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Compressed Gas Association

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OSHA PROCESS SAFETY MANAGEMENT AND EPA RISK MANAGEMENT PLAN GUIDANCE DOCUMENT FOR BULK LIQUID HYDROGEN SUPPLY SYSTEMS

FOURTH EDITION

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NOTE—Technical changes from the previous edition are underlined.

NOTE—Appendices A and B (Normative) are a requirement.

NOTE—Appendices C, D, E, F, G, H, I, and J (Informative) are for information only.

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1 Introduction

The U.S. Occupational Safety and Health Administration (OSHA) Process Safety Management (PSM) standard and the U.S. Environmental Protection Agency (EPA) Risk Management Program (RMP) rule require that some U.S. industrial gas facilities comply with these regulations. For the purpose of this document, OSHA PSM refers to Title 29 of the U.S. *Code of Federal Regulations* (29 CFR) Part 1910.119, "Process Safety Management of Highly Hazardous Chemicals", and EPA RMP refers to Title 40 of the *U.S. Code of Federal Regulations* (40 CFR) Part 68, "Chemical Accident Prevention Provisions" [1, 2]. [1]

PSM and RMP regulations require that companies develop a program to prevent accidental releases of regulated toxic and flammable substances and reduce the severity of releases, which do occur [1]. Hydrogen is one regulated flammable substance under this regulation. Both OSHA PSM and EPA RMP regulations are intended to prevent or lessen consequences of a catastrophic release of a regulated substance from a covered process. Processes are defined broadly to encompass any activity involving a chemical including any use, storage, manufacturing, handling, on-site movement of chemicals, or any combination of these activities. This definition of process also includes any group of vessels that are interconnected and separate vessels that are located so a regulated substance could be involved in a potential release. Transportation activities regulated by the U.S. Department of Transportation (DOT) including pipelines are excluded from coverage [3].

While PSM requirements focus on facility and worker safety, RMP requirements are concerned with the possible effects on the community outside the facility in the event of a catastrophic fire or loss of containment at the facility. The RMP rule requires the implementation of a risk management program for all covered processes at facilities containing regulated substances above threshold quantities. A full risk management program is composed of a hazard assessment, a management system, a prevention program, and an emergency response program. However, RMP allows for a tiered approach to regulating stationary sources subject to the rule. In addition, the RMP rule requires covered sites to register with EPA and submit a risk management plan. There are no such requirements under PSM. Also, PSM does not allow a tiered approach and requires a 14-element prevention program for all covered processes.

The RMP rule requires the implementation of a risk management program for all covered processes at stationary sources containing regulated substances above threshold quantities. A full RMP is comprised of a hazard assessment, a management system, a prevention program, and an emergency response program. However, the RMP rule allows for a tiered approach to regulating stationary sources subject to the rule. There are three tiers or program levels. The placement of a facility into one of the three regulatory tiers is based on the facility's accidental release history, its offsite impact potential, and types of processes operated at the site. In short, a facility that presents a greater risk to offsite receptors shall comply with more stringent requirements than those that present a lower risk to offsite receptors. Appendix A compares regulatory requirements for each tier, known as programs 1, 2, and 3. In addition to the RMP, the RMP rule requires the submission of a risk management plan document. The plan document summarizes the key elements of the RMP at the stationary source.

This publication is designed to help owners and operators of liquid hydrogen bulk tanks comply with PSM and RMP rules.

More details about the application of OSHA PSM and EPA RMP to hydrogen supply systems and other compressed gas and cryogenic fluid systems can be found in CGA P-29, *Application of OSHA PSM and EPA RMP to the Compressed Gas Industry* [4]. CGA P-29 gives examples of covered systems and details about calculating threshold quantities of covered compressed gases.

2 Purpose

This publication is intended to provide information that is required to meet PSM and RMP requirements in an easy to understand form. It allows for more efficient completion of RMPs while at the same time promoting consistent responses to PSM and RMP regulatory requirements. A typical system hazard and operability study (HAZOP) as well as the hazard assessment for release scenarios typical of the standard hydrogen customer station tanks used in the gas industry are provided to assist these critical PSM and RMP responses.

3 Scope

Hydrogen is a PSM and RMP regulated flammable substance at a threshold quantity of 10 000 lb. PSM and RMP rules apply when the total weight of hydrogen in the bulk tank plus the weight of hydrogen in the process meets or exceeds 10 000 lb. More details about calculating the 10 000 lb system threshold quantity can be found in Appendix B. PSM and RMP apply to companies that store more than certain threshold amounts of hazardous and flammable chemicals on-site. Each regulation defines chemicals that are covered.

In many ways, these regulations are similar and they overlap in much of their coverage. However, the focus is different. PSM regulations are meant to protect the personnel working at a plant, which is consistent with OSHA's goals of protecting workers. RMP regulations are meant to protect people in the community outside of the plant, which is consistent with EPA's goals of protecting the environment.

PSM regulations apply to processes with chemicals at or above a threshold quantity listed in Appendix A of 29 CFR Part 1910.119 or to processes with flammable or combustible liquids in quantities of 10 000 lb (4536 g) or more. Hydrogen is not listed in Appendix A of 29 CFR Part 1910.119, but it is considered a flammable gas. Hydrogen is covered by OSHA PSM when it is present in quantities greater than 10 000 lb (4536 kg).

RMP regulations are different and apply only to processes that use chemicals in amounts larger than the quantities listed in its Tables 1 and 2 (toxic substances) and Tables 3 and 4 (flammable substances). Hydrogen is listed in its Tables 3 and 4 at a 10 000 lb (4536 kg) threshold quantity. Therefore, hydrogen is covered by RMP regulations when it is present in quantities greater than 10 000 lb (4536 kg) [2].

Typically, large hydrogen systems are covered by both PSM and RMP regulations. However, in certain cases only one or neither of these regulations may apply:

- PSM regulations exempt retail facilities that have been typically defined as locations that receive more than one-half of their income from direct sales to outside customers (for example, a commercial gasoline service station); and
- RMP regulations do not apply to the storage of flammable gases that are used for fuel.

The responsibility for compliance with these regulations is typically that of the end-use customer (i.e., the process owner). This is because the customer normally "operates" liquid hydrogen supply systems daily and, more so than the gas supplier personnel, is the most likely to be involved in an incident involving a release. However, since industrial gas employees visit these installations periodically to perform maintenance and to deliver hydrogen into the system, the hydrogen supplier shall cooperate with customers in fulfilling the regulation requirements.

Both regulations apply only to equipment used for permanent storage of gas at customer locations, where permanent equipment is different from transportation equipment. However, some transportation equipment is covered if it is left on-site. For example:

- The weight of hydrogen in a liquid hydrogen trailer is not added to that in the storage tank if the trailer is only used for delivering hydrogen and is not left on-site for supplying hydrogen to a customer. If the tank alone has less than 10 000 lb (4536 kg) but the tank and delivery trailer have more than 10 000 lb (4536 kg), the system is not covered by these regulations;
- If a liquid hydrogen trailer is left on-site to deliver hydrogen to the customer (such as using a liquid trailer with a portable vaporizer), and the weight of hydrogen is more than 10 000 lb (4536 kg), then the system is covered by these regulations. Liquid trailers generally hold less than 10 000 lb (4536 kg) of hydrogen;
- A temporary or portable liquid hydrogen tank is covered if it has more than 10 000 lb (4536 kg) of hydrogen;
- Nonconnected hydrogen storage systems are not covered if each one individually is less than 10 000 lb (4536 kg) of hydrogen and are far enough apart that an incident occurring at one storage system would not affect another; and
- Typically, a tank with a nominal gross volume of 18 000 gal (68 140 L) or less holds less than 10 000 lb (4536 kg) of hydrogen and is excluded from PSM and RMP regulations. Table C-1 in Appendix C lists