosgene process area, maintain an appropriate distance between the equipment and a service trench. A similar distance should be considered between a drain and the processing equipment unless the drain system is completely isolated from any other drains that could transport flammable liquids. Refer to NFPA 30 “Flammable and Combustible Liquids Code,” NFPA 55 Compressed Gases and Cryogenic Fluids Code and NFPA 1 “Fire Code” for more information on appropriate distance.[1]

6.2b.4 Vessel

Consider required pressure rating, operating temperature, and absolute vacuum conditions within the vessel during design. A corrosion allowance may also be incorporated into the design. A number of companies can provide design and fabrication materials and methods for lethal service vessels. See Tubular Exchanger Manufacturers Association[2] Class R and American Society of Mechanical Engineers[3], Section VIII (paragraph UW-2(a)) for further information.

Users can take steps to help ensure that the vessels are protected against over-pressurization. (Refer to Section 6.6 *Relief Devices*). High-pressure alarms serve in this capacity. Consider setting the alarm approximately mid-way between normal operating and the burst disc failure pressure to give warning of a potentially dangerous occurrence.

Extra protective devices may be required as a function of the site chosen for the vessel. (See Section 6.1 *Plant Layout and Siting*). For example, the vessel may be double walled to reduce the risk of damage from falling objects, corrosion and subsequent leaks.

Lifting plans can be developed to address lifting activities required in the area of the vessel. The plan may incorporate appropriate use of special permits and supervision. Use of a lifting plan helps reduce risk of accidental damage by falling or swinging loads.

Consider designing branch connections of processing equipment above the liquid level. However, if use of this approach presents a problem, consider alternatives, for example evaluate including a remotely operated valve in branch lines below the liquid level.

Where cold storage is practiced, the processing equipment can be insulated to reduce warming of the contents during the summer months. Lagging also reduces the rate of heating should a fire develop in the close proximity. Consider potential problems related to corrosion under insulation (CUI).

Fire drench sprays have been fitted over insulated phosgene equipment. Spraying the surfaces helps reduce vessel warming in the case of a local fire. National Fire Protection Agency[4] 15 offers further information on the subject. Evaluate whether provisions to address water runoff are adequate.

Consider the flange rating and branch size of vessel nozzles. For example, a threaded connection may be undesirable because of the risks of leaks.

Certain jurisdictions may require vessels to be registered and/or inspected as pressure vessels. American Petroleum Institute[5] 510 (Pressure Inspection Code: Maintenance Inspection, Rating, Repair, and Alteration) offers further information on the subject.

References

[1] NFPA 30 "Flammable and Combustible Liquids Code," and NFPA 1 "Fire Code"
http://www.nfpa.org

[2] Tubular Exchanger Manufacturers Association Class R
http://www.tema.org/

[3] American Society of Mechanical Engineers, Section VIII (paragraph UW-2(a))
http://www.asme.org/

[4] NFPA 15 "Standard for Water Spray Fixed Systems for Fire Protection"
http://www.nfpa.org

[5] American Petroleum Institute 510 (Pressure Inspection Code: Maintenance Inspection, Rating, Repair, and Alteration)
http://www.api.org/