6.2a Materials of Construction

Introduction

The information presented in this section is a general composite of best practices and current knowledge about the materials of construction of equipment in phosgene processes.

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.

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An example of materials of construction for equipment and piping in phosgene service is carbon steel, which is often used. Austenitic stainless steel, duplex stainless steel, and high nickel alloys have also been used. As with other sections of the Phosgene Safe Practices Guidelines, consult with Metallurgic expertise to help ensure the appropriate material is selected for the process.

Industry practices also generally include a cleaning procedure for equipment, piping, valves, and instrumentation in phosgene service to meet standards of being oil-, grease-, and residue-free similar to cleaning procedures used for chlorine service.

6.2a.1

Metals for handling liquid pure phosgene

Carbon steel is generally accepted and often used as the material of construction for dry liquid phosgene up to 200°C (392°F). Low-temperature rated steels are only indicated if the temperature is below –29°C (–20°F).

Above 200°C (392°F), nickel-based alloys have typically been used.

6.2a.2 Metals for handling phosgene vapor

The metals for handling dry vapor phosgene are generally the same as those used for handling dry liquid phosgene.

6.2a.3 Metals for handling mixtures containing phosgene

When designing for processes with mixtures of phosgene and other chemicals or solvents, including water, experience in the industry is that the material of construction selected is often based on corrosive species in the mixture. For mixtures, where moisture may be in contact with phosgene producing very acidic conditions, nickel-based alloys have been used. For mixtures where there is no experience or data corrosion testing could be considered. The presence of solids could also influence the choice of material. Consult with Metallurgic expertise to help ensure the appropriate material is selected for the process.

6.2a.4 Special metallic components

Consider whether the material of construction for level devices and other instrumentation in contact with phosgene is suitable. In instrumentation or similar items (e.g., diaphragms) where thin metals are required, the nickel-based alloys, tantalum, stainless steels, glass-lined steel, or other corrosion-resistant materials have been used in the industry (Refer to Section 6.5 Instrumentation).

Stainless steel may be considered, provided that chloride stress corrosion-cracking mechanisms are addressed. Stainless steel bodies can be used as instrument housings when there is no contact with the process. Consult with

Metallurgic expertise to help ensure the appropriate material is selected for the process.

6.2a.5 Flanges and Connectors

Industry experience is to minimize flanges whenever possible. Where flanges are used, industry practice is that Stainless steel bolting of flanges is generally not used in process lines containing phosgene. Phosgene can be a source of chloride ions that can lead to chloride stress corrosion cracking. The experience of some companies is that for phosgene service high strength carbon steel fasteners can be used for pipe flanges and valve bolting. (Refer to SPG Section 6.3 Piping and Valves).

6.2a.6 Nonmetals for handling phosgene

Nonmetallic materials, which include FRPs, thermoplastic materials (e.g., polypropylene, polyvinyl chloride (PVC), polytetrafluoroethylene (PTFE)) and graphite, have been used in phosgene service most notably in gaskets and in scrubber systems. When PTFE lined equipment is being considered, the selection should involve consideration of the issues created by the permeation of phosgene into and through the PTFE. Phosgene permeation can lead to corrosion and decontamination issues.

Glass-lined steel has also been used in some phosgene process applications. Glass-lined steel is subject to special maintenance and operational practices. Consult with Metallurgic/Materials expertise to help ensure the appropriate material is selected for the process.