EPA
RISK MANAGEMENT PROGRAMS
(RMP) OVERVIEW

Prepared by
Peter S. Puglionesi, P.E., DEE
610-449-3430
peter.puglionesi@appliedehs.com

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Peter S. Puglionesi, P.E., DEE
Principal, Applied EHS Management, Inc.
610-449-3430
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INTRODUCTION

When man first tried to use fire, he probably got burned and then asked: "...how do I cook my food and stay warm without burning myself?" Over time and after many accidents, safer approaches were developed: put fire in a sheltered place with a stone floor and provide a way for smoke to escape, use a long stick to hold your range hen, and keep a supply of water nearby. This was not called “process safety” or "risk management”; but it had many essential attributes: Incident Investigation, Hazard Analysis, engineering controls, and safety systems. It was a simple solution and yet, many got burned before the rules were “set in stone.”

In the Modern version of this story, more complicated processes and more hazardous materials were used. Unfortunately, lessons were initially also learned the hard way. A series of catastrophic accidents and a steady increase in industrial losses in the United States and abroad occurred through the 1980s (see Table 1). Bhopal was the watershed event that led both government and industry to conclude that society could no longer accept the risks of large-scale industrial accidents unless more aggressive prevention efforts were taken.

Table 1: Chemical Catastrophe Cases Cited by OSHA

<table>
<thead>
<tr>
<th>Date</th>
<th>Location</th>
<th>Fatalities</th>
</tr>
</thead>
<tbody>
<tr>
<td>1974</td>
<td>Flixborough, England</td>
<td>29</td>
</tr>
<tr>
<td>1976</td>
<td>Seveso, Italy</td>
<td>--</td>
</tr>
<tr>
<td>1984</td>
<td>Bhopal, India</td>
<td>2,500</td>
</tr>
<tr>
<td>1988</td>
<td>Mexico City, Mexico</td>
<td>650</td>
</tr>
<tr>
<td>1988</td>
<td>Henderson, Nevada</td>
<td>2</td>
</tr>
<tr>
<td>1989</td>
<td>Pasadena, Texas</td>
<td>26</td>
</tr>
<tr>
<td>1990</td>
<td>Channelview, Texas</td>
<td>17</td>
</tr>
</tbody>
</table>

Following Bhopal, there was consensus in the petrochemical industry that historical loss control practices did not provide sufficient tools and protections for highly hazardous chemicals. Effective prevention required a management systems approach. Since then, many industry groups have developed standards and guidelines for process safety and risk management, OSHA developed its Process Safety Management (PSM) Rule (29 CFR 1910.119) and EPA developed its Risk Management Programs (RMP) Rule.
RMP OVERVIEW

EPA regulations on Risk Management Programs (RMP) for accidental chemical release prevention in effect since June 21, 1999 cover facilities that handle explosive, flammable, or toxic materials above threshold quantities. Typical operations that could be regulated include:

- Manufacturers of chemicals and refineries;
- Drinking water and wastewater treatment systems that use significant quantities of chlorine, sulfur dioxide, or ammonia;
- Ammonia refrigeration systems;
- Power plants that use significant quantities of ammonia or aqueous ammonia for air pollution control systems or significant quantities of hydrogen for cooling.
- Propane wholesale facilities and gas processing facilities; and
- Other manufacturers using chemicals.

Most of these facilities are also subject to prior OSHA Process Safety Management (PSM) regulations in effect since 1992. Some, including many municipal water and wastewater treatment facilities not regulated by Federal OSHA rules and power plants using between 20 and 44% strength aqueous ammonia, are only subject to the RMP requirements.

Over the past few years, industry has learned that while costs are incurred for development, a well-designed PSM program has the benefits of improved accident prevention, protection of the environment, community relations, and employee relations. It can also improve operating performance and efficiency as a result of better training and safer operations.

The EPA and OSHA rules have different thresholds above which a facility is regulated. Facilities subject to OSHA rules need to consult both thresholds. Table 2 lists some chemicals commonly found at plants.

Table 2 Sampling of RMP Thresholds

<table>
<thead>
<tr>
<th>Chemical</th>
<th>OSHA PSM Threshold</th>
<th>EPA RMP Threshold</th>
</tr>
</thead>
<tbody>
<tr>
<td>Chlorine</td>
<td>1,500 lb</td>
<td>2,500 lb</td>
</tr>
<tr>
<td>Sulfur Dioxide</td>
<td>1,000 lb</td>
<td>5,000 lb</td>
</tr>
<tr>
<td>Ammonia (Anhydrous)</td>
<td>10,000 lb</td>
<td>10,000 lb</td>
</tr>
<tr>
<td>Aqueous Ammonia</td>
<td>[&gt;44%] 15,000 lb</td>
<td>[≥20%] 20,000 lb</td>
</tr>
<tr>
<td>(based on solution weight)</td>
<td></td>
<td>(based on weight of NH₃)</td>
</tr>
<tr>
<td>Flammable Liquid/Gas (except if</td>
<td>10,000 lb</td>
<td>*</td>
</tr>
<tr>
<td>used solely as fuel)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Propane, Methane, etc.</td>
<td>---</td>
<td>10,000 lb*</td>
</tr>
</tbody>
</table>

* EPA covers only listed flammables (e.g., methane and propane) while OSHA covers them as a category. EPA does not regulate propane users and retail distributors, or methane from anaerobic digesters used as fuel.

If a facility has an inventory greater than the above thresholds, the EPA RMP rules require:
• Development and implementation of a comprehensive Risk Management Program.

• Submittal of a Risk Management Plan to EPA (and/or state or local agency under some state programs). Information on the submittal will be available to the State Emergency Response Commission, Local Emergency Planning Committee, and the public.

The EPA rules required that a facility Risk Management Program be developed and implemented and a Risk Management Plan be submitted by June 21, 1999. New facilities, or facilities that will be regulated due to a new regulated chemical use, must be in compliance before the chemical is received. If a new chemical is listed, facilities have 3 years from the effective date of the listing to develop a program and submit a plan.

EPA and OSHA both applied a "go slow" approach to enforcement and the first year or two after the effective dates were spent on gentle prodding for those who had not complied. EPA has, however, issued dozens of consent orders for those who did not submit plans.

After the first two years, enforcement became more aggressive and focused on comprehensive compliance. Enforcement is generally targeted to those industry sectors perceived to be lagging in implementation or perceived to be higher risk and those facilities that have had a release. Food and water/wastewater industries have traditionally been in the "lagging" category.

Those who wait until the rules are enforced may pay significant penalties and have little time to develop programs. On the other hand, those that continue program development and upgrades on an ongoing basis are better able to plan and proceed in a cost-effective manner.

This paper reviews the EPA RMP and OSHA PSM regulations, describes the guidance and Model RMPs that have been developed, gives advice on getting started, presents examples of the Model RMP content and summarizes resources available to help industry comply.

THE GENERAL DUTY CLAUSE

The General Duty Clause—Section 112(r)(1) of the Clean Air Act (CAA)—is a performance based authority making owners and operators of facilities responsible for preventing accidental chemical releases. It requires owners and operators to:

1. Identify hazards which may result from accidental releases of extremely hazardous substances using appropriate hazard assessment techniques,

2. Design and maintain a safe facility taking such steps as are necessary to prevent releases, and

3. Minimize the consequences of accidental releases which do occur.

The General Duty Clause applies to any stationary source producing, processing, handling, or storing any extremely hazardous substance. This includes, but is not limited to, RMP regulated chemicals present under Threshold Quantity and extremely hazardous substances identified under the Emergency Planning and Community Right-to-Know Act (EPCRA). For more information see our guidance on the General Duty Clause at our website, www.appliedehs.com.
RMP COMPONENTS

The EPA rule defines the following three major Risk Management Program components for facilities handling extremely hazardous substances:

- Hazard Assessment.
- Prevention Program.
- Emergency Response Program.

EPA also established three tiers of requirements to reduce the level of effort for facilities with lower risk of off-site impacts, labeled Programs 1, 2, and 3. Program 1, for “no impact” facilities, has the fewest requirements, while Program 3 has the most. Each facility must first complete several Hazard Assessment tasks and then determine which program is applicable, as described in Figure 1. Program 1 “no impact” facilities must demonstrate that the worst-case release has no off-site impacts and that no accidents have occurred in the last 5 years that caused off-site injury, death, or environmental restoration actions.

Hazard Assessment

All facilities must assess the worst-case release scenarios. Program 2 and 3 facilities must also assess at least one alternative release scenario for every covered toxic chemical and one representing all covered flammable chemicals. The assessment would include dispersion modeling, identification of the area where impacts are above specified toxic or fire/explosion “end point” criteria, and estimating the potentially affected populations and environmental receptors within the potentially impacted area. The assessment would also include a 5-year accident history involving chemical releases.

The definition of the worst-case release has been perhaps the most controversial aspect of the rules because of concerns over public perception and emergency planning. The assumptions required for the worst-case release depends upon whether the chemical is a gas or liquid at ambient conditions, normally refrigerated, and listed due to toxicity or flammability.

For liquefied gases, the worst-case release would usually be the release as a gas of the contents of the largest vessel over a 10-minute period. EPA recognizes that the worst-case scenario may represent a highly improbable scenario that may not be the most appropriate for emergency planning. Because the results of the worst-case scenario impacts can raise concerns, be prepared to explain why it may not be appropriate to base emergency management plans and response capabilities on the worst-case.

The alternative release scenarios selected should be more likely to occur than the worst-case and reach an end point off-site (if such an alternative scenario exists). It may be based on accident history or the process hazard analysis. While not explicitly stated, the intent is to select a credible worst-case that provides the basis for planning on-site emergency response and off-site community response. It should include incidents known to the industry, even if it has not happened at this facility.

The 5-year accident history would include incidents from covered processes that resulted in on-site or off-site death, injury, evacuation, sheltering in-place, property damage, or environmental damage. This history must include more minor accidents than those with offsite impacts used as the basis for determining eligibility for Program 1.
**Prevention Program**

The Prevention Program is where EPA rules define very different requirements for the different program levels. Program 1 facilities are not required to develop a prevention program. The Prevention Program requirements for Program 2 and Program 3 are presented in Table 3.

### Table 3

<table>
<thead>
<tr>
<th>RMP Prevention Program Requirements</th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Prevention Program 3</strong></td>
<td><strong>Prevention Program 2</strong></td>
</tr>
<tr>
<td>40 CFR 68.65 - .87</td>
<td>40 CFR 68.65 - .87</td>
</tr>
<tr>
<td>Management System</td>
<td>Management System</td>
</tr>
<tr>
<td>☐ Process Safety Information</td>
<td>☐ Safety Information</td>
</tr>
<tr>
<td>☐ Process Hazard Analysis</td>
<td>☐ Hazard Review</td>
</tr>
<tr>
<td>☐ Operating Procedures</td>
<td>☐ Operating Procedures</td>
</tr>
<tr>
<td>☐ Training</td>
<td>☐ Training</td>
</tr>
<tr>
<td>☐ Mechanical Integrity</td>
<td>☐ Maintenance</td>
</tr>
<tr>
<td>☐ Management of Change</td>
<td>☐ Compliance Audits</td>
</tr>
<tr>
<td>☐ Pre-startup Review</td>
<td>☐ Incident Investigation</td>
</tr>
<tr>
<td>☐ Compliance Audits</td>
<td>☐ Compliance Audits</td>
</tr>
<tr>
<td>☐ Incident Investigation</td>
<td>☐ Incident Investigation</td>
</tr>
<tr>
<td>☐ Employee Participation Plan</td>
<td>☐</td>
</tr>
<tr>
<td>☐ Hot Work Permit</td>
<td>☐</td>
</tr>
<tr>
<td>☐ Contractors</td>
<td>☐</td>
</tr>
</tbody>
</table>

EPA’s Program 3 prevention program includes most of the elements of the OSHA PSM rule. Both the EPA RMP and OSHA PSM rules emphasize the application of performance-oriented management programs rather than the application of specific requirements. The following synopsis outlines key compliance points for Program 3.

**Management** - Only EPA RMP explicitly requires a documented management system with a clear delineation of overall management responsibility for the program and lines of authority for all personnel assigned responsibility for individual requirements; however, most facilities find that implementation of PSM without a clear management structure is difficult.

**Employee Participation** - Employers must develop a written plan describing how they will involve employees and their representatives in hazard analysis and other PSM elements and provide access to all PSM information.

**Process Safety Information** - The facility must maintain toxicity information, permissible exposure levels (PELs), physical data, reactivity data, corrosivity data, thermal and chemical stability data, synergistic effects from mixing process flow, process chemistry, safe upper and lower operating limits, maximum intended inventory, consequences of process deviation, and detailed process design information (piping, instrumentation, mass balance, electrical, safety, ventilation, etc.).
Process Hazard Analysis (PHA) - Must be performed in accordance with generally accepted methodologies (i.e., What If Analysis, FMEA, HAZOP, etc.). The PHA must be revalidated and updated once every 5 years, and copies kept of the two most recent PHAs.

Operating Procedures - Detailed process operating procedures must be developed, implemented, and maintained for each regulated process, including steps for each operating phase (including startup, shutdown, emergency, temporary, etc.), operating limits, safety procedures, and safety and health considerations.

Training (Initial, and Refresher) - All employees involved in working with these processes must be thoroughly trained in operating and safety (including emergency) procedures initially and, at minimum, every 3 years. The training and means to confirm employee understanding must be documented.

Contractors - Contractors working in or near these processes must be informed of all hazards related to the work and the emergency action plan. Employers must evaluate safety performance before contractor selection, log contractor injury and illness, and periodically evaluate performance.

Prestartup Safety Reviews - Must be performed on new or modified process facilities to ensure that equipment and construction meet design specifications, that procedures and training have been implemented, and that hazard analysis recommendations have been resolved.

Mechanical Integrity - The mechanical integrity of process equipment will be documented and maintained through inspection and testing programs and through detailed maintenance documentation. Written procedures, training, and construction quality assurance (CQA) programs are also necessary.

Hot Work Permit - An authorization and permit program for welding and brazing activities near or around these processes shall be implemented and maintained by the employer or his representative.

Management of Change - Implement a program to prevent incidents caused by changes in process chemicals, technology, equipment, or procedures.

Incident Investigation - Incident investigation, reporting, and documentation procedures must be prepared and implemented for any incident that did or could have resulted in a catastrophic release, initiating the investigation as soon as possible and within 48 hours.

Compliance Audits - In-house compliance audits must be performed at least once every 3 years to verify that the program elements are in place and that they have been implemented effectively.

Trade Secrets - Only OSHA PSM explicitly states that secrets must be made available to employees if needed to meet PSM responsibilities, but may be protected under confidentiality agreements.
Emergency Response Program

Both the RMP and PSM rules rely mainly on previous requirements for emergency action plans and training (e.g., 29 CFR 1910.38 and 1910.120[a], [p], and [q]). A facility may continue to plan to evacuate and not actively respond to emergencies, provided that the facility is included in the community emergency response plan developed under U.S.C. 11003 and that appropriate mechanisms are in place to notify emergency responders. While the RMP rule allows the use of plans and programs developed under prior emergency regulations, it stipulates that the plan includes items required under the statute, notably procedures for informing the public and local responders about a release. It also encourages the use of the EPA Integrated Contingency Planning (or “One-Plan”) approach.

MODEL RISK MANAGEMENT PLANS AND GUIDANCE

Guidance and model Risk Management Plans were developed for several industries that have similar regulated process operations. Guidance for various types of facilities and industries, and their developers, include:

- General RMP Guidance and Offsite Consequence Analysis Guidance – US EPA
- Chlorine Packaging Plants – The Chlorine Institute
- Water Treatment Facilities -- American Water Works Association Research Foundation (AwwaRF)
- Wastewater Treatment Plants – US EPA
- Ammonia Fertilizer Distributors – The Fertilizer Institute
- Refining –American Petroleum Institute
- Warehousing --USEPA

The author led the development of the RMP guidance for AwwaRF intended to facilitate the implementation of RMPs by water treatment facilities that use chlorine, anhydrous ammonia, and/or aqueous ammonia in quantities exceeding the EPA threshold quantities. It can also be useful to regulated water treatment operations in other types of regulating facilities ranging from power plants to manufacturing plants (or to facilities with less than threshold quantities that want to apply best management practices to meet their General Duty).

The water industry model differs from the EPA guidance by providing industry specific information to help develop a Risk Management Program. It is unique in providing easy to understand management procedure templates and integrating regulations, instructions, guidance and examples for each section of the regulations. An example of the content of the model is presented in Figure 2.

EPA electronic RMP submission software allows a quick check-off or fill-in of appropriate responses intended to inform EPA whether key compliance activities have been completed. Although not obvious from the questions, EPA considers affirmative answers a representation that you are in compliance. After initial RMP compliance and submittal by June 21, 1999 (or upon introduction of a threshold quantity of a chemical), you must resubmit every 5 years, or upon a change requiring a PHA or resulting in a significant change in offsite consequences.
GETTING STARTED

It can be difficult to initiate a Risk Management Program at some facilities, particularly without imminent enforcement. No two organizations are alike, and it is probable that your facility has some Risk Management Program elements already in place, although it may not be perfectly clear just how closely existing programs meet the requirements. Many risk management elements, such as a program to maintain equipment integrity, already exist at plants, and may merely need to be upgraded or documented. In some cases, programs, such as hazard analysis and management of change, need to be developed from scratch.

A good first step is to determine whether you are subject to OSHA PSM (either federal or state) or EPA RMP Program 1, 2, or 3. Most facilities will not qualify for Program 1 because worst-case scenario distances will reach offsite populations, so worst-case modeling and the 5-year accident history must be completed even if you qualify for Program 1.

If your facility’s inventory is above any of the OSHA PSM thresholds listed, you MAY BE regulated under OSHA PSM rules. Federal OSHA does not have authority over local or state government operated facilities; however, many states have their own rules or adopt OSHA rules and apply them to state and local government operations (i.e., those with “State Plans” approved by OSHA). Federal or state OSHA PSM rules are applicable and enforceable if you are both over the listed thresholds AND you are either:

- A privately operated plant.
- Operated by the federal government.
- In one of the OSHA plan states (Alaska, Arizona, California, Connecticut, Hawaii, Indiana, Iowa, Kentucky, Maryland, Michigan, Minnesota, Nevada, New Mexico, New York, North Carolina, Oregon, Puerto Rico, South Carolina, Tennessee, Utah, Vermont, Virgin Islands, Virginia, Washington, Wyoming).

If you are covered by EPA RMP or OSHA PSM, you should be in compliance now or actively working to correct a non-compliance situation. The OSHA PSM deadline for completion of the management components was in 1992 and the EPA RMP deadline was 1999.

For EPA RMP Programs 2 or 3, facilities should become thoroughly familiar with the rules and may want to begin assessing current programs relative to the new rules and develop a plan to develop the needed changes. The program will typically take 6 months to 1 year to develop and implement for small facilities, although crash programs can be implemented more quickly. Facilities may also want to consider alternative chemicals or processes before expending significant effort on compliance.

About the author: Peter S. Puglionesi, founder and President of Applied EHS Management, Inc., led the development of AwwaRF’s Compliance Guidance and Model Risk Management Program for WTPs and participated in writing the Center for Chemical Process Safety's Technical Planning for On-Site Emergencies book. He has provided PSM/RMP development and audit services, conducted hazard analyses, assisted in implementing other PSM/RMP requirements and provided workshops and training for over 100 facilities.
Figure 1 Applicability of EPA RM Program Rules and Program Classifications
Management System

68.15 Management.

(a) The owner or operator of a stationary source with processes subject to Program 2 or Program 3 shall develop a management system to oversee the implementation of the risk management program elements.

(b) The owner or operator shall assign a qualified person or position that has the overall responsibility for the development, implementation, and integration of the risk management program elements.

(c) When responsibility for implementing individual requirements of this part is assigned to persons other than the person identified under paragraph (b) of this section, the names or positions of these people shall be documented and the lines of authority defined through an organization chart or similar document.

The RMP regulations require a management system. This provision of the regulations requires that you clearly delineate the lines of authority, accountability, and responsibilities for the overall RMProgram and any delegated responsibilities.

Small, Medium, or Large

Compliance for a small facility can be as simple as naming a single individual or position as having overall authority for the program and for overseeing every element of the program. It is best if this is the individual with direct responsibility for managing the facility and supervising all of its employees.

For larger facilities and more complex organizations, you may want to also name several individuals with delegated responsibilities either in an organization chart or a simple table. In larger organizations, overall responsibility may be assigned to a dedicated process safety manager, risk manager, or a manager dedicated to organization-wide environmental and/or health and safety programs.

Qualifications

Qualifications for overall RMProgram responsibility should include experience and/or training in developing and/or implementing health, safety, or environmental programs at WTPs or similar facilities. It is also advisable to select someone who is interested in the position and to either endow the position with the authority to make decisions or be backed up by senior management who have the authority to make decisions based on the RMProgram Manager’s recommendations. In either case, the authority to make decisions must be documented in the RMProgram and communicated to personnel affected by the program.

Selecting the right leader and team is critical. Failure to comply with these rules can result in penalties of up to $25,000 per day per violation and managers may be personally liable for civil and criminal penalties. Care should be taken not to assign overall responsibility to a support position that does not normally have decision authority or that is not adequately supported by a manager having decision authority.

Figure 2  Example Risk Management Program Guidance