BSR/IIAR 7-201X

Developing Operating Procedures for Closed-Circuit Ammonia Refrigeration Systems

Public Review #2 Draft

Note: This document shows substantive changes made subsequent to the first public review. Certain portions of the original text remain to provide the reader with some context and certain portions of the original text that were removed are not shown from editorial corrections or to prevent and avoid confusion. You are invited to provide comments on only the striked-through (also shown in red) or the underlined changes.

Legend:

New words are underlined and Green.
Removed words are striked-through and Red.

General/Repeated Changes:

1) The task items or words "~~emergency action and/or response procedures~~" (initially "emergency action and response procedures" per an earlier comment change) were removed, due to a later comment, from Sections 12.2 Item 4, 12.8 Item 6, 13.2 Item 4, 13.8 Item 4, 14.1.1 Item 4, and 14.3 Item 4.

2) In informative Appendix A, the following sentence, "The operating procedures should stress the of importance of communicating deviations to normal operating procedures to all who are involved in the process." was added to Sections A.6.4, A.7.4, A.8.4, A.9.4, A.10.4, A.11.4, A.12.4, and A.13.4.

3) In the informative Appendix A, the following change to "BSR/IIAR 6-201x, *Standard for Inspection, Testing, and Maintenance of Safe Closed-Circuit Ammonia Refrigeration Systems*, lists the safety system parameters that ~~should~~ shall be inspected regularly." was made in Sections A.6.3, A.7.3, A.8.3, A.9.3, A.10.3, A.11.3, and A.13.3.

A PDF copy of BSR/IIAR 7-201x Public Review #1 Draft can be obtained by sending a request to tony_lundell@iiar.org.

Chapter 1. Definitions

Trapped liquid: The complete filling of the internal volume of a container, such as a pressure vessel, pipe, or valve with liquid refrigerant (or any liquid) subject to temperature rise. This is also referred to as hydrostatic lockup.

Vapor-propelled liquid: The high-velocity movement of liquid refrigerant propelled ~~at high velocity~~ by high-pressure vapor in hot gas or suction lines due to high or excessive differential pressure. ~~This is also referred to as hydraulic shock, liquid hammer, or surge.~~ This surge of liquid causes hydraulic shock or liquid hammer when sudden deceleration happens.

Chapter 4. Operating Procedure Contents

4.4 *Safety and Regulatory Considerations

4.4.1 ***Personal Protective Equipment (PPE).** Operating procedures shall describe the appropriate PPE that shall be worn when performing work on the ammonia refrigeration system, where appropriate.

4.4.2 ***Buddy System.** Operating procedures shall indicate when the buddy system shall be practiced in performing work on the ammonia refrigeration system.

4.4.3 ***Lockout/Tagout Procedures.** Operating procedures shall refer to the facility's lockout/tagout procedures, where appropriate.

4.4.4 **Confined Space Entry Procedures.** Operating procedures shall refer to the facility's confined space entry procedures, where appropriate.

4.4.5 **Equipment and Piping Opening Procedures.** Operating procedures shall refer to the facility's procedures for opening equipment and piping, where appropriate.

~~4.4.6 ***Trapped Liquid.** Operating procedures shall include steps where appropriate to prevent trapping liquid ammonia when closing valves to isolate system components.~~

~~4.4.7 ***Sudden Liquid Deceleration.** Operating procedures shall include steps where appropriate to prevent damage due to sudden liquid deceleration.~~

~~4.4.8 ***Vapor Propelled Liquid.** Operating procedures shall include steps where appropriate to prevent damage due to vapor propelled liquid.~~

4.4.~~9~~6 ***Regulatory Requirements**. Operating procedures shall comply with regulatory requirements.

Chapter 7. Refrigerant Pumps

7.2 Refrigerant Pump Initial Start-Up Procedures. The following items shall be considered when documenting refrigerant pump initial start-up procedures:

6. Verification that the liquid supply level is sufficient for pump operation;
~~6~~7. Steps to start the refrigerant pump;
~~7~~8. Process status;
~~8~~9. Minimum refrigerant flow, where applicable;
~~9~~10. Hydrostatic pressure relief, where applicable; and
~~10~~11. Motor cooling.

7.7 *Refrigerant Pump Emergency Operating Procedures. The following shall be considered when documenting refrigerant pump emergency operating procedures:

1. Steps to operate the refrigerant pump under emergency operations, if applicable.

7.8 Refrigerant Pump Start-Up Procedures Following Abnormal Shutdown Conditions or a Turnaround. The following items shall be considered when documenting refrigerant pump start-up procedures following abnormal shutdown conditions or a turnaround:

10. Minimum refrigerant flow, where applicable;
11. Hydrostatic pressure relief, where applicable; and
12. Motor cooling.

Chapter 9. Evaporators

9.6 Evaporator Emergency Shutdown Procedures. The following item shall be considered when documenting evaporator emergency shutdown procedures:

3. Steps to discontinue process operations, where applicable;

9.9 *Evaporator Defrost Procedures.

The following items shall be considered when documenting evaporator defrost procedures:

3. The method used to initiate a defrost cycle, such as manually initiated, initiated using a timer, or initiated by a computer control system;

Chapter 10. Pressure Vessels

10.5 Pressure Vessel Normal Shutdown Procedures. The following items shall be considered when documenting pressure vessel normal shutdown procedures:

2. Steps to shut off the liquid make-up system, where applicable;

Chapter 14. Tasks

14.3 ~~Line and~~ Equipment and Piping Opening Procedures. The following items shall be considered when documenting equipment and piping opening procedures:

1. The appropriate PPE that shall be worn and indications of when the buddy system shall be practiced;
2. The conditions under which pump-out for ~~a line opening,~~ equipment opening, piping opening, or both are required;

3. Confirmation of the location of the ~~line,~~ equipment, piping, or both that will be pumped out and/or opened, prior to commencing work;
4. Facility safe work practices applicable to the ~~line/~~equipment/piping opening procedures;
5. Steps required to pump out the ~~line/~~equipment/piping;
6. Steps required to open the ~~line,~~ equipment, piping, or both; and
7. Steps required to place the system back in normal operations.

Part 4 Appendices

(Informative) Explanatory Material

This informative appendix is not a part of the standard. It provides explanatory information related to provisions in the standard. Sections of the standard with associated explanatory information in this appendix are marked with an asterisk "*" after the section number, and the associated appendix information is located in a corresponding section number preceded by "A."

A.4.4 Operating procedures should include steps to prevent damage due to trapped liquid ammonia, sudden liquid deceleration, and vapor-propelled liquid where appropriate. See BSR/IIAR 6-201x, *Standard for Inspection, Testing, and Maintenance of Safe Closed-Circuit Ammonia Refrigeration Systems*, for guidance on avoiding component failure in industrial refrigeration systems due to trapped liquid, sudden liquid deceleration, and vapor-propelled liquid."

A.4.4.2 The buddy system should be practiced for operations where there is the potential that ammonia could be released, for example, operations which involve opening ammonia refrigeration equipment or piping. The buddy system should also be practiced during emergency operations involving ammonia releases.

A.4.4.3 Lockout/tagout procedures need to be addressed during the development of operating procedures and/or maintenance procedures either by reference or, if a facility so desires, by specifying the valves which will be locked and tagged as part of specific steps with the operating procedures and/or maintenance procedures. It is up to each individual facility to decide where the lockout/tagout procedures will reside.

Pertaining to lockout/tagout, refer to OSHA's 29 CFR 1910.147 *Control of Hazardous Energy ("Lockout/Tagout").*

A.6.2 An example of an abnormal condition which should be addressed during the initial start-up of a compressor is the check for visible frost on the compressor oil separator.

A.6.8 An example of an abnormal condition which should be addressed during the start-up of a compressor following abnormal shutdown conditions is to check for visible frost on the compressor oil separator.

A.7.7 ~~An example of a refrigerant pump emergency operating procedure would be the procedures to operate a refrigerant pump when there are high levels in the vessel associated with the pump.~~ Since there are not likely to be any scenarios where pumps would be operated on an emergency basis, refrigerant pump emergency operating procedures are most likely "not applicable".

A.8.7 An example of a condenser emergency operating procedure ~~would be the procedures to operate (or turn off) the condenser fans and cooling water pumps if there were to be an ammonia release inside the engine room.~~ is the procedure to isolate one leaking coil while continuing to run the condenser with the other coil(s).