MARY KAY O'CONNOR PROCESS SAFETY CENTER
TEXAS A&M ENGINEERING EXPERIMENT STATION

Response to Request for Information

OSWER Docket
EPA Docket Center
Mail Code 2822-1T
Environmental Protection Agency
1200 Pennsylvania Avenue, N.W.
Washington, DC 20460
Attention Docket ID No. EPA–HQ–OEM–2014–0328

Accidental Release Prevention Requirements: Risk Management Programs Under the Clean Air Act, Section 112(r)(7)

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This statement was prepared by the Mary Kay O'Connor Process Safety Center (MKOPSC) at Texas A&M University. Founded in 1995, the Center conducts programs and research activities that enhance safety in the chemical process industries. Educational activities of the Center promote safety as second nature to everyone in the industry. In addition, the Center develops safer processes, equipment, procedures, and management strategies to minimize losses within the processing industry. The Center supports the Environmental Protection Agency (EPA) and welcomes opportunities to assist the EPA in its mission to improve safety in the process industry.

These comments were prepared in response to the EPA **Request for Information** (RFI) published in the Federal Register, vol. 79, no. 147 on July 31, 2014. The comments contained in this document were prepared by the staff of the Mary Kay O'Connor Process Safety Center and may or may not represent the opinions of the MKOPSC Consortium members, various MKOPSC committees, or their employers, or any other individuals/organizations participating in the various activities of the Mary Kay O'Connor Process Safety Center.

Background

The Mary Kay O'Connor Process Safety Center[1] (MKOPSC) was established in 1995 in memory of Mary Kay O'Connor, an Operations Superintendent killed in a petrochemical plant explosion on October 23, 1989, in Houston, Texas. The Center's mission is to promote safety as second nature in industry around the world with goals to prevent future accidents. In addition, the Center develops safer processes, equipment, procedures and management strategies to minimize losses within the process industry. Other functions of the Center include providing

[1] http://psc.tamu.edu/about-the-center

services to its stakeholders, providing a common forum, and developing programs and activities that will forever change the paradigm of process safety.

In response to Executive Order 13650, EPA has requested comments on potential revisions to its Risk Management Program (RMProgram) standard. In its Request for Information (RFI), the Agency asks for information and data on specific regulatory elements and process safety management approaches, the public an environmental health and safety risks they address, and the costs and burdens they may entail. The EPA will use the information received in response to this RFI to inform what action, if any, it may take.

Both EPA's 40 CFR part 68 RMP regulation and OSHA's 29 CFR 1910.119 PSM standard were authorized in the Clean Air Act (CAA) Amendments of 1990 (1990 CAAA), in response to a number of catastrophic chemical accidents occurring worldwide that had resulted in public and worker fatalities and injuries, environmental damage, and other community impacts. OSHA published the PSM standard in 1992 (57 FR 6356, February 24, 1992), as required by section 304 of the 1990 CAAA, using its authority under 29 U.S.C. 653. The 1990 CAAA added to the accidental release provisions under CAA section 112(r). The statute required EPA to develop a list of at least 100 regulated substances for accident prevention and related thresholds (CAA section 112(r)(3)-(5)), authorized accident prevention regulations (CAA section 112(r)(7)(A)), and required EPA to develop "reasonable regulations" requiring facilities with over a threshold quantity (TQ) of a regulated substance to undertake accident prevention steps and submit a "risk management plan" to various local, state, and federal planning entities (CAA section 112(r)(7)(B)). EPA published the RMP regulation in two stages. The Agency published the list of regulated substances and TQs in 1994 (59 FR 4478, January 31, 1994) (the "list rule") and published the RMP final regulation, containing risk management requirements for covered sources, in 1996 (61 FR 31668, June 20, 1996). Both the OSHA PSM standard and the EPA RMP regulation aim to prevent or minimize the consequences of accidental chemical releases through implementation of management program elements that integrate technologies, procedures, and management practices. In addition to requiring implementation of management program elements, the RMP regulation requires covered sources to submit a document summarizing the source's risk management program – called a risk management plan – to EPA. The RMP regulation required covered sources to comply with its requirements and submit initial risk management plans to EPA by June 21, 1999.

Some general comments that EPA should consider in evaluating the proposed changes are given as follows:

1. EPA Risk Management Program was designed to address process risks at plant settings with fixed work forces under the constant supervision of company management.
2. Eliminating or reducing incidents in facilities and operations must be effectively and efficiently pursued using a risk-based approach.
3. One of the challenges in assessing process safety performance in the industry and assessing the effectiveness of regulatory and other programs is the lack of appropriate

data. While changes in regulatory and other programs can be based on an overall understanding of the process and its associated hazards, meaningful and quantifiable progress will result from appropriate data collection. MKOPSC urges EPA to work with industry to gather appropriate data that represent process safety performance indicators.

In its RFI published in the Federal Register, EPA identified topics as potential candidates for rulemaking or enforcement policy changes. In the following sections, we provide an item-by-item discussion of some of the proposed changes and our inputs and comments regarding these proposed changes.

C. Items in OSHA's RFI relevant to EPA's RMP Regulation

1. Update the List of Regulated Substances

Before updating the list of regulated substances, consideration should be given to: a) identifying incidents that have occurred from covered (or potentially covered) facilities that have had offsite impacts that were not covered by the existing regulations, and b) the substance is manufactured, stored or transported in significant quantities in the U.S. The chemicals involved that meet both these criteria are a good starting point if expanding the list of regulated substances is necessary.

a. Adding Other Toxic or Flammable Substances

a1) What other chemical lists or other sources of information should be reviewed to identify acutely toxic or flammable chemicals meeting the RMP listing criteria?

Response:

We do not recommend EPA to expand their current list of hazardous chemicals, since it cannot be concluded definitively that a gap in the current regulations by itself was responsible for the incidents. If augmenting the list is considered, it should be based on risk-based criteria as discussed above and/or a demonstrated potential for disastrous consequences if the substance is released.

For review purposes, a summary of various sources that have enumerated a list of hazardous chemicals are discussed below.

National Institute of Occupational Safety and Health (NIOSH) developed Immediately Dangerous to Life and Death (IDLH) values for 387 chemicals in the year 1970[2]. According to NIOSH, if a worker is exposed to a chemical at a concentration greater than the IDLH concentration then it can result in his death or cause an immediate or delayed adverse health effects (30 minute exposure period is used). It may also prevent his escape from the affected environment. While determining the IDLH values a tiered approach was used wherein the human acute toxicity data was considered first followed by the animal acute lethal concentration data (LC50) and animal lethal dose data (LD50). The IDLH values are listed in concentration units (ppm or mg/m^3). Example: According to NIOSH, the IDLH for nitric oxide is 100 ppm[3]. RMP suggests a threshold value of 10,000 lbs for the same compound[4].

[2] http://www.cdc.gov/niosh/idlh/idlhintr.html
[3] http://www.cdc.gov/niosh/idlh/intridl4.html

The American Industrial Hygiene Association's (AIHA) Emergency Response Planning (ERP) Committee has come up with a list of chemicals and threshold values to assist emergency response personnel in planning for accident prevention and containment procedures. The Emergency Response Planning Guideline (ERPG) values for chemicals have been determined based on short-term exposures (1 hr) and immediate and delayed health effects have been considered while developing the values. Generally, acute inhalation toxicity data for humans are used for the analysis. If sufficient data is not available, toxicity data (with uncertainty factors) for animals are used to set the limits. The ERPG values are classified into three classes[5].

ERPG 1 – Exposure at or below this level causes mild, transient adverse health effects.

ERPG 2 – Exposure at or below this level will not cause any irreversible health effects (which can affect a person's ability to act)

ERPG 3 – Exposure at or below this level will not cause any life threatening health effects.

In situations where the chemical is flammable above a certain limit, the Lower Explosive Limit (LEL) is included in the table. Example: According to the ERPG table, vinyl chloride has a LEL of 36,000 ppm.[6] As against this, a flammable limit of 10,000 lbs is prescribed by RMP[4]. Similarly, the ERPG 1, ERPG 2, ERPG 3 values of hydrogen sulfide are 0.1, 30 and 100 ppm respectively[6]. RMP recommends a limit of 10,000 lbs for the same chemical[4].

U.S Navy has established a list of chemicals with threshold values to guide the Navy personnel working in submerged submarines. In the isolated, enclosed environment the workers are exposed to airborne chemicals for 24 hours. The U.S Navy has suggested exposure guidance levels for 1hr, 24 hrs and 90 days.

Emergency Exposure Guidance Level (EEGL's) – Airborne concentrations of a chemical, which will not cause any irreversible health effects or prevent a worker from performing essential tasks during an emergency (emergency can last from 1 to 24 hrs).

Continuous Exposure Guidance Level (CEGL's) - Airborne concentrations of a chemical, which will not cause any immediate or delayed health effects from continuous exposures for 90 days.[7]

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[4] http://www.epa.gov/R5Super/cepps/pdfs/rmp-listed-chemicals-200708.pdf

[5] https://www.aiha.org/get-involved/AIHAGuidelineFoundation/EmergencyResponsePlanningGuidelines/Documents/ERPGIntroText.pdf

[6] https://www.aiha.org/get-involved/AIHAGuidelineFoundation/EmergencyResponsePlanningGuidelines/Documents/2014%20ERPG%20Values.pdf

[7] http://www.cdc.gov/niosh/docket/archive/pdfs/NIOSH-125/125-NationalAcademyofSciences2007.pdf

Example:

Acrolein	EEGL (1 hr) EEGL (24 hrs) CEGL (90 days) RMP TQ	0.05 ppm 0.01 ppm 0.01 ppm 5000 lbs

However, before looking into such chemical lists, it would be advisable to identify incidents which have impacted offsite areas that were not covered by the existing regulations. The chemicals involved in these events are a good starting point for expanding the RMP list.

a2) What chemicals, if any, should EPA add to the RMP list of regulated toxic and flammable substances? Please provide references to the acute toxicity studies, sources of flammability information or summary results of such studies, information showing that the chemical meets the listing criteria or examples of incidents related to the hazards associated with the chemicals.

Response:

The current approach of listing substances in the RMP regulation (included in 40 CFR §68.130[8]) does not solve the problem.

The current list does not consider the interaction between chemicals or the effect of process conditions on any chemical. Any chemical, which is benign at normal conditions, may become hazardous in the presence of other chemicals or extreme process conditions. Thus, a list would be inadequate in identifying all the hazards and in many respects may introduce other unintended consequences (*i.e.,* facilities may think that if something is not on the list, there is no hazard or risk). Thus, we do not recommend the expansion of the list.

However, for all substances reported under the Tier II list, the employer should conduct a screening analysis. This must be followed by a thorough analysis of the potential consequences of an incident caused by these substances. Based on this, a tiered process safety program (similar to the tiered prevention program practiced within the current RMP regulation) could be implemented. Special considerations should be given to those chemicals, which were involved in incidents with offsite consequences. Efforts should be directed towards reducing their quantities so that offsite impacts are minimized.

a3) Please provide any information on the annual amount of the individual substance manufactured, imported or used, the extent of its availability in commerce and the types of U.S. industries that manufacture, import, or use the substance.

[8] http://www.ecfr.gov/cgi-bin/text-idx?SID=be8e7386f1f72a2309abd433a858f29b&node=se40.16.68_1130&rgn=div8

Response:

Since, we do not endorse the expansion of the chemical list (or the chemical list), we are not in a position to answer this question.

b. Adding High and/or Low Explosives

b1) Should EPA reconsider listing explosives on the RMP list? What are the safety gaps in current regulations and practice (*e.g.*, EPCRA, other federal programs, state programs, and industry efforts) that can best be filled by expansion of the RMP? Are there other approaches for filling any such safety gaps? What type of explosive materials should be covered and why? How many facilities manufacture, store, or use explosives and what are the typical quantities stored on-site by the type of facility or industry? What TQs should be established, and what should be the basis for the TQs? If EPA were to list explosives and establish a TQ at 5000 pounds (the same TQ that was established for the explosives in the 1994 list rule), how many facilities would exceed that TQ and potentially be regulated?

Response:

b1.1 Should EPA reconsider listing explosives on the RMP list?

No, EPA should not consider listing explosives on the RMP list. Explosives are quite adequately dealt with by other regulations.

The assertion made by IME in response to the 1994 regulation still holds true. Explosive substances are already placed under extensive regulation from various government agencies at the Federal and State levels. Looking at the federal government alone, these materials are already regulated in the following ways:

- Department of Transportation (DOT) regulates how hazardous materials, including division 1.1, 1.2, and 1.3 explosives are transported by various means including road and rail. DOT is also responsible for creating the classification system we use in defining explosives as division, 1.1, 1.2, 1.3, 1.4, 1.5 and 1.6. These regulations control the design and maintenance of packaging, require the registration of hazardous material carriers, and require permitting to carry and transport hazardous materials. These regulations are contained in 49 CFR 100-185[9].
    - Pipeline and Hazardous Materials Safety Administration (PHMSA)
    - Federal Motor Carrier Safety Administration (FMCSA)

- The Bureau of Alcohol, Tobacco, Firearms and Explosives (ATF) regulates the "importation, manufacture, distribution, and storage of explosive materials" under Title 18 of the CFR and "commerce in explosives" under Title 27. ATF also has licensing and registration procedures

[9] http://www.fmcsa.dot.gov/regulations/hazardous-materials/how-comply-federal-hazardous-materials-regulations#overview

for companies wanting to import, export, or deal in explosive materials. The ATF also has regulations for the marking/labeling of some explosive materials, reporting quantities and the like to the government, and storage. For storage, under part K, the ATF has requirements for the construction, inspection, and use of 5 different types of explosive magazines. Housekeeping procedures are regulated under part K along with standards for lighting schemes. ATF specifies minimum distances that should separate magazines from highways, schools, hospitals, and other densely populated or sensitive sites. These regulations apply to all explosives storage[10].

- The Occupational Safety and Health Administration (OSHA) provides, perhaps, the most important source of federal regulation of the storage and use of explosive materials under 29 CFR 1910.109, the explosives and blasting agents regulation, which also regulates ammonium nitrate in paragraph (i). OSHA regulates the storage of explosives in a similar fashion as ATF in 1910.109c, where-in they define class I and class II magazines (as opposed to the 5 class system used by ATF and provide requirements on construction, land grade, and separation distances. The OSHA regulations require that the magazines be isolated from sources of water and heat, require adequate air circulation to maintain temperature uniformity, and regulate lighting equipment to prevent sparking[11].

The storage and handling of explosives is therefore regulated quite extensively already, and these regulations are already sufficient to ensure the safe handling and storage of explosives if the regulated community is sufficiently informed of expectations and the regulations are effectively enforced. Adding an additional regulator, in the absence of effective inspection and enforcement systems will simply add to the regulations, not improve safety, especially given the regulatory overlap that already exists between OSHA and ATF.

b1.2 What are the safety gaps in current regulations and practice (*e.g.*, EPCRA, other federal programs, state programs, and industry efforts) that can best be filled by expansion of the RMP?

See response to C.1.b1.1

The handling and storage of explosives is already heavily regulated by more than one federal agency. However, a fair criticism might be made in that the OSHA and ATF regulations are somewhat old. The OSHA regulation uses a table of separation distances released by IME in 1964. A review and possible update of these regulations may be required.

[10] http://www.atf.gov/files/publications/download/p/atf-p-5400-7.pdf

[11] http://www.gpo.gov/fdsys/pkg/CFR-2011-title29-vol5/pdf/CFR-2011-title29-vol5-sec1910-109.pdf

b1.3 Are there other approaches for filling any such safety gaps?

There are other ways to fill gaps in existing regulatory and safety efforts. Any major regulatory gaps or deficiencies can likely be addressed through an extensive and systematic review of the existing OSHA and ATF regulations, with the intent to update them to be consistent with current guidelines and accepted best practices. The most significant regulatory gap however is an enforcement and communication gap on the part of OSHA that will need to be addressed somehow in order for the existing regulations to be effective. Any current gaps in regulations may also be addressed through the involvement of industry organization or through third-party inspection and auditing.

EPA has already attempted to resolve these issues in the past by partnering with an industry organization, namely IME. In the wake of the West, Texas explosion industry organizations including The Fertilizer Institute (TFI) and the Agricultural Retailers Association (ARA) came forward to work with each other, their members, and the government in order to address gaps and raise awareness of hazards[12],[13],[14]. The principle weakness of such actions – and the most common complaint lodged against them - is that compliance is usually voluntary. However, under current conditions compliance with federal regulations is largely also effectively voluntarily because the regulators have not been able to effectively inspect and enforce the regulations at all sites due to resource limitations.

This is not to say that voluntary compliance with limited enforcement is not or cannot be effective. The IRS achieves very high compliance rates with income tax payments with an auditing rate of less than 1%. Many – if not an overwhelming majority of – chemical companies voluntarily research, identify and comply with regulations, sometimes exceeding requirements. The task therefore becomes using outreach and facility identification programs to identify facilities that are unaware of regulations and not in compliance.

b1.4 What type of explosive materials should be covered and why?

As previously stated in our response section C.1.b1.1, explosive materials are already extensively regulated by several other government agencies. We therefore do not recommend or support expanding RMP to include explosive materials.

However, if the EPA elects to add explosive materials to the RMP list contrary to our recommendation, division 1.1 materials should be included as these are the materials with mass explosion hazards that are most likely to create blast waves. However, at that point it may be wise to include materials beyond division 1.1. Ammonium Nitrate is not considered a division

[12] Kennedy, Michael (2013). The West Fertilizer accident: A road map of AN and NH_3 regulations for ag retailers. Ag Professional, May issue, p. 22-24.

[13] http://www.aradc.org/Resources/Resources1/ViewDocument/?DocumentKey=46c54d6e-6336-4d32-abe7-a9b636a86e20

[14] http://image.exct.net/lib/fe64157071610474731 6/m/1/TFI+and+ARA+Testimony.pdf

1.1 material in any grade. Ammonium Nitrate + Fuel Oil (ANFO) mixtures are only considered a division 1.5 material, because it – and other materials in division 1.5 - possess a low probability mass explosion potential[15]. The incident in West clearly demonstrates that a low probability is not a zero probability. Division 1.5 materials should therefore be included alongside division 1.1 if explosives are included. Division 1.2 and 1.3 materials should NOT be included under any circumstances. These categories include – for example – ammunition and other products that contain amounts of explosives in smaller packages[16]. These materials often have "projection hazards," and can produce projectiles – like ammunition cooking off when a gun and ammo store burns down. These projectiles can pose a serious hazard, as exemplified by past incidents involving propane cylinders that were launched great distances during a fire[17],[18], but including these materials could result in regulating a very large number of businesses that are not consistent with the regulatory priorities of EPA and which would be highly impractical for coverage by the RMP regulation. Alternatively, exemptions would have to be made for ammo suppliers and similar businesses or the TQ would need to be set high enough as to not capture most of these small businesses.

b1.5 How many facilities manufacture, store, or use explosives and what are the typical quantities stored on-site by the type of facility or industry?

Answering this question will require that EPA or another agency undertake an effort to compile data from multiple existing data sources available from state, federal, and local agencies, as well as some private institutions, to build a more comprehensive list of sites.

A recent report issued by the GAO – also undertaken in response to the West incident – demonstrates the process needed for Ammonium Nitrate. The GAO was able to identify 1,300 sites in 47 states that possessed the material but for various reasons couldn't get an exact count of the facilities or the number of facilities that would fall under various existing regulations. They also found, after a review of different state and federal databases, that neither state nor federal databases successfully and accurately captured all the potentially regulated sites[19].

NAICS codes can be used to identify companies in industries and undertaking types of activities that might involve explosives, but may not be comprehensive and may include facilities that are not truly part of the regulated community. NAICS is a system of grouping establishments into industries based on their production processes. NAICS classifies industries using 2-, 3-, 4-, 5-, and 6- digit levels of detail. This classification replaces the previously used

[15] http://environmentalchemistry.com/yogi/hazmat/placards/class1.html

[16] http://blog.sfgate.com/stew/2014/03/28/lucky-to-be-alive-after-propane-tank-totals-car/

[17] http://wildfiretoday.com/2010/06/04/propane-tank-launched-from-structure-fire-narrowly-misses-boaters/

[18] http://environmentalchemistry.com/yogi/hazmat/placards/class1-chemicals.html#Div1.1

[19] Actions Needed to Improve Federal Oversight of Facilities With Ammonium Nitrate. Government Accountability Office. http://www.gao.gov/assets/670/663293.pdf

Standard Industrial Classification (SIC) codes. There is no central government agency with the role of assigning, monitoring, or approving NAICS codes for establishments. The U.S. Census Bureau assigns each establishment one NAICS code based on its primary activity (the activity that generates the most revenue for the establishment)[20]. However, the US Census Bureau is banned by law from sharing information on specific businesses/companies and can only publish statistics. Also, because only the primary revenue source for the business is used in determining the NAICS codes, NAICS lists will miss companies that don't deal in explosive materials as their primary revenue stream. OSHA maintains extensive databases documenting their inspection and enforcement efforts – most of these records provide information on the business being inspected and the vast majority include NAICS codes.

Tier II reports – submitted under EPCRA - can also be used to gain information on the number of facilities holding certain chemicals if requested from state and local LEPCs; however, these reports may still not capture all the facilities in an area if the facilities haven't filed, or were exempt from filing. Obtaining comprehensive information may also be difficult in the case of areas with small, weak, or under-supported LEPCs[21,22,23].

State agencies that regulate specific industries and issue permits like the Department of State Health Services in Texas and the Office of the Texas State Chemist sometimes maintain databases of facilities that produce and handle certain types of materials like ammonium nitrate, anhydrous ammonia, or explosives, as part of their regulatory mandate from the state. Local communities often – to one extent or another – require businesses to apply for Building Occupancy Permits and or other licenses, for which they have to divulge if they are storing hazardous materials at that site. These also represent potential data sources for compiling a list of regulated sites.

b1.6 What TQs should be established, and what should be the basis for the TQs?

As previously stated in our response section C.1.b1.1, explosive materials are already extensively regulated by several other government agencies. We therefore do not recommend or support expanding RMP to include explosive materials.

As with the existing RMP regulation, the TQs used should vary depending on the substance or class of substances based on the potential consequences of an incident. The following method is one possible way to establish TQs for explosive materials. The equivalent mass of TNT for a given mass of an explosive material can be calculated. This equivalent mass of TNT can then be

[20] What is NAICS and how is it used? http://www.census.gov/eos/www/naics/faqs/faqs.html#q1
[21] What facilities are covered? http://www.epa.gov/osweroe1/content/epcra/epcra_storage.htm
[22] How do I submit a Tier I or Tier II inventory report? http://www.epa.gov/osweroe1/content/epcra/epcra_storage.htm
[23] How will citizens have access to Tier I or Tier II inventory forms? http://emergencymanagement.supportportal.com/link/portal/23002/23016/Article/17885/How-will-citizens-have-access-to-Tier-I-or-Tier-II-inventory-forms

used to estimate the overpressure that will be felt from a resulting explosion at various distances from the point of the explosion[24]. If EPA defines a maximum overpressure at a given distance from the explosion as "acceptable" or "tolerable" "as is" and, therefore, not requiring compliance with the RMP regulation. An equivalent TNT mass that would generate the specified overpressure at the specified distance from the blast can be back-calculated, allowing EPA to set an appropriate threshold quantity. This TQ would be based on a reasonable assessment that a stockpile of that size or smaller would not pose a sufficiently severe hazard to the surrounding community.

b1.7 If EPA were to list explosives and establish a TQ at 5000 pounds (the same TQ that was established for the explosives in the 1994 list rule), how many facilities would exceed that TQ and potentially be regulated?

Response:

Please refer to the response to question C.1.b1.5.

b2) b2.1 Are there other incidents involving the manufacture and processing of explosive materials that should be reviewed to determine if covering these operations under the RMP would decrease the risk of an accidental explosion affecting an off-site community?

b2.2 Does the presence of explosives impose unique risks on rural, disadvantaged, or otherwise environmentally burdened communities?

Response:

b2.1: Are there other incidents involving the manufacture and processing of explosive materials that should be reviewed to determine if covering these operations under the RMP would decrease the risk of an accidental explosion affecting an off-site community?

The RFI references:

- The Sierra Chemical Company's Kean Canyon explosives manufacturing plant explosion
- Donaldson Enterprises explosion in Waikele, Hawaii.
- The Adair Grain Company explosion in West, Texas

Other incidents involving explosives are listed below[25]:

- Evangelos Florakis Naval Base Explosion, Cyprus, July 11, 2011

[24] Crowl, D.A., and J.F. Louvar, Chemical Process Safety Fundamentals with Applications, Third edition, Prentice-Hall, 2011.

[25] http://en.wikipedia.org/wiki/List_of_industrial_disasters

- Oppau, Germany AN explosion. Sep 21, 1921
- Port Neal, IA AN plant explosion, Dec 19, 1994
- Azote de France fertilizer factory explosion, Toulouse, France. Sept. 21, 2001
- T.A. Gillespie Company Shell Loading Plant Explosion; Sayreville, New Jersey; October 4, 1918
- Nixon Nitration Works explosion; Edison New Jersey; March 1, 1924
- Port Chicago Explosion; Port Chicago, California; July 17, 1944
- Ojhri Camp explosion; Rawalpindi Pakistan; April 10, 1988
- Washburn "A" Mill flour dust explosion; Minneapolis; May 2, 1878
- Roland Mil Flour Dust Explosion; Bremen, Germany; February 6, 1979
- Haysville KN Grain Elevator explosion; Haysville, Kansas; September 3, 1998
- Georgia Sugar Company Refinery Explosion; Port Wentworth, Georgia; February 7, 2008
- Benton Fireworks Disaster; Benton, Tennessee; May 27, 1983
- Enschede Fireworks Disaster; Enschede, Netherlands; May 13, 2000
- Seest Fireworks Disaster; Kolding, Denmark; November 3, 2004
- Istanbul Fireworks Explosion; Istanbul; February 1, 2008
- Wood Mill explosion; Burns Lake, British Columbia; January 20, 2012
- Coteau-du-lac, Quebec Fireworks Warehouse explosion, June 20, 2013.

b2.2 Does the presence of explosives impose unique risks on rural, disadvantaged, or otherwise environmentally burdened communities?

This is still a largely open question with the National Science Foundation (NSF) and the US Department of Agriculture's (USDA) National Institute of Food and Agriculture working together on projects to advance research into the disaster resilience of rural communities – both the current state of it and how to improve it[26]. The University of Queensland and University of Southern Queensland prepared a "toolkit" on how to improve rural community disaster resilience[27].

The issue of rural resilience is based around how long it would take a typical rural community to return to its pre-disaster state after a technical disaster, if it did at all. Would the rural community rebuild or would the people move always? Where would the funds for rebuilding come from? Rural communities tend to be more impoverished than urban/suburban communities. There may be smaller portions of the community with adequate insurance coverage to cover the costs of rebuilding homes and businesses. A technical disaster is likely to impact a larger portion of a rural community and may damage a larger portion of the local infrastructure than it would in a more urban setting. This may also impact the ability of community to rebuild.

[26] http://www.federalgrants.com/Disaster-Resilience-for-Rural-Communities-27176.html

[27] http://www.uq.edu.au/bluecare/docs/toolkit_v5.pdf

b3). Should the RMP regulation apply to manufacturers of explosives, end users, and/or explosive recyclers?

Response:

As previously stated in our response section C.1.b1.1, explosive materials are already extensively regulated by several other government agencies. We therefore do not recommend or support expanding RMP to include explosive materials at all, which would render the question which users to regulate or exclude moot.

The explosive properties of the material remain the same irrespective of the reason the chemicals are being stored at the facility. The only reasonable conclusion therefore is that all facilities storing the materials above the final TQ should be required to comply with the RMP regulation. One possible exception may be agricultural facilities that exist away from cities, towns, and other populated areas with a sufficient buffer space present such that explosions at that facility most likely would not heavily impact a local community. An example might be grain elevators and silos on farms, not adjoining towns.

b4)
b4.1. If the RMP regulation is amended to cover explosives, should EPA consider establishing requirements for safe separation distances between explosive materials and public receptors similar to those required by ATF and OSHA (see section II.D.4 of this RFI for additional discussion of stationary source location requirements)?
b4.2. What other requirements should EPA consider?
b4.3. Which if any of these requirements could have prevented or minimized the impacts of specific historical accidents?

Response:

b4.1. If the RMP regulation is amended to cover explosives, should EPA consider establishing requirements for safe separation distances between explosive materials and public receptors similar to those required by ATF and OSHA (see section II.D.4 of this RFI for additional discussion of stationary source location requirements)?

As stated previously, it is not recommended to cover the explosives under RMP, since explosive materials are already extensively regulated by several other government agencies.

If explosives have to be covered, EPA should consider establishing requirements for safe separation distances between explosive materials and republic receptors. OSHA 1910.109(c)(1)(vi) has information about explosive storage separation distance between magazines rather than between explosive materials and public receptors. UK[28] and Australia[29] also have

[28] http://www.hse.gov.uk/explosives/licensing/separation/separation-tables/table3.htm

separation distances between explosive storage and different receptors, such as vulnerable facilities, process buildings and so on.

b4.2. What other requirements should EPA consider?

As stated previously, it is not recommended to cover the explosives under RMP, since explosive materials are already extensively regulated by several other government agencies.

If the explosives have to be regulated, risk-based factors should be considered such as different types of public receptors (*e.g.*, road, waterway, buildings) according to the following factors, but not limited to: vulnerability and occupancy. Specific requirements should be established based on the consequences caused by every chemical. Quantity of chemicals is another important factor to be considered: threshold quantities are also suggested to be set up based on the offsite consequences.

b5) Are there any special circumstances involving small entities that EPA should consider with respect to adding explosives to the RMP list of substances?

Response:

We recommend that EPA should take a risk-based approach. Regardless of the size of the entity, if the facility is posing an unreasonable risk, the entity should be required to comply with necessary standards and regulations to manage the risk effectively.

b6)

b6.1. As an alternative to expanding the scope of the RMP, would expanded use of EPCRA information (such as better integration of information on explosive hazards into local emergency plans) and other governmental and industry programs (including voluntary programs) be able to address safety gaps?

b6.2. What are the advantages and disadvantages of such an approach relative to expansion of the RMP?

Response:

b6.1. As an alternative to expanding the scope of the RMP, would expanded use of EPCRA information (such as better integration of information on explosive hazards into local emergency plans) and other governmental and industry programs (including voluntary programs) be able to address safety gaps?

[29] http://www.dmp.wa.gov.au/documents/Factsheets/DGS_G__StorageOfExplosives.pdf

Yes, better integration of information on explosive hazards into local emergency plans would help address safety gaps. For example, in the case of the West Fertilizer incident, it is doubtful how much information was available to the local emergency response agencies regarding the contents or the associated hazards and risks of the contents.

b6.2. What are the advantages and disadvantages of such an approach relative to expansion of the RMP?

Take the EPCRA as an example: advantages: It would be efficient in improving the communication between the facility and the community and will make the emergency response from the local fire department. Disadvantage: EPCRA mainly covers the reporting from the facility to its community while RMP covers every aspect related to the process, and explosive substances.

Supporting Information:

Emergency Planning and Community Right-to-know Act (EPCRA)[30]

c. Adding Ammonium Nitrate

c1) Are there safety gaps in the current regulations for AN that could be addressed using regulations under CAA section 112(r)? Should EPA regulate AN under CAA section 112(r) authority to improve chemical safety practices at facilities handling AN? What types of AN and AN facilities should be subject to the RMP regulations to prevent chemical accidents involving AN that could have adverse effects, such as blast overpressure, on the public, environment and off-site property? Should EPA consider safety regulations to cover the storage and handling of AN fertilizer only and continue to rely on ATF regulations and OSHA standards to cover AN in explosives and blasting agents? What role should voluntary industry programs (such as the one undertaken by IME for high explosives) have in a decision on whether safety gaps exist that warrant regulation under the RMP? Please discuss the economic impacts associated with the potential regulation of AN under CAA section 112(r), including any special circumstances involving small entities that EPA should consider.

Response:

No, EPA should not regulate AN under CAA section 112(r) authority. In general, the requirements under the RMP rule include development of a hazard assessment, a prevention program, and an emergency response program[31]. However, such regulating programs can be also found in other federal agencies which have already regulated AN, such as the Emergency

[30] http://www2.epa.gov/epcra
[31] http://www.epa.gov/osweroe1/docs/chem/ammonitr.pdf

Action Plan (EAP) of OSHA Standard 1910.38[32], Hazard Communication Standard of OSHA 1910.1200[33], Chemical Facility Anti-Terrorism Standards (CFATS) under DHS, EPCRA Sections 301-303 and 312[34]. If CAA section 112(r) also covers AN, there will overlapping of regulations. More details could be found in the supporting information.

We believe that there are appropriate and adequate regulations with regard to AN storage and handling. But the enforcement of regulations needs to be improved. The important issue is how to ensure that facilities are aware of the relevant regulations, especially for small-scale facilities; and how federal agencies identify their regulatory landscape. It is important to understand if regulations are doing what we intend them to do and in the right direction.

The existing AN requirements and hazard/risks should be clarified. Recommendations should be given using risk-based approach and technical-based approach. New regulations should not cause more problems.

In the August 2013 "Chemical Advisory: Safe Storage, Handling, and Management of Ammonium Nitrate", in the "Hazard Reduction" section, under fire protection, states that the use of sprinkler systems should be reconsidered. However, based on Lees[35], the use of water sprinklers, fog nozzles, and foam or dry powder extinguishers are ineffective to attack an AN fire. Hence, the presence of insufficient water at elevated temperature facilitates AN fire and increase explosion hazards[36]. Based on HSE[37], AN should be maintained away from water contamination, to prevent caking, which can increase the AN detonation hazards. For this reason, AN loading under raining and snowing conditions is not recommended.

Retailer facilities should not be exempted from regulations. It is also important to ensure an operational and effective local emergency planning committee (LEPC). Amongst other things, compliance with paragraph (i) of 29 CFR 1910.109 (which they were required to do) would in most likelihood have prevented the West incident. We believe that improvements can and should be made through increased awareness, enhanced and effective compliance, and inspection regimes.

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[32] Shea, D.A., Schierow, L.J., Szymendera, S. (2013) Congressional Research Service. *Regulation of Fertilizers: Ammonium Nitrate and Anhydrous Ammonia.*

[33] 29 C.F.R. §1910.1200. Available at: http://www.osha.gov/pls/oshaweb/owadisp.show_document?p_table=standards&p_id=10099

[34] What Does EPCRA Cover: http://www.epa.gov/oem/docs/chem/epcra.pdf

[35] Mannan, M.S., *Ch11. Process design*, in *Lees' Loss prevention in the process industries (fourth edition)*. 2012, Butterworth-Heinemann: Oxford. p. iv.

[36] Mannan, M.S., *Ch11. Process Design*, in *Lees' Loss Prevention in the Process Industries (Fourth Edition)*. 2012, Butterworth-Heinemann: Oxford. p. iv.

[37] HSE. *Storing and handling ammonnium nitrate*. Available from: http://www.hse.gov.uk/pubns/indg230.pdf.

EPA should not consider safety regulations to cover the storage and handling of AN fertilizer. ATF regulations and OSHA standards have already covered AN in explosives and blasting agents (see supporting information).

Voluntary industry programs should play a role in a decision on whether safety gaps exist that warrant regulation under the RMP. Voluntary industry programs should include, but not limited to, RMP rules as well as other regulations, helping facilities to identify the risks in the specific site, with detailed analysis of risk assessment, management plans, and emergency plans.

Supporting Information

Requirements if AN were covered by CAA 112:

EPA defined three "program levels" to ensure that individual chemical processes are subject to appropriate requirements based on the size of the process and the associated risks[38].

- **Program 1 eligibility requirements (provided in section § 68.10)[39].**

(1) For the five years prior to the submission of an RMP, the process has not had an accidental release of a regulated substance where exposure to the substance, its reaction products, overpressure generated by an explosion involving the substance, or radiant heat generated by a fire involving the substance led to any of the following offsite: (i) Death; (ii) Injury; or (iii) Response or restoration activities for an exposure of an environmental receptor.

(2) The distance to a toxic or flammable endpoint for a worst-case release assessment conducted under Subpart B and § 68.25 is ***less than the distance to any public receptor****, as defined in § 68.30.*

(3) Emergency response procedures have been coordinated between the stationary source and local emergency planning and response organizations.

- **Program 1 requirements (provided in section § 68.12):**

(1) Analyze the worst-case release scenario for the process(es), as provided in § 68.25; document that the nearest public receptor is beyond the distance to a toxic or flammable endpoint defined in § 68.22(a); and submit in the RMP the worst-case release scenario as provided in § 68.165;

(2) Complete the five-year accident history for the process as provided in § 68.42 of this part and submit it in the RMP as provided in § 68.168;

(3) Ensure that response actions have been coordinated with local emergency planning and response agencies; and

(4) Certify in the RMP the following: ``Based on the criteria in 40 CFR 68.10, the distance to the specified endpoint for the worst-case accidental release scenario for the following process(es) is less than the distance to the nearest public receptor: Within the past five years, the process(es) has (have) had no accidental release that caused offsite impacts provided in the risk management program rule (40 CFR 68.10(b)(1)).

[38] RMP requirements: http://www.epa.gov/emergencies/docs/chem/clean_air_guidance.pdf

[39] APPENDIX A. 40 CFR 68 (page 9): http://www.epa.gov/osweroe1/docs/chem/Appendix-A-final.pdf

- **Program 2 eligibility requirements.**

A covered process is subject to Program 2 requirements if it does not meet the eligibility requirements of program 1 and 3.

- **Program 2 requirements (provided in section § 68.12):**

(1) Develop and implement a management system as provided in § 68.15;
(2) Conduct a hazard assessment as provided in Sec.§ 68.20 through 68.42;
(3) Implement the Program 2 prevention steps provided in Sec.§ 68.48 through 68.60 or implement the Program 3 prevention steps provided in Sec.§ 68.65 through 68.87;
(4) Develop and implement an emergency response program as provided in Sec. § 68.90 to 68.95; and
(5) Submit as part of the RMP the data on prevention program elements for Program 2 processes as provided in § 68.170.

- **Program 3 eligibility requirements**. *A covered process is subject to Program 3 if the process does not meet the requirements of program 1 of this section, and if either of the following conditions is met:*

(1) The process is in NAICS code 32211, 32411, 32511, 325181, 325188, 325192, 325199, 325211, 325311, or 32532; ***or***
(2) The process is subject to the OSHA process safety management standard, 29 CFR.

- **Program 3 requirements (provided in section § 68.12):**

(1) Develop and implement a management system as provided in § 68.15;
(2) Conduct a hazard assessment as provided in Sec.§ 68.20 through 68.42;
(3) Implement the prevention requirements of Sec.§ 68.65 through 68.87;
(4) Develop and implement an emergency response program as provided in Sec.§ 68.90 to 68.95 of this part; and
(5) Submit as part of the RMP the data on prevention program elements for Program 3 processes as provided in § 68.175.

<u>CFATS requirements</u>

> "Chemical Facility Anti-Terrorism Standards (CFATS) under DHS[40] has developed a risk-based tiering structure that will allow it to focus resources on the high-risk chemical facilities. To that end, the Department will assign facilities to one of four risk-based tiers ranging from high (Tier 1) to low (Tier 4) risk.

Assignment of tiers is based on an assessment of the potential consequences of a successful attack on assets associated with chemicals of interest. The Department of Homeland Security uses information submitted by facilities through the Chemical Security Assessment Tool Top Screen and Security Vulnerability Assessment (SVA) processes to identify a facility's risk, which is a function of the potential impacts of an attack (consequences), the likelihood that an attack

[40] http://www.dhs.gov/risk-chemical-facility-anti-terrorism-standards-cfats

on the facility would be successful (vulnerabilities), and the likelihood that such an attack would occur at the facility (threat).

EPCRA Sections 301-303

EPCRA Sections 301-303 provide a systematic framework for coordination of hazard information, prevention programs, and emergency planning and response involving the federal government, state emergency response commissions (SERC) and the local emergency planning committees (LEPC).

EPCRA[41] Section 312

EPCRA[42] Section 312 requires the same employers to submit annually an emergency and hazardous chemical inventory form to the SERC, LEPC, and local fire department. These forms must provide estimates of:

- Maximum amount of the chemicals present at the facility at any time during the preceding year
- Average daily amount of chemicals present
- General location of the chemicals in the facility

Emergency Action Plan (EAP) of OSHA Standard 1910.38

Emergency Action Plan (EAP) of OSHA Standard 1910.38[43] would have applied to the use and possession of AN. The Emergency Action Plan must have, at minimum, the following elements[44].

- procedures for reporting a fire or other emergency;
- procedures for evacuation;
- procedures to be followed by employees who remain to operate parts of the
- facilities before evacuating;
- procedures to account for all employees after evacuation;
- procedures for employees performing rescue or medical duties; and
- names and job titles of persons who may be contacted by employees to provide
- information to employees about the EAP

Standard 1910.1200: Hazard Communication[45]

1910.1200(b)(2) – "This section applies to any chemical which is known to be present in the workplace in such a manner that employees may be exposed under normal conditions of use or in a foreseeable emergency."

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[41] What Does EPCRA Cover: http://www.epa.gov/oem/docs/chem/epcra.pdf

[42] What Does EPCRA Cover: http://www.epa.gov/oem/docs/chem/epcra.pdf

[43] Shea, D.A., Schierow, L.J., Szymendera, S. (2013) Congressional Research Service. *Regulation of Fertilizers: Ammonium Nitrate and Anhydrous Ammonia.*

[44] 29 C.F.R. §1910.38(c). Available at: http://www.osha.gov/pls/oshaweb/owadisp.show_document?p_id=9726&p_table=STANDARDS

[45] 29 C.F.R. §1910.1200. Available at: http://www.osha.gov/pls/oshaweb/owadisp.show_document?p_table=standards&p_id=10099

c2) Should EPA amend the RMP requirements to address the hazard posed by AN? If so, what specific requirements would be appropriate for AN? Alternatively, should EPA use its regulatory authority under CAA 112(r)(7)(A) to require more tailored safety steps for facilities handling AN and list AN at a high threshold to better focus these requirements on fewer holders of large quantities that pose the greatest risk? What would be the benefits of regulating AN under the RMP regulations as opposed to only maintaining the current SDS and hazardous chemical inventory reporting already required under EPCRA?

Response:

As discussed in C.1.c1, AN should not be regulated under CAA 112(r), then AN should not be addressed under the RMP requirements.

If AN is regulated under RMP regulations, facilities handling AN would be required to develop of a hazard assessment, a prevention program, and an emergency response program[46], which have been covered by other agencies, as discussed in C1c.1. Therefore there is no need to do so. The benefits of regulating AN under the RMP regulations is listed in the supporting information in C.1.c1. EPCRA has reporting systems as mentioned in the supporting information.

c3) If EPA were to regulate AN under 40 CFR part 68, what quantity of AN poses a sufficient hazard to be covered? What would be the basis for establishing this TQ?

Response:

If EPA were to regulation AN under 40 CFR part 68, the amount of AN that should trigger the submission of risk management plans could be similar to the threshold imposed by DHS in the CFATS rule, the COMAH and CIMAH regulations, as listed below, with a tiered approach.

Also, facilities should be required to assess their risk. Regulators should determine the accuracy of documents submitted by facilities. For example, the RMP submitted by West Fertilizer stated no fire or explosion hazard associated with anhydrous ammonia. This should have raised red flags, given the flammability hazards associated with anhydrous ammonia. EPA should provide guidance on how to perform a hazard evaluation and risk management plan for facilities that store and handle AN and other fertilizers.

DHS - CFATS
Facilities having ≥ **5,000 lb** of AN (**400 lb** for theft/ if packaged for transportation) as a blasting agent (ammonium nitrate with more than 0.2% combustible substances), or ≥ **2,000 lb** of

[46] http://www.epa.gov/osweroe1/docs/chem/ammonitr.pdf

transportable fertilizer (with nitrogen concentration of 23% or greater, or fertilizer mixture containing at least 33% of AN) are considered a high risk facility[47].

COMAH Regulation

Table C1c.iii.1: Tier levels classification used by COMAH[48]

Type of fertiliser	Lower tier qualifying quantity (tonnes)	Top tier qualifying quantity (tonnes)
Note 1. Fertilisers capable of self-sustaining decomposition*	5000	10,000
Note 2. Fertiliser grade*	1250	5000
Note 3. Technical grade*	350	2500
Note 4. Off-spec material and fertilisers not satisfying the detonation resistance test*	10	50

CIMAH Regulation

Table C1c.iii.2. Quantities of AN at or above for applying regulations[49]

Type of ammonium nitrate (AN)	Application of CIMAH reg 4 to storage[i] (tonnes)	Application of CIMAH regs 7-12 to storage[ii] (tonnes)	Application of CIMAH regs 7-12 to industrial activities, other than storage[iii] (tonnes)	Application of PHS (tonnes)
Straight AN, designated EEC fertilizer	1 250	10 000	5 000	1 000
Compound fertilizer	1 250	10 000	5 000	1 000
Other AN or AN mixtures	350	2 500	2 500	500

<u>Supporting Information</u>

<u>EPA RFI opinion</u>

EPA could list AN on the RMP list with a high threshold in order to prioritize process safety requirements for those facilities and locations where large amounts of AN are stored. When EPA had included high explosives on the RMP list, the TQ was based on a trinitrotoluene (TNT) equivalent weight; EPA could determine a threshold amount for AN, based on a TNT-

[47] 72 Federal Register 65396-65435 (November 20, 2007) at 65407, http://www.gpo.gov/fdsys/pkg/FR-2007-11-20/html/07-5585.htm

[48] http://www.agindustries.org.uk/document.aspx?fn=load&media_id=2850&publicationId=680

[49] Storing and Handling Ammonium Nitrate, Available at http://www.hse.gov.uk/pubns/indg230.pdf

equivalent weight calculation adjusted for AN[50]. The RMP requirements for AN could be established at the statutory minima with more specific provisions tailored to particular types of facilities, e.g., manufacturers, fertilizer distributors and other facilities that have large amounts of explosives, blasting agents or fertilizers.

DHS threshold quantity for AN

CFATS addresses hundreds of chemicals, including ammonium nitrate, and is directed at the security of high-risk facilities. DHS stated in the CFATS interim final rule that "*if a retail establishment does exceed any of these [screening threshold quantities], the retail establishment will have to complete the Top-Screen.*"[51] Based on this information, DHS will determine whether a facility present a high level of security risk.

The DHS lists 322 chemicals and screening threshold quantities for each chemical to determine whether they need to comply with CFATS[52]. "The DHS considers each chemical in three main categories of security issues: release; theft or diversion; and sabotage and contamination. The regulation lists two formulations of ammonium nitrate (one used as a blasting agent, the other as fertilizer) as a chemical of interest and identifies them as release and theft or diversion threats."[53]

The screening threshold quantity differs depending on whether the ammonium nitrate is blasting agent or fertilizer. Facilities having ≥ **5,000 lb** of AN (**400 lb** for theft/ if packaged for transportation) as a blasting agent (ammonium nitrate with more than 0.2% combustible substances), or ≥ **2,000 lb** of transportable fertilizer (with nitrogen concentration of 23% or greater, or fertilizer mixture containing at least 33% of AN) are considered a high risk facility[54].

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[50] TNT equivalent- weight calculation is a method for estimating the quantity of an explosive required to produce blast effects at various distances from the source of the explosion. The method uses the scaling law of distances, which relates quantity of explosive material and distance for a given overpressure. For explosives other than TNT, an empirically- derived equivalency factor is used to account for differences between the explosive characteristics of the actual explosive and those of an equivalent weight of TNT. Additional information on EPA's threshold methodology for high explosives can be found in the Technical Background Document, Development of Threshold Quantities for List of Regulated Substances for Accidental Release Prevention, Clean Air Act Section 112(r). See: Technical Background Document for the Development of Threshold Quantities for List of Regulated Substances for Accidental Release Prevention, Clean Air Act Section 112(r). Original Docket# A- 91- 74, document # III- B- 2, June 21, 1992.

[51] 72 Federal Register 17688-17745 (April 9, 2007) at 17697 (in page 17697, it is the last sentence of "1. Definition of ``Chemical Facility or Facility''", right above "2. Multiple Owners and Operators"). http://www.gpo.gov/fdsys/pkg/FR-2007-04-09/html/E7-6363.htm

[52] DHS list of chemicals: http://www.dhs.gov/xlibrary/assets/chemsec_appendixa-chemicalofinterestlist.pdf

[53] Regulation of Fertilizers: Ammonium Nitrate and Anhydrous Ammonia. Congressional Research Service. http://www.fas.org/sgp/crs/homesec/R43070.pdf

[54] 72 Federal Register 65396-65435 (November 20, 2007) at 65407, http://www.gpo.gov/fdsys/pkg/FR-2007-11-20/html/07-5585.htm

COMAH Regulation

AN is listed under the dangerous substances list in COMAH. A facility can be classified as sub-COMAH, low-tier or top-tier COMAH, according to the qualifying quantities for different types of AN (fertilizer, technical or off-spec) established by COMAH. The set quantities for the different types of AN are listed in Table C1c.iii.1 below. The owner of the facility must comply with lower or top tier duties, as described below:

(i) Lower tier duties for the operator include a requirement to take all necessary measures to prevent major accidents and limit their consequences to people and the environment, notification to the COMAH Competent Authority (CA) and the preparation of a major accident prevention policy.

(ii) Top tier duties require, in addition, a safety report, the preparation of an external emergency plan by the local authority, and the provision of information to the public.

Where 10-50 tons or more of fertilizer fail a DRT, for the purposes of COMAH, this is considered to be a change of classification of the material. An operator previously outside the scope of COMAH will need to take some actions.

Table C1c.iii.1: Tier levels classification used by COMAH[55]

Type of fertiliser	Lower tier qualifying quantity (tonnes)	Top tier qualifying quantity (tonnes)
Note 1. Fertilisers capable of self-sustaining decomposition*	5000	10,000
Note 2. Fertiliser grade*	1250	5000
Note 3. Technical grade*	350	2500
Note 4. Off-spec material and fertilisers not satisfying the detonation resistance test*	10	50

CIMAH Regulation

Depending on the quantity stored, CIMAH may require the preparation and updating of a safety report and the preparation of emergency plans. Table C1c.iii.2 shows the quantities of ammonium nitrate (in tonnes) at or above which these Regulations apply.

Table C1c.iii.2. Quantities of AN at or above for applying regulations[56]

Type of ammonium	Application of CIMAH reg 4 to	Application of CIMAH	Application of CIMAH regs 7-	Application of PHS

[55] http://www.agindustries.org.uk/document.aspx?fn=load&media_id=2850&publicationId=680

[56] Storing and Handling Ammonium Nitrate, Available at http://www.hse.gov.uk/pubns/indg230.pdf

nitrate (AN)	storage[i]	regs 7-12 to storage[ii]	12 to industrial activities, other than storage[iii]	
Straight AN, designated EEC fertilizer	1 250	10 000	5 000	1 000
Compound fertilizer	1 250	10 000	5 000	1 000
Other AN or AN mixtures	350	2 500	2 500	500

i. These categories only apply where the nitrogen content derived from AN exceeds 28% w/w

ii. Regulation 4 of CIMAH requires an operator to be able to demonstrate safe operation

iii. Regulations 7-12 require the preparation of a safety report and emergency plans, and the provision of information to persons liable to be affected by a major accident

Summary of categories and thresholds for chemicals under RMP

Table C1c.iii.3 shows a summary of the criteria used by EPA for determining extremely hazardous materials and the corresponding thresholds to be covered under the RMP rule. Based on Table B-1, ammonium nitrate is not covered by the RMP rule because ammonium nitrate does not meet the requirements to be considered as toxic or flammable.

Table C1c.iii.3. Summary of categories and thresholds of extremely hazardous materials[57]:

Categories	Requirements	Threshold quantities (lb)*
77 Toxic substances	*Acute toxicity:* - Inhalation: LC50 = 0.5 mg/L or - Dermal: LD50 = 50 mg/kg of body weight, or - Oral: LD50 = 25 mg/kg of body weight *Vapor pressure* >10 mmHg *Accident history*	500 – 20,000
63 Flammable substances	FP < 73 °F (22.8 °C) BP < 100 °F (37.8 °C)	10,000

*Substances in mixtures would be exempted from the threshold determination if they represent less than one percent of the mixture by weight. (EPA List of Regulated Substances is found in Appendix A: EPA_RMP_substances)[58].

[57] EPA list of regulated substances and thresholds: http://www.ncair.org/112r/files/40cfr68(9&68)_01141994.pdf

[58] Appendix A-EPA_RMP_substances: https://mailhost-4.tamu.edu/service/home/~/EPA_RMP_substances-CFR-2011-title40-vol15-sec68-130.pdf?auth=co&loc=en_US&id=88486&part=2

- **Listing criteria:**

- ***Toxicity:*** *Listed toxic substances are expected to rapidly become airborne, thus human exposure by the inhalation route is of primary concern. The listing criteria established for toxic substances considers not only acute toxicity, but also physical/chemical properties (physical state, vapor pressure), and accident history.*

  The acute toxicity criteria:
  (a) Inhalation LC50 0.5 milligrams per liter of air (for exposure time 8 hours), or
  (b) Dermal LD50 50 milligrams per kilogram of body weight, or
  (c) Oral LD50 25 milligrams per kilogram of body weight.
  Vapor pressure cut off:
  Initially, a vapor pressure criterion of ***0.5 mm Hg*** *was used as a baseline, based on the vapor pressure of toluene diisocyanate, a substance mandated for the initial list by Congress. However, EPA considered that this low vapor pressure level may lead to an overly conservative listing of chemicals that pose a relatively lower potential for air releases. Then,* ***EPA decided to set the vapor pressure criterion at the higher level of 10 mm Hg****. Substances with pressures above 10 mm Hg is likely to be volatilized and released, even after a timely facility response occurs, potentially causing off-site impacts.*
  Accident history:
  Substances that "are known to cause ... death, injury, or serious adverse effects on human health or the environment" may be included on the list under section 112(r)(3).
  The accident history should be clearly associated with the substance itself[59]. For example, sulfuric acid was not included in the list. Its high boiling point and low vapor pressure under ambient conditions, makes it impossible for an accidental release to have any effect beyond the fenceline. Several accidents involving sulfuric acid have been reported. However, some accidents involved fuming sulfuric acid (oleum), which is a mixture of sulfuric acid and sulfur trioxide, and vapor clouds reported from these accidents were attributable to sulfur trioxide rather than sulfuric acid. *Because of the uncertainty associated with past reported accidental release information and the common confusion between oleum and sulfuric acid in such reporting, sulfuric acid was not included in the list.*

- ***Flammable gases and volatile flammable liquids:*** *Based on the flash point (FP) and boiling point (BP) criteria used by NFPA. Based on both accident reports and modeling results, EPA considered that flammable substances that meet the listing criteria, in quantities above the threshold quantity of 10,000 lb, could present a hazard to the public from a vapor cloud explosion.*

OSHA's PSM Standard provides an exemption for flammable liquids kept in atmospheric tanks below their normal boiling. Unlike OSHA, EPA considers these substances to be intrinsically

[59] Personal interpretation from: EPA list of regulated substances and thresholds (pag 17): http://www.ncair.org/112r/files/40cfr68(9&68)_01141994.pdf

hazardous, regardless of conditions of storage, and, therefore, no exemption is provided in those cases.

c6) Please provide any data or information on accidents involving the storage, handling, and management of AN that affected people or property.

Response:

Accidents related with AN fire and explosion have occurred time and again, causing both fatalities and material losses. During the past 100 years, there are approximately 70 AN related accidents, as listed in Table C1c.vi. To give an example, an AN explosion involving 450 tons of AN happened on September 21, 1921, in Oppau, Germany, causing 561 fatalities and 1952 injuries[60]. The fertilizer used in Oppau was a mixture of ammonium nitrate and ammonium sulfate. Due to caking of the fertilizer, people attempted to break it into pieces using explosives, leading to a powerful AN explosion.

Table C1c.vi. AN related accidents[61, 62, 63, 64]

Location	Year	Location	Year
Kensington, UK	1896	Boron, CA, US	1960
Faversham, Kent, UK	1916	Norton, VA, US	1961
Oakdale, PA, US	1916	Traskwood, AR, US	1963
Gibbstown, NJ, US	1916	Typpi, Oy, Finland	1963
Morgan, NJ, US	1918	Mt. Vernon, MO, US	1966
Stolberg, Germany	1920	Peytona, WV, US	1966
Vergiati, Italy	1920	Amboy, IL, US	1966
Barksdale, WI, US	1920	Potosi, WI, US	1967

[60] French Ministry of Environment. (2008). Explosion in a nitrogenous fertiliser plant, 21 September 1921, Oppau, Germany. from French Ministry of Environment

[61] Fertilizer explosions listed and US facilities mapped. (2013). Retrieved http://www.theguardian.com/news/datablog/2013/apr/18/us-fertilizer-explosions-list-facilities-map/print - accidents, from Theguardian

[62] Heather, David. (2002). *A review of past ammonium nitrate accidents and lessons learned.* Paper presented at the Workshop on ammonium nitrate. 30 January to 1 February, 2002, European Fertilizer Manufactures Association. European Commision Joint Research Centre. Ispra, Italy.

[63] Nygaard, Erik C. (2006). Safety of ammonium nitrate. *International Society of Explosives Engineers.*(2006G Volume 2).

[64] Wood, M., & Duffield, S. (2002). Ammonium nitrate safety. from Summary report of the workshop on ammonium nitrate held on 30 January - 1 February 2002, Ispra, Italy

Brooklyn, NY, US	1920
Kriewald, Germany	1921
Oppau, Germany	1921
Knurów, Poland	1921
Sinnnemahoning, PA, US	1922
Cleveland, OH, US	1922
Nixon, New Brunswick, NJ, US	1924
Muscle Shoals, AL, US	1925
Emporium, PA, US	1925
Gibbstown, NJ, US	1932
Merano, Italy	1936
Gibbstown, NJ, US	1940
Rouen, France	1940
Miramas, France	1940
Tessenderloo, Belgium	1942
Milan, TN, US	1944
Benson, AZ, US	1944
Texas City, TX, US	1947
Presque Isle, ME, US	1947
Brest, France	1947
St. Stephens, Canada	1947
Independence, KS, US	1949
Pinole, CA, US	1953
Red Sea, Israel	1953
Red Sea	1954
New Castle, PA, US	1956
Mt. Braddock, PA, US	1958
Taroom, Queensland, Australia	1972
France	1972
Cheerokee, Prvor, OK, US	1973
Bucharest, Romania	1974
Tahawas, NY, US	1976
Delaware City, DE, US	1977
Rocky Mountain, NC, US	1978
Moreland, ID, US	1979
UK	1982
Kansas City, MO, US	1988
Joplin, MO, US	1989
Porgera Valley, Papua New Guinea	1994
Port Neal, IA, US	1994
Brazil	1997
Xingping, Shanxi, China	1998
Kentucky, US	1998
FL, US	2000
Toulouse, France	2001
Cartagena, Murcia, Spain	2003
Saint-Romain-en-Jarez, France	2003
Keyshabur, Khorasan, Iran	2004
Barracas, Spain	2004
Mihăileşti, Buzău, Romania	2004
Ryongchŏn, North Korea	2004
Estaca de Bares, Spain	2007
Monclova, Coahuila, Mexico	2007
Bryan, TX, US	2009

Roseburg, OR, US	1959	Zhaoxian, Hebei, China	2012
Traskwood, AR, US	1960	West, TX, US	2013

Supporting Information

Incidents discussed in the EPA RFI

There are several examples of accidents involving AN. As discussed earlier, on April 17, 2013, an AN explosion at the West Fertilizer Company storage and distribution facility in West, Texas involving about 30 tons of AN killed 15 people and injured over 160 others.

The deadliest industrial accident in United States history was an AN explosion in Texas City, Texas, on April 16, 1947. In that case, the initial explosion of a ship carrying AN, and the subsequent chain reaction of fires and explosions in other ships and nearby oil-storage facilities, killed at least 581 people and injured thousands of others. The AN was coated with wax, a combustible material, to prevent caking. New process technologies and safe practices introduced in the 1950s eliminated the use of wax coatings and AN currently produced for fertilizer use contains less than 0.2 percent combustible material.

On September 21, 2001, a massive explosion occurred in a warehouse at the Azote de France fertilizer factory in Toulouse, France, involving 200-300 tons of AN, which was stored in bulk in a hangar. The explosion resulted in the death of 30 people, 2,500 injuries, the destruction of the factory, and an additional 10,000 buildings being heavily damaged.

On December 13, 1994 at Terra Industries in Port Neal, Iowa, AN solution exploded in a neutralizer vessel in a manufacturing process that was in standby mode, causing four deaths[65]. The blast resulted in major plant damage, including damage to on-site ammonia tanks, creating an ammonia cloud that resulted in the evacuation of 2,500 people.

c7) Please provide data on the population surrounding AN sites, including socioeconomic information and other environmental burdens on surrounding communities.

Response:

Using AN sites in Texas as an example, based on records obtained by *The Dallas Morning News* from Department of State Health Services (DSHS)[66], around 112 facilities in Texas store large amounts of AN. As shown in Table C1c.vii.1, around 44 of those facilities store at least 10,000 pounds of AN or AN-based explosive material. Figure C1c.vii shows the facilitates that store large amounts AN (or AN based materials) located in close proximity to the public [67]. After the identification of the locations of AN facilities, the population surrounding AN sites can be

[65] http://www.epa.gov/oem/docs/chem/cterra.pdf

[66] *Records ammonium nitrate facilities*. Available from: http://www.dallasnews.com/news/west-explosion/headlines/20130501-44-texas-facilities-have-large-stores-of-ammonium-nitrate-state-records-show.ece.

[67] *Major ammonium nitrate facilities*. Available from: http://watchdogblog.dallasnews.com/2013/05/major-ammonium-nitrate-facilities.html/

identified accordingly. As can be seen in Figure C1c.vii, there are three facilities in TX which have the population of 6001 - 10500 around the facility.

Table C1c.vii.1 Facilities like West located in Texas [68]

Quantity of AN or AN-based explosive material (pounds)	< 10,000	(10,000 - 99,999)	(100,000 - 499,999)	≥ 500,000	Total
No. of facilities	~ 24	27	14	3 (including West Fertilizer)	~112

The remainder reported storing forms or mixtures of AN that experts say pose little explosive risk.

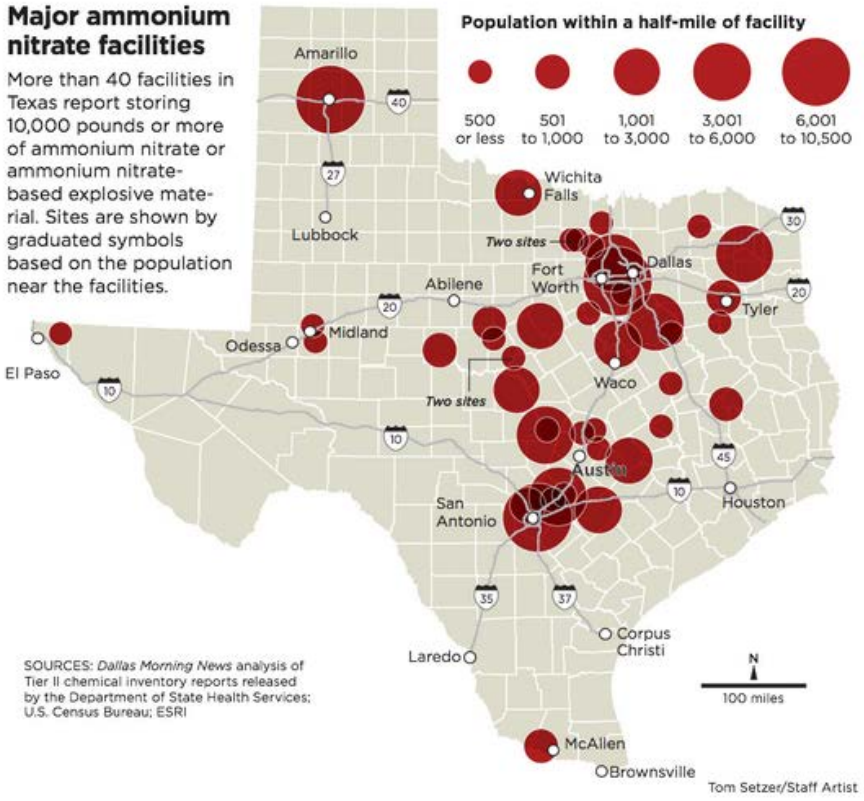

Figure C1c.vii. Major ammonium nitrate facilities in Texas [69].

[68] *Records ammonium nitrate facilities*. Available from: http://www.dallasnews.com/news/west-explosion/headlines/20130501-44-texas-facilities-have-large-stores-of-ammonium-nitrate-state-records-show.ece.

[69] *Major ammonium nitrate facilities*. Available from: http://watchdogblog.dallasnews.com/2013/05/major-ammonium-nitrate-facilities.html/

Supporting Information

In US there are approximately 6,000 AN facilities [70]. Table C1c.vii.2 lists some examples of these fertilizers companies using ammonia which do not take into account the explosion hazards into their RMP submitted to EPA. The RMP reports have no or little information on ammonium nitrate mentioned in the process description part.

Table C1c.vii.2. Statistics of some fertilizer companies in USA Data taken from a Risk Management Plant database[71]

Name	State	RMP		Hazard	
		Chemical	Amount/lb	Toxicity	Fire / Explosion
Agrium US, Inc.	CA	Ammonia	79,000,000	X	-
Apache Nitrogen Products, Inc.	AZ	Ammonia	9,175,000	X	-
DSM Chemicals North America, Inc.	GA	Ammonia	590,000	X	-
PSC Nitrogen Fertilizer, L.P.	GA	Ammonia	72,270,000	X	-
El Dorado Chemical Company	AR	Ammonia	3,000,000	X	-
Terra Nitrogen - Port Neal Complex	IA	Ammonia	60,000,000	X	-
Dakota Agronomy Partners East NH_3 Plant	ND	Ammonia	211,000	X	-
Martin Resources - Plainview Plant	TX	Ammonia	690,000	X	-

Alternatives for identifying the regulated community

- North American Industry Classification System (NAICS)

The North American Industry Classification System (NAICS) is a system of grouping establishments into industries based on their production processes. NAICS classifies industries using 2-, 3-, 4-, 5-, and 6- digit levels of detail. This classification replaces the previously used Standard Industrial Classification (SIC) codes.

[70] *The Texas fertilizer plant explosion is horrific. But how common is this?* [cited 2013 05/25/2013]; Available from: http://www.washingtonpost.com/blogs/wonkblog/wp/2013/04/18/the-texas-fertilizer-plant-explosion-is-horrific-but-how-common-is-this/.

[71] *Risk Management Plan (Database)*. Available from: http://www.rtknet.org/db/rmp.

There is no central government agency with the role of assigning, monitoring, or approving NAICS codes for establishments. The U.S. Census Bureau assigns each establishment one NAICS code based on its primary activity (the activity that generates the most revenue for the establishment)[72]. Information about the type of activity of the establishment is typically requested when a company applies for an Employer Identification Number (EIN) in order to assign the appropriate NAICS code[73].

The NAICS Association, LLC can provide lists of establishments classified according to their NAICS code. Lists provided by the NAICS Association can be customized by multiple criteria in order to obtain a more targeted list.

Since NAICS codes represent the primary activity of an establishment in the U.S. Census Bureau database, other activities can be hidden if only the primary code is checked. For example, the West fertilizer used the NAICS code 42451 on its Risk Management Plan (submitted in 2011)[74]. This code only stands for grain and field bean merchant wholesalers; the activity as a fertilizer distributor is hidden. But each establishment can have more than one NAICS code because various other government agencies, trade associations, and regulation boards adopted the NAICS classification system to assign codes to establishments for their own programmatic needs. For example, the West fertilizer company employed the NAICS code 325314 on its Tier II form[75], which stands for fertilizer (mixing only) manufacturing. Detailed results on the number of facilities with potential to store ammonium nitrate obtained from the NAICS Association website are provided in the Table C1c.vii.3.

Table C1c.vii.3. Industries with a high probability of having ammonium nitrate[76]

Code	Industry Title	Number of Business in US
325311	Nitrogenous Fertilizer Manufacturing	543
325314	Fertilizer (Mixing Only) Manufacturing	618
424910	Farm Supplies Merchant Wholesalers	19474
424510	Grain and Field Bean Merchant Wholesalers	8201

- Tier II reports

Any facility required under OSHA regulations to maintain material safety data sheets (MSDS) for hazardous chemicals stored or used in the work place with chemicals in quantities that equal or exceed a certain thresholds must submit an emergency and hazardous chemical inventory form to the LEPC, the SERC and the local fire department annually. Facilities provide

[72] What is NAICS and how is it used? http://www.census.gov/eos/www/naics/faqs/faqs.html#q1
[73] http://www.naics.com/faq.htm
[74] Risk Management Plan of the West fertilizer
http://www.rtknet.org/db/rmp/rmp.php?facility_id=100000135597&database=rmp&detail=3&datype=T
[75] Tier II form of the West fertilizer
[76] NAICS search http://www.naics.com/search.htm

either a Tier I or Tier II form. Most States, like Texas, require the Tier II form[77]. In Texas, the reports are collected by the Department of State Health Services.

- Office of the Texas State Chemist (OTSC) - Texas Feed and Fertilizer Control Service

OTSC includes two units: the Texas Feed and Fertilizer Control Service and the Agricultural Analytical Service. The Texas Feed and Fertilizer Control Service (FFCS) is the state government agency responsible for administering the Texas Commercial Fertilizer Control Act of the Texas Agriculture Code Chapter 63, and the Texas Administrative Code Title 4 Chapter 65 Commercial Fertilizer Rules[78].

OTSC's mission is to "*protect consumers and enhance agribusiness through its feed and fertilizer regulatory compliance program, surveillance and monitoring of animal-human health and environmental hazards, and preparedness planning*" [79].

According to the Fertilizer Control Act - Texas Agriculture Code Chapter 63, "*a person may not manufacture or distribute a commercial fertilizer in this state [Texas] without a valid current permit issued by the Service [OTSC] and a person may not manufacture or distribute a commercial fertilizer in this state, other than customer-formula fertilizer, unless the person first registers the fertilizer with the Service*" [80]

- OSHA Data, Statistics, and Databases
- Agricultural Retailers Association (ARA) & The Fertilizer Institute (TFI) databases
- Agencies regulating fertilizers in different States
- Building Occupancy Permits
- Department of Transportation (DOT) database

c8) If EPA were to regulate AN under CAA Section 112(r), should EPA exempt farmers who store AN for use as a fertilizer? How many farmers would be eligible for such an exemption? Should there be any limits on such an exemption, such as maximum quantity on-site at any given time? Please provide the reasoning and any available data supporting your views.

Response:

We recommend that EPA should take a risk-based approach. Regardless of the nature of the activity of the facility, if the facility is posing an unreasonable risk, the facility should be required to comply with necessary standards and regulations to manage the risk effectively. However, another factor that may be considered in determining any potential exemption is the history of incidents involving AN being stored by farmers. Should EPA decide to regulate AN stored by farmers, a tailored risk management program should be considered by EPA taking into account the lack of complexity and other specific factors.

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[77] What facilities are covered? http://www.epa.gov/osweroe1/content/epcra/epcra_storage.htm

[78] http://otscweb.tamu.edu/Reports/pdf/nwl/2013/May-2013-NL.pdf

[79] http://otscweb.tamu.edu/About/Mission.aspx

[80] http://otscweb.tamu.edu/Laws/PDF/FertilizerControlAct.pdf

Supporting Information

AN fertilizer is not allowed in Afghanistan, where the use of AN was banned a few years ago because of its use in bombs against NATO soldiers. The fertilizer's explosive nature has led to similar prohibitions in other countries including China, Colombia, Germany, Ireland, and the Philippines. But in the United States, **AN can be purchased by the ton,** and it is allowed to be stored in a wooden warehouse with no sprinkler system, a few hundred feet from a middle school[81].

EPA Frequent Questions[82]

Question from farms: Is my farm covered by SPCC (Spill Prevention, Control, and Countermeasure)?

SPCC applies to a farm that:

* Stores, transfers, uses or consumes oil or oil products, such as diesel fuel, gasoline, lube oil, hydraulic oil, adjuvant oil, crop oil, vegetable oil or animal fat; and
* Stores more than 1,320 US gallons in total of all aboveground containers (start counting at 55 gallons or more) or more than 42,000 gallons in completely buried containers; and
* Could reasonably be expected to discharge oil to waters of the US or adjoining shorelines, such as interstate waters, intrastate lakes, rivers and streams.

Regulations on the sales and permits of AN

DHS is in charge of preventing terrorist attacks using AN by controlling the purchase and the sales of AN.

Under DOT, both 49 CFR 176.410[83] and 176.415[84] are prescriptive regulations that regulate transport of AN, AN mixtures, and AN fertilizers. Section 410 concerns on the transportation of AN by vessel and mainly focuses on fire prevention in areas where AN is present. Section 415 concerns permits for sale and purchase of AN in waterfront transactions. The mission of these regulations is to ensure the safe transportation of these materials. AN and AN mixtures are also part of PHMSA's list of hazardous materials[85].

The Office of the Texas State Chemist regulates AN through the Fertilizer Control Act[86]. It holds records and issues permits for fertilizer production based on largely on product quality and

[81] http://www.dallasnews.com/investigations/20131005-ammonium-nitrate-sold-by-ton-as-u.s.-regulation-is-stymied.ece

[82] http://emergencymanagement.supportportal.com/link/portal/23002/23016/Article/32496/Is-my-farm-covered-by-SPCC

[83] 49 CFR 176.410

[84] 49 CFR 176.415

[85] 49 CFR 172.101

[86] Office of the Texas State Chemist. Fertilizer Control Act. By Tim Hermann. Revised. College Station, Texas: Texas Agricultural Experiment Station, September 1, 2011.

does not assess facilities on the basis of safety performance. These regulations are a prescriptive with a focus on the sale of AN. Companies are required to register with the OTSC prior to selling AN, and facilities storing AN must be secured to OTSC standards. Additionally, this regulation covers record keeping and criminal consequences.

Retailer exemption

- PSM standard provides an exemption for retail facilities.
- EPCRA Section 311(e)(5) excludes certain substances, including "fertilizer held for sale by a retailer to the ultimate customer."
- EPA is authorized under CAA section 112(r)(5) to establish a greater TQ for, or to exempt entirely, any substance that is a nutrient used in agriculture when held by a farmer. Therefore, farmers who hold AN for use as a fertilizer could be exempted entirely in the same way as EPA has exempted farmers holding ammonia for use as a fertilizer (see 40 CFR 68.125).
- DHS' proposed rule regulating the control of the purchase and the sales of AN, Section 563 of the 2008 Consolidated Appropriations Act, Subtitle J, Secure Handling of Ammonium Nitrate ("Section 563"), Public Law 110-161[87], exempted AN fro explosive purposes:

  SEC. 899B *(f) EXEMPTION FOR EXPLOSIVE PURPOSES .—The Secretary may exempt from this subtitle a person producing, selling, or purchasing ammonium nitrate exclusively for use in the production of an explosive under a license or permit issued under chapter 40 of title 18, United States Code.*
- ATF does not regulate AN as fertilizer because of the exemption in subpart H.

  Subpart H- Exemptions §555.141.(a).(8) [88] *"Gasoline, **fertilizers**, propellant actuated devices, or propellant actuated industrial tools manufactured, imported, or distributed for their intended purposes."*

Retailer exemption details

RMP has retailer exemption similar to OSHA. However, based on the purpose and threshold quantity of the product, retailers may not be qualified for the exemption even though it meets other requirements for the exemption.

Farm use of ammonia (§68.125)

"The rule exempts ammonia when held by a farmer for use on a farm. This exemption applies to ammonia only when used as a fertilizer by a farmer. It does not apply to agricultural suppliers or the fertilizer manufacturer. It does not apply to farm cooperatives or to groups of farmers who buy, use, and sell ammonia. In the event that a farmer stores one or more other regulated substance above threshold quantities, that storage would be covered."

Flammable fuel (§68.126)

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[87] 2008 Consolidated Appropriations Act, Subtitle J, Secure Handling of Ammonium Nitrate ("Section 563",Public Law 110–161(http://www.gpo.gov/fdsys/pkg/PLAW-110publ161/pdf/PLAW-110publ161.pdf)

[88] ATF Federal Explosives Law and Regulations (2012)
http://www.atf.gov/files/publications/download/p/atf-p-5400-7.pdf

"The flammable substances listed in § 68.130 are excluded from coverage under part 68 when they are used as a fuel or held for sale as a fuel at a retail facility. A retail facility is defined as a stationary source at which more than half of the income is obtained from direct sales to end users or at which more than one-half of the fuel sold, by volume, is sold through a cylinder exchange program. Unless your facility meets the definition of a "retail facility," if you hold a listed flammable substance for purposes other than on-site use as fuel, you are potentially covered by part 68. For example, if you manufacture a listed flammable fuel, use it as a chemical feedstock, or store it in bulk for sale and do not meet the definition of a retail facility, you may be covered by the rule. If you store a listed flammable substance for non-fuel use and also use some of it on-site as a fuel, the quantity used as a fuel is not covered; the quantity not used on site as a fuel is potentially subject to the rule. If you are a retailer who sells a flammable fuel and a listed toxic substance, the toxic substance is potentially subject to the rule, but the flammable substance is excluded from coverage."[89]

EPA Chapter 1 – General Applicability document:

- "If you have multiple unconnected vessels containing the same substance, you will have to determine whether they are co-located and thus considered a single process for purposes of the rule."
- "A process can be as simple as a single storage vessel or a group of drums or cylinders in one location or as complicated as a system of interconnected reactor vessels, distillation columns, receivers, pumps, piping, and storage vessels."
- Co-Location - "Separate vessels that contain the same regulated substance that are located such that they could be involved in a single release. If so, you must add together the total quantity in all such vessels to determine if you have more than a threshold quantity. This possibility will be particularly important if you store a regulated substance in cylinders or barrels or other containers in a warehouse or outside in a rack. In some cases, you may have two vessels or systems that are in the same building or room.
- For each of these cases, you should ask yourself: Could a release from one of the containers lead to a release from the other? For example, if a cylinder of propane were to rupture and burn, would the fire spread to other propane cylinders?
- Could an event external to the containers, such as a fire or explosion or collapse of collision (e.g., a vehicle collides with several stored containers), have the potential to release the regulated substance from multiple containers?"

d. Adding Reactive Substances and Reactivity Hazards

d1) What are the best criteria to use in classifying reactive hazards? How do you identify a reactive chemical or a reactive mixture?

Response:

The overall reactive hazard of a chemical/mixture depends on the intrinsic reactivity of the

[89] http://www.epa.gov/oem/docs/chem/Chap-01-final.pdf

chemical/mixture and the exposed conditions. Generally, the reactivity of chemicals/mixtures and their potential to be involved in an uncontrolled chemical reaction depends to a large extent on the thermodynamic (decomposition heat) and kinetic properties (onset temperature) of the chemical/mixture.

The total energy released during a reaction determines the magnitude of hazard associated with a chemical/mixture. The heat of decomposition (or heat of reaction) of a chemical/mixture gives us a fair indication of the total energy released by one mole of the chemical. Those chemicals with a negative heat of reaction value undergo exothermic reactions to release heat. This may lead to vaporization of liquid materials, ignition of nearby materials, burns, acceleration of chemical reaction etc. It has been seen that most of the chemicals involved in accident in chemical industries have energy in the range of 500-1500 cal/gm. A critical value for heat of reaction could be 660 cal/gm, which is equivalent to half of the decomposition energy released by Tri-Nitrotoulene (TNT).[90,91]

Apart from the heat of reaction, the temperature at which the system exhibits exothermic activity for the first time is also reported. This is called as the onset temperature (T_o), which can also be used to define reactivity. A critical onset temperature of 200^{o}C will be consistent with the NFPA intrinsic thermal stability rating.[91]

A substance having a high decomposition energy and high onset temperature has the potential to release high amounts of energy. However, it becomes reactive only at high temperatures. Similarly, a compound having a low onset temperature with a low heat of decomposition may be termed as hazardous. However, the decomposition produces small amounts of energy. Hence, the reactivity of a chemical/mixture is a combination of the two parameters i.e. Heat of decomposition and Onset temperature. Hence, an index combining both the parameters would adequately represent the hazard associated with a chemical/mixture.

A few of these indices are discussed in the ensuing paragraphs. One such index is the Explosion Potential (*EP*), which is represented by the following equation.[92]

Explosion Potential (*EP*) = $log(\Delta H_{dec}) - 0.38\ log(T_{ot} - 25) - 1.67$

Where, ΔH_{dec} – *Heat of decomposition (cal/gm),* T_{ot} – *Onset temperature (^{o} C)*

Substances having an EP > 0 can be termed as hazardous and have the potential to detonate or deflagrate violently. The equation is valid for values obtained from a Differential Scanning

[90] American Institute of Chemical Engineers, Guidelines for safe storage and handling of reactive materials,1995.

[91] Saraf, S.R., W.J. Rogers and M.S. Mannan, Using screening test data to recognize reactive chemical hazards, Journal of Hazardous Materials, Volume 104, Issues 1–3, 14 November 2003, Pages 255-267

[92] Saraf S. R.,(2003). *Molecular characterization of energetic materials*. Ph. D. Thesis, Texas A&M University, USA.

Calorimeter (DSC).

The Melhem index is another technique to identify and classify chemicals and mixtures. The Melhem index is based on two thermo physical properties of a chemical/mixture: a) Equilibrium heat of reaction b) Ratio of equilibrium heat of reaction to average heat capacity (Computed equilibrium adiabatic reaction temperature - CART). These two parameters are used to separate chemicals into four groups[93].

Table 1.d.1: The Melhem index criteria[93]

Class	**Heat of reaction (cal/gm)**	**+**	**CART (° K)**	**Rank**	**Characterization**
No Hazard	< 100		-	D	Endothermic or low exothermic
Low Hazard	100-287	And	< 700	C	Reactions with low heat release per unit mass
Medium Hazard	287-724	Or	700-1600	B	Moderately exothermic
High Hazard	> 724	Or	> 1600	A	Very high heat release

The substances with high hazard ranking need further examination to determine the optimum process conditions. The compounds, which lie in the intermediate hazard rank, need further experiments for identification of thermal hazard. Chemicals and mixtures with rank D need no further tests. A CSB report in 2002 identified a total of 167 reactive incidents from 1981 to 2001.[94] The Melhem index could successfully predict the reactive hazard in 98 accident chemicals, which had sufficient thermo-physical data.[93]

Another type of hazard index, which can be used to differentiate toxic chemicals, is referred to as the Substance hazard index. Substance hazard index (SHI) is used to detect the catastrophic release of toxic chemicals. The SHI depends on the vapor pressure of a substance. The higher a substance's vapor pressure, the more readily it will enter the atmosphere in the event of a release. The greater a substance's toxicity, the lower the concentration required to present a hazard, and the higher its SHI.[95]

In summary, a number of such indices are available and in the case of the Melhem index, as discussed above, the index could have successfully identified the reactive hazard in 98 of the 167 reactive chemical incidents included in the CSB report.

[93] Melhem, G. (2006), Strategy for managing reactivity hazards, ioMosiac Corporation Whitepaper
[94] http://www.csb.gov/assets/1/19/ReactiveHazardInvestigationReport.pdf
[95] API RP 750, Management of Process Hazards, First Edition, January 1990

d2) Should EPA add reactive chemicals to the list of RMP-covered chemicals in 40 CFR 68.130? If so, which chemicals? What criteria should EPA consider using to establish TQs for reactive chemicals? Should EPA add only specific chemicals, or groups of chemicals defined by particular chemical characteristics?

Response:

As we have already mentioned in the previous sections, we do not recommend the addition of chemicals to the list. Instead, the following process should be followed. For all substances that are reported under the Tier II list, the employer should conduct a screening analysis. The reactivity of chemicals should be evaluated (as mentioned in the above section) and hazard scenarios must be determined. In conducting the reactive hazard evaluation, the employer should consider relevant factors, such as:

1) Rate and quantity of heat or gas generated.
2) Maximum operating temperature to avoid decomposition.
3) Thermal stability of reactants, mixtures, byproducts, waste streams, and products.
4) Effect of variables such as charging rates, catalyst addition, and possible contaminants.
5) Understanding the consequences of runaway reactions or toxic gas evolution.

We recommend that based on the reactive hazard determination, the employer should be required to consider the implementation of a tiered risk management program.

d3) Should EPA list additional chlorosilanes as toxic substances on the RMP list due to their reactive hazard due to formation of hydrochloric acid when a chlorosilane is accidentally released into the air and reacts with moisture?

Response:

EPA has listed three of the alkylchlorosilanes based on their water reactivity, NFPA instability rating and flammability. However, the addition of all other chlorosilanes to the list is not suggested. Instead, each facility should be made to analyze every chemical involved in the process separately and determine the hazards associated with it. The presence of other chemicals (*e.g.,* presence of water) and operating temperatures and pressures should be considered when evaluating the reactive hazards. For example: trichlorosilanes like alkylchlorosilanes react with water and are unstable under ambient conditions.[96] On the other hand, Chloro-dimethyl-octadecylsilanes are stable under storage conditions.[97] Also, the offsite consequence analysis should be performed to determine the overall hazard of the chemical.

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[96] http://articles.philly.com/1997-11-19/news/25543340_1_acid-cloud-hydrochloric-acid-chemical-plant

[97] http://www.sigmaaldrich.com/MSDS/MSDS/DisplayMSDSPage.do?country=US&language=en&productNumber=40950&brand=FLUKA&PageToGoToURL=http%3A%2F%2Fwww.sigmaaldrich.com%2Fcatalog%2Fproduct%2Ffluka%2F40950%3Flang%3Den

d5) Should EPA revise the RMP regulation to use chemical functional groups similar to those in the TCPA to define hazardous reactive mixtures? If so, which chemical functional groups should EPA use?

Response:

Identifying certain functional groups as reactive would not solve the problem. The interaction between various functional groups has to be considered. Two functional groups termed as benign might interact and become explosive. Similarly, the external conditions might make certain functional groups reactive. Hence, we do not recommend the adoption of chemical functional groups from TCPA.

d6) Is following NFPA 400 an effective way of protecting human health and the environment from reactive hazards? Please explain.

Response:

NFPA has specific characteristics and applications, which are not amenable to protect people and environment from reactive hazards. First, NFPA standards were developed to aid emergency response actions during accidents. The application of these standards to process safety is inappropriate. Second, the behavior of a chemical under non-ambient conditions and the presence of other substances are not taken into consideration. Third, the total number of chemicals covered by NFPA 400 is 325, which accounts for a small fraction of chemicals used in the industry.[73]

d8) What alternative regulatory approach to TCPA or NFPA 400, if any, should EPA consider using to address reactive hazards? Are there specific requirements that EPA should consider adding to the RMP regulations to ensure that owners and operators adequately manage reactive hazards?

Response:

Reactive hazards can be addressed by using the screening technique mentioned in the previous section.

d9) Please provide any data or information on accidents, near misses, or other safety-related incidents involving reactive hazards not covered under the existing RMP regulation. What reactive-hazards management requirements might have prevented these incidents if they had been included in the RMP regulation?

Response:

The First Chemical Corporation (FCC) facility in Pascagoula, Mississippi saw an explosion on

October 13, 2002. The stand-by distillation column used to refine Mononitrotoluene (MNT) exploded because of the decomposition runaway reaction of the Mononitrotoluene (MNT) caused by overheating. This overheating was caused by the steam, which was leaking through the manual isolation valves.[98]

On February 19, 1999, there was fire and explosion at Concept Science Inc. Lehigh, Pennsylvania. The facility was involved in production of Hydroxylamine. The incident occurred when the concentration of Hydroxylamine (HA) in the distillation still (used to separate hydroxylamine from potassium sulfate) increased leading to explosive decomposition of HA. Inadvertent heating of the still accelerated the process.[99]

A powerful explosion rocked T2 laboratories, Inc., Jacksonville, Florida on December 19, 2007. The explosion was a result of an uncontrollable runaway reaction between sodium metal and Methyl Cyclopentadiene (MCPD) dimer which would have produced the desired product, *i.e.*, Methyl Cyclopentadienyl Manganese Tricarbonyl (MCMT). The runaway reaction was a direct result of the cooling system failure, which was connected to the city water supply. Increased temperatures and pressures resulted in the explosion of the reactor.[100]

In all the cases, the chemical involved in the incident and the facility were not covered under the RMP. FCC's hazard evaluation was not adequate and did not consider the continuous process. The risk analysis was based on a batch process and was insufficient. Though the hazards of concentrating hydroxylamine were known to Concept Sciences, their equipment were not designed to handle such situations. In case of T2 laboratories, the plant personnel did not perform a comprehensive HAZOP. Relief valve was not designed to consider the worst-case scenarios. All these incidents underscore the importance of hazard analysis and risk-based approach by competent individuals towards process safety.

e. Adding Other Categories of Substances

e1) Should EPA consider adding organic peroxides, oxidizers, combustible dusts, flammable solids, or other additional types of chemicals to the RMP list? Are there any particular chemicals belonging to these or other classes which present a high hazard that could cause adverse effects beyond a facility's fence line in the event of an accidental release?

Response:

e1.1 Should EPA consider adding organic peroxides, oxidizers, combustible dusts, flammable solids, or other additional types of chemicals to the RMP list?

[98] http://www.csb.gov/assets/1/19/First_Report.pdf
[99] http://www.csb.gov/assets/1/19/Concept_case_study.pdf
[100] http://www.csb.gov/assets/1/19/T2_Final_Copy_9_17_09.pdf

No. While there are many types of combustible dusts and these materials have demonstrated the capacity to cause explosions resulting in catastrophic damage to the facility, few if any of these incidents caused catastrophic physical or environmental damage beyond the fenceline.

Since the focus on the RMP regulation is on risks posed to people and the environment outside the facility and effects within the facility itself are the domain of OSHA, we do not feel that these materials should be added to the RMP list. Flammable solids, organic peroxides, and oxidizers are similarly likely to cause fires that will affect the facility extensively while not having catastrophic impacts beyond the fence line.

Control of combustible dust hazards are also addressed under other OSHA regulations such as, §1910.22 (housekeeping), §1910.38 (emergency action plans), §1910.94 (ventilation), §1910.146 (confined space entry), §1910 subpart N (materials handling and storage), §1910 subpart R (Special industries), §1910 subpart S (electrical systems and equipment) and §1910.1200 (HAZCOM standard). Subpart R offers industry specific guidance for pulp, paper, and paperboard mills, bakeries, sawmills, and grain handling facilities[101]. These OSHA standards, taken in total, should be sufficient to ensure combustible dust safety. Any gaps in these regulations should be addressed by revising and expanding these existing regulations, and expanding the enforcement and communication efforts of OSHA.

The report by the CSB, "Combustible Dust Hazard Study," in Nov. 9 2006 concludes that existing codes and standards are good but not understood or applied consistently, and MSDS often do not include enough information on dust explosion hazards[102]. It is rather greater awareness and understanding of the hazards of combustible dusts that need improvement[103].

Flammable solids should not be included. The National Uniform Fire Code and the guidance from NFPA should be sufficient to regulate these substances. Therefore, improved education, awareness, and enforcement of existing regulations are sufficient to manage these hazards.

e1.2 Are there any particular chemicals belonging to these or other classes which present a high hazard that could cause adverse effects beyond a facility's fence line in the event of an accidental release?

As indicated in C.1.e1.1, these materials should not be included in the RMP regulation as they are unlikely to pose a significant hazard to communities beyond the fence line of the facility. However, if EPA elects to include such materials, there's a large variety of explosive dusts, and organic peroxides that have been known to cause incidents including: grains, grain dusts, flour, wood dust, metal dusts, coal dust, sugar, methyl ethyl

[101] 29 CFR 1910

[102] CSB, "Combustible Dust Hazard Study," Nov. 9 2006

[103] Ebadat, V., "Dust Explosion Hazard Assessment," Presentation at the Metropolitan New York AIHA Local Section, October 16, 2009, New York, NY

ketone peroxide, acetyl acetone peroxide, acetyl benzoyl peroxide, tert-butyl hydroperoxide, diacetyl peroxide, ethyl hydroperoxide, methyl isobutyl ketone peroxide[104,105].

e2) If a particular new category of chemicals should be considered for inclusion on the RMP list, what criteria should be used to prioritize the hazard(s) and determine which chemicals should be listed?

Response:

As indicated in C.1.e1.1, these materials should not be included in the RMP regulation as they are unlikely to pose a significant hazard to communities beyond the fence line of the facility.

However, if they are brought under the RMP regulation, a systematic approach including the following properties and criteria should be considered: minimum ignition energy for particles of a typical size, minimum explosive concentration in air, maximum explosive concentration in air[106], the amount of that material typically used/stored within the United States, the typical size of inventories at facilities (is the material usually stored or present in large bulk quantities?)

e3)

1. If EPA were to add combustible dusts to the lists of covered chemicals, are there categories of dusts, such as agricultural dusts (*e.g.*, grain dust, pesticide dust, etc.) that should be excluded?

Response:

If combustible dusts and similar material classes are included, only materials with a demonstrated history of causing or being involved in major incidents and loss events with consequences beyond the fence line of the facility should be regulated.

2. What factors, such as existing handling practices, accident history, and potential risk to surrounding communities should EPA consider in evaluating potential inclusions?

Response:

[104] http://www.ccohs.ca/oshanswers/chemicals/organic/organic_peroxide.html
[105] http://en.wikipedia.org/wiki/Organic_peroxide
[106] http://www.sciencedirect.com/science/article/pii/S0950423002000037

If combustible dusts and other new classes of materials are included, materials with a demonstrated history of major accidents and materials that are most often stored in large quantities near populated areas should be prioritized for inclusion.

f. Removing Certain Substances from the List or Raising their Threshold Quantity

f1). Would it be appropriate for EPA to delete TDI (a substance mandated by Congress to be included on the initial RMP list) from the RMP toxic substances list because its vapor pressure does not meet the vapor pressure listing criteria established by EPA?

Response:

TDI should stay in the list because of its large production and potential high hazards to people. In 2008, the U.S. demand for TDI was 425.2 million pounds (ACC, 2009) with 280,000 U.S. workers potentially exposed to diisocyanates.[107] Fatalities linked to diisocyanate exposures have been reported (NIOSH, 1996; ACC, 2005)[108].

The vapor pressure of TDI is 0.05 mmHg at 25°C.[109] The Acute Exposure Guideline Level -2 (AEGL-2) for a 1-hour exposure of TDI has been established at 0.083 ppm.[110] After calculations, the vapor concentration of TDI at 25°C is indeed lower than the AEGL-2's standard. However, this only considers the situation when incidents happened at 25°C and no extra heat added when TDI got released, which means TDI only in the condition of liquid. If we consider the worst-case scenario, which is mandated by RMP, it is possible that fire may be caused and the TDI will be heated to cause higher vapor pressure or vaporized, which could meet the criteria of AEGL-2. Also, TDI is known as a potent dermal and lung sensitizer, it is a toxic air contaminant especially affecting infants and children[111] and more importantly, it has caused fatalities in the past incidents, so it may be not appropriate to delete from the list. EPA may want to consider additional reviews before deleting TDI from the list.

Supporting Information

1) General Information
Toluene diisocyanate exists in two isomeric forms (2,4-toluene diisocyanate and 2,6-toluene diisocyanate) which have similar properties and effects. Toluene diisocyanate is produced commercially as an 80:20 (2,4-toluene diisocyanate:2,6-toluene diisocyanate) mixture of the two isomers. At room temperature, the mixture is a clear, pale yellow liquid with a sharp, pungent

[107] http://www.cdc.gov/niosh/docs/96-111/
[108] http://www.epa.gov/oppt/existingchemicals/pubs/actionplans/tdi.pdf
[109] http://www.cdc.gov/niosh/docs/81-123/pdfs/0621.pdf
[110] http://www.epa.gov/oppt/aegl/pubs/tsd47.pdf
[111] http://oehha.ca.gov/air/hot_spots/pdf/July2014TDIPubReview.pdf

odor. It should be stored under refrigeration, away from light and moisture in a tightly closed container under an inert atmosphere. Toluene diisocyanate is insoluble in water and miscible with most common organic solvents.

2) Sources/Uses
Toluene diisocyanate is made by reacting toluene diamine with carbonyl chloride (phosgene).
Toluene diisocyanate is commonly used as a chemical intermediate in the production of polyurethane foams, elastomers, and coatings; paints; varnishes; wire enamels; sealants; adhesives; and binders. It is also used as a cross-linking agent in the manufacture of nylon polymers.

3) Toxicity study of TDI
There are numerous reports in the literature in which low acute concentrations of TDI were used to study or confirm a diagnosis of probable toluene diisocyanate asthma in workers. Concentrations of TDI in these challenge tests usually ranged between 5 and 20 ppb with exposure durations of 10 min to several hours[112].

More pertinent to derivation of an acute REL for TDI, some studies also tested pulmonary response in exposed normal and asthmatic subjects with no sensitization or history of exposure to isocyanates, in addition to testing the pulmonary response in workers with probable TDI sensitization. Vogelmeier et al[113] concluded that supposedly sub-irritant concentrations of TDI may induce a marked airway reaction in healthy volunteers and patients with asthma.

In April 2010, California's Office of Environmental Health Hazard Assessment (OEHHA) released "for comment" draft documents describing proposed Reference Exposure Levels (RELs) for TDI which have been revised to include consideration of possible differential effects on the health of infants, children and other sensitive subpopulations (California EPA, 2010).[114]

From American Conference of Governmental Industrial Hygienists (ACGIH), it revised the current TLV-TWA (Threshold limit value - Time weighted average) of 0.005 ppm to 0.001 ppm and TLV–STEL (Threshold limit value - Short-term exposure limit) of 0.02 ppm to 0.003 ppm taking into account the sensitized or susceptible individuals.[115] Also, in studies in workers suspected to have TDI-induced asthma, pulmonary responses often resulted from exposures below 10 ppb (1ppb = 0.001ppm) TDI from the study of Lemiere et al. (2002).[116]

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[112] http://oehha.ca.gov/air/hot_spots/pdf/July2014TDIPubReview.pdf
[113] Vogelmeier et al., 1991; and Baur and Colleagues, 1994
[114] http://www.epa.gov/oppt/existingchemicals/pubs/actionplans/tdi.pdf
[115] https://www.acgih.org/tlv/03_TLV-CS-Update_AIHce06.pdf
[116] Lemiere C, Romeo P, Chaboillez S, Tremblay C and Malo JL (2002). Airway inflammation and functional changes after exposure to different concentrations of isocyanates. J Allergy Clin Immunol 110(4): 641-6.

4) Standards and Guidelines[117]
OSHA PEL (permissible exposure limit) = 0.02 ppm (ceiling)
NIOSH IDLH (immediately dangerous to life or health) = 2.5 ppm

5) AEGL-2
AEGL-2 is the airborne concentration (expressed as ppm or mg/m3) of a substance above which it is predicted that the general population, including susceptible individuals, could experience irreversible or other serious, long-lasting adverse health effects or an impaired ability to escape[118].

f2) If it is not appropriate to delete TDI, would it be appropriate for EPA to continue to list TDI on the RMP list but with a higher TQ for RMP reporting? Should the methodology for assigning TQs account for the much lower vapor pressure of TDI, and if so, how should this be done? Currently, the TQ for all three TDI listings is 10,000 pounds.

Response:

EPA could consider changing TQ to a higher value for RMP reporting. The current TQs were assigned based on a ranking scheme using a Level of Concern (LOC) based on acute toxicity and the potential for airborne dispersion. Calculating air dispersion factor (V) uses the boiling point of the chemical to reflect worst-case conditions of accidental releases that are likely to involve heat, which cause more rapid volatilization of the liquid[119]. 'MDI and TDI: Safety, Health and the Environment…', mentions that in the 300 listed incidents involving TDI, none of them indicated that any burning of the released diisocyanate occurred[120]. The boiling point of TDI is 251°C, which is a high temperature that is hard to reach at most occasions. So, it is not appropriate to use the boiling point of TDI to calculate the ranking factor and to get the corresponding TQ value. Since TDI has special toxicity, when deciding the TQ value it could be based on the risk-assessment method to find a balanced TQ value for this substance.

<u>Supporting Information</u>

1) Chemical Accidents with Toluene diisocyanate (TDI)
There are at least 48 accidents involve TDI all around the world from 1975 to 2012. The details of these accidents can be found in the internet[121].

[117] http://www.atsdr.cdc.gov/MHMI/mmg179.pdf
[118] http://www.epa.gov/oppt/aegl/pubs/define.htm
[119] RMPRFI_20140724
[120] http://books.google.com/books?id=l2_FR5xM8A8C&pg=PA321&dq=incidents+involving+TDI&hl=en&sa=X&ei=_L0xVNeZHta1yATE7YCADQ&ved=0CCgQ6AEwAA#v=onepage&q=incidents%20involving%20TDI&f=false
[121] http://www.factsonline.nl/accidents/%205405/92078_TOLUENE%20DIISOCYANATE%20(TDI)/chemical-accidents-with-toluene-diisocyanate-(tdi)

2) Threshold methodologies for toxic substances[122]

- EHS TPQ Methodology

TPQs were assigned to groups of EHSs according to their relative ranking. The overall risk ranking factor is defined as IDLH/V. IDLH level is developed by the National Institute of Occupational Safety and Health. V is the index of potential to become airborne and disperse.

- Delaware methodology

The Delaware thresholds for toxic chemicals were determined on the basis of dispersion model.

- OSHA Threshold Methodology

OSHA's thresholds for toxic substances listed in its Process Safety Management Standard were based on dispersion modeling using assumptions similar to those used in Delaware, as described above.

- ORC Methodology

This method uses dispersion modeling, assuming the total quantity of the substances released immediately becomes airborne, to determine the quantity of a toxic substance that would lead to a concentration that could cause death or permanent disability from a one-hour exposure at a distance of 100 meters from the point of release. The assumptions used for dispersion modeling were the same as those used by the state of Delaware. The order of choice of toxicity data is different from that used by Delaware.

- New Jersey Methodology

It is based on dispersion modeling and mortality curves; a Registration Quantity (RQ) is the quantity that will produce one fatality in a location with 10,000 people per square mile.

f3) If it is not appropriate to delete TDI because it is a sensitizer, should EPA continue to list TDI on the RMP list but with a lower TQ because of its unique toxicity, and if so, what should be the basis for setting a lowered TQ?

Response:

There is no need to lower the TQ value of TDI.

TDI is a sensitizer and may cause a serious of effects to subpopulation and small children. However, EPA regulation focuses on the catastrophic incidents and not chronic effects. The vapor pressure of TDI at the 25°C is lower than the AEGL-2's criteria and the boiling point of TDI is 251°C, which is very high. EPA could set a higher TQ value of TDI considering its low vapor pressure and special toxicity based on the risk-assessment methods.

[122] USEPA. June 21, 1992. Technical Background Document for the Development of Threshold Quantities for List of Regulated Substances for Accidental Release Prevention, Clean Air Act Section 112(r). Original Docket# A-91-74, document # III-B-2.

f4) Are there other listed substances that should have a higher TQ? If so, which ones, what are the appropriate TQs, and why?

Response:
The list now consists of two categories of chemicals – 77 toxic substances and 63 flammable substances. The regulated substances and TQs are found in 40 CFR 68.130[123]. To check whether these substances should have a higher TQ, it could be done by considering the following factors: 1) LOC value - Higher value of LOC will lead to higher TQ, and 2) Air dispersion factor (V) - Lower value of V will lead to higher TQ.

For a specific industry, it may have some protective methods that could help to lower the risk of incidents (*e.g.*, protective barriers). After a thorough risk assessment, it could lead to higher TQ.

Supporting Information

EPA 40 CFR Parts 9 and 68 (TQ related)[124].

EPA's proposed thresholds were lower than OSHA's for 15 of the substances listed by both OSHA and EPA. A number of commenters stated that EPA's thresholds should not be lower than OSHA's for any listed substances, since in general, workers face a more immediate threat of exposure in an accidental release than would the public. Several commenters indicated that EPA should adopt the OSHA thresholds for chemicals that EPA had assigned lower thresholds. Conversely, there were other comments supporting the lower thresholds proposed by EPA for several chemicals, based on the commenters' experience with these chemicals.

No other methodology was identified that EPA could use to derive thresholds that would be consistent and equally applicable to the current listed substances and to those that may be added in the future. Therefore, EPA is not adopting the OSHA thresholds.

f5) Should EPA delete from the RMP list any of the six substances for which the Agency has not received any RMP report if the Agency believes that they are not widespread in commerce or only stored in quantities well below the RMP TQ? EPA requests any available information about the extent of these six chemicals' manufacture and use in commerce, including any annual amounts manufactured, imported or used in the U.S.

Response:

There is no need to delete these substances.

[123] http://www.gpo.gov/fdsys/pkg/CFR-2011-title40-vol15/pdf/CFR-2011-title40-vol15-sec68-130.pdf
[124] http://www.gpo.gov/fdsys/pkg/FR-1994-01-31/html/94-1556.htm

The six substances include 4 toxic chemicals and two flammable chemicals. The four toxic chemicals are arsenous trichloride (CASRN 7784-34-1), cyanogen chloride (CASRN 506-77-4), sulfur tetrafluoride (CASRN 7783-60-0), and tetramethyl lead (CASRN 75-74-1). The two flammable chemicals are: chlorine monoxide (CASRN 7791-21-1) and ethyl nitrite (CASRN 109-95-5).

These six chemicals can all cause high risk of safety. Four toxic chemicals are highly or extremely toxic. The two flammable substances both are very hazardous. If it cannot be guaranteed that there is no or very little use of these substances, they should not be deleted from the list.

Supporting Information

1) Arsenous Trichloride

- Toxicity
  Arsenic compounds are highly toxic, and $AsCl_3$ especially so because of its volatility and solubility. Extremely hazardous in case of skin contact (corrosive, irritant), of eye contact (corrosive), of ingestion, of inhalation (lung-corrosive). Hazardous in case of skin contact (permeator)[125].

- Industries using arsenic and arsenic compounds
  From the paper of Saburo lshiguro which was published in 1992.[126] It reviews industries using arsenic and arsenic compounds such as wood preservatives and agricultural chemicals, the use of arsenic trioxide in glass manufacture, and the applications of metallic arsenic in non-ferrous alloys and of high-purity arsenic in the electronics industry.

2) Cyanogen Chloride

- Toxicity
  Cyanogen chloride (CK) is a highly volatile and toxic chemical asphyxiant that interferes with the body's ability to use oxygen. Exposure to cyanogen chloride (CK) can be rapidly fatal. It has whole-body (systemic) effects, particularly affecting those organ systems most sensitive to low oxygen levels: the central nervous system (brain), the cardiovascular system (heart and blood vessels), and the pulmonary system (lungs). Cyanogen chloride (CK) has strong irritant and choking effects. Its vapors are extremely irritating and corrosive. Cyanogen chloride (CK) is a chemical warfare agent (military designation CK). It is used commercially in chemical synthesis and fumigation[127].

[125] http://www.sciencelab.com/msds.php?msdsId=9927086

[126] Ishiguro, Saburo. "Industries using arsenic and arsenic compounds." Applied organometallic chemistry 6.4 (1992): 323-331.

[127] http://www.cdc.gov/niosh/ershdb/emergencyresponsecard_29750039.html

- Application in synthesis.
  Cyanogen chloride is a precursor to the sulfonyl cyanides and chlorosulfonyl isocyanate, a useful reagent in organic synthesis[128].

3) Sulfur Tetrafluoride

- Toxicity
  In acute toxicity studies, sulfur tetrafluoride has been shown to be extremely toxic to rats[129]. Short Term Exposure: Exposure can severely irritate the nose, throat and lungs. May cause skin burns (from SF4 releasing hydrofluoric acid on exposure to moisture). High levels can cause a build-up of fluid in the lungs (pulmonary edema) with cough and shortness of breath. This can lead to death. Contact with liquid may cause frostbite. Sulfur tetrafluoride is about as toxic as phosgene. It is a strong irritant.[130]

4) Tetramethyl Lead

- Toxicity
  Tetramethyl lead affects the central nervous system in animals and causes signs of increased irritability. It resembles that caused by tetraethyl lead (TEL). Tetraethyl lead exposure effects range from difficulty in sleeping, bad dreams, restlessness, anxiety, nausea, and poor appetite to the more severe symptoms of acute mental disturbance characterized by delirium[131]. The current OSHA standard for tetramethyl lead is 0.075 mg/m^3.[132]

5) Chlorine Monoxide

- Health and Flammability
  It can cause serious or permanent injury. It can burn readily. Rapidly or completely vaporizes at atmospheric pressure and normal ambient temperature[133].

- Application of synthesis
  Chlorine monoxide is a chemical radical with the formula ClO. It plays an important role in the process of ozone depletion. In the stratosphere, chlorine atoms react with ozone molecules to form chlorine monoxide and oxygen[134].

6) Ethyl Nitrite

- Health and Flammability

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[128] Graf, R. (1966), "Chlorosulfonyl Isocyanate", Org. Synth. 46: 23; Coll. Vol. 5: 226

[129] Scientific basis for Swedish Occupational Standards XI. Consensus report for sulfur fluorides Arbete och Halsa , 8 (Issue 1991:7 in Swedish) pp 141-9 (1991)

[130] Sittig, M. Handbook of Toxic and Hazardous Chemicals and Carcinogens, 2002. 4th ed.Vol 1 A-H Norwich, NY: Noyes Publications, 2002., p. 2127

[131] http://www.cdc.gov/niosh/docs/81-123/pdfs/0603.pdf

[132] https://www.osha.gov/pls/oshaweb/owadisp.show_document?p_table=STANDARDS&p_id=9992

[133] http://cameochemicals.noaa.gov/chemical/18051

[134] Egon Wiberg; Nils Wiberg; Arnold Frederick Holleman (2001). Inorganic chemistry. Academic Press. p. 462. ISBN 0-12-352651-5.

It can be lethal. It can burn readily. Rapidly or completely vaporizes at atmospheric pressure and normal ambient temperature. Detonation or explosive decomposition or explosive reaction could happen at normal temperatures and pressures[135].

- U. S. Production:
  (1972) Probably Greater than $4.54*10^5$grams[136].

f6): Is there any reason that EPA should not delete 1, 3-pentadiene from the RMP list as it does not meet the listing criteria for flammable substances and was erroneously listed? Are there any other RMP substances that are known to be listed based on erroneous data?

Response:

1,3-pentadiene should be deleted from the RMP list, because the boiling point of 1,3-pentadiene is 43°C, which does not meet the regulation criterion (boiling point below 37.8°C).

No other erroneous data was found by checking the boiling point of the 63 flammable substances in the RMP list.

g. Lowering the Threshold Quantity for Substances Currently on the List

g1) Are the current TQs protective of human health and the environment, or are there certain substances for which the TQ is too high? If so, which substances? For such substances, what TQ should EPA establish and what would it be based on?

Response:

The initial determination of the threshold quantities by the EPA for both toxic and flammable materials leaves room for improvement and the development of more useful threshold quantities.

The worst-case scenario evaluation are indeed very limited screening cases, but if the coarse TQ values can be refined based on more sound science, it should remove overregulation as well as cover hazardous facilities which should be covered by RMP.

For toxic substances, TQs were initially determined using a ranking methodology from the IDLH (or LD50 where IDLH is unavailable) and a volatility ranking index. Each substance is assigned to a TQ category based on the order of magnitude of the ranking factor. TQ categories include 500; 1,000; 2,500; 5,000; 10,000; 15,000; and 20,000 lbs. These categories are of a small drum (500lbs) to a large storage tank (20,000lbs). A more in-depth risk assessment for each chemical should be conducted to determine if new TQ values are necessary. The risk

[135] http://cameochemicals.noaa.gov/chemical/3440

[136] http://toxnet.nlm.nih.gov/cgi-bin/sis/search2/r?dbs+hsdb:@term+@rn+@rel+109-95-5

assessment should be shaped by appropriate incident histories, simulation results, and take into account readily available threshold data, such as EEGL and ERPG values. Every toxic chemical should undergo a separate risk analysis to assure each substance has a suitable TQ.

For flammable substances, the initial TQs were based off of vapor cloud explosion detonation blast effects at 100m. The threshold quantity of 10,000 lbs was chosen based on lethal blast effects at this distance. Similar to the toxic substances, more appropriate TQs can be determined for flammable RMP substances through more in depth risk assessment. Again, the risk assessment should be shaped by appropriate incident histories, simulation results, and take into account readily available threshold data, such as EEGL and ERPG values. This analysis should be conducted for every flammable substance separately to assure up-to-date and reasonable TQs are available.

Supporting Documents:
Presentation on Applicability of CAA Section112(r) & General Duty Clause. US EPA, Region 5.

2. Additional Risk Management Program Elements

b1. Would expanding the scope of the RMP regulation to require additional management system elements, or expanding the scope of existing RMP management-system elements, improve the protection of human health and the environment?

Proposed Changes:
To add additional management system elements:
(1) Measurements and Metrics;
(2) Management Review and Continuous Improvement; and
(3) Process Safety Competency.

Response:

We do not recommend the addition of any additional elements. We believe that EPA objectives and goals with respect to additional management system elements to improve the protection of human health and environment can be met by making the following adjustments to the RMP regulation:

Compliance Audits (Section 68.58 & 68.79)
Revise the audit element to include:
1. Review the stationary source's use of leading and lagging indicators to provide a complete picture of process safety effectiveness and ensure it meets the stated purpose.
2. Management to review the RMP program elements at appropriate intervals to determine if it continues to be suitable, adequate, and effective. Document the observations, conclusions, and recommendations of that review.

Training (Sections 68.54 & 68.71)
Revise the training element to include:
1. Continuously improving knowledge and competency. Establish criteria and guidelines for ensuring an appropriate and effective level of competency. Initial and continuing competency for operators and process safety personnel should be established clearly and programs put in place to accomplish those standards.

<u>Supporting Information</u>

- Continuous Improvement is one of the four fundamentals of the Operating Management System (OMS)[137].
- Training & Competency required to be reported under one of the 'other reporting elements.' [138]

[137] OGP-IPIECA OMS Guidance Document (OGP Report No. 453)
[138] OIL AND GAS INDUSTRY GUIDANCE ON VOLUNTARY SUSTAINABILITY REPORTING (IPIECA, API, OGP)

- Three OGP guidance reports mention about the continuous improvement cycle. The concept is, whether at corporate, business or facility level, it is a fundamental process for any structured HSE-MS which provides the framework to address Process Safety[139].
- The Norwegian regulations require compliance with the latest applicable regulations and updated reference standards. The regime focuses the operator's attention on its HSE performance through self-regulation and continuous improvement[140].
- CCPS specifies in its RBPS program 20 different management-system elements. A number of which are not spelled out explicitly in the PSM standard (shown with highlights)[141]

1. Process Safety Culture
2. Compliance with standards
3. Process safety competence
4. Workforce involvement
5. Stakeholder outreach
6. Process knowledge management
7. Hazard identification and risk analysis
8. Operating procedures
9. Safe work practices
10. Asset integrity and reliability
11. Contractor management
12. Training and performance
13. Management of change
14. Operational readiness
15. Conduct of operations
16. Emergency management
17. Incident investigation
18. Measurement and metrics
19. Auditing
20. Management review and continuous improvement

b2. Should EPA require safety culture assessments, job safety analyses, or any of the other new management system elements described above? If so, please describe the elements, the safety benefits, any economic impacts associated with expanding the scope of the RMP regulation in this way, and any special circumstances involving small entities that EPA should consider.

Proposed Changes:
To consider inclusion of new management system elements not present in RMP regulation:

[139] OGP: Process Safety- Recommended Practice on Key Performance Indicators, Report Number 456, November 2011
[140] Statement from the Norwegian Oil Industry Association
[141] Guidelines for Risk-Based Process Safety, CCPS. http://www.aiche.org/ccps

(1) Conduct of operations;
(2) Process Safety Culture; and
(3) Job Safety Analysis.

Response:
Conduct of operations:
From literature and various incident investigation reports it is evident that 'Conduct of Operations' element is a critical aspect of any process safety program. Although it is essential to realize that it is closely related to culture. Also, it is associated with other management system elements like Training, Operating Procedures, Maintenance and Process Safety Information. Thus, we do not recommend the addition of 'Conduct of Operations' element to the EPA RMP regulation. Instead, we recommend that EPA should make following changes to current Management System elements under RMP as follows:

Maintenance & Mechanical Integrity (Sections 68.56 & 68.73)
If existing safe work practices cannot be followed, stop the work until an appropriate alternative method can be devised and approved.

Process Safety Culture:
Even though Process Safety Culture is very important for improving safety performance, it should also be recognized that there is no clear consensus on what is meant by process safety culture. Thus, we do not recommend the addition of process safety culture to the EPA RMP regulation. Instead, we recommend that EPA & OSHA together convene a stakeholder summit to help develop a consensus regarding the attributes of a good process safety culture. Based on the outcome of the summit, subsequent path of action can be determined.

Job Safety Analysis:
Job Safety Analysis is one of the basic risk assessment tools and is part of the Operating Procedures element of the regulation. Hence, we do not recommend the addition of "Job Safety Analysis" element to the EPA RMP regulation at this time.

Supporting Information[142]

The definition of 'job safety analysis', according to the National Minerals Industry Safety and Health Assessment Guideline (Prof. Jim Joy and Dr Derek Griffiths) is: "A JSA is a task oriented risk assessment which can be applied by a work team prior to undertaking a potentially hazardous activity. Generally the technique is applied on site for routine activities as a precursor to a safe working procedure. It uses job observation and experience as the basis for identifying hazards and controls to be used. It is a primitive, but helpful, qualitative analysis".

[142] Guidance Note QGN 17 'Development of effective Job Safety Analysis', Mining and Quarrying Safety and Health Act 1999

A JSA is a basic and low level risk assessment tool and sits above the individual, informal risk assessment tools. It is used for routine and non-routine job and task planning to help develop effective safe work expectations — such as guidelines, procedures, standard work instructions (SWIs) and job plans — and review tasks and the level of risk where adequate procedures or SWIs are not available.

b3. Would current staff at a facility be able to implement these additional elements or would new staff need to be hired?

Response:

As suggested above, no additional elements would be added to the existing RMP management system elements. Therefore, no new staff would be required. However, at the same time, more competent staff may be needed to evaluate and check the fulfillment and compliance to the requirements of existing elements with new suggested requirements.

c. In systems using management and metrics, how do facilities develop useful leading indicators? Do you track the frequency of events such as process upsets, accidental releases, and "near-miss" incidents? Does tracking such events allow managers and employees to make changes that prevent accidental releases? What other metrics and indicators do you use, and how do they help prevent releases?

Response:

In systems using management and metrics, facilities generally use a structured and guided method to develop useful leading indicators. This would include the following:

- Select indicators associated with each management system element.
- Select and develop leading indicators with the goal to increase operational safety.
- Select and define indicators that are measurable.
- Identify roles and responsibilities of employees for each indicator reporting, analysis and conclusion
- Defining sources to get metrics for selected indicators.
- Communicating the conclusion and analysis of leading indicators.
- Reporting the trend analysis and gaps to higher management and developing corrective action plans.

As an example, refer to the API Recommended Practice 754, which is being adapted by large number of facilities to develop and implement management systems for process safety metrics and indicators. API RP 754 was developed using consensus standards based on ANSI approach.

Supporting Information:
Too many organizations rely heavily on failure data to monitor performance. The consequence of this approach is that improvements or changes are only determined after something has gone wrong. Often the difference between whether a system failure results in a minor or a catastrophic outcome is purely down to chance. Effective management of major hazards requires a proactive approach to risk management, so information to confirm critical systems are operating as intended is essential. Switching the emphasis in favor of leading indicators to confirm that risk controls continue to operate is an important step forward in the management of major hazard risks[143].

Dual assurance – a leading and lagging indicator for each risk control system
The main difference between the approach outlined in this guide and existing guidance on performance measurement is the introduction of the concept of 'dual assurance' that key risk control systems are operating as intended. Leading and lagging indicators are set in a structured and systematic way for each critical risk control system within the whole process safety management system. In tandem they act as system guardians providing dual assurance to confirm that the risk control system is operating as intended or providing a warning that problems are starting to develop.

When selecting metrics, the performance improvement objectives and assessment of current performance will play a major role. The improvement objectives set the context within which the metrics are to be selected. Metrics that do not relate to those objectives will not support progress toward the objectives. For example, if an objective is to improve process safety training, metrics that indicate completeness and effectiveness for the training efforts will be selected[144].

Metrics Need to Reflect Process Safety System Performance
Metrics should relate to the elements of the process safety system. Poorly selected metrics that do not specifically relate to the execution of process safety elements will not provide an accurate evaluation of process safety system performance. Occupational injury and illness reporting rates are sometimes used to judge overall safety performance, and this metric does track the incidence of employee injuries quite well. However, this rate does not reflect the effectiveness of the process safety system. Occupational safety is quite important to the health and well-being of employees, but the metrics involved in assessing the occupational safety performance are not appropriate for process safety system evaluation; the detailed elements of a process safety program differ markedly from an occupational safety program.

Use Objective Methods to Select Metrics
A technically sound and unbiased method should be used to decide which process safety data to collect. Selection of metrics needs to be based on a representative performance across the

[143] Developing process safety indicators A step-by-step guide for chemical and major hazard industries, HSE UK, ISBN 978 0 7176 6180 0
[144] CCPS book on Process Safety Metrics

organization and not just the very good or very bad performers. Metrics chosen solely using long-held assumptions may or may not truly indicate process safety system performance.

Use hazard analysis findings to identify potential high-impact events and the process safety barriers intended to prevent such incidents. Select metrics that indicate the health of these barriers. This is a direct recommendation in HSG254, and the BP plant in Hull, England, is piloting this approach. This perspective is seen as a leading indicator.

d. Would requiring RMP facilities to conduct periodic safety culture assessments meaningfully strengthen the safety culture incentives that already exist, such as avoidance of deaths, injuries, property and environmental damage, production loss, community impacts, damage to company reputation, etc., that may result from accidents?

Response:

As mentioned earlier in response to section b.2, we do not recommend the addition of process safety culture element to the EPA RMP regulation.

e. Would expansion of the RMP employee participation provision to include requirements such as the SEMS II stop-work authority, or other efforts to involve employees in all management-system elements, enhance protection of human health and the environment?

Response:

We believe that expansion of the RMP employee participation (Section 68.83) provision to include requirements such as the SEMS II stop-work authority, or other efforts to involve employees in all management-system elements would enhance protection of human health and the environment.

Supporting Information

CCPS Employee Participation Element [145]

Workers, at all levels and in all positions in an organization, should have roles and responsibilities for enhancing and ensuring the safety of the organization's operations. Workforce involvement provides a system for enabling the active participation of company and contractor workers in the design, development, implementation, and continuous improvement of the RBPS management system. Effective workforce involvement involves developing a written plan of action regarding worker participation, consulting with workers on the development of each element of the RBPS management system, and providing workers and their representatives access to all information developed under the RBPS management system. Workforce involvement provides for a consultative relationship between management and workers at all levels of the organization. This element is not intended to create a system

[145] Guidelines for Risk-Based Process Safety, CCPS. http://www.aiche.org/ccps

whereby any worker or group can dictate the content of the RBPS management system; however, for workforce involvement to succeed, management must provide due and fair consideration of the input provided by workers.

Those workers directly involved in operating and maintaining the process are most exposed to the hazards of the process. The workforce involvement element provides an equitable mechanism for workers to be directly involved in protecting their own welfare. Furthermore, these workers are potentially the most knowledgeable people with respect to the day-to-day details of operating the process and maintaining the equipment and facilities, and may be the sole source for some types of knowledge gained through their unique experiences. Workforce involvement provides management a formalized mechanism for tapping into this valuable expertise. Workforce involvement also ensures that mechanisms exist for workers to access the information they need to perform their jobs, including fulfilling their roles in support of the implementation of the RBPS management system. Workforce involvement either directly implements or helps reinforce a number of the essential features of a sound process safety culture.

BSEE [146]
The SEMS is a dynamic program. Requiring the operator to have an EPP will ensure that all employees understand and are involved in updating the SEMS program on an ongoing basis. The EPP adds value to the overall safety of OCS operations because this plan provides employees a stake in the development and implementation of an operator's SEMS program. This program engages employees in the field and in the office, bridging a significant gap between those actually performing OCS operations and those planning, managing, and/or monitoring these operations in an onshore office. The EPP requirements provide the operator with a significant amount of flexibility to tailor this plan to its specific needs. The final rule grants operators one year after the effective date to modify their recordkeeping policies to capture EPP information.

f. Are there any other management-system elements in the existing RMP regulation that EPA should expand or clarify (*e.g.*, a new requirement that facilities perform a root cause analysis for incidents under § 68.81, clarify PHA and hazard review requirements, require more frequent PHA and hazard review updates, strengthen contractor requirements, or require pre-startup reviews prior to all process startups)?

Response:

Yes, we agree that expanding or clarifying the following elements would help improve human health, safety and environment:

[146] http://www.bsee.gov/BSEE-Newsroom/BSEE-Fact-Sheet/SEMS-II-Fact-Sheet.aspx

PHA

- Include requirements and details on revalidation of PHAs.
- Update PHA scenarios based on incidents and learning from incidents.

Contractor Requirements

- Include requirements for pre-screening candidate firms and for subsequent selection of specific contractors, including explicit criteria for evaluating past safety performance and safety program adequacy as part of the selection process.
- Include monitoring contractor safety performance and their audit requirements.

Pre-startup reviews prior to all process startups

- Include requirements to establish special plans and safe work checklists for unsteady/abnormal operations like shut-down and start-up.

Supporting Information

The Piper Alpha explosion and fire where it was noted that the failure to properly follow a safe work procedure allowed a massive release of hydrocarbon that led to the disaster. The subsequent investigation indicated that the contract supervisor responsible for the related maintenance job had not been properly trained in the safe work procedure. Furthermore, the investigation inferred that inadequacies in the emergency response training given (or in some cases, not given) to contractors on the oil platform likely contributed to the high loss of life in the accident[147].

The foundation of any successful process safety program is a current set of process hazard analyses (PHAs) for each of its processes. CCPS has published ***Guidelines for Revalidating Process Hazards Analyses*** that presents demonstrated, concise, and common sense approaches for a resource-effective revalidation of PHAs[148].

g. Are there any data or information on accidents, near misses, or other safety-related incidents that the facility could have prevented by following management-system elements not currently required under the RMP regulation?

Response:

Some of the Chemical Safety Board Incident Investigation reports contain information which found that some elements were missing like Process Safety Culture, Measurement & Metrics, which are currently not required under RMP. Also, there are recommendations to improve on some additional management system elements like Process Hazard Analysis (PHA).

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[147] ***Guidelines for Risk-Based Process Safety***, CCPS. http://www.aiche.org/ccps

[148] ***Guidelines for Revalidating Process Hazards Analyses,*** CCPS. http://www.aiche.org/ccps/publications/books/revalidating-process-hazard-analyses

While the Chemical Safety Board Incident Investigation Reports summarized below provide root causes of incidents, it must also be understood that these deficient Management System elements identified in these reports alone may not have prevented these incidents. The fact is that there were other Process Safety deficiencies too already covered under regulation which occurred over time and led to such incidents. Hence, the whole aspect needs to be looked from a systems approach viewpoint.

Supporting Information:[149]

1. Bayer Crop Science: Pesticide Chemical Runaway Reaction Pressure Vessel Explosion, August 28th, 2008

The investigation report includes recommendations to have a more robust PHA. These include revision of PHA policies and procedures to validate all assumptions to ensure that risk analysis of each hazard scenario specifically examines the risk(s) of intentional bypassing of safeguards, to address all phases of operation and to train PHA facilitators on the revised policies and procedures prior to assigning the facilitator to a PHA team. Also, to ensure that all PHAs are updated to conform to the revised procedures.

2. BP Texas City Explosion, August 17th, 2005

The investigation report identifies Process Safety Culture a s major deficiency. The report found "instances of a lack of operating discipline, toleration of serious deviations from safe operating practices, and [that an] apparent complacency toward serious process safety risk existed at each refinery."

The Baker Panel Report stated that BP's corporate safety management system "does not effectively measure and monitor process safety performance" for its U.S. refineries. The report also found that BP's over-reliance on personal injury rates impaired its perception of process safety risks, and that BP's Board of Directors "has not ensured, as a best practice, that BP's management has implemented an integrated, comprehensive, and effective process safety management system for BP's five US refineries." The report's 10 recommendations to BP addressed providing effective process safety leadership, developing process safety knowledge and expertise, strengthening management accountability, developing leading and lagging process safety performance indicators, and monitoring by the Board of Directors the implementation of the Baker Panel's recommendations.

3. LPG Fire at Valero Refinery, February 16th, 2007

Audit PHA performance at its refineries to ensure adherence to company standards and good practice guidelines. Work together to benchmark effective PHA methods and practices and implement improvements to the McKee Refinery PHA program, including:

- involving the workforce in PHA preparation, performance, and follow-up;

[149] Chemical Safety Board Incident Investigation Reports

- training participants;
- conducting PHA quality control checks; and
- following up on recommendations for timely implementation and appropriate close-out.

4. Tesoro Anacortes Refinery, April2nd, 2010
   - Implement a process safety culture program that will assess and continually improve any identified.
   - Process safety culture issues at the Tesoro Anacortes Refinery.
   - Effectively participate in the process safety oversight committee to continually improve any identified.

h. What would be the paperwork burden associated with the revisions to management system elements discussed above? What special skills or training would employees need to implement these elements, including associated reporting and record-keeping requirements? What would be the costs of additional reporting and record-keeping requirements, including costs for worker training and any required data management system upgrades?

Response:

It is difficult to estimate the exact paperwork burden associated with the revisions to management system elements discussed. From above, we note that there are no suggestions to add any new elements to the EPA RMP. There are suggestions to revise some of the management system elements to address some of the issues and strengthen these elements further. Based on the added revisions to these elements, there probably would be additional paperwork required. Special skills or competencies have been mentioned in the revisions to the 'Training' Management System element. These requirements may be streamlined and met by taking more effective measures.

3. Define and Require Evaluation of Updates to Applicable Recognized and Generally Accepted Good Engineering Practices

a. Would adding a definition for RAGAGEP to the RMP rule improve understanding of RMP requirements and prevent accidental releases? If so, what specific definition for RAGAGEP should EPA add to the RMP rule? What would be the economic impacts of adding such a definition?

Response:
It may improve understanding of RMP requirements and prevent accidental releases by adding a definition for RAGAGEP.

However, it has to be understood that engineering standards evolve naturally as technology, materials, and applications improve. Within industries RAGAGEP evolves and develops as new data and science unveil new learnings. While an attempt to regulate RAGAGEP can seem like an improvement it can inadvertently and unintentionally inhibit the natural evolution of the engineering process. Any regulated attempt should only be done after a thorough review and technical vetting process that includes a test against data from past (while easy to add to the list, the unintended burden has to be understood) and then a well-defined pilot process that tests the actual proposal against events that unfold.

Regulatory agencies (at the federal level) should take responsibility to examine what is considered to be RAGAGEP and from it to develop, in an open process with involvement of all stakeholders, prescriptive regulations including determination of where they are applicable. Based on our understanding, if EPA wants to add a definition of RAGAGEP, the following items should be considered to be included in the definition for RAGAGEP:

• RAGAGEP is a basis for design, engineering, operation, and maintenance[150].

• RAGAGEP should include recommendations (developed through established consensus-development mechanisms, *e.g.*, ANSI, ISO) in established codes and standards published by organizations such as NFPA, ASTM, and ANSI, as well as "appropriate internal standards."[151]

- ✧ The codes and standards should be easy to access by industries, and there should not be any conflicts between RAGAGEP and other rules.
- ✧ The standards and codes should not be outdated.

• RAGAGEP should also include published technical reports, recommended practices or similar documents[152].

[150] CCPS Guidelines for Mechanical Integrity Systems
[151] https://www.osha.gov/pls/oshaweb/owadisp.show_document?p_table=FEDERAL_REGISTER&p_id=24053
[152] CCPS Guidelines for Mechanical Integrity Systems

• The RAGAGEP should be approved and accepted by professional associations, industry practitioners, as well as recognized academic/research institutions.

• RAGAGEP should provide details on proper ways to perform specific engineering, inspection, and related activities[153].

In addition, in order to meet the RAGAGEP definition, the following two conditions must be met:

• RAGAGEP should be proved to be effective through the practices of a large number of facilities.

- ✧ Incidental or anecdotal success of a practice in only a few facilities cannot make that practice RAGAGEP.
- ✧ RAGAGEP must have been implemented by a large number of facilities and proved to be effective in most facilities.

• RAGAGEP should be proved to be effective over a certain period of time.

- ✧ The success of a practice in only limited time will not make that practice RAGAGEP.
- ✧ RAGAGEP must have been implemented by facilities for a certain period time and proved to be effective in this period.

Supporting Information

RAGAGEP definition from CCPS's Guidelines

OSHA's Petroleum Refinery NEP directive (CPL 03-00-010) provides one example of a RAGAGEP definition from CCPS's Guidelines for Mechanical Integrity Systems[154]:

> *Recognized And Generally Accepted Good Engineering Practices (RAGAGEP)--are the basis for engineering, operation, or maintenance activities and are themselves based on established codes, standards, published technical reports or recommended practices (RP) or similar documents. RAGAGEPs detail generally approved ways to perform specific engineering, inspection or mechanical integrity activities, such as fabricating a vessel, inspecting a storage tank, or servicing a relief valve.*

API's attempt to define RAGEGEP

In concern over the OSHA refining NEP questions, API began work on an RAGAGEP document in 2010[155]. They discuss the development of reasonable criteria to evaluate what was/was not RAGEGEP, including consensus, due process, balanced and broad input, openness, and relevancy and applicability. Their attempt to create a draft lengthy list of RAGAGEP applicable to oil and gas facilities has not completed.

[153] CCPS Guidelines for Mechanical Integrity Systems
[154] https://www.osha.gov/pls/oshaweb/owadisp.show_document?p_table=FEDERAL_REGISTER&p_id=24053
[155] http://www.absconsulting.com/webinars/defining-ragagep.cfm

b. From what sources (*e.g.*, codes, standards, published technical reports, guidelines, etc.) does your facility select applicable RAGAGEP for operations covered under the PSM standard?

Response:
At this moment, cooperation with consensus standard groups to stay current on industry best practices and improve chemical process safety is limited. EPA and OSHA can adopt applicable RAGAGEP from various sources for operations covered by RMP and PSM.

We are not a facility owner. However, the following sources should be considered:

• Established codes and standards published by organizations such as NFPA, ASTM, and ANSI, as well as "appropriate internal standards."[156]
  - ✧ The codes and standards should be easy to access by industries, and there should not be any conflicts between RAGAGEP and other rules.
  - ✧ The standards and codes should not be outdated.

• Published technical reports, recommended practices or similar documents[157].

• Industry practices, operation procedures, and related reports.

• The RAGAGEP should be approved and accepted by professional associations, industry practitioners, as well as recognized academic/research institutions.

• Industry associations and standard groups as listed below.
  - NFPA-400 consolidates fundamental safeguards for the storage, use, and handling of hazardous materials in all occupancies and facilities, including ammonium nitrate.
  - ANSI K61.1/CGA G-2.1 addresses the safety requirements for the storage and handling of anhydrous ammonia, including standards for the design, construction, repair, alteration, location, installation, and operation.
  - CCPS is an initiative of the American Institute for Chemical Engineers and is a non-profit organization that addresses process safety within the chemical, pharmaceutical, and petroleum industries.
  - The Agricultural Retailers Association (ARA) is a 501(c)(6) non-profit trade association which represents the interests of agricultural retailers and distributors across the United States on legislative and regulatory issues[158]. ARA developed a table after the West incident, containing the regulations for AN in an effort to raise awareness in facilities and facilitate compliance.
  - The Fertilizer Institute (TFI) is the leading voice in the fertilizer industry, representing the public policy, communication and statistical needs of producers, manufacturers,

[156] https://www.osha.gov/pls/oshaweb/owadisp.show_document?p_table=FEDERAL_REGISTER&p_id=24053
[157] CCPS Guidelines for Mechanical Integrity Systems
[158] http://www.aradc.org/ARADC/About/About/

retailers and transporters of fertilizer[159]. Several years ago, ARA joined The Fertilizer Institute (TFI) in putting together the "Know Your Customer" Campaign. This campaign was initiated to prevent the misuse of nitrate-based fertilizer and provides retailers with suggested guidelines to follow regarding the sale of these products.

- The American Petroleum Institute (API) is the only national trade association that represents all aspects of America's oil and natural gas industry[160].
- American Society of Mechanical Engineers (ASME) is a not-for-profit membership organization that enables collaboration, knowledge sharing, career enrichment, and skills development across all engineering disciplines, toward a goal of helping the global engineering community develop solutions to benefit lives and livelihoods[161].
- American Institute of Chemical Engineers (AIChE) is the world's leading organization for chemical engineering professionals, with over 45,000 members from over 100 countries[162].

d. Please provide any data or information on accidents, near misses, or other safety-related incidents involving failure to evaluate and/or implement updates to applicable RAGAGEP for RMP-covered processes. Would requiring employers to evaluate and/or implement updates to applicable RAGAGEP prevent such accidental releases?

Response:

Requiring employers to evaluate and/or implement updates to applicable RAGAGEP could be helpful in preventing incidents involving failure to evaluate and/or implement updates to applicable RAGAGEP for RMP-covered processes. However, it is more efficient and cost-effective for regulatory agencies to identify justifiable prescriptive requirements than each company evaluating their facilities. We recommend that RAGAGEP should be updated based on our recommendations discussed in C.3.e.

Example on the importance of updating RAGAGEP

An accident that occurred at a Formosa Plastics facility in Point Comfort, Texas, on October 6, 2005, illustrates the importance of evaluating updates to applicable RAGAGEP [163]. It belongs to RMP-covered processes[164].

A trailer towed by a forklift became snagged and pulled a small drain valve out of a strainer in a liquid propylene system at the facility. Escaping propylene rapidly vaporized, causing a series of explosions and fires that injured 16 workers. According to the CSB's investigation report on the incident (CSB Report No. 2006-01-I-TX), Formosa and the company that sold the plant

[159] http://www.tfi.org/about
[160] http://www.api.org/globalitems/globalheaderpages/about-api
[161] https://www.asme.org/about-asme?cm_re=Home-_-GlobalHeader-_-About%20Us
[162] https://www.aiche.org/about
[163] https://www.osha.gov/pls/oshaweb/owadisp.show_document?p_table=FEDERAL_REGISTER&p_id=24053
[164] http://data.rtknet.org/rmp/rmp.php?facility_id=100000134936&detail=3

design failed to evaluate updates to applicable RAGAGEP for fireproofing structural steel that supports critical safety systems. The CSB concluded in its report that had Formosa fireproofed the steel according to more recent RAGAGEP, then "the consequences of this incident would likely have been less severe." It has to be admitted that this can be retroactively applied to every older plant. There has to be a cost and benefit trade off, and in this case the cost associated with fire proofing everything could have been an end of life decision for the site and the practical implications of fireproofing to protect from a jet fire are limited. Therefore, a risk-based approach should be implemented when deciding whether or not to update RAGAGEP, and many more factors such as cost should also be taken into account.

e. Should owners or operators covered by the applicable provisions of the RMP regulation be required to evaluate updates to applicable RAGAGEP? Should owners and operators be required to comply with new RAGAGEP requirements that occur after the owner or operator's initial compliance with the applicable provision of the RMP regulation? How would such updates or new requirements be identified? What would be an appropriate time period in which to conduct this evaluation and/or to comply with updated RAGAGEP? What would be the economic impacts of this change?

Response:

RAGAGEP provide an effective approach for keeping up with current and advanced technology and ultimately manage the risk to an acceptable level. The implementation of RAGAGEP should be based on the following considerations:

(1) For new facilities, employers should make sure that updated RAGAGEP is implemented in the design and construction of new facilities and provide initial baseline documentation[165].

(2) For existing plants (where no major changes[166] in equipment, process, or operation procedure are being implemented), updated RAGAGEPs should not be required, if the facility can demonstrate:

- The employer is able to manage the risk at an acceptable level through the adoption of other engineering or administrative measures. Risk assessment should be employed by facility owners to evaluate the risks in the facility in order to decide whether to update the RAGAGEP.
- There is no solid evidence that the new RAGAGEP can prevent or reduce worker injuries and fatalities.

[165] http://www.projeng.com/processsafety.html

[166] OSHA provided a standard interpretation in 2006 which said "… Once this baseline has been established and the employer follows all PSM requirements including all applicable RAGAGEP, OSHA generally does not require the employer to upgrade in a latter version of some RAGAGEP. The only exception to this would be if the equipment was being changed and an applicable RAGAGEP required that the equipment be updated to meet the latest version of the RAGAGEP".

- Implementation of RAGAGEP is prohibitively expensive. The economic impact of the updates has not been studied yet.

(3) When there are changes in the equipment or process, the re-evaluation of the feasibility of the current RAGAGEPs is required subject to the prohibitively expensive items described above. Some situations that require the re-evaluation are listed below:

- When there are major changes in the equipment or process;
- If a new piece of equipment is added and implemented in the process;
- A different type of instrument is replaced with the previous one;
- There is a management of change (MOC) that is related with the current process.

(4) For facilities that share similar equipment or process, if an accident with an offsite impact occurs on one facility, then the other facilities should take proper measures, after the investigation report identifies industry standard short comings, to evaluate the risks in the facility and come up with solutions on how to avoid similar incidents.

- Based on the root cause of the accidents, measures such as replacing parts of the equipment, implementing safety measurements, or changing the operation procedure.
- Update the RAGAGEP to make sure the risk level is reduced.

Such updates of RAGAGEP to applicable facilities should be identified through the following methods:

- Investigate and document applicable RAGAGEP for existing facilities, particularly if the facility uses highly hazardous chemicals or processes. Come up with updates through necessary analysis.

- Learn from precious accidents. Summarize the lessons learned from case histories. Include the recommendations into the RAGAGEP for new facilities.

- Federal agencies should encourage industries to update RAGAGEP on regular bases. Guidance should be provided on how to include updates to RAGAGEP. Those updates can be used in new plants.

- Third party audit could be used to make sure regular updates are documented by existing facilities.

- Specialist team can help update the RAGAGEP.

<u>Supporting Information</u>
<u>Implementation of RAGAGEP</u>

RAGAGEP's provide an effective method to stay abreast of current and advanced technology, management systems, and procedures. However, in implementing RAGAGEP, a thoughtful risk-based approach as described below should be taken.

- For each facility, assess whether implementing the new RAGAGEP will shift the f-N curve towards the broadly acceptable region compared with the f-N curve without the new RAGAGEP.

- Access the risk level in the facility, and find out whether it falls in unacceptable region, broadly acceptable region, or tolerable if ALARP region for both the original RAGAGEP and the updated RAGAGEP.

Decision on whether to implement the new RAGAGEP should be based on the risks of the facility.

- If the risks of the facilities fall in the acceptable region or tolerable for both situations whether to update the RAGAGEP or not, there is no need to update the RAGAGEP.

- If the risks are acceptable with old RAGAGEP, but are not acceptable if RAGAGEP are updated, then the facility needs to implement the new RAGAGEP.

- Safety measurements such as water spray systems, temperature control systems, or alarm systems should be implemented to ensure that the risk of the facility fall into the acceptable region or tolerable region.

f. Would a requirement to evaluate updates to applicable RAGAGEP be more appropriate in another paragraph of the RMP rule? For example, should such a requirement become part of the Process Hazard Analysis revalidation requirements at § 68.67(f), or the management of change requirements at § 68.75? How would EPA incorporate such a requirement for Program 2 processes?

Response:

Current Standard

These requirements of EPA for RAGAGEP are parallel with the requirements in OSHA, with the only difference being that OSHA uses the term "employer" where EPA uses the term "owner or operator."

EPA 40 CFR part 68 requirements for RAGAGEP [167, 168]:

[167] http://www2.epa.gov/sites/production/files/2013-11/documents/appendix-a-final.pdf

[168] http://www.epa.gov/oem/docs/chem/W-ApendAB.pdf

- *Subpart C (i.e., Program 2 Prevention Program) - 68.48 (b): "The owner or operator shall ensure that the process is designed in compliance with recognized and generally accepted good engineering practices."*
- *Subpart C (i.e., Program 2 Prevention Program) - 68.56 (d): "Inspection and testing procedures shall follow recognized and generally accepted good engineering practices."*
- *Subpart D (i.e., Program 3 Prevention Program) - 68.65(d)(2) "The owner or operator shall document that equipment complies with recognized and generally accepted good engineering practices."*
- *Subpart D (i.e., Program 3 Prevention Program) - 68.65(d)(3) "The owner or operator shall determine and document that the equipment is designed, maintained, inspected, tested, and operating in a safe manner."*
- *Subpart D (i.e., Program 3 Prevention Program) - 68.73 (d)(2): "Inspection and testing procedures shall follow recognized and generally accepted good engineering practices."*

Recommendations

Currently, compliance with RAGAGEP is regulated under RMP in the design, inspection, testing, and equipment aspects.

However, there should not be a requirement to evaluate updates to applicable RAGAGEP under the RMP rule. The updates should not be regulated under the Process Hazard Analysis requirements, because it focuses on the risks of facilities. The requirement to evaluate updates to applicable RAGAGEP should not be covered by the Management Of Change requirements either, because it looks at the changes in the facility. Moreover, based on the procedures discussed in C3.e, it doesn't necessarily require facilities to update RAGAGEP after the evaluation, and a MOC doesn't necessarily result in updating RAGAGEP. The updates to RAGAGEP are not related with PHA or MOC. Similarly, EPA should not incorporate the requirement for Program 2 processes.

From economic analysis point of view, a requirement to evaluate updates to applicable RAGAGEP every five years as required by § 68.67(f) could be an economic burden for facilities. An economically wise approach to update RAGAGEP would be to follow the procedures discussed in C3.e.

Supporting Information

§ 68.67(f) the Process Hazard Analysis revalidation requirements

"*At least every five (5) years after the completion of the initial process hazard analysis, the process hazard analysis shall be updated and revalidated by a team meeting the requirements in paragraph (d) of this section, to assure that the process hazard analysis is consistent with the current process. Updated and revalidated process hazard analyses completed to comply with 29 CFR 1910.119(e) are acceptable to meet the requirements of this paragraph*"

OSHA 29 CFR 1910.119 (process safety management of highly hazardous chemicals) has the following description for RAGAGEP[169]:

- *1910.119 (d)(3)(ii): The employer shall document that equipment complies with recognized and generally accepted good engineering practices.*
- *1910.119 (d)(3)(iii): For existing equipment designed and constructed in accordance with codes, standards, or practices that are no longer in general use, the employer shall determine and document that the equipment is designed, maintained, inspected, tested, and operating in a safe manner.*
- *1910.119 (j)(4)(ii): Inspection and testing procedures shall follow recognized and generally accepted good engineering practices.*
- *1910.119 (j)(4)(iii): The frequency of inspections and tests of process equipment shall be consistent with applicable manufacturers' recommendations and good engineering practices, and more frequently if determined to be necessary by prior operating experience.*

American Chemistry Council (ACC) Responsible Care Process Safety Code[170]:

- *Each member company shall have an ongoing process safety program that includes... Facility design, construction and maintenance using sound engineering practices consistent with recognized codes and standards.*

Inspectors need to improve the way it inspects facilities:

Facilities like the one in West, Texas are barely inspected on under the current regulatory system used by OSHA. These facilities are not covered under the PSM standard because they do not contain a process as defined by the standards, they merely store the material. Therefore, while such a facility may be inspected, especially in response to a compliant by workers, these inspections will not have the same requirements and depth that would be associated with an inspection of a PSM covered facility. Even these inspections were few and far between; however, as the West facility had not been inspected in nearly 30 years. A systematic way to inspect facilities has not been implemented.

This also assumes however that the inspectors are qualified to perform the inspections. Title 29 CFR 1960.25 states the following with regard to the qualifications for inspectors.

> ***1960.25(a)***
> *Executive Order 12196 requires that each agency utilize as inspectors "personnel with equipment and competence to recognize hazards." Inspections shall be conducted by inspectors qualified to recognize and evaluate hazards of the working environment and to suggest general abatement procedures. Safety and health specialists as defined in 1960.2(s), with experience and/or up-to-date training in occupational safety and health hazard recognition and evaluation are considered as meeting the qualifications of safety and health inspectors. For those working environments where there are less complex hazards, such safety and health specializations as cited above may not be*

[169] https://www.osha.gov/pls/oshaweb/owadisp.show_document?p_table=STANDARDS&p_id=9760
[170] http://actrav.itcilo.org/actrav-english/telearn/global/ilo/code/responsi.htm

required, but inspectors in such environments shall have sufficient documented training and/or experience in the safety and health hazards of the workplace involved to recognize and evaluate those particular hazards and to suggest general abatement procedures. All inspection personnel must be provided the equipment necessary to conduct a thorough inspection of the workplace involved.

1960.25(b)
Each agency which has workplaces containing information classified in the interest of national security shall provide access to safety and health inspectors who have obtained the appropriate security clearance.

1960.25(c)
*All areas and operations of each workplace, **including office operations**, shall be inspected at least **annually**. More frequent inspections shall be conducted in all workplaces where there is an increased risk of accident, injury, or illness due to the nature of the work performed. Sufficient unannounced inspections and unannounced follow-up inspections should be conducted by the agency to ensure the identification and abatement of hazardous conditions.*

1960.25(d)
When situations arise involving multiple agencies' responsibilities for conditions affecting employee safety and health, coordination of inspection functions is encouraged.

The qualifications are vague. There are no explicit requirements for inspectors to have training in process safety, which is very different than personnel safety. The regulation does not explicitly require hazardous materials or reactive chemicals training and awareness. Additionally, the regulation provides that facilities that are not considered to have complex hazards may be inspected by OSHA personnel with ever more relaxed training standards. Depending on the interpretation used by OSHA, this may allow inspectors with almost no safety and hazards evaluation training to inspect non-PSM facilities, like the one in West. OSHA also needs to have a sufficient number of adequately trained inspectors.

<u>Inspection issues</u>
Two things should be noticed here: 1) the definition for "best practices" is not clear and there is really no consistent best practices worldwide or nationwide; 2) it has to be understood that best practices are not law, and the facilities are responsible for deciding whether to adopt the suggestions/recommendations from inspectors. If the facilities decide not to adopt the guidance for best practices, they are still responsible for control risks to acceptable level.

Inspectors should focus mainly on inspecting the facilities' compliance with regulations, and they can provide guidance for facilities on best practices. Also, the inspection requirements are not clear enough on best practices. Given situations of current inspections, it might be difficult for inspectors to provide best practice guidance to facilities beyond regulatory requirements.

Third-party auditing and inspection systems:

Federal agencies could create verifiable and certified third-party auditing and inspection systems. Such a system could be implemented using the ISO 9000 family of standards as a basis. The ISO 9000 family pertains to developing and maintaining quality management systems within companies that provide either physical goods or services to clients.

Standard/Document	Title
ISO 9000:2005	Quality Management Systems - Fundamentals and Vocabulary
ISO 9001:2008	Quality Management Systems - Requirements
ISO 9004:2000	Quality Management Systems - Guidelines for Performance Improvements
ISO 10001:2007	Quality Management - Customer Satisfaction - Guidelines for codes of conduct for organizations
ISO 10002:2004	Quality Management - Customer Satisfaction - Guidelines for complaints handling in organizations
ISO 10003:2007	Quality Management - Customer Satisfaction - Guidelines for dispute resolution external to the organization
ISO 10005: 2005	Quality Management -Guidelines for Quality Plans
ISO 10006:2003	Quality Management - Guidelines for Quality Management in Projects
ISO 10007:2003	Quality Management -Guidelines for configuration management
ISO 10012:2003	Measurement management systems – Requirements for measurement processes and measuring equipment
ISO 10014:2006	Quality management – Guidelines for realizing financial and economic benefits
ISO 10015:1999	Quality management – Guidelines for training
ISO 10019:2005	5 Guidelines for the selection of quality management system consultants and use of their services
ISO 19011:2002	Guidelines for quality and/or environmental management systems auditing

The ISO standards are reviewed and updated as necessary every 5 years to maintain their applicability and relevance. ISO does not perform certifications. ISO writes the standards and distributes them to companies, but external organizations perform audits and grant certifications[171, 172]. In a similar manner, EPA, OSHA, USCG, and PHMSA could write regulations which would then be enforced largely by inspections performed by third party companies.

[171] http://www.iso.org/iso/iso_9000_selection_and_use-2009.pdf

[172] http://www.iso.org/iso/home/standards/certification.htm

Some insurance companies employ risk engineers and safety specialists who are tasked with inspecting the facilities of companies that may be seeking insurance coverage. These risk specialists are responsible for identifying the level of risk present in a company and reporting to the insurance provider so that rates can be set appropriately. Some insurance providers allow companies to hire them to perform third party inspections and report on their findings, even if the company is not seeking coverage. These inspections allow the companies to identify hazards and improve their safety performance. Companies can be incentivized to act on recommendations arising from the inspections by offering lower insurance premiums[173, 174].

Some companies also attempt to implement pseudo-third-party inspections by sending other employees from other units or facilities to inspect and audit a facility. The assumption is that bias will be eliminated because the inspectors have no loyalty to the specific facility or unit they are inspecting and are instead pursuing the interests of the company. The advantage is that highly knowledgeable individuals are completing the reviews and can quickly focus on areas of concerns.

[173] http://www.zurich.com/productsservices/corporations/riskengineering/riskengineering.htm
[174] http://www.zurich.com/riskengineering/global/services/services_overview

4. Extend Mechanical Integrity Requirements to Cover Any Safety-Critical Equipment

a. Should EPA amend the mechanical integrity provisions of the RMP rule to explicitly cover all safety critical process equipment? If so, what type(s) of equipment? Did you identify safety-critical equipment not explicitly covered under § 68.73? If so, how did your facility determine that the equipment was safety-critical, and does your facility treat the equipment as if it were RMP-covered for safety or other reasons? Did you identify the equipment as safety-critical through an RMP process hazard analysis?

Response:

We believe that the mechanical integrity element of the 40 CFR 68.73 should be clarified[175]. An important component of the clarification should be to define safety-critical equipment, the failure of which could lead to a catastrophic release of the hazardous substance. Our recommendation is to add "Safety-Critical Equipment" to the mechanical integrity equipment list and in addition provide clear and unambiguous definition of what constitutes a "Safety-Critical Equipment." That would ensure that any equipment that is not in the list, but meets the criteria and definition of "Safety-Critical Equipment" for a particular process would be included under the 40 CFR part 68.73 Mechanical integrity list and the associated compliance requirements. It is equally important to have a risk-based approach to identify the scope of asset integrity program[176].

There is other equipment listed for mechanical integrity consideration by different agencies. Some of the examples of equipment that are not included in the current standard are: fire protection equipment, testing equipment such as calibrators, test pressure gages. Also structural components that are generally used to support the weight or movement of fixed or rotating equipment are not in the list[177]. Another suggestion is the critical utilities whose failure might lead to a release of EPA 40 CFR-covered materials.

Other example: API's[178] Recommended Practices 580-Risk Based Inspection (RBI) 68 is focused on maintaining the mechanical integrity of pressure equipment items and minimizing the risk of loss of containment due to deterioration. Equipment that are covered include [The highlighted equipment are not specifically called out in the current EPA 40 CFR part 68.73]:

1. Pressure Vessels,
2. Process Piping,
3. Storage tanks,

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[175] Mary Kay O Connor Process Safety Center, "Response to Request for Information from OSHA" 2014.
[176] Guidelines for Risk-Based Process Safety, CCPS. http://www.aiche.org/ccps
[177] AcuTech Consulting Group. "Possible Changes to OSHA's Process Safety Management." 2013.
[178] API recommended practice 580, 2009

4. Rotating equipment,
5. Boiler and heaters,
6. Heat exchangers (shell, floating heads),
7. Pressure relief devices

Supporting Information:

During OSHA PSM RFI one of the common feedback received from industry was to define safety critical equipment. For example, a commenter from Chevron Corporation stated: *The basic intent of the mechanical integrity provision in the proposed rule is to ensure that highly hazardous chemicals are contained within the process and not released in an uncontrolled manner. To achieve this intent, Chevron believes OSHA should use performance language and require the employer to develop and maintain a list of equipment that the employer has determined to be critical to process safety. This equipment would be subject to the provisions of paragraph (j).*[179] Since EPA has the similar equipment list the above comment is appropriate for EPA as well.

Current Standard: CFR § 68.73 Mechanical Integrity

(a) ***Application.*** Paragraphs (b) through (f) of this section apply to the following process equipment:
(1) Pressure vessels and storage tanks;
(2) Piping systems (including piping components such as valves);
(3) Relief and vent systems and devices;
(4) Emergency shutdown systems;
(5) Controls (including monitoring devices and sensors, alarms, and interlocks) and,
(6) Pumps.
(b) ***Written procedures.*** The owner or operator shall establish and implement written procedures to maintain the on-going integrity of process equipment.
(c) ***Training for process maintenance activities.*** The owner or operator shall train each employee involved in maintaining the on-going integrity of process equipment in an overview of that process and its hazards and in the procedures applicable to the employee's job tasks to assure that the employee can perform the job tasks in a safe manner.
(d) ***Inspection and testing.***
(1) Inspections and tests shall be performed on process equipment.
(2) Inspection and testing procedures shall follow recognized and generally accepted good engineering practices.
(3) The frequency of inspections and tests of process equipment shall be consistent with applicable manufacturers' recommendations and good engineering practices, and more frequently if determined to be necessary by prior operating experience.
(4) The owner or operator shall document each inspection and test that has been performed on process equipment. The documentation shall identify the date of the inspection or test, the name of the person who performed the inspection or test, the serial number or other identifier of the

[179]https://www.osha.gov/pls/oshaweb/owadisp.show_document?p_table=PREAMBLES&p_id=1041

equipment on which the inspection or test was performed, a description of the inspection or test performed, and the results of the inspection or test.
(e) ***Equipment deficiencies.*** The owner or operator shall correct deficiencies in equipment that are outside acceptable limits (defined by the process safety information in § 68.65) before further use or in a safe and timely manner when necessary means are taken to assure safe operation.
(f) ***Quality assurance.***
(1) In the construction of new plants and equipment, the owner or operator shall assure that equipment as it is fabricated is suitable for the process application for which they will be used.
(2) Appropriate checks and inspections shall be performed to assure that equipment is installed properly and consistent with design specifications and the manufacturer's instructions.
(3) The owner or operator shall assure that maintenance materials, spare parts and equipment are suitable for the process application for which they will be used.

b. Please provide any data or information on accidental releases, near misses, or other safety-related incidents related to the mechanical integrity of safety-critical equipment not explicitly covered under § 68.73.

Response:

We could not find any data related to the mechanical integrity of safety-critical equipment not explicitly covered under § 68.73. However, based on a review of OSHA citation records, until 2011, 22.5% of the PSM citations were for violations of the various requirements of mechanical integrity element[180].

c. Would expanding the scope of § 68.73 to explicitly cover the integrity of all equipment critical to process safety make it more likely to prevent accidental releases?

Response:

As discussed in **Question a.** we believe it is not practical to add all possible equipment in this list. However, adding "Safety-Critical Equipment" to the list and providing clear and unambiguous definition of what constitutes a "Safety-Critical Equipment" will help in preventing accidental releases. An example of definition of the safety critical equipment is: the failure of which could lead to a catastrophic release of the hazardous substance. Determination of scope of the safety critical equipment must be through specific guidelines applying risk-based approach.

[180] Lay, J., "An Update on OSHA's Chemical PSM National Emphasis Program." N.p., n.d. Web. 27 Feb 2014.

It can definitely be argued that having a proper mechanical integrity equipment list (which is developed applying risk-based approach to identify the safety-critical equipment) will add a strong protective barrier for preventing accidental releases.

Supporting Information:
CCPS Guidelines[181] requires the determination of the scope of the asset integrity element. Equipment that contains hazardous materials, or safety/utility systems that help prevent or mitigate the effects of a catastrophic release of a hazardous material or a sudden release of energy, should be included in the scope of the asset integrity element. Some companies limit the list of equipment covered by the asset integrity element as much as possible based on a narrow interpretation of regulatory requirements. However, a risk-based approach to process safety requires a more holistic view, basing decisions regarding the scope of this element on the risk associated with equipment failure and/or failure modes. Regardless, the policy governing this element should clearly state management's intent for including or excluding equipment from the asset integrity program. For example, "safety systems and critical utility systems that help prevent or mitigate incidents (l) are capable of performing their intended function and (2) will operate when needed. Thus, maintaining the performance of the pumps and fans for a scrubber that should mitigate a release of toxic gas, and maintaining the required concentration of caustic in the scrubber bottoms, are activities that fall under the asset integrity element, even though the related work activities may be performed by operators and described in operating rather than maintenance procedures."

d. Should EPA add additional requirements to the mechanical integrity provisions, or clarify any existing provisions? For example, should the Agency require that certain types of covered facilities install emergency shutdown systems, such as redundant power supplies, emergency flares, vents, or scrubbers, etc., in order to prevent accidental releases resulting from uncontrolled emergency shutdowns?

Response:

As discussed earlier, we believe that the mechanical integrity element of the 40 CFR 68.73 should be clarified. Instead of adding additional requirements to the mechanical integrity provision, clarifying existing provisions or asking the facility's to determine the scope of asset integrity element is more practical. The EPA regulation does not explicitly require that all covered sources install emergency shutdown systems. But clear definition of safety-critical equipment and a defined scope of asset integrity elements should be sufficient for the facility to add an emergency shutdown system to the mechanical integrity provision when necessary.

Supporting Information**:**

Same as Question a.

[181] Guidelines for Risk-Based Process Safety, CCPS. http://www.aiche.org/ccps

e. Are there any other provisions of this section that should be enhanced or clarified? Does labeling § 68.73 as "Mechanical Integrity" cause owners and operators to disregard or neglect the maintenance, functionality, or integrity of process components that would not typically be considered "mechanical" components, such as electrical and computer systems?

Response:

Some companies limit the list of equipment covered by the asset integrity element as much as possible based on a narrow interpretation of regulatory requirements[182]. Clear definition of Safety critical equipment will help in removing the ambiguity element to prevent misuse of the guidelines. For example, if a facility has a computer system whose failure could lead a catastrophic release, by definition of safety critical equipment it must be considered under EPA mechanical integrity provision.

f. Are there any special circumstances involving small entities that EPA should consider with respect to revising the mechanical integrity provisions of the RMP?

Response:

EPA should apply appropriate economic analysis technique to identify the economic impacts of revising the mechanical integrity provision for large and small entities.

[182] Guidelines for Risk-Based Process Safety, CCPS. http://www.aiche.org/ccps

5. Require Owners and Operators to Manage Organizational Changes

a. What do you consider to be an organizational change within the context of process safety management practices? For example, would you consider the following, or similar, changes to be organizational changes: reducing the number of operators in a shift; changing from 5-day to 7-day operations; changing from 8-hour to 12-hour operator shifts; replacing a unit manager; reducing the facility operations or maintenance budget; relocating a technical group to a remote corporate location; changing a supervisory or compensation structure; or hiring contractors to do work formerly performed by employees of the regulated facility? Are there other examples of organizational changes that may be relevant to safety management practices?

Response:

We recommend that following elements be considered as an organizational change within the context of process safety management. However, the clear definitions with examples should be established for such organizational changes, which should be included in the proposed revision[183].

- personnel changes, including changes in staffing levels or staff experience

  Changes in staffing level and staff experience have significant impact on process safety. Examples of staffing level changes are giving less experienced personnel more serious responsibility, delayering etc.[184] The Challenger incident and the tragedy of Bhopal had downsizing as one of the underlying causes[185].

  However it must be clarified; personnel changes that have impact on process safety should only be considered as an organizational change. For example: hiring a qualified person following the job description for replacing position of a previous employee is not an organizational change.

- major reorganizations
- major organizational changes such as mergers or divestment
- policy changes

[183] Mary Kay O Connor Process Safety Center, "Response to Request for Information from OSHA," 2014.
[184] Kletz, T., 2003. "The Management of Organisational Change," Symposium Series 149, IChemE.
[185]Philley, J., 2002. "Potential impacts to process safety management by mergers, acquisitions, downsizing and re-engineering" Process Safety Progress, Vol 21

Studies have shown major re-organizations, mergers, downsizing and policy changes to have significant impact on process safety management practices[186,187]. "In re-organizations, total staff headcount may remain constant, but individual duties and responsibilities can change significantly. In mergers/acquisitions, there is sometimes an initial duplication or overlap of staff and process safety management performance criteria standards"[188]. It is therefore very important to provide clear definitions and examples to establish elements of organizational changes.

Based on above discussion following are the categorization of the examples given by EPA as organizational change:

- **Staffing levels:** *Reducing the number of operators in a shift; changing from 5-day to 7-day operations; changing from 8-hour to 12-hour operator shifts; replacing a unit manager; reducing the facility operations or maintenance budget;*

  Explanation: From earlier discussion it is clear staffing level change can have significant impact on process safety. The Challenger incident and the tragedy of Bhopal had downsizing as one of the underlying causes.[189] Hence these are valid examples of organizational change.
- **Personnel changes including changes in staffing levels or staff experience**: *relocating a technical group to a remote corporate location;*

  Explanation: In Trevor Kletz's discussion about management of organizational change he pointed out relocating technical group to a remote location can affect process safety performance. The Longford incident is an example of that[190].
- **Major reorganizations**: *changing a supervisory or hiring contractors to do work formerly performed by employees of the regulated facility*

  Explanation: Reorganizations also have impact on process safety management. The Hickson & Welch accident in 1992 is an example of impact on changing a supervisory [191]

Supporting Information

Current Standard: § 68.75 Management of change.

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[186] Philley, J., 2002. "Potential impacts to process safety management by mergers, acquisitions, downsizing and re-engineering" Process Safety Progress, Vol 21

[187] U.S. Chemical Safety And Hazard Investigation Board, Investigation Report Refinery Explosion And Fire, Report No. 2005-04-I-TX

[188] Philley, J., 2002. "Potential impacts to process safety management by mergers, acquisitions, downsizing and re-engineering" Process Safety Progress, Vol 21

[189] "Silent Safety Program-Challenger," The Presidential Commission on the Space Shuttle Challenger Accident Report, Chapter 7, pp 152-161, June 1986.

[190] The Esso Longford gas plant accident, report of the Longford Royal Commission," Government Printer , State of Victoria, Australia, (available on Internet)

[191] The fire at Hickson & Welch Ltd: A report of the investigation by the Health and Safety Executive into the fatal fire at Hickson and Welch Ltd, Castleford on 21 September 1992 Report HSE Books 1994 ISBN 0 7176 0702 X.

(a) The owner or operator shall establish and implement written procedures to manage changes (except for "replacements in kind") to process chemicals, technology, equipment, and procedures; and, changes to stationary sources that affect a covered process.
(b) The procedures shall assure that the following considerations are addressed prior to any change:
(1) The technical basis for the proposed change;
(2) Impact of change on safety and health;
(3) Modifications to operating procedures;
(4) Necessary time period for the change; and,
(5) Authorization requirements for the proposed change.
(c) Employees involved in operating a process and maintenance and contract employees whose job tasks will be affected by a change in the process shall be informed of, and trained in, the change prior to start-up of the process or affected part of the process.
(d) If a change covered by this paragraph results in a change in the process safety information required by § 68.65 of this part, such information shall be updated accordingly.
(e) If a change covered by this paragraph results in a change in the operating procedures or practices required by § 68.69, such procedures or practices shall be updated accordingly

c. Would clarifying § 68.75 with an explicit requirement that employers manage organizational changes prevent accidental releases? What would be the economic impact of such a clarification? Are there any special circumstances involving small entities that EPA should consider with respect to this option?

Response:

Yes, clarifying 40 CFR 68.75 with specific requirements that employers manage organizational changes will help in risk management. This will definitely add to the barrier list for lowering the risk as low as reasonably practicable (ALARP). However, as mentioned earlier clear definitions with examples should be established for such organizational changes within the context of process safety management.

Supporting information:
Chemical safety board identifies several guidelines that emphasize on management of organizational changes such as CCPS (1992)[192] ; American Chemistry Council (CMA, 1998) [193] ; the Health and Safety Executive (2003) ; the Canadian Society for Chemical Engineering (2004)[194] ; and Contra Costa County in California (1999)[195]. A 2002 study conducted by Keren,

[192] CCPS, 1992. Plant Guidelines for Technical Management of Chemical Process Safety, AIChE.
[193] CMA, 1998. Management of Safety and Health During Organization Change ¨C A Resource Kit for Organizations Facing Change, Washington, D.C.
[194] Canadian Society for Chemical Engineers (CSChE), 2004. Managing the Health and Safety Impacts of Organizational Change, Ottawa, Ontario, Canada.

West, and Mannan[196] showed that only 44 percent of chemical processing companies in USA address organizational change in the management of change program. Also, Kletz (2003) has recommended evaluation and review of the impact of high-level organizational changes on safety and health, such as outsourcing, major re-organizations following mergers or downsizing.

e. What do you consider to be the best safety practices concerning management of organizational change?

Response:
Management of organizational change should be maintained/controlled systematically following proper risk-based analysis and handled by team of competent people. An example is given: the guidance for a 3-step framework for managing organizational changes. Step 1 - Getting organized for change, Step 2 - Assessing risks, Step 3 - Implementing and monitoring the change[197,198,199]

Supporting information:
HSE 2003 report discusses all the 3 steps in details. Below is a summary of the guidance-
Step 1 Getting organized

- Have a strong policy
- Make senior-level managers accountable
- Have a clear change-management procedure
- Communicate and include everyone
- Review and challenge

Step 2 Risk assessment

- Identify the people involved
- Identify all changes
- Assess the risks: The risk scenarios should sufficiently address risk associated with the change process rather than drawing some arbitrary degree of risk.
- Consider human factors, competence and workload
- Test scenarios

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[195] Contra Costa County, 1999. "Management of Change for Organizational Changes," Industrial Safety Ordinance Guidance Document, Section B, Ch. 7, http://www.cchealth.org/groups/hazmat/industrial_safety_ordinance_guidance.php.
[196] Keren, N., H.H. West, and M.S. Mannan, "Benchmarking MOC Practices in the Process Industries," Process Safety Progress, Volume 21, No.2, pp. 103-112.
[197]Health and Safety Executive (HSE), 2006a. Developing Process Safety Indicators: A Step-By-Step Guide For Chemical And Major Hazard Industries, U.K.: HSE Books.
[198] HSE, 2003a. Major Incident Investigation Report, BP Grangemouth, Scotland, U.K., http://www.hse.gov.uk/comah/bpgrange/contents.htm, retrieved January 13, 2007.
[199] HSE, 2003b, Organisational change and major accident hazards, Chemical Information Sheet No. CHIS7.

Step 3 Implementing and monitoring

- Provide enough resources to make the change safely
- Monitor risks during change
- Keep your plan under review, track actions
- Monitor performance after change
- Review your change policy

f. Please provide any data or information on accidents, near misses, or other safety related incidents involving the failure to manage organizational change. Would following management-of-change procedures under § 68.75 have prevented these incidents?

Response:

1. BP Texas City Refinery Explosion incident[200]

The **organizational changes** involved in this incident include decentralized process safety management structure, corporate mergers, leadership, and budget cuts, which were not evaluated and adversely impacted the process safety function.

2. Five employees were killed from fire while cleaning of a vessel containing potentially unstable sludge at Hickson & Welch[201] in 1992. One of the root cause identified behind the incident was reorganization before the accident. Because of recent company reorganization, the cleaning task had been organized by inexperienced team leaders reporting to an overworked area manager. The HSE incident report commented: 'Companies should review the workload and other implications to ensure that key personnel have adequate resources, including time and cover, to discharge their responsibilities.'

3. Also Kletz in one of his investigation studies on an incident similar to the BP Texas City identified immediate causes as failure to complete instrument repairs (the high level alarms did not activate); operator fatigue; and inadequate process knowledge. Kletz attributed the incident to changes in staffing levels and schedules, cutbacks, retirements, and internal reorganizations. He recommends "with changes to plants and processes, changes to organization should be subjected to control by a system…which covers…approval by competent people"[202].

In all of the above three examples, not following Management of change standards, or not having proper management of organizational change was one of the underlying reasons behind the incident. It is difficult to predict or give a direct statement saying, following the MOC-guidelines would have stopped this incidents. However, it can definitely be said having proper

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[200] U.S. Chemical Safety and Hazard Investigation Board, Investigation Report Refinery Explosion And Fire, Report No. 2005-04-I-TX

[201] The fire at Hickson & Welch Ltd: A report of the investigation by the Health and Safety Executive into the fatal fire at Hickson and Welch Ltd, Castleford on 21 September 1992 Report HSE Books 1994 ISBN 0 7176 0702 X

[202] Kletz, T., 2003. "The Management of Organisational Change," Symposium Series 149, IChemE.

management of change (including organizational change) will add a strong protective barrier for preventing a catastrophic incident.

6. Require Third-Party Compliance Audits

Overview

EPA seeks information on whether to revise 40 CFR 68.58 and 68.79 to require facility owners and operators to use a third-party for compliance audits, on whether requiring a third-party auditing process would increase protection of human health and the environment, and on whether the existing compliance audit requirements are sufficiently clear or if changes should be made to strengthen the audit requirements.

EPA RMP Compliance Audits
40 CFR 68.58 and 68.79[203]
"(a) The owner or operator shall certify that they have evaluated compliance with the provisions of this subpart at least every three years to verify that the procedures and practices developed under the rule are adequate and are being followed.
(b) The compliance audit shall be conducted by at least one person knowledgeable in the process.
(c) The owner or operator shall develop a report of the audit findings.
(d) The owner or operator shall promptly determine and document an appropriate response to each of the findings of the compliance audit and document that deficiencies have been corrected.
(e) The owner or operator shall retain the two (2) most recent compliance audit reports. This requirement does not apply to any compliance audit report that is more than five years old."

Questions

b) Please provide any data or information on accidents, near misses, or other safety related incidents that could have been prevented by conducting more effective compliance audits for operations covered under § 68.58 and § 68.79. What were the deficiencies in those audits? Were the audits in question conducted by in-house staff or a third party?

Response:

Yes, one of the well-recognized incidents, where reporting could have prevented the incident is that of BP Texas city incident.

Following the BP Texas city incident, it was identified that significant deficiencies existed in BP's site and corporate systems for measuring process safety performance, incident investigation and near-misses, and auditing system performance[204]. The process safety

[203] http://www.gpo.gov/fdsys/pkg/CFR-2000-title40-vol10/pdf/CFR-2000-title40-vol10-sec68-79.pdf
[204] http://www.csb.gov/assets/1/19/csbfinalreportbp.pdf

deficiencies were previously identifiable to BP based upon lessons from previous process safety incidents. However, it was noted that BP had not taken adequate actions to address the previous process safety incidents.

One of the main reasons that were quoted was that BP had not implemented an effective process safety audit system for its U.S. refineries and that there were concerns about auditor qualifications, audit scope, reliance on internal auditors, and the limited review of audit findings.

c) **Would revising § 68.58 and § 68.79 to require owners and operators of RMP regulated facilities to use a third-party for compliance audits help prevent accidental releases?**

Response:

Yes, a revision is required. However, a range of options should be considered for making the revision. This is explained as follows.

- A facility can be audited by a third-party audit that will require auditors from an independent organization, such as a consulting firm to perform the RMP audits.

- A facility can be also audited by auditors (meeting the qualification and competency level required by EPA), who are assigned from centralized corporate audit or safety/process safety group, or from another production facility within the company. However, care should be taken so that the auditors selected do not have any recent involvement with the implementation of the facility's RMP program. This is category of second party auditing.

- In situations where the facilities are small, having only one processing unit, and/or lacking a corporate office, or facilities where reasonably skilled personnel are removed, a third-party audit should be considered.

Due attention should be paid to check whether the auditors are competent for RMP audits. The auditor should have worked in RMP-related activities or should have considerable years of experience in RMP-related work. Although, it can be helpful in reducing hazards, third-party auditors have some disadvantages as well as discussed below.

- The third party auditors could be offering recommendations/engineering solutions to create additional work for themselves. EPA should ensure that there is complete independence and separation of the audit and implementation functions of the company.

- It is not certain that the audit findings will definitely lead to reduction of accidents. Reduction of hazards is a more comprehensive process and it not completely achieved

through auditing process. It requires implementation of the various factors that can lead to reduction of hazards. One such example of a factor which is difficult to address through audit finding is "safety culture". EPA should make sure that the audit process is comprehensive wherever possible.

d) Should EPA revise § 68.58 and § 68.79 to require owners and operators to use compliance auditors (internal or third-party) with certain minimum credentials or certifications? If so, what minimum credentials or certifications should the agency require?

Response:

- Yes, EPA should revise § 68.58 and § 68.79 to require owners and operators to use compliance auditors (internal or third-party) with certain minimum credentials or certifications. However, the audit process should not be restricted to certified personnel alone. The audit process can include personnel with experience in the process and procedures relating to the plant.
- Currently the following organizations/regulations have put forward auditor training requirements.

Organization Name	Document Name	Purpose and Scope
BSEE	COS-2-02[205]	Qualification and Competence Requirements for Audit Teams and Auditors Performing Third-party SEMS Audits of Deepwater Operations
International Organization for Standardization	ISO 17024 [206]	sets out criteria for an organization's certification program for individual persons
Qualification-based QMS Auditor Certification Scheme	RABSQA certifications	Qualification and training for Quality Management System (QMS) Auditor

[205] http://www.centerforoffshoresafety.org/documents/120813-cos-2-01-auditor-qual-and-comp-reqs.pdf
[206] CCPS. (2011). *Guidelines for Auditing Process Safety Management Systems* (2nd Edition, p. 960). Wiley-AIChE.

American Chemistry Council	RC205.04[207] Responsible Care Certification Auditor Qualification and Training Requirements	Apply to all auditors providing certification auditing services for RCMS (RC101) and RC14001 (RC151). Both focuses on environmental management system

- It is to be noted that there is no specific regulation/standard for the competency requirements of process safety management auditors. However, many private organizations provide training and certification for PSM auditors. Training is provided on the basis of different aspects of EPA's EMP and process experience. For example. performing audits on adequacy/appropriateness of required Process Hazard Analysis;

- EPA can modify to accommodate competency requirements for auditors. This can be similar to the BSEE SEMS auditor requirements and can be customized to the suit the EPA RMP program.

Supporting Information

A note on the BSEE SEMS Audits

BSEE has put forward well-defined structure for auditing. Given below are few documents that describe the auditing process of BSEE[208].

- ISO/IEC 17021: Conformity Assessments – Requirements for bodies providing audit and certification of management systems
- COS-1-01: COS SEMS RP 75 Audit Protocol
- COS-2-02: Training Program Requirements for Auditors and Audit Team Leads Performing Third-party SEMS Audits of Deepwater Operations
- COS-2-03: Requirements for Third-party SEMS Auditing and Certification of Deepwater Operations
- COS-2-04: Requirements for Accreditation of Audit Service Providers Performing SEMS Audits and Certification of Deepwater Operations
- ISO 19011: Guidelines auditing management systems

EPA should consider establishing competency requirements similar to BSEE. The competency requirements for auditors could include the following aspects.

- The auditors should have undergone formal and recognized training on EPA RMP audit procedures.

[207] http://responsiblecare.americanchemistry.com/ServicesResources/Certification-Process/RC20504.pdf

[208] http://www.centerforoffshoresafety.org/documents/120813-cos-2-01-auditor-qual-and-comp-reqs.pdf

- Auditors should meet specific knowledge and understanding of the elements of EPA RMP program and its implementation.
- The auditor should have worked in RMP-related activities or should have considerable years of experience in RMP-related work. RMP related audits include
  - RMP elements audit (done to check whether RMP elements are applied in a facility)
  - Detailed RMP performance audit or full compliance audit (to check the performance of RMP elements employed in a facility)

e) How should owners/operators of RMP-regulated facilities address the findings of the third-party auditor? Should EPA amend the RMP rule to require owners/operators to document how they addressed each of the findings of the third-party auditor? Should a timeframe for addressing those findings be included in the RMP regulation? Should EPA include a procedure for how an owner/operator may appeal the findings of the third-party auditor?

Response:

The timeframe to implement audit findings of RMP-regulated facilities may vary based on the following factors:

- Time duration of task
- Personnel available to address the task
- Availability and procedure for tracking the findings
- Management involvement
- Risk ranking associated with audit findings

Findings with urgent action

Findings with urgent action are included in the RMP regulation. However, a general guidance is provided in the following section for addressing urgent findings (CCPS, 2011).

- Findings with urgent action require special attention. The deficiencies identified in the audit should be addressed before the final audit reports are issued and action plans for audit findings are initiated.
- The action plans for urgent deficiency correction should involve the manager responsible for the audited facility or operation. The individual is responsible for addressing the deficiencies identified in the audit.
- There should be an established system for review and approval of the action plan by appropriate levels of management documented in the EPA audit program management system procedure.

General procedure to address audit findings

A procedure can be developed by EPA to address the findings of the audit. The purpose of this procedure can be to determine what actions are appropriate, and to establish priorities, timetables, resource allocations and requirements, and responsibilities. The CCPS has

established guidance on addressing audit finding. The procedure designed to manage recommendations should include the following aspects (CCPS, 2011).

1. **Schedule.** The management system for audit recommendations should have a defined schedule that describes the various dates for resolving the recommendation as well as implementing the final action item(s)

2. **Responsibility.** The management system for audit recommendations should identify who is responsible for each step of the resolution and implementation process

3. **Status.** The management system for audit recommendations should provide a clear indication of the status of the recommendation, *e.g.*, complete, pending technical review, awaiting final disposition, overdue, rejected

4. **Sorting and filtering.** The management system should be capable of sorting and filtering by schedule, responsibility, and status data, so that periodic metrics can be produced and reviewed. In particular, the management system should easily produce a list of recommendations where the required action has exceeded the scheduled dates and are overdue for resolution or implementation. A grading system can also be introduced based on the severity and time frame to address the findings

5. **Computerized system.** The EPA can suggest that the system for managing audit recommendations be computer based wherever possible. Software-based management systems offer many advantages, including ease of entry and modification of data; ease of access for those in distant locations who need to see and work with the information; ease of sorting, filtering, and reporting of the data and its variations; ease of storage; and ease of quick information retrieval and transmission over a wide area

6. **Security.** The management system should be capable of controlling access and editing the action plans for addressing the audit deficiencies.

7. **Communication.** The management system should facilitate the communication of audit results. This includes making basic audit results available to the employees and certain contractors as part of employee participation goals, as well as for use in process safety-related training and other similar activities.

f) Should EPA require facilities that have incidents or near misses to conduct a full compliance audit under § 68.58 or § 68.79, as appropriate? Would such a requirement create a perverse incentive to underreport incidents or near misses?

Response:

Requiring full compliance audits on facilities that have reported incidents or near-misses can create adverse behavior and lead to a perverse incentive to underreport incidents and near-misses. Hence, EPA mandated proper compliance audits with competent auditors on all RMP facilities should continue to be performed every three years. EPA could additionally strengthen the corrective actions for facilities that have incidents or near-misses.

g) During compliance inspections at multiple-process sources, EPA inspectors have noted that some owners or operators have audited only a subset of covered processes at the source. Should EPA clarify § 68.58 and § 68.79 to explicitly indicate that all covered processes must receive a full compliance audit at least every three years?

Response:

No, not all covered processes must receive a full compliance inspection at least every three years. But all covered facilities should be included in the sampling process each cycle.

The purpose of the compliance inspection is to insure compliance with the facility's work standards and evaluate their safety performance. However, it is difficult to review each element in a facility even with the availability of complete information even by a highly competent inspector. In such situations the inspector needs to examine a representative sample or cross-section of the various types of elements that need to be audited in a facility. This sampling should be based on the size of facility and the critical issues associated with the facility through proper analysis and research. Additionally due attention must be paid to ensure that all facilities are included in the audit sampling process.

h) Does the identity of the auditor (*e.g.*, in-house, contractor, professionally-certified, party licensed by EPA) affect the credibility of the audit for potentially impacted communities?

Response:

No, the identity of the auditor does not affect the credibility of the audit for potential impacted communities.

The potentially impacted communities are interpreted here as public communities surrounding a facility.

An audit is usually considered as a procedure to evaluate and check the risk and safety management systems. Ultimately, the credibility of the facility is established not by the identity of the auditor, but by a lot of other factors (including past incident history and status of communications and trust between the facility and the community). If the facility has established previous credibility, then the credibility of the auditors is rather easily established irrespective of the identity of auditors. The facility can establish their credibility to public by initiating dialogue regarding the risk and safety aspects of the facility.

7. Effects of OSHA PSM Coverage on RMP Applicability

c. Should RMP-covered municipal water and wastewater plants that are not eligible for Program 1 always be subject to RMP Program 3, regardless of whether or not they are located in a state with a Federally-delegated OSHA program? Why or why not?

Rationale/History:

The facilities operated by state or municipal government employees in states without delegated OSHA programs are generally not covered by OSHA PSM. These facilities are then generally subject to RMP Program 2 by definition since they are not covered by PSM. However, it may be peculiar that two identical facilities in different states may be subject to different program levels, and private industry sectors with such chemicals and quantities are always subject to Program 3 because of high risk to public.

Response:

Two identical facilities in different states should be covered under the same RMP program level for uniform regulation compliance and management, but this is not a guarantee for improved safety.

The incident data of municipal water and wastewater plants can be divided into Program 1, Program 2 and Program 3 covered facilities. However, Program 3 covered facilities did not show clear better safety performance than Program 2 covered. Moreover, though the statistical sample is small, Program 1 covered facilities which require least requirements have no RMP incident in these years.

As stated in Chlorine Gas Letter EPA April 2013[209], EPA visited numerous water and wastewater plants in New England (4 Federal OSHA states and 2 states with a delegated OSHA program, that was including both Program 2 and Program 3 covered facilities) to determine regulation compliance and found many facilities did not manage hazardous substances safely. Therefore, simply moving Program 2 covered facilities to Program 3 only may not promote safety. The keys are implementation and compliance of the regulations strictly.

Supporting information:

Based on NAICS code, water and wastewater plants are 22131 and 22132 respectively. The respective facility numbers for different Program levels are listed in the table below. Due to high quantities and high toxicities, there are few Program 1 covered facilities.

[209] Chlorine Gas Letter EPA April 2013

# of facilities* in US[210]	Program 1	Program 2	Program 3
22131 Water Supply and Irrigation Systems	34	990	1265
22132 Sewage Treatment Facilities	17	548	949

*including deregistered facilities, data was from rtk_net, August, 2014
* There may be more than one NAICS process in some facilities

The following list includes the chemicals regulated under EPA RMP and OSHA PSM that are commonly used at water and wastewater plants.

Chemical	EPA Threshold Quantity	OSHA Threshold Quantity
Chlorine	2,500 pounds	1,500 pounds
Anhydrous Ammonia	10,000 pounds	10,000 pounds
Aqueous Ammonia (concentration 20% or greater)	20,000 pounds	15,000 pounds (>44%)
Anhydrous Sulfur Dioxide	5,000 pounds	1,000 pounds (Liquid)
Methane	10,000 pounds	10,000 pounds

EPA's threshold quantities are generally equal or higher than OSHA's so it is possible that a process is subject to PSM but not covered by RMP. On the other hand, EPA RMP covers aqueous ammonia at or above 20%, which is 44% for OSHA PSM. Therefore, an aqueous ammonia process may be only subject to RMP regulation.

Among those RMP-covered municipal water and wastewater plants, some are also covered by OSHA PSM and thus are subject to Program 3 because the facilities are in states with delegated OSHA programs. The states with and without delegated OSHA programs are listed in following tables.

Federal OSHA states which do not cover public sector employees[211]

Alabama	Georgia	Missouri	Ohio	West Virginia
Arkansas	Idaho	Mississippi	Oklahoma	Wisconsin
Colorado	Kansas	Montana	Pennsylvania	
Delaware	Louisiana	Nebraska	Rhode Island	
DC	Maine	New Hampshire	South Dakota	
Florida	Massachusetts	North Dakota	Texas	

[210] http://www.rtknet.org/db/rmp/search
[211] https://www.osha.gov/dcsp/osp/faq.html#oshaprogram

States with a delegated OSHA program which cover public sector employees

Alaska	Indiana	Nevada	Puerto Rico	Virginia
Arizona	Iowa	New Mexico	South Carolina	Washington
California	Kentucky	New Jersey	Tennessee	Wyoming
Connecticut	Maryland	New York	Utah	
Hawaii	Michigan	North Carolina	Vermont	
Illinois	Minnesota	Oregon	Virgin Islands	

By specifying the states and other parameters, it was able to separate RMP incidents from THE RIGHT-TO-KNOW NETWORK as follows[212]

NAICS: **22131** Water Supply and Irrigation Systems	Facilities in **federal OSHA states**			Facilities in states with a **delegated OSHA** program		
	Program 1	Program 2	Program 3	Program 1	Program 2	Program 3
Number of facilities*	15	887	418	18	103	847
Number of facilities with RMP Accident	0	23 (2.6%)	**26 (6.2%)**	0	2 (1.9%)	**24 (2.8%)**
Number of RMP Accidents	0	31	**43**	0	**4**	30
RMP Accident Flammable (lbs)	0	0	**3501**	0	0	0
RMP Accident Toxic (lbs)	0	23,016	**15,152**	0	608	9,812
RMP Accident Deaths	0	0	0	0	0	0
RMP Accident Injuries	0	21	**38**	0	3	**28**
RMP Accident Evacuated/Sheltering In Place	0	606	**1,009**	0	0	**200**
RMP Accident Property Damage	0	$250,000	**$3,374,000**	0	0	**$29,153**

*including deregistered facilities, data was from rtk_net, August, 2014

For Water Supply and Irrigation Systems industry, it may be stated that facilities in states with a delegated OSHA program have a better safety record (especially for Program 3 covered facilities). However, it is not clear that Program 3 covered facilities can show less incidents and consequences than Program 2 covered. Moreover, there was no RMP incident in Program 1 covered facilities which require less management and prevention steps than Program 2 and Program 3, although the number of Program 1 covered facilities is small.

[212] http://www.rtknet.org/db/rmp/search

NAICS: **22132** Sewage Treatment Facilities	Facilities in **federal OSHA states**			Facilities in states with a **delegated OSHA** program		
	Program 1	Program 2	Program 3	Program 1	Program 2	Program 3
Number of facilities*	7	515	299	9	33	650
Number of facilities with RMP Accident	0	19 (3.7%)	**13 (4.3%)**	0	**2 (6.1%)**	26 (4.0%)
Number of RMP Accidents	0	24	**24**	0	**12**	32
RMP Accident Flammable (lbs)	0	0	**2,334**	0	0	0
RMP Accident Toxic (lbs)	0	**8,029**	2,259	0	183	**234,413**
RMP Accident Deaths	0	0	0	0	0	0
RMP Accident Injuries	0	18	**22**	0	0	**30**
RMP Accident Evacuated/Sheltering In Place	0	61	**511**	0	**350**	564
RMP Accident Property Damage	0	$3,020,000	**$2,003,800**	0	0	**$155,700**

*including deregistered facilities, data was from rtk_net, August, 2014

For Sewage Treatment Facilities, again, it is not clear that Program 3 covered facilities can show less incidents and consequences than Program 2 covered. Moreover, there was also no RMP incident in Program 1 covered facilities which require less management and prevention steps than Program 2 and Program 3, although the number of Program 1 covered facilities is small.

d. If OSHA restricts its retail exemption to facilities selling regulated substances in small containers, should EPA eliminate RMP Program level 2 entirely or alternatively, modify Program 2 prevention elements or otherwise change the eligibility criteria for Program 2? If so, why?

Rationale/History:
If OSHA restricts its retail exemption to facilities selling regulated substances in small containers, and EPA excludes municipal water and wastewater plants from RMP Program 2, there would be only 200 processes remain eligible for Program 2.

Response:

As indicated by the incident information above, more strict prevention elements (Program 3) did not promote safety significantly. The key issue is how to implement the current regulations. However, it is recommended to look into incident and release histories from the 200 facilities. If they maintain a good safety record, it may be not necessary to modify the Program 2 criteria to avoid documentation burdens.

e. Would eliminating Program level 2 simplify rule compliance for the regulated universe and improve human and environmental health and safety, or does the current three-tiered prevention program framework under the RMP provide an appropriate level of protection?

Response:

EPA RMP has been implemented for more than 10 years, so most facilities should be familiar with current standards and already submitted required prevention programs. Eliminating Program level 2 may just create confusion and make additional documentation and implementation burdens to those facilities eligible for Program 2. And again, the previous incident tables showed the three-tiered prevention program framework would be appropriate.

f. What would be the economic impacts of modifying or eliminating Program level 2? Are there any special circumstances involving small entities that EPA should consider with respect to modifying or eliminating Program 2?

Response:
When EPA needs to make any change to current standards, EPA may need to provide assistance for small entities (*i.e.,* Number of Full Time Employees is small) to comply with the modification. Using water and wastewater plants as an example, Number of Full Time Employees (FTE) of two-third of water plants and one-half of wastewater plants which are under RMP Program level 2 are less than ten. It would be hard for them to comply with new program shortly. Moreover, in the twenty most commonly reported NAICS codes facilities, eight of them had an average FTE number smaller than 21, indicating there were a lot of small entities.

The main difference between Program 2 and Program 3 is prevention program. Program 3 requires five additional prevention program elements not required under Program 2 and the seven more rigorous versions of the Program 2 elements. As mentioned above, simply moving Program 2 covered processes to Program 3 or modification of Program 2 may not promote safety significantly. However, it will cause documentation burdens and confusion which are negative impacts.

Supporting information:

	Facilities under 22131	Facilities under 22132
Total facilities under Program 2	990	548
Number of Full Time Employees		
0 to 9	667	276
10 to 19	186	135
20 to 29	60	51
30 to 49	44	43
50 to 99	23	27
At or above 100	10	16

*including deregistered facilities (Source: rtk_net, August, 2014)

Twenty most commonly reported NAICS codes and characteristics of the facilities reporting them in 2004-2005[213].

NAICS DESCRIPTION	NAICS Code	Number of Filers	Mean FTEs of Filing Facilities
Farm Supplies Merchant Wholesalers	42491	3,039	6
Water Supply and Irrigation Systems	22131	1,507	190
Sewage Treatment Facilities	22132	971	219
Refrigerated Warehousing and Storage	49312	626	218
Other Chemical and Allied Products Merchant Wholesalers	42469	393	21
Natural Gas Liquid Extraction	211112	391	16
Farm Product Warehousing and Storage	49313	284	3
Support Activities for Crop Production	11511	276	7
Poultry Processing	311615	231	821
All Other Basic Organic Chemical Manufacturing	325199	224	235
Plastics Material and Resin Manufacturing	325211	215	235
Other Farm Product Raw Material Merchant Wholesalers	42459	194	10
All Other Basic Inorganic Chemical Manufacturing	325188	168	210
Fossil Fuel Electric Power Generation	221112	149	99
Petroleum Refineries	32411	146	375
Industrial Gas Manufacturing	32512	122	46
Urethane and Other Foam Product (except Polystyrene) Manufacturing	32615	121	123
Meat Processed from Carcasses	311612	115	487
Petroleum Bulk Stations and Terminals	42471	114	17
Corn Farming	11115	104	7

[213] 2007 Accident Epidemiology and the RMP Rule Learning from a Decade of Accident History Data for the U.S. Chemical Industry

D. Additional Items for which EPA Requests Information

1. Safer Technology and Alternative Analysis

A. Should EPA require a safer alternatives options analysis either as a new prevention program element, as part of the existing PHA/Hazard Review element, or as a separate new requirement under CAA section 112(r)?

Response:

We recommend that EPA should not require a safer alternative options analysis, neither as a new prevention program element nor as a part of the existing PHA/Hazard Review element, nor as a separate requirement under CAA section 112(r). The PHA/Hazard Review element of RMP has requirements of recommending safer alternatives for process, controls, and other safety features for making the process facility safer. The PHA teams that perform the hazard analysis are also very highly skilled in hazard identification and the process of the plant and hence, they are highly skilled in giving recommendations. EPA may consider requiring the facility owner/operator to ensure that the people who are a part of the PHA team should be aware of and/or trained on inherently safer technologies and its related concepts.

Supporting Information:
40 CFR 68.67[214] and 29 CFR 1910.119(e)[215] describes the process of process hazard analysis. It requires the team to give recommendations to the facility (40 CFR 68.67(e)) and also directs the facility to heed to those recommendations. 40 CFR 68.67(d) describes the composition of the team that does the PHA. 40 CFR 68.10 establishes the applicability of the different programs levels of RMP for the regulated processes. So the processes covered by the program level 3 are required to do the PHA and the program level 1 and 2 processes have hazard assessments.

These hazard assessments and especially PHA consume a lot of time to undertake and maintain[216]. Adding safer alternative options analysis as a separate and mandatory program element of RMP or as a part of existing PHA/Hazard Analysis, may add unnecessary analysis and hence time and money at some parts of the hazard analysis.

"Change in "technology" is one aspect of inherent safety. The term inherently safer technology (IST) has received considerable attention in recent years, but it is only one of many approaches that may be employed to achieve risk reduction. A successful approach to changing technology in this area will come about through a holistic application of safety analysis that extends from the top to the bottom of the organization, designing safer systems that include safer practices

[214] http://www.epa.gov/ceppo/web/docs/chem/Appendix-A-final.pdf
[215]https://www.osha.gov/pls/oshaweb/owadisp.show_document?p_table=STANDARDS&p_id=9760
[216] Judy A. Perry, Molly R. Myers, Streamline Your Process Hazard Analysis, www.aiche.org/cep, January 2013.

and an organizational culture. It should also be noted that the safest, most environmentally benign process choice may not be unequivocally identified." [217]

B. How should safer alternatives be defined if it were to be a requirement under CAA section 112(r) regulations? What specifically should a safer alternatives analysis require and how would this differ from what is already required under other provisions of the RMP?

Response:

As stated earlier, we do not recommend adding a regulatory requirement for safer alternatives analysis under CAA section 112(r). The identification and evaluation of a safer alternative is not an off-the-shelf concept, but requires a holistic and often complex evaluation involving various factors. As such, it does not lend itself very well to a regulatory approach. Improper implementation of a seemingly safer alternative may lead to undesired consequences. **The safer alternative should decrease the overall risk of the process.** Many procedures are there to evaluate the total quantitative risk of the facility[218]. Then the limitation of number of alternatives should be considered or the risk limit, if achieved, consideration of the safer alternatives should be exempted. The total overall risk of the process can also be reduced by using risk-based layers of protection approach.

Supporting information:
40 CFR 68.67[219] and 29 CFR 1910.119(e)[220] describes the process of process hazard analysis. It requires the team to give recommendations to the facility (40 CFR 68.67(e)) and also directs the facility to heed to those recommendations. 40 CFR 68.67(d) describes the composition of the team that does the PHA. 40 CFR 68.10 establishes the applicability of the different programs levels of RMP for the regulated processes. So the processes covered by the program level 3 are required to do the PHA and the program level 1 and 2 processes have hazard assessments.

An article on the inherently safer technology review also states that the best possible solution should be provided by the operators and the engineering team for the inherent safety[221].

CCPS provides the following definition of Inherently Safer Technology[222]:

> *Inherently Safer Technology (IST), also known as Inherently Safer Design (ISD), permanently eliminates or reduces hazards to avoid or reduce the consequences of incidents. IST is a philosophy,*

217 http://www.acs.org/content/acs/en/policy/publicpolicies/promote/ist.html
218 Lees' Loss Prevention in the Process Industries: Hazard Identification, Assessment and Control
219 http://www.epa.gov/ceppo/web/docs/chem/Appendix-A-final.pdf
220https://www.osha.gov/pls/oshaweb/owadisp.show_document?p_table=STANDARDS&p_id=9760
221 http://cen.acs.org/articles/92/i10/Deconstructing-Inherently-Safer-Technology.html
222 https://www.aiche.org/sites/default/files/docs/embedded-pdf/ist_final_definition_report.pdf (Final Report:
Definition for Inherently Safer Technology in Production, Transportation, Storage, and Use)

applied to the design and operation life cycle, including manufacture, transport, storage, use, and disposal. IST is an iterative process that considers such options, including eliminating a hazard, reducing a hazard, substituting a less hazardous material, using less hazardous process conditions, and designing a process to reduce the potential for, or consequences of, human error, equipment failure, or intentional harm. Overall safe design and operation options cover a spectrum from inherent through passive, active and procedural risk management strategies. There is no clear boundary between IST and other strategies.

- *ISTs are relative: A technology can only be described as inherently safer when compared to a different technology, including a description of the hazard or set of hazards being considered, their location, and the potentially affected population. A technology may be inherently safer than another with respect to some hazards but inherently less safe with respect to others, and may not be safe enough to meet societal expectations.*

- *ISTs are based on an informed decision process: Because an option may be inherently safer with regard to some hazards and inherently less safe with regard to others, decisions about the optimum strategy for managing risks from all hazards are required. The decision process must consider the entire life cycle, the full spectrum of hazards and risks, and the potential for transfer of risk from one impacted population to another. Technical and economic feasibility of options must also be considered.*

C. How should industries determine if a safer alternative exists for their particular process? What safer alternative chemicals are available for the listed RMP chemicals and for ammonium nitrate?

Response:

We do not recommend the addition of safer alternative analysis options to be added into the PHA/Hazard Assessment or a separate element in the CAA act 112(r). There are provisions for recommending safer options from the PHA team. The PHA team consists of highly skilled personnel. There are requirements already in place on the composition of the team in the RMP. The team should capable of recommending safer alternatives after thorough analysis and proper technical considerations based on the process proved to be safer already. As discussed in the D1(a), the team for the PHA should be trained in safer alternative analysis.

A definitive conclusion that a safer alternative to a chemical exists is dependent on a holistic risk analysis that can be very case-specific. It is highly dependent on the process we are concerned about and about the application we are concerned about, which then will vary dependent on the chemical. Ammonium Nitrate is used as explosives, fertilizers, cooling agents

and many more industrial uses[223]. Every industry could have different types of process. For every process there could be different type of alternative chemical use.

Supporting Information:
40 CFR 68.67(d) describes the composition of the team that does the PHA. "The process hazard analysis shall be performed by a team with expertise in engineering and process operations, and the team shall include at least one employee who has experience and knowledge specific to the process being evaluated. Also, one member of the team must be knowledgeable in the specific process hazard analysis methodology being used".

D. What should facilities consider when determining if such technologies, when identified, are effective, available, and economically justified for their particular process or facility? Can the RMP national database, Lessons Learned information System or other federal databases be structured to promote the exchange of information both within industry and with other stakeholders on potentially safer technologies?

Response:

The first and foremost consideration would be to assess the total risk reduced by implementing that alternative. Secondly, the alternative should be easy to be applied. The technology should have been properly tested. The PHA for the new process should be done again to find the new hazards that could be generated or increased due to the alternative process.

We do not recommend the addition of the safer alternatives analysis in PHA or as a separate part to CAA section 112(r). But the development and use of such a database would be highly appreciated. RMP national database[224] stores the RMP plan submitted by each facility that is covered by RMP. This database will include all the important information about different practices followed by different companies, which could then be used for a statistical review for finding the most used safe practices, with the incident data with different facility, which can then be assumed to be the most available safer alternative, or the at least a database for different facilities to consider and analyze. Obviously, the legal procedure of the proprietary information should be followed. The other two databases mentioned are the Lesson's Learned Information System[225], which brings forth the people to give voluntary information about the best practices. This system, which could be implemented for the facilities, has already been started by the working committee formed by the DO 13650[226].

E. If EPA were to require facilities to undertake an evaluation of the potential to incorporate safer alternatives, what minimum criteria should this evaluation be required to meet? How

[223]http://www.ipni.net/publication/nss.nsf/0/67265A0AC9302CC5852579AF0076927A/$FILE/NSS-22%20Amm%20Nit.pdf
[224] http://rtknet.ombwatch.org/db/rmp/about
[225] https://www.llis.dhs.gov/ by Homeland Security
[226] https://www.llis.dhs.gov/topics/chemical-facility-safety-and-security.

would the evaluation determine if a particular alternative is feasible, cost effective and results in less risk? What requirements or incentives, if any, should there be for implementation of identified safer alternatives? How should any such requirements be structured and enforced?

Response:

We do not recommend the addition of safer alternatives analysis in PHA/ Hazard assessment or as a separate section to the CAA section 112(r).

F. Should EPA require facilities to use a safer alternatives evaluation method such as the CCPS Inherently Safer Technology Checklist?

Response:

We recommend that EPA should not require a safer alternative options analysis, neither as a new prevention program element nor as a part of the existing PHA/Hazard Review element, nor as a separate requirement under CAA section 112(r). Checklist analysis is already included in the PHA and is being widely used in the process facilities. Many questions pertaining to the safer alternatives are included in the checklist. Hence, we do not recommend the use of Checklist approach[227] separately for the Safer Technology analysis.

Supporting Information:
40 CFR 68.67 (b) describes the techniques that could be used for the PHA[228]. One of the techniques mentioned is the checklist analysis. 40 CFR 68.67(d) describes the composition of the team that does the PHA. "The process hazard analysis shall be performed by a team with expertise in engineering and process operations, and the team shall include at least one employee who has experience and knowledge specific to the process being evaluated. Also, one member of the team must be knowledgeable in the specific process hazard analysis methodology being used".

G. How should EPA and facilities address the risk tradeoffs that could result when changing a process to incorporate safer alternatives?

Response:

It is true that incorporating one safer practice in one part of the process may add or increase risk in other parts of the process and facility. The tradeoffs analysis is very complicated and should be carried out carefully. Addressing of risk tradeoffs can be done by estimating the overall risk of the whole process. The team should do the PHA for the process again thoroughly and

[227] CCPS, Inherently Safer Chemical Processes: A Life Cycle Approach, 2nd Edition (2009), Appendix A
[228] http://www.epa.gov/ceppo/web/docs/chem/Appendix-A-final.pdf

analyze the risk for comparing with the previous process. The facilities should always consider the process alternative that decreases the total risk of the process. Also, a comprehensive comparison of risk inside and outside the fence line should be considered.

H. Should EPA consider requirements similar to those used by the State of New Jersey or Contra Costa County, California, and if so, why? What have been the benefits of such programs in risk reduction or process safety for the facilities covered under these requirements? What have been the limitations or drawbacks of these programs?

Response:

We recommend that EPA should not require a safer alternative options analysis, neither as a new prevention program element nor as a part of the existing PHA/Hazard Review element, nor as a separate requirement under CAA section 112(r).

We do not have enough evidence to show the benefits of TCPA or Contra Costa County, California programs, if they have been successful in reducing risk in the facilities they cover compared to the other states. EPA should do a thorough analysis of the benefits, limitations and applicability of these programs before incorporating it in the federal regulations.

I. If EPA were to develop regulatory requirements for safer alternatives, which facilities should be subject to those requirements? Should all RMP facilities be subject to such requirements, or only "high risk" facilities, such as refineries and large chemical plants? How would "high risk" be defined? Are there particular processes or chemicals that should be targeted or prioritized for implementation of such requirements?

Response:

We recommend that EPA should not require a safer alternative options analysis, neither as a new prevention program element nor as a part of the existing PHA/Hazard Review element, nor as a separate requirement under CAA section 112(r).

J. What barriers exist for industry to adopt safer alternatives? What incentives can be used by government to have facilities implement safer alternatives? Should the Agency provide special recognition to companies that implement safer alternatives?

Response:

Some of challenges in the implementation of inherently safer options have been discussed widely in various publications. Some of these challenges include: lack of consensus agreement on the definition of inherently safer options; lack of a measurement system or quantitative metrics for inherently safer design; risk transfer, risk accumulation; and finally competence of personnel for identifying inherently safer design options. EPA should redouble its efforts to

address research in these areas before requiring inherently safer alternatives analyses, which may result in undesirable consequences.

K. What are other options (other than regulatory requirements) exist to encourage facilities to investigate, develop or implement safer alternatives and how can EPA further these efforts?

Response:

Please refer to response in item (J) above.

L. If RMP facilities are required to perform safer alternative options analyses and implementation plans, should EPA require that the analyses and/or implementation plans be submitted to the Agency? Should EPA have any role in approving such analyses or plans? In lieu of an approval, can EPA promote safer alternatives through reporting and the dissemination of information on potentially applicable practices?

Response:

We recommend that EPA should not require a safer alternative options analysis, neither as a new prevention program element nor as a part of the existing PHA/Hazard Review element, nor as a separate requirement under CAA section 112(r). However, in order to promote safer alternatives, EPA may consider establishing a Clearing House for inherently safer information, analysis methods, case histories and other related information. In addition, EPA may consider sponsoring research on inherently safer technologies and approaches as well as sponsoring seminars and conferences of inherently safer technology.

M. If RMP facilities are required to consider safer alternative options, what role should local communities have in these analyses? Should facilities be required to disclose these analyses or recommendations resulting from such analyses to local authorities or the public prior to the selection of options? Are there any other disclosure options that will ensure that decisions on implementing safer technologies are made with transparency? Are there any means of oversight other than disclosure that would ensure that safer alternatives analyses are thorough and implementation decisions are appropriate?

Response:

We recommend that EPA should not require a safer alternative options analysis, neither as a new prevention program element nor as a part of the existing PHA/Hazard Review element, nor as a separate requirement under CAA section 112(r).

2. Emergency Drills to Test a Source's Emergency Response Program or Plan

A. Are RMP-regulated facilities currently exercising their emergency response plans? If so, are they doing these exercises to comply with other federal, state or local regulatory requirements? What references or guidelines were used to develop the exercise program?

Response:
Yes, RMP-regulated facilities are currently exercising their emergency response plans and the exercises of the emergency response plans are implemented according to the EPA Emergency Response program and OSHA Emergency Action Plan. Some of the companies are also required to comply with state emergency management plan requirements. RMP-regulated facilities are using 29 CFR 1910.38 as the reference for the emergency response plans. The interaction between companies and ER officials of the community should be encouraged.

Supporting information:
http://www.tnema.org/ema/response/plans.html
https://www.osha.gov/SLTC/etools/evacuation/implementation.html
http://www.epa.gov/region9/disaster/emerresponse.html
http://www.deepeningportofhouston.com/downloads/BCT-PortSecurity.pdf

Before implementing the emergency action plan, the employer must designate and train enough people to assist in the safe and orderly emergency evacuation of employees [29 CFR 1910.38(e)]. Employers should review the plan with each employee when the initial plan is developed and when each employee is initially assigned to the job [29 CFR 1910.38(f)(1)]. Employers should review the plan with each employee when his/her actions or responsibilities under the plan change [29 CFR 1910.38(f)(2)], or when the plan changes [29 CFR 1910.38(f)(3)]. Effective plans often call for retraining employees annually and include drills in which employees can practice evacuating their workplace and gathering in the assembly area.

Educate your employees about the types of emergencies that may occur and train them in the proper course of action. The size of your workplace and workforce, processes used, materials handled, and the availability of onsite or outside resources will determine your training requirements. Be sure all employees understand the function and elements of your emergency action plan, including types of potential emergencies, reporting procedures, alarm systems, evacuation plans, and shutdown procedures. Discuss any special hazards you may have onsite such as flammable materials, toxic chemicals, radioactive sources, or water-reactive substances. An employer must inform employees of the fire hazards to which they are exposed and review with each employee those parts of the fire prevention plan necessary for self-protection [29 CFR 1910.39(d)].

Clearly communicate to your employees who will be in charge during an emergency to minimize confusion.

General training for your employees should also address the following:

- Individual roles and responsibilities;
- Threats, hazards, and protective actions;
- Notification, warning, and communications procedures;
- Means for locating family members in an emergency;
- Emergency response procedures;
- Evacuation, shelter, and accountability procedures;
- Location and use of common emergency equipment; and
- Emergency shutdown procedures.

And remember, if training is not reinforced it will be forgotten. Consider retraining employees annually. Once you have reviewed your emergency action plan with your employees and everyone has had the proper training, it is a good idea to hold practice drills as often as necessary to keep employees prepared. Include outside resources such as fire and police departments when possible. After each drill, gather management and employees to evaluate the effectiveness of the drill. Identify the strengths and weaknesses of your plan and work to improve it.

Once you have completed your emergency action plan, review it carefully with your employees and post it in an area where all employees will have access to it.

The plans also should be reviewed with other companies or employee groups in your building to ensure that your efforts will be coordinated with theirs, enhancing the effectiveness of your plan. In addition, if you rely on assistance from local emergency responders such as the fire department, local HAZMAT teams, or other outside responders, you may find it useful to review and coordinate your emergency plans with these organizations. This ensures that you are aware of the capabilities of these outside responders and that they know what you expect of them.

It is a good idea to hold practice evacuation drills. Evacuation drills permit employees to become familiar with the emergency procedures, their egress routes, and assembly locations, so that if an actual emergency should occur, they will respond properly. Drills should be conducted as often as necessary to keep employees prepared. Include outside resources, such as fire and police departments, when possible. After each drill, gather management and employees to evaluate the effectiveness of the drill. Identify the strengths and weaknesses of your plan and work to improve it.

Operations and personnel change frequently, and an outdated plan will be of little use in an emergency. You should review the contents of your plan regularly and update it whenever an

employee's emergency actions or responsibilities change, or when there is a change in the layout or design of the facility, new equipment, hazardous materials, or processes are introduced that affect evacuation routes, or new types of hazards are introduced that require special actions. The most common outdated item in plans is the facility and agency contact information. Consider placing this important information on a separate page in the front of the plan so that it can be readily updated.

<u>One example is Port of Houston and their emergency management.</u>
Recognizing the importance of an overarching emergency management approach to all hazards, the Port of Houston Authority hired a full time Emergency Management Coordinator (EMC) in late 2011. The EMC is responsible for the continual updating of the PHA Emergency Response Plan, coordination of drills and exercises across all Divisions, preparations for hurricane season, reviews of major emergency responses and the implementation of any "lessons learned", and acts as the liaison with other emergency management agencies.

Recent initiatives include reviews of several annexes of the PHA Emergency Response Plan, revision of internal protocols and procedures, reconfiguration of the Emergency Operations Center, and the conduct of both National Incident Management System and pre-Hurricane season training for senior PHA staff members.

B. What should be the scope of an exercise/drill program? Should the exercise/drill program include internal (emergency response, notifications, and evacuation) and external elements (involving community and federal and state responders, as appropriate)? What elements should be exercised as part of the drill/exercise program? For example, should the program include communications, coordination, logistics, and evacuations/accounting for personnel, etc? What response scenarios should be considered for the exercise/drill program?

Response:
We believe that the scope of the exercise and drill depends on the purpose of the exercise/drill program. The exercise can be categorized into 5 types: 1. Orientation Seminars; 2. Emergency Drills; 3. Tabletop Drills; 4. Functional Drills/Exercises; 5. Full Scale Drills/Exercises.

The exercise/drill program should include both internal and external elements. It is very important that the drill would include both company and the ER officers from the local community. According to OSHA 29 CFR 1910.38, the minimum elements of an emergency action plan include the following information:

- Emergency escape procedures
- Escape routes
- Procedures to be followed by employees who remain to operate critical plant operations before they evacuate
- Procedures to account for all employees after evacuation has been completed
- Duties for employees designated to perform rescue and medical functions

- The preferred means of reporting fires and other emergencies
- The names or regular job titles of people or departments that can be contacted for further information or explanation of duties under the plan.

In addition, the OSHA standard contains requirements for establishing types of evacuation and training, and a review of the plan. A written plan is required in workplaces with more than 10 employees.

Response scenarios include the Roles and responsibilities of emergency evacuation staff, accountability of building occupants, staff roles and responsibilities, coordination with fire department, coordination within the facility and coordination with State and Local emergency response team.

Supporting information
http://www.lwptsa.net/wp-content/uploads/2012/08/EMP-Planning-for-Emergency-Drills.pdf

For most emergency plans, the scope of the plan is defined in the first two pages and it only applies to certain type of emergency situation. So for different types of emergency situation, different emergency drill should be tested and applied.

The exercise can be categorized into 5 types[229,230]:

1. Orientation Seminars– Introduces new programs or plans, Reviews roles and responsibilities, Serves as a starting point for most other drills (Will focus on internal coordination)
2. Emergency Drills – Practice and perfect a single emergency response, Concentrate the efforts of a single function, Provide field experience (Will focus on internal coordination)
3. Tabletop Drills – discussion based, Allows low stress discussion of plans, policies and procedures, Provides an opportunity to resolve questions of coordination and responsibility (Will feature possible information exchange among school and public safety personnel)
4. Functional Drills/Exercises- Simulates a real emergency under high stress conditions, Tests coordination among various functions and outside response agencies (Will involve outside planning and response. The coordination of these drills should include a joint agency plan for response)
5. Full Scale Drills/Exercises - Tests a community's total response capability, Drills as close to reality as possible – using real equip and agency personnel (Should involve all responding agencies with an emphasis on local emergency management coordination)

229
http://www.nfpa.org/~/media/files/safety%20information/for%20consumers/occupancies/evacuation.pdf
230 2001 National Fire Protection Association, Excerpts from Introduction to Employee Fire and Life Safety

C. How frequently should drills/exercises be performed?

Response:

The drill/exercise must be performed frequently enough to familiarize employees with the drill procedure and to establish a routine.

Article 4.12.4.1. of the Fire Code also requires fire drills to be held at intervals not exceeding 6 months in laboratories where flammable and combustible liquids are used or handled.

According to NFPA Life Safety Code,

TABLE 6.1
Occupancies Where Fire Drills Are Required and Number of Drills Required per Occupancy

Occupancy	*Location in Life Safety Code*		*Number of Drills Required per Year*
	Chapter	*Section*	
Assembly	12, 13	12.7.6, 13.7.6	N/A
Educational	14, 15	14.7, 15.7	Not less than 1 per month for every month a facility is in session*
Day care	16, 17	16.7, 17.7	Not less than 1 per month for every month a facility is in session*
Health care	18, 19	18.7.1.2, 19.7.1.2	Quarterly on each shift
Ambulatory health care	20, 21	20.7.1.2, 21.7.1.2	Quarterly on each shift
Detention and correctional	22, 23	22.7.1, 22.7.1	N/A
Hotels and dormitories	28, 29	28.7.1.2, 29.7.1.2 28.7.3, 29.7.3	**Hotels:** Quarterly emergency organization **Dorms:** Regular evacuation drills
Residential board and care	32, 33	32.7.3, 33.7.3	Bimonthly drills (2 must be while patients are sleeping)
Mercantile	36, 37	36.7.1, 37.7.1	Periodic employee drills
Business	38, 39	38.7.1, 39.7.1	Periodic drills in buildings with more than 500 occupants or more than 100 above or below street level
Industrial	40†	40.2.2.11	Regular drills†

*Exception: In climates where the weather is severe, the monthly emergency egress and relocation drills are permitted to be deferred, provided that the required number of emergency egress and relocation drills is achieved and not less than four are conducted before the drills are deferred.

†For slide escapes only.

Group	Frequency	Participation
A	Quarterly	Employees
B	Annually	Employees
Note: Occ. load >500, or >100 persons above or below the lowest level of exit discharge.		
E	Monthly	All occupants
Note: Daycares collocated on Group E campuses participate in emergency drills.		
F	Annually	Employees
I	Quarterly/shift	Employees
R-1	Quarterly/shift	Employees
R-2	Quarterly/shift	Employees
Note: Group R-2 college and university buildings.		
High Rise	Annually	All occupants
Note: Jail inmates, hospital patients, hotel guests and occupants of apartment or residential condominium are not required to participate unless they are also a member of the high rise building staff.		

Supporting information

FIRE DRILL FREQUENCIES from Office of the Fire Marshal

http://www.mcscs.jus.gov.on.ca/stellent/groups/public/@mcscs/@www/@ofm/documents/webasset/ecofm000489.pdf

http://www.nfpa.org/~/media/files/safety%20information/for%20consumers/occupancies/evacuation.pdf

For Seattle fire department drill frequency,

- Group A - Assemblies with more than 100 persons.
- Group B - Business occupancies having an occupant load of 500 or more persons or more than 100 persons above or below the lowest level of exit discharge.
- Group E - Educational.
- Group F - Factory/industrial buildings having an occupant load of 500 or more persons or more than 100 persons above or below the lowest level of exit discharge.
- Group H - Hazardous processes.
- Group I - Institutions such as hospitals, care facilities, corrections facilities.
- Group M - Retail stores & markets having an occupant load of 500 or more persons or more than 100 persons above or below the lowest level of exit discharge.
- Group R-1 - Residential (transient) such as hotels, boarding houses.
- Group R-2 - College and university buildings and boarding homes, group homes, and residential treatment facilities licensed by the State of Washington.

Frequency of Drills – from NFPA
The NFPA Life Safety Code states that drills must be frequent enough to familiarize employees with the drill procedure and to establish a routine. The requirement is stated as follows:

Emergency egress and relocation drills, where required by Chapters 11 through 42 or the authority having jurisdiction, shall be held with sufficient frequency to familiarize occupants with the drill procedure and to establish conduct of the drill as a matter of routine. Drills shall include suitable procedures to ensure that all persons subject to the drill participate.

The code goes on to state: If an emergency egress and relocation drill is considered merely as a routine exercise from which some persons are allowed to be excused, there is a grave danger that, in an actual emergency, the evacuation and relocation will not be successful. However, there might be circumstances under which all occupants do not participate in an emergency egress and relocation drill; for example, infirm or bedridden patients in a health care facility.

Specific frequencies in terms of the number of drills per year are provided in Table 6.1 and in the occupancy chapters of the Life Safety Code. If a specific frequency is not indicated in the occupancy chapter, then the performance requirement just stated applies. In most workplaces, one or two drills conducted annually are considered adequate to meet the requirement to keep occupants familiar with the facility's emergency procedures.

Many jurisdictions adopt local ordinances that specify the frequency of evacuation drills for their facilities. The individual who is responsible for planning and conducting fire drills should review the requirements of the applicable codes and also consult with the local fire department to determine whether any local requirements apply to the facility.

Additional drills, beyond the minimum required for the applicable occupancy in the Life Safety Code, should be considered when there are changes to the emergency plan or evacuation routes. The addition of a significant number of new employees may also warrant an additional drill. Another indication that more drills are necessary would be a poor response by personnel during a scheduled drill or the actual activation of the fire alarm. Fire drills serve as a training tool as well as a method of evaluating the knowledge, skills, and attitude of employees; if there is any indication that personnel need additional practice, the responsible party should schedule more drills.

D. Who should be involved in the exercise program? How should the management team be engaged as part of the drills/exercises? How should contractors be included in the exercise/drill planning and when conducting exercises/drills? Who should be the designated official responsible for coordinating the exercises and drills conducted at the RMP facility? How should other federal, state and local agencies be included in the exercise/drill program?

Response:

The occupants who will be involved in the exercise program depend on the scope and type of the drill. Management will be in charge of evacuating occupants from the building and guiding other emergency response teams during the drill. NFPA has provided an example of the drill staff responsibilities.

TABLE 6.4
Fire Drill Staff

Position	*Responsibility*
Drill coordinator	Plans, conducts, and evaluates fire drill. This position may be assigned to the safety director or head of security. In jurisdictions with local ordinances regulating fire safety, the responsibility may be assigned to the fire safety coordinator. At small facilities, the responsibility may fall on the plant or facility manager.
Floor/area warden	Individual assigned to coordinate emergency evacuations of a specific floor or area and to ensure that all occupants have evacuated the building. The floor warden is also responsible for verifying the evacuation of all spaces, including rest rooms.
Stairway monitor	Individual assigned to monitor the use of the stairway on a specific floor during an emergency evacuation.
Elevator monitor	Individual assigned to monitor the elevator lobby during an evacuation to prevent the elevator from being used and to direct occupants in elevators to emergency stairways.
Aide to employees with disabilities (buddy)	Employee assigned to assist occupants with disabilities during emergencies.
Assembly area monitor	Employee assigned to monitor assembly points and take attendance as occupants arrive.
Communicator/ runner	Staff assigned to the command post or assembly areas responsible for communications between assembly points and the command post.
Drill evaluator	Individual assigned to monitor occupant actions during the fire drill and report their findings to the drill coordinator at the completion of the drill.

The contractor should provide correct and detailed information to the drill participants and coordinate with the emergency rescue team. Emergency evacuation staff will be the designated official responsible for coordinating the exercises and drills. Other federal, state and local agencies will be informed of the drill program and coordinate with the emergency evacuation staff and emergency response team to successfully execute the exercise/drill program.

Supporting information
http://www.nfpa.org/~/media/files/safety%20information/for%20consumers/occupancies/evacuation.pdf

http://www.mcscs.jus.gov.on.ca/stellent/groups/public/@mcscs/@www/@ofm/documents/webasset/ecofm000489.pdf

Office of Fire Marshal and NFPA has given some of the information for the assignment of the designated official responsible for coordinating the exercises and drills.

E. Should all RMP facilities be required to participate in some type of exercise/drill program or only those who are required to develop an emergency response program? Should Program 1 facilities (and Program 2/Program 3 facilities that do not respond to accidental releases with their own employees) be required to conduct external exercises with community responders and test notification procedures? Should Program 2 and Program 3 facilities whose employees respond to accidental releases conduct both internal and external exercises?

Response:

We believe that All RMP facilities should participate in drill programs. Program 1 facilities (and Program 2/Program 3 facilities that do not respond to accidental releases with their own employees) will be required to conduct external exercises with community responders and test notification procedures when Functional Drills/Exercises or Full scale Drills/Exercises since these two types of emergency drill will involve external planning and response. Program 2 and Program 3 facilities whose employees respond to accidental releases conduct both internal and external exercises.

Ref:
http://www.mcscs.jus.gov.on.ca/stellent/groups/public/@mcscs/@www/@ofm/documents/webasset/ecofm000489.pdf

F. How should lessons learned and recommendations be documented and addressed? What timeframe should be considered for completing such records? How long should records of exercises/drills be maintained?

Response:

According to the Office of the Fire Marshal, the person(s) participating in the analysis of the responses and outcomes must be fluent with the emergency procedures expected of personnel being assessed during the exercise.

As part of every fire drill, the following supervisory staff responses and outcomes require analysis:

- discovering of the fire;
- sounding the fire alarm (responses involving coded voice messages, second stage alarm, etc.);

- notifying the fire department;
- establishing provisions for access for firefighting;
- responding to the fire alarm signal(s) and coded voice messages;
- evacuating endangered occupants (evacuation techniques, safe areas of refuge, horizontal evacuation, vertical evacuation, establishment of carrying teams, stairway teams and receiving teams where applicable, etc.); and
- confining, controlling and/or extinguishing the fire.

Where applicable, additional analysis is necessary to determine the adequacy of procedures and responses by designated supervisory staff or other persons operating or using equipment, such as:

- voice communication or paging systems;
- smoke control equipment, fixed fire extinguishing system or other specialized fire protection device(s);
- firefighter elevators, passenger elevators;
- designated equipment or machinery that must be shut down;
- electromagnetic locking and door release or hold open device(s);
- emergency power system transfer where applicable; and
- the fire alarm system and other equipment that requires resetting.

Periodically fire drills should involve the use and assessment of the alternative measures outlined in the fire safety plan, for any shutdown of fire protection equipment and systems or part thereof.

Fire drills must be documented. As a minimum, the documentation must be retained for a period of at least 12 months after the drill. The documentation should identify the date of the drill, persons participating, the type of drill, fire drill scenario, and the summary analysis and outcomes of the fire drill.

Ref:
http://www.mcscs.jus.gov.on.ca/stellent/groups/public/@mcscs/@www/@ofm/documents/webasset/ecofm000489.pdf
Section 10.0 FIRE DRILL ANALYSIS & Section 11.0 DOCUMENTATION from "Fire Drills", office of fire marshal

G. Should stationary source operators be required to document and address lessons learned and recommendations when they respond to an actual accidental release?

Response:

We believe that it is very important to record the information about each drill and keep the record updated. See Answer in 2F.

Ref:
http://www.mcscs.jus.gov.on.ca/stellent/groups/public/@mcscs/@www/@ofm/documents/webasset/ecofm000489.pdf
Section 10.0 FIRE DRILL ANALYSIS & Section 11.0 DOCUMENTATION from "Fire Drills", office of fire marshal

H. Should information such as the date of the most recent exercise involving the emergency response plan be required to be reported to EPA in the facility's RMP?

Response:

We believe that it is very important to record the information about each drill and keep the record updated. However, according to the OSHA and EPA regulation, different facilities will have different frequency for emergency exercise/drill program, based on the quantity of RMP-regulated facilities, the number of the exercise/drill report will be multiplied by 4 or 12 (quarterly or monthly). It is not very efficient to send large amount of exercise reports to EPA. Instead, the report should be kept by the facility and/or contractor so that EPA can check the record as needed.

I. What would be the economic impacts and paperwork burden of requiring an exercise/drill program for all or a subset of RMP facilities? Would such a requirement substantially improve preparedness for dealing with emergency situations? Are there any special circumstances involving small entities that EPA should consider with respect to an exercise/drill program?

Response:

As mentioned earlier, facilities are already conducting emergency response drills. A regulatory requirement will create unnecessary paperwork and bureaucracy without any commensurate improvements in safety or risk management.

Ref:
http://www.nfpa.org/~/media/files/safety%20information/for%20consumers/occupancies/evacuation.pdf
http://www.mcscs.jus.gov.on.ca/stellent/groups/public/@mcscs/@www/@ofm/documents/webasset/ecofm000489.pdf

3. Automated Detection and Monitoring for Releases of Regulated Substances

A. Should facilities be required to install monitoring equipment or sensors to detect releases of RMP regulated substances, or the conditions that could lead to such a release? Should the

systems provide for continuous detection and monitoring? How should any such requirements be crafted to provide appropriate site-specific flexibility?

Response:

The development of an effective monitoring and detection system is complex and does not lend itself to regulatory program. By implementing broad, general requirements for monitoring systems for a large number of facilities, not only is the development of these systems more expensive, but it also less effective. A risk-based approach to detection systems in necessary to assure that a facility has adequate monitoring that fits that facilities specific needs, without having to comply with detection requirements that don't affect risk at that specific facility.

B. Are there specific issues that need to be considered for unmanned and/or remote facilities?

Response:

Please refer to part A.

C. Should an automated mechanism to notify, alert and warn the local responders and surrounding public of an incident be considered as part of any detection and monitoring system requirement? If so, how should the potential for false alarms be addressed within such a requirement?

Response:

Please refer to part A.

D. How can a requirement for automated detection and monitoring systems be best coordinated with the community emergency response plan? What are the advantages/disadvantages between continuous monitoring conducted by automated systems in contrast to third-party alarm agencies?

Response:

Please refer to part A.

E. How would a requirement for appropriate detection thresholds be best established for activating alarms and/or alerts?

Response:

Please refer to part A.

F. How would the significance and appropriate protective response action of the alarms/alerts be best communicated to responders and the public (including shelter- in-place and evacuations)?

Response:

Please refer to part A.

G. What involvement should LEPCs and SERCs have in the development of the emergency response plan, particularly with respect to what actions are to be taken in the event of an incident where and alarm/alert is activated?

Response:

Please refer to part A.

H. How frequently should monitoring equipment or sensors to detect releases of RMP-regulated substances be tested? How should these tests be documented? How long should records of such tests be maintained? Should automated monitoring records for periods of normal operations be maintained, so that past records may serve as an aid in determining what may have gone wrong prior to an accident (*e.g.,* a gradual increase in emissions)? Should EPA specify requirements in this area, or are these aspects of program implementation best left to the facility?

Response:

Please refer to part A.

I. Leak detection and repair programs are common under the CAA's routine emission programs. Can these programs be integrated with the accidental release prevention program to reduce accidental releases and to simplify requirements for stationary sources subject to both the RMP and these other programs? Are there jurisdictional issues that prevent integration?

Response:

Please refer to part A.

J. What would be the economic impacts of specifying additional monitoring and detection requirements in the RMP? Are there any special circumstances involving small entities that EPA should consider with respect to such monitoring and detection requirements?

Response:

The installation of monitoring and detection equipment should be justified based upon the risk of the facilities, rather than under prescriptive regulations. We believe that there would be a negative economic impact if prescriptive regulatory requirements with regard to installation of detection equipment are adopted.

4. Additional Stationary Source Location Requirements

Stationary source siting: (40 CFR part 68)
Stationary source means any buildings, structures, equipment, installations, or substance emitting stationary activities which belong to the same industrial group, which are located on one or more contiguous properties, which are under the control of the same person (or persons under common control), and from which an accidental release may occur. The term stationary source does not apply to transportation, including storage incident to transportation, of any regulated substance or any other extremely hazardous substance under the provisions of this part. A stationary source includes transportation containers used for storage not incident to transportation and transportation containers connected to equipment at a stationary source for loading or unloading. Transportation includes, but is not limited to, transportation subject to oversight or regulation under 49 CFR parts 192, 193, or 195, or a state natural gas or hazardous liquid program for which the state has in effect a certification to DOT under 49 U.S.C. section 60105. A stationary source does not include naturally occurring hydrocarbon reservoirs. Properties shall not be considered contiguous solely because of a railroad or pipeline right-of-way.

a. Would additional specifics on stationary source siting and occupancy siting under the RMP minimize the impacts of chemical accidents to local communities? How should RMP stationary source siting requirements relate to OHSA PSM and other industry standards?

Response:

The requirements to the stationary source siting and occupancy siting can prevent or minimize the consequences of catastrophic releases of chemicals that may result in explosions, fires, or toxic hazards. The procedure of RMP requirements for the stationary source siting evaluation should be distinctive to OSHA PSM's facility siting. The purpose of facility siting is to provide appropriate siting and layout which can serve as a foundation for a safe and secure site[231]. On the other hand, EPA RMP should focus on the consequences of release incidents, which results in acute adverse impact on people "outside the fence". While OSHA addresses the risks to employees inside the facility, RMP should address the risks to the offsite receptors[232].

[231] CCPS, Guidelines for Facility Siting and Layout, AIChE, New York, 2003.
[232] http://emergencymanagement.supportportal.com/link/portal/23002/23016/Article/18963/Is-EPA-s-PHA-stationary-source-siting-requirement-analogous-to-OSHA-s-PSM

Supporting Information:
Frequent questions about the prevention program in RMP in EPA website:

Does EPA interpret the Program 3 process hazard analysis - stationary source siting requirement analogously to OSHA's Process Safety Management standard?

Yes. The requirement to consider stationary source siting during the process hazard analysis means that you should consider the location of the covered vessels and evaluate whether their location creates risks for offsite public or environmental receptors, as well as onsite receptors. This analysis should consider the proximity of the vessels that could lead to a release of a regulated substance. The proximity of the vessels to onsite equipment or activities nearby will have been considered for OSHA; the proximity of the vessels in relation to offsite receptors will be considered if not already considered for OSHA. The analysis may be done qualitatively. The analysis addresses whether the location of the vessels creates risks that could be reduced by changing the location or taking other actions, such as installing mitigation systems. The evaluation of offsite consequences is more fully addressed under the hazard assessment requirement.

b. What guidance should EPA consider in the development of stationary source siting requirement?

Response:

As per the current regulations, EPA's stationary source siting is analogous to OSHA's facility siting. The requirement of stationary source siting during the process hazard analysis is considering the location of the covered vessels and evaluating whether their location creates risks for offsite public or environmental receptors, as well as onsite receptors. Stationary source siting should consider the proximity of the vessels that could lead to a release of a regulated substance. The proximity of the vessels to onsite equipment or activities nearby will have been considered for OSHA[233].

Dow Fire and Explosion Index (Dow F&EI), Industrial Risk Insurance (IRI)'s General Recommendation for Spacing, and Guidelines for Evaluating Process Plant Buildings for External Explosions and Fires, and Toxic Releases, 2nd Edition (2012) can be used for the qualitative analysis for stationary source siting. Dow F&EI is the leading hazard index recognized by the process industry to quantitatively measure the safe separation distance from the hazardous unit by considering the potential risk from a process and the properties of the process materials under study. This index has also been incorporated in risk analysis tools for

[233] EPA Frequently asked questions:
http://emergencymanagement.supportportal.com/link/portal/23002/23016/Article/18963/Is-EPA-s-PHA-stationary-source-siting-requirement-analogous-to-OSHA-s-PSM

evaluating the layout of new and existing facilities. Various standards from NFPA also provide guidance on layout and spacing distances between equipment and other structures within the plants.

Though EPA's stationary source siting and OSHA's facility siting have different emphasis, the basic qualitative calculation of the safety distance of a vessels is the same. Thus, the current guidance and recommended practices for facility siting, such as American Petroleum Institute (API) Recommended Practice (RP) 752 and 753, and Center for Chemical Process Safety (CCPS) Guidelines for Facility Siting and Layout (2003) can also be adopted as guidance for stationary source siting in the process industries.

Supporting Information:
Guidance principles for API 752 (2009):
a) Locate personnel away from process areas consistent with safe and effective operations;
b) Minimize the use of buildings intended for occupancy in close proximity to process areas;
c) Manage the occupancy of buildings in close proximity to process areas;
d) Design, construct, install, modify, and maintain buildings intended for occupancy to protect occupants against explosion, fire, and toxic material releases;
e) Manage the use of buildings intended for occupancy as an integral part of the design, construction, maintenance, and operation of a facility.

Guidance principles for API 753:
Appendix B – Guidance for locating portable buildings

Guidance for facility siting and layout (CCPS):
• Approaching siting and layout from a safety perspective
• Assembling a site selection team, compiling the issues they need to consider, and determining what data they should collect (This information is needed for selecting a location for a new grassroots site, a brownfield site, or an expansion within a site.)
• Balancing infrastructure, environmental, security, population, and process risk considerations with each other in the site selection process.
• Anticipating outside factors that may affect the project cost and schedule.
• Fitting a new expansion within an existing unit and compensating for limited spacing by taking risk mitigation measures.
• Maximizing inherently safer design in siting and layout by gathering data and conducting hazard analysis in the conceptual design and layout stages of the site design.
• Maximizing ease of operations and maintenance as well as minimizing operating and maintenance risks to personnel and the surrounding site through layout and equipment spacing.

c. What information should EPA consider in the development of stationary source buffer or setback zones for different risks? How should EPA address siting when limited space is available?

Response:

The development of stationary source buffer or setback zones should be based on the risk levels that the facilities impose on the surrounding areas. However, specifying or requiring buffer or setback zones is a complicated issue and must be looked at differently for new and existing facilities. In addition, regardless whether it is a new or existing facility, it must be noted that space might not be available for buffer or setback zones. Thus, it is suggested that EPA consider a flexible approach based on risk assessment and risk management. When limited space is available, the facility may be able to manage the risk appropriate with the use of other approaches such as inventory control, process changes, mitigation systems, early detection systems, and other available methods (including in some cases relocation or shutdown of the facility).

Where space is available, new facilities should use the detailed information about the process to demonstrate that the risk of accidental release to the surrounding communities is within the acceptable risk level by setting reasonable buffer or setback zones. For existing facilities, that is usually not possible, and as such overall risk management measures should be relied on to manage the risk. Reducing the risk by setting the buffer or setback zones may not be possible for existing facilities. In such circumstances, owner/operator should demonstrate that other technologies, such as early detection, early communication, prevention and mitigation measures, and so on, are applied to manage the risk within the acceptable levels. In some cases, it may be necessary to make process changes and in unique cases where the risk cannot be abated, consider relocation of part or all of the facility operations.

d. What administrative processes and controls should be incorporated into stationary source siting requirements?

Response:

Administrative processes aimed at reducing employee exposure to hazards, including additional relief workers, exercise breaks and rotation of work, can be incorporated in operating procedures to assure the safe and environmentally sound operation of the facility.

Through administrative processes and control, owner/operators should periodically check the effectiveness of working procedures and the implementation of safety regulations, *e.g.*, owner/operators should periodically confirm that buildings not intended for occupancy remain unoccupied. When there are situations that require management of change (MOC), administrative processes and controls take place to identify the situations, evaluate the MOC, and coordinate different part of the facility to implement the MOC.

Supporting materials:
Definition: Administrative controls mean written procedural mechanisms used for hazard control. (40 CFR part 68)

API RP 14J: Design safety is comprised of three approaches: Inherent design features, engineering controls, and administrative controls. Inherent design features include designing inherently safer facilities by reducing or eliminating hazardous materials or processes. The first step should be the elimination of potential hazards by improving the inherent safety of the design and then relying next on engineering controls and finally on administrative controls where inherent design is not technically or economically feasible.

API RP 14J: Operating procedures should be written, addressing activities for safe start-up, normal operations, and shutdown. Procedures should include administrative controls to assure the safe and environmentally sound operation of the facility.

OSHA: While safe work practices can be considered forms of administrative controls, OSHA uses the term administrative controls to mean other measures aimed at reducing employee exposure to hazards. These measures include additional relief workers, exercise breaks and rotation of workers. These types of controls are normally used in conjunction with other controls that more directly prevent or control exposure to the hazard.[234]

API RP 752: Owners/operators shall identify situations that require MOC. Situations that may require MOC evaluation include, but are not limited to:

— Changes to plant operations, processes or equipment (including decommissions or additions) cause a change in potential for, or severity of, explosion, fire, or toxic impacts at the building location;
— A new building intended for occupancy is added to the facility;
— A modification or addition to an existing building occurs that could cause a change in the potential for, or severity of, explosion, fire, or toxic material release impacts;
— The building's occupancy status changes from not intended for occupancy to intended for occupancy;
— The number of personnel or time spent inside the building increases either permanently or for a defined period of time. The actions from the MOC evaluation may vary depending on whether the change is permanent or for a defined period of time. Where the change is permanent, a revision of the building siting evaluation may be necessary. For change which is for a defined period of time, interim risk mitigation measures may be appropriate.

e. what safety and process devices, instruments and controls should be incorporated into stationary source siting requirements?

[234] https://www.osha.gov/SLTC/etools/safetyhealth/comp3.html#Administrative%20Controls

Response:

- Safety exit routes from each unit
- Adequate access for emergency vehicles (fire trucks)
- Control room alarm
- Emergency shutdown
- Fire hazards:
  Fire detection devices should be installed in all areas
- Vent, flare and emergency relief systems
- Fire protection devices
- Toxic release hazards:
  Toxic concentration detection
- Personal protection:
  Personal escape routes and devices
  Emergency communications equipment
  PPE

f. What criteria are appropriate for siting of occupancies (such as offices, control rooms, cafeterias, etc.) near an RMP-regulated process?

Response:

With regard to this question, we believe that OSHA PSM regulation appropriately addresses the siting of such occupancies. API RP 752 provides guidance for managing the risk from explosions, fires and toxic material releases to personnel located in new and existing buildings intended for occupancy. RP 752 provides three approaches as a building siting evaluation methods (consequence-based approach, risk-based approach, spacing tables approach), and the associated criteria for each approach. Again, RP 752 provides conceptual guidelines to address facility siting without specific recommendations for layout and spacing of occupied buildings. In addition, API RP 753 and API RP 756 provide additional guidelines for temporary buildings and tents respectively.

Supporting material:
Management of Building Occupancy: Owners/operators shall develop policies and practices to address housing of personnel located in buildings intended for occupancy considering exposure level to explosion, fire, and toxic material release. Personnel (essential and nonessential) may be located in a building intended for occupancy that meets the owner/operators' building siting evaluation criteria. Consideration should be given to locating nonessential personnel as far as practicable from the hazard and discouraging congregation of personnel in buildings close to process areas.

Building siting evaluation criteria for the consequence-based approach: these criteria are specific to the materials of construction, building design, and hazard type (explosion, fire, toxic material release). Building exposure criteria are typically expressed as:

- blast load,
- thermal flux and exposure time,
- flammable gas concentration, or
- toxic concentration and exposure time.

Consequence criteria are typically expressed as:

- occupant vulnerability,
- potential building damage, or
- building internal environment degradation (*i.e.,* inability to support human life).

Building siting evaluation criteria for the risk-based approach: Building siting evaluation criteria for the risk-based approach shall address the risk to the building occupants as a group (aggregate risk) and the risk to an individual. An owner/operator may choose to establish a single risk criterion that addresses both individual and aggregate risk. Building siting evaluation criteria may be expressed as numerical values of individual risk, aggregate risk or exceedance values. They can also be expressed as graphical formats which include cumulative frequency vs. consequence (F/N) curves, or matrices with numerical axes.

Building siting evaluation criteria for the spacing tables approach: When a spacing tables approach is used, the building siting evaluation criteria are the appropriate values in the spacing table. The criterion is satisfied when the separation distance in the spacing table is met or exceeded.

Owners/operators shall document the following elements of the building siting evaluation:

- Assessment approach
- Scenario selection basis
- Analysis methodologies
- Applicability of analysis methodologies
- Data sources used in the analysis
- Applicability of data sources
- Building siting evaluation criteria
- Results of the analysis
- Documentation of mitigation plans

CCPS guide: For fire considerations, separate unit substations from process equipment handling flammables. Do not locate the switchgear room either above or below the control room. Do not locate HVAC on the roof of a control building unless it is provided with independent support. All switch racks should meet electrical classification requirements. Separate electrical switch racks supporting shutdown or emergency functions from equipment

handling flammables by at least 20 ft (6 m) and from fired heaters or gas compressors by at least 50 ft (15 m).

g. How often should stationary source siting be evaluated for effectiveness? What criteria should be used?

Response:

In OSHA PSM, it requires that all the hazard analyses must be updated and revalidated at least every five years. This can be adopted as one of the criteria. In addition, as required in 29 CFR 1910.119 (f)(3), the operating procedures must be reviewed as often as necessary to assure that they reflect current operating practice, including changes that result from changes in process chemicals, technology, and equipment, and changes to facilities. The employer shall certify annually that these operating procedures are current and accurate. The same concept could be applied to the evaluation for the effectiveness of stationary source siting. When there are many changes over time, the synergistic effect may not be addressed by the MOC system. The validation of the effectiveness of the stationary source siting should conducted to determine if any MOCs violate the assumptions of another, and if any new hazards are introduced[235]. Moreover, if there are any changes in the neighboring area, such as the new development of residential areas, the effectiveness of stationary source siting should be evaluated.

h. What documentation should be required for evaluating stationary source siting determinations?

Response:

The following documentations should be considered for evaluating stationary source siting determinations (not all the documentations are always available), including but not limiting to[236]:

- Prior stationary source siting reports and related documentation
- Local zoning information
- Neighboring area information
- Resolution of recommendations and actions needed in prior stationary source siting
- MOC and PSSR documentations
- Accident and near miss reports
- Process safety information
- Operating procedures
- Mechanical integrity information
- Data sources used in the analysis

[235] Frank, W.L., and Whittle, D.K., Revalidating Process Hazard Analysis, Chapter 3, CCPS, 2001.
[236] CCPS, Guidelines for Evaluating Process Plant Buildings for External Explosions, Fires, and Toxic Releases, AIChE, New York, 2012.

• Assessment approach
• Scenario selections
• Stationary source siting evaluation criteria
• Results of evaluation

Supporting Information:
CCPS – Guidelines for evaluating process plant buildings for external explosions, fires, and toxic releases
11.2 DOCUMENTATION REQUIREMENTS
11.2.1 Building Siting Procedure

The overall building siting evaluation process provides a framework that is a useful structure for documentation. The major steps in the process and potential documentation for each step are identified in API RP-752. They include:

• Building siting evaluation procedure – describe the overall procedure followed to accomplish the building siting evaluation.
• The assessment approach – identify whether a consequence or risk-based approach was used, or if the spacing tables approach was used. RP-752 does not give preference to either the consequence- or risk-based approaches, so the documentation does not need to justify the approach but needs to clearly state the approach used. The use of the spacing table approach is applicable only for fire hazards.
• Scenario selection basis – identify how scenarios were selected, and how past industry experience was considered. This is an appropriate place to identify the basis for selecting the MCE if a consequence-based approach is used.
• Analysis methodologies – identify the analysis methods used for the fire, explosion, and toxic hazards present.
• Applicability of analysis methodologies – a statement that sets forth why the selected methods are appropriate for the scenarios the methods are applied to.
• Data sources used in the analysis – the appropriate source of the information is identified. While not stated in RP-752, the intent is to ensure that the evaluation is applicable to the existing or planned future conditions on the site at the time the evaluation was performed.
• Applicability of data sources – if data such as operating temperatures or failure rates are used, state why the data are applicable to the scenarios considered if this is not apparent.
• Building siting evaluation criteria – identify the criteria selected by the owner/operator.
• Results of the analysis – identify which buildings meet the selected siting evaluation criteria and which do not. The mitigation plans for buildings that do not meet owner/operator requirements may be a separate document.

i. Is it appropriate to reflect the environmental burden of the surrounding community in siting criteria for either new facilities or expansions within an existing site? Is it appropriate to consider chronic burdens or only burdens associated with accidental release?

Response:

No. In considering changes to the Risk Management Program, EPA should only consider the burdens of the release incidents, which results in acute adverse impact on people and environment "outside the fence". We believe that Congress intended the Risk Management Program to address catastrophic incidents of an immediate nature that has impacts on the public and/or the environment beyond the fence line. There are other regulations that deal with chronic effects and other impacts.

In addition, the relationship between chronic exposures to environmental pollution and health risks is complex and often poorly characterized, especially considering the lack of monitoring and inevitable variations within any population group[237]. Some researchers believe that it has not yet been fully understood, and there are some ongoing corresponding studies related to this issue[238, 239, 240]. Therefore, it is not appropriate for EPA to reflect the environmental burden of the surrounding community in siting criteria.

j. What challenges would the agency face in specifying uniform siting requirements for the wide variety of covered sites? What site specific factors would need to be addressed?

Response:

If the agency wants to specify uniform siting requirements for the wide variety of covered sites, the first challenge would be faced is the enforcement of requirements on the existing facilities that have not undergone major modifications but have remained in operations[241]. In addition, the uniform requirements may not be able to address the territory upon which they are imposed is itself not uniform, but with a number of variation in relevant respects[242]. The natural resource endowments, degrees of development, human attitudes and the size and nature of the

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[237] Briggs, D., Environmental Pollution and the Global Burden of Disease. British Medical Bulletin, 68, 2003, 1-24.

[238] Sears, M.E., and Genuis, S.J., Environmental Determinants of Chronic Disease and Medical Approaches: Recognition, Avoidance, Supportive Therapy, and Detoxification, Journal of Environmental and Public Health, 2012, 2012, 1-15.

[239] Cooper, K., Marshall, L., Vanderlinden, L., and Ursitti, F., Early Exposures to Hazardous Pollutants/Chemicals and Associations with Chronic Disease—A Scoping Review, Canadian Partnership for Children's Health and Environment, Canadian Environmental Law Association, Ontario College of Family Physicians, and the Environmental Health Institute of Canada, for the Canadian Partnership for Children's Health and Environment, 2011, http://www.healthyenvironmentforkids.ca/resources/EE-andCD-scoping-review.

[240] Liess, J.K., and Kotch, J.B., The importance of children's environmental health for the field of maternal and child health: a wake-up call, Maternal and Child Health Journal, 14, 2012, 307-317

[241] Committee on Air quality Management in the United States, National Research Council, Air Quality Management in the United States, pp 215, 2004.

[242] Krier, J.E., On the Topology of Uniform Environments Standards in a Federal System and Why it Matters (Symposium: Environmental Federalism), Maryland Law Review, 54, 1995, 1226-41.

population of any particular area should be taken into consideration. Moreover, the cost of stationary source siting that can fulfill the uniform requirements differs significantly from place to place[242].

k. If EPA mandated siting criteria, how should EPA account for local zoning codes when establishing such criteria? Would setting federal requirements overstep into normal state and local zoning process, or would it act as a supplemental measure ensuring minimal safety standards across the country?

Response:

Zoning codes are used for designating permitted uses of certain parcel of land by local government. In general, zoning codes are divided five major categories: residential, mixed residential-commercial, commercial, industrial and special (*e.g.*, power plants, sports complexes, airports, shopping malls). There are often sub-categories under these categories. The setback requirements for the industrial zoned properties are usually higher than other zoned properties. EPA must account for local zoning codes when establishing siting criteria. When there are any conflicts between local zoning code and the federal requirements, the purpose of avoiding or mitigating an environmental impact should be adopted[243].

Supporting Information:
CCPS – Guidelines for Facility Siting and Layout
3.5. Guidelines for the Survey and Data Collection Effort
3.5.1. Codes, Standards, and Local Requirements

5. Compliance with Emergency Response Program Requirements in Coordination with Local Responders

EPA is considering whether the Emergency Response provisions in Subpart E of the RMP regulation should be revised to state more explicitly that owners and operators of RMP regulated facilities must comply with the emergency response program requirements of section 68.95 unless local public responders both have the means and agree to respond to releases of regulated substances at the facility, and to describe what facility owners or operators must do to coordinate with local authorities on the development of community emergency response plans.

[243] City of San Bernardino, Palm/Industrial Distribution Center: Addendum to the Palm/Industrial Distribution Center Final Environmental Impact Report, SCH No. 2007081029, 2013.

40 CFR 68.95[244]

(a) The owner or operator shall develop and implement an emergency response program for the purpose of protecting public health and the environment. Such program shall include the following elements:

(1) An emergency response plan, which shall be maintained at the stationary source and contain at least the following elements:

(i) Procedures for informing the public and local emergency response agencies about accidental releases;

(ii) Documentation of proper first-aid and emergency medical treatment necessary to treat accidental human exposures; and

(iii) Procedures and measures for emergency response after an accidental release of a regulated substance;

(2) Procedures for the use of emergency response equipment and for its inspection, testing, and maintenance;

(3) Training for all employees in relevant procedures; and

(4) Procedures to review and update, as appropriate, the emergency response plan to reflect changes at the stationary source and ensure that employees are informed of changes.

(b) A written plan that complies with other Federal contingency plan regulations or is consistent with the approach in the National Response Team's Integrated Contingency Plan Guidance ("One Plan") and that, among other matters, includes the elements provided in paragraph (a) of this section, shall satisfy the requirements of this section if the owner or operator also complies with paragraph (c) of this section.

(c) The emergency response plan developed under paragraph (a)(1) of this section shall be coordinated with the community emergency response plan developed under 42 U.S.C. 11003. Upon request of the local emergency planning committee or emergency response officials, the owner or operator shall promptly provide to the local emergency response officials information necessary for developing and implementing the community emergency response plan."

Questions

a) **Should EPA clarify what steps RMP facilities should take in order to properly coordinate their emergency response plan with the community emergency response plan?**

Response:

Yes, EPA should clarify the steps that need to be taken to properly co-ordinate their emergency response plan with the surrounding community. The clarification can be provided to responding and non-responding facilities. Both responding and non-responding facilities should ensure that proper emergency response will be available during an emergency event.

[244] http://www.gpo.gov/fdsys/pkg/CFR-2000-title40-vol10/pdf/CFR-2000-title40-vol10-sec68-95.pdf

For responding facilities, the involvement from community emergency response or public responders can be enhanced through LEPCs. EPA has established LEPCs for proper co-ordination of emergency response. LEPC is currently mandatory for all RMP regulated facilities. According to LEPC the facilities must coordinate its response activities with the LEPC for its area or with local responders.

For "non-responding facilities", public authorities are required to respond to accidental releases of regulated substances. For facilities that have not included any community emergency plan nor have not properly coordinated response actions with local authorities, EPA can,

- Improve public participation in emergency response through proper risk communication. This can be done in a manner similar to EPA's community involvement program.
- Make sure that there is a secondary emergency response plan in place using third party emergency responders.
- Can identify methods that will increase the emergency preparedness by identifying the root causes of gaps between community emergency plans and EPA's emergency plan.
- Can modify the emergency planning and response tools like CAMEO to be available for all types of emergency responders. This includes onsite emergency responder, first responders, surrounding community, LEPCs and third party emergency contractor[245].
- Conduct training to improve the effectiveness of emergency response measures.
- Mandate and track regular co-ordination with local emergency responders and other community emergency responders.

b) What steps have you taken to coordinate with local responders on emergency response planning?

Response:

EPA regulated facilities can include regular co-ordination with LEPC. Other "non-responding" facilities can involve Regional Response Teams (RRT) and other municipal fire department or municipal hazardous materials response team.

In both cases, due attention needs to be paid to track the activities of this regular co-ordination to make sure the emergency response plans for non-responding facilities are effective.

c) Should EPA clarify what is necessary for RMP facilities to adequately coordinate their emergency response plan with the community emergency response plan?

[245] https://www.osha.gov/chemicalexecutiveorder/EO_ProgressUpdate022014.pdf

Response:

Yes, EPA should clarify the RMP facilities to adequately coordinate their emergency response plan with the community emergency response plan. To achieve this, EPA can

- Improve public participation in emergency response through proper risk communication. This can be done in a manner similar to EPA's community involvement program.
- Can identify methods that will increase the emergency preparedness by identifying the root causes of gaps between community emergency plans and EPA's emergency plan.
- Make sure that there is a secondary emergency response plan in place using third party emergency responders. A proper co-ordination procedure can be listed in the Federal Contingency Plan. Through "One Plan" policy EPA can cover both onsite and offsite emergency response options and one or more additional/secondary emergency options that will be in place for emergency situations.
- Can modify the emergency planning and response tools like CAMEO to be available for all types of emergency responders. This includes onsite emergency responder, first responders, surrounding community, LEPCs and third party emergency contractor[246].
- Conduct training to improve the effectiveness of emergency response measures.
- Mandate and track regular co-ordination with local emergency responders and other community emergency responders.

d) Are there certain substances or types of facilities that present particular response challenges for local authorities? If so, which substances or types of facilities? Should such facilities be required to prepare and implement comprehensive emergency response programs instead of relying primarily on public responders? Do public responders in your area have adequate existing authority to require this now?

Response:

Yes, following facilities pose response challenges.

1. Remote facilities
2. Extremely toxic/flammable substances and explosives (as listed in EPA RMP)
3. High risk facilities identified through hazard assessment
4. Densely populated facilities
5. Facilities which do not have adequate emergency response measures. (For example – inadequate water for fighting large fires)

Yes, facilities can prepare and implement comprehensive emergency response plan. The Federal Integrated Contingency Plan (ICP) or "One-Plan" is one of the comprehensive emergency plans initiated by EPA to consolidate emergency plans of various federal

[246] https://www.osha.gov/chemicalexecutiveorder/EO_ProgressUpdate022014.pdf

organizations. "One Plan" allows a facility to comply with multiple federal planning requirements by consolidating them into one functional emergency response plan. The "One Plan" can include several aspects training, data recording, tracking, software and several aspects designed for emergency response.

The comprehensive emergency plan can be improvised to involve

- Nearby facilities
- Onsite emergency response teams
- Governmental bodies trained on emergency response
- Regional response teams
- State response teams
- Local community
- Third party emergency response contractors
- LEPCs involving public, facility and government.
- Municipal fire departments
- HAZMAT teams
- Other hazardous response teams.

A Comprehensive emergency response plan which includes several secondary measures is implemented in the Port of Houston Authority[247]. It works very closely with private industry and federal agencies Houston Ship Channel for co-operation during emergency situations. The Port of Houston Authority has liaised with Area Maritime Security Committee (AMSC), Houston Ship Channel Security District (HSCSD), Channel Industries Mutual Aid (CIMA), The East Harris County Manufacturers Association (EHCMA), U.S. Coast Guard (USCG), Customs and Border Protection (CBP), Harris County Sheriff's Office (HCSO), Houston Area Maritime Operations Center (HAMOC) [248].

e) If public responders are not capable of responding to a particular type of chemical or release event at an RMP-regulated facility, should the owner or operator of the facility be required to provide for an effective response, either with the facility's own employees, response contractors, a mutual aid agreement with nearby facilities, or some other means?

Response:

- A facility which has only one offsite emergency response will need to have a contingency emergency plan for emergency situations. The contingency emergency response plan or the secondary emergency response plan can involve onsite emergency responders, third-party response contractors, mutual aid agreement with nearby facilities or other offsite emergency responders from different location.

[247] http://www.deepeningportofhouston.com/downloads/BCT-PortSecurity.pdf
[248] http://www.deepeningportofhouston.com/downloads/BCT-PortSecurity.pdf

- The type of secondary emergency response plan will depend on the availability of resources near the facilities.
- The secondary emergency response plan can be included in the existing comprehensive emergency response plan (EPA's one plan).

f) What would be the economic impacts of expanding the emergency response requirements as discussed above? Are there any special circumstances involving small entities that EPA should consider with respect to modifying emergency response requirements?

Response:

While modifying the emergency response requirements, EPA should consider risk posed by facility. This risk should be properly identified through hazard assessment of the facility and tracked through proper audits. It is to be noted that the West Fertilizer plant in West, Texas was a small entity but turned out to pose a high risk. Such facilities are at greater risk when trying to respond to emergencies.

6. Incident Investigation and Accident History Requirements

a1. Are the RMP incident investigation requirements too narrowly focused?
a2. Would identifying a broader range of incidents requiring investigation (*e.g.*, near-misses) help prevent additional accidental releases?
a3. Please provide specific examples where possible.
a4. EPA requests information on alternative definitions or incident classifications that could be included within the rule's incident investigation requirements.

a1. Are the RMP incident investigation requirements too narrowly focused?

Response:

The RMP incident investigation requirements are narrowly focused, considering that it currently only requires investigation for incidents that meet the criteria for including in the five-year accident history section or a catastrophic release. For minor incidents or near-misses, investigation is only suggested, but not required.

a2. Would identifying a broader range of incidents requiring investigation (*e.g.*, near-misses) help prevent additional accidental releases?

Response:

Identifying a broader range of incidents requiring investigation may help prevent additional accidental releases (please see a3 below for examples). However, clear definitions of broader

range of incidents are required before expanding the range of incidents requiring investigation. For example, what are the definition/criteria of "minor incidents" and "near-misses"? One definition of "near-miss" could be those events where no loss of primary containment occurred based upon the functioning of the last line of defense system, without which a catastrophic release would have occurred. However, it is very hard to make a rigid line due to the enormous number and variety of processes. Within this context and because of associated difficulties, instead of stipulating a regulatory requirement, EPA may wish to issue guidance encouraging and promoting operating company's responsibility for investigation of low level events and near-misses.

Moreover, the importance of learning from the investigation results should be emphasized. If the lessons are not learned from past incidents, the investigation will be counterproductive to its purpose. EPA should also consider emphasizing the importance of disseminating the lessons learned from finished investigation rather than expanding the regulation, especially for Common Cause incidents. There are many examples that show industry processes already at work to share lessons learned from events. EPA should emphasize and build on these processes.

a3. Please provide specific examples where possible.

Response:

The Tesoro Incident: Cracking was observed in non-PWHT'd (Post Weld Heat Treatment) carbon steel piping and vessels operating at conditions immediately below the "Nelson" curve[249] without reporting any property damage or personal injury. However, Tesoro did not realize High Temperature Hydrogen Attack (HTHA) would happen to their vessels with operating conditions below "Nelson" curve. This tragedy could be prevented if Tesoro knew this problem and took efficient actions.

The incident happened in NDK Inc. is another example of not learning from previous near-miss incidents. Before the incident, in January 2007, there was an uncontrolled leak of the 400°F caustic sodium hydroxide solution that expelled through the threaded pressure sensor connection at the top of the vessel while in service. No one was injured as a result of the incident. However, while the consultant notified the insurer it had "serious reservations" about returning any of the vessels to service and "far more catastrophic scenarios" involving the vessels were possible[250].

[249] James McLaughlin, Joseph Krynicki, Thomas Bruno. Cracking of Non-PWHT'd Carbon Steel at Conditions Below the Nelson Curve, 2010 ASME conference

[250] CSB (2011). NDK Crystal, Inc., Belvidere, IL High-Pressure Vessel Rupture.

a4. EPA requests information on alternative definitions or incident classifications that could be included within the rule's incident investigation requirements.

Response:

EPA should consider broadening the definition of incidents to include incidents and near-misses that have resulted in or could reasonably have resulted in catastrophic incidents. Of course, that would mean that the owner/operator would have to put in place a management system to identify and investigate these incidents, which could be resource intensive. Thus, EPA should in conjunction with broadening the definition of incidents allow the owner/operator to develop and implement a screening system with a layered investigation approach.

Supporting Information:
Currently, the RMP regulation requires that:

Facilities must investigate each incident which resulted in a catastrophic release of a regulated substance. A catastrophic release is one that presents an imminent and substantial endangerment to public health and the environment. If the incident meets the criteria for including in the five-year accident history section of your RMP, it warrants an incident investigation. Facilities should also consider investigating minor accidents or near-misses because they may help identify problems that could lead to more serious accidents; however, you are not required to do so under part 68. (Prevention Program (Program 2), (§ 68.60)).

The five-year accident history covers only certain releases:

- The release must be from a covered process and involve a regulated substance held above its threshold quantity in the process.
- The release must have caused at least one of the following:
    - On-site deaths, injuries, or significant property damage (§68.42(a));
    - Known offsite deaths, injuries, property damage, environmental damage, evacuations, or sheltering in place (§68.42(a)).

The Bureau of Transportation Statistics (BTS) and the U.S. Department of the Interior's Bureau of Safety and Environmental Enforcement (BSEE) have signed an interagency agreement to develop a confidential near-miss reporting system for use on the Outer Continental Shelf (OCS)[251].

The Tesoro Incident: On April 2, 2010, at approximately 12:35 a.m., a heat exchanger, E-6600E, in the Naphtha Hydrotreater unit at the Tesoro Anacortes Refinery ruptured, releasing a mix of hydrogen and naphtha. The dispersed material auto-ignited, causing an explosion and fire

[251] http://www.rita.dot.gov/bts/bts_bsee

which fatally injured seven employees who were in the area while a parallel bank of E-6600s were being placed in service.

The NDK Incident: On December 7, 2009, at approximately 2:30 pm, State Special Vessel No. 2, under an operating pressure of 29,000 psig, suddenly and violently ruptured, 120 days into a 150-day operating cycle. A white cloud of steam and debris rapidly expanded outward from the facility, traveled onto the interstate, and dissipated within seconds. It caused one public fatality, one public injury and significant property damage.

Table 1 Incident Investigation Requirements (Program Level 2) [252]

Initiate an investigation promptly	Begin investigating no later than 48 hours following the incident.
Summarize the investigation in a report	Among other things, the report must identify the factors contributing to the incident. Remember that identifying the root cause may be more important than identifying the initiating event. The report must also include any recommendations for corrective actions. Remember that the purpose of the report is to help management take corrective action.
Address the report's findings and recommendations	Establish a system to address promptly and resolve the incident report findings and recommendations and document resolutions and corrective actions.
Review the report with your staff and contractors	You must share the report – its findings and recommendations – with affected workers whose job tasks are relevant to the incident
Retain the report	Keep incident investigation summaries for five years

[252] EPA PRM guidance http://www2.epa.gov/sites/production/files/2013-11/documents/chap-06-final.pdf

Table 2. Incident Investigation Requirements (Program Level 3)[253]

Initiate an investigation promptly	Begin investigating no later than 48 hours following the incident.
Establish a knowledgeable investigation team	Establish an investigation team to gather the facts, analyze the event, and develop the how and why of what went wrong. At least one team member must have knowledge of the process involved. Consider adding other workers in the process area where the incident occurred. Their knowledge will be significant and should give you the fullest insight into the incident. Ideally, employees who may serve as investigation team members should be trained in investigation techniques before an incident occurs.
Summarize the investigation in a report	Among other things, the report must identify the factors contributing to the incident. Remember that identifying the root cause may be more important than identifying the initiating event. The report must also include any recommendations for corrective actions. Remember that the purpose of the report is to help management take corrective action.
Address the team's findings and recommendations	Establish a system to address promptly and resolve the incident report findings and recommendations and document resolutions and corrective actions.
Review the report with your staff and contractors	You must share the report – its findings and recommendations – with affected workers whose job tasks are relevant to the incident
Retain the report	Keep incident investigation summaries for five years

b. Are there any data or information on process upsets, near-misses or other incidents that were not required to be investigated, but where an investigation and resulting changes in management systems might prevent accidental releases?

[253] http://www2.epa.gov/sites/production/files/2013-11/documents/chap-07-final.pdf

Response:

There are some incidents where investigation of the incident found out similar things happened earlier without leading to any property damage and injuries. Here we take the Imperial Sugar incident as an example, although it mainly has onsite impacts.

During the investigation about the Imperial Sugar incident, CSB found out that the sugar conveying and processing equipment were not adequately sealed, so that there were significant quantities of sugar spilled onto the floors. In addition, workers there reported that airborne sugar dust and spilled sugar were a constant problem[254]. Therefore, if an investigation had been conducted earlier and corresponding actions taken with regard to engineering solutions, improved housekeeping, and maintenance of the equipment, the tragedy may have been prevented.

Support Information:
The Imperial Sugar Incident: On February 7, 2008, a series of sugar dust explosions happened at the Imperial Sugar manufacturing facility in Port Wentworth, Georgia, resulted in 14 worker fatalities. Another 36 workers were treated for serious burns and injuries.

d. d1.Would a specific time frame for incident investigations to be completed benefit overall safety?
d2. What should be the basis for establishing an appropriate timeframe requirement for an incident investigation to be completed?
d3. What are the challenges and limitations to completing an incident investigation within a specified timeframe?

d1. Would a specific time frame for incident investigations to be completed benefit overall safety?

Response:

A specific time frame for incident investigations to be completed may benefit overall safety; however, it has to be realized that the chemical process is very complicated and there are big differences between incidents and plants, which makes it not practical to set up a time frame for all incident investigations. Currently, OSHA and EPA have requirements for initiating an investigation within 48 hours. It does not require a due date for the completion of an investigation. It would be beneficial, if an initial report including information with "Date of incident", "Date investigation began", "A description of the incident" could be finished within a certain time frame (*e.g.,* like 10 working days).

[254] CSB (2009). Sugar Dust Explosion and Fire, Imperial Sugar Company, Port Wentworth, Georgia.

d2. What should be the basis for establishing an appropriate timeframe requirement for an incident investigation to be completed?

Response:

Basis for establishing an appropriate timeframe is very complicated. These factors should be considered in the process: the consequence, the complexity of the incident, the process, the substances, the investigation team's experience, knowledge and members and so on. However, for a complete list of basis to establish such a timeframe would need further more research.

d3. What are the challenges and limitations to completing an incident investigation within a specified timeframe?

Response:

There are some challenges and limitations to completing an incident investigation within a specified timeframe, for example experts, analysis equipment, and financial support (especially for small companies), complexity of the incident and the process etc.

Supporting Information:
§ 68.60 Incident investigation.
(a) The owner or operator shall investigate each incident which resulted in, or could reasonably have resulted in a catastrophic release.
(b) An incident investigation shall be initiated as promptly as possible, but not later than 48 hours following the incident.
(c) A summary shall be prepared at the conclusion of the investigation which includes at a minimum:

(1) Date of incident;
(2) Date investigation began;
(3) A description of the incident;
(4) The factors that contributed to the incident; and,
(5) Any recommendations resulting from the investigation.

(d) The owner or operator shall promptly address and resolve the investigation findings and recommendations. Resolutions and corrective actions shall be documented.
(e) The findings shall be reviewed with all affected personnel whose job tasks are affected by the findings.
(f) Investigation summaries shall be retained for five years.

e. 1.Are there benefits from requiring that investigations must be performed even in cases where the owner/operator elects to decommission the process involved, where the process is destroyed in the incident, or where a facility determines there were no actual or potential off-site consequences?

2. Would such a requirement provide a disincentive to decommission potentially risky processes?

e1. Are there benefits from requiring that investigations must be performed even in cases where the owner/operator elects to decommission the process involved, where the process is destroyed in the incident, or where a facility determines there were no actual or potential off-site consequences?

Response:

Yes, there are potential benefits for similar process in other companies or other facilities. For illustration, consider the incident that occurred in the Tesoro Refinery. The lessons learned from this incident can give other companies with similar vessels an awareness that cracking can be observed in non-PWHT'd (Post Weld Heat Treatment) carbon steel piping and vessels operating at conditions immediately below the "Nelson" curve.

e2. Would such a requirement provide a disincentive to decommission potentially risky processes?

Response:

Not really, if an incident happened, whatever their decision to decommission the process or sustain it, they still need to conduct the investigation. Therefore, the cost of investigation should not be a factor affecting the decision of decommissioning or not. On the other hand, if the investigation results show the process is still capable for further operation, then actually it helps to keep the process operational.

Supporting Information:
http://www.csb.gov/tesoro-refinery-fatal-explosion-and-fire/

The vessel here due to the different requirements and standards in old decades, cannot meet the operating condition. An investigation of this incident found out this root cause will benefit the company and other companies who have other same vessels in use.

f. Would a modification of the definition of "catastrophic release" assist in addressing the concerns regarding the appropriate scope of incidents that require investigation?

Response:

Probably not, since the OSHA definition and EPA definition matches well for their different aspects. It might be better to focus on expanding the scope from including near-misses under the accident history reporting requirements.

Supporting Information:
OSHA Catastrophic release: Catastrophic release means a major uncontrolled emission, fire, or explosion, involving one or more highly hazardous chemicals, that presents serious danger to employees in the workplace. Facility means the buildings, containers or equipment which contain a process.

EPA Catastrophic release: Catastrophic release means a major uncontrolled emission, fire, or explosion, involving one or more regulated substances that presents imminent and substantial endangerment to public health and the environment[255].

g. Would a modification of the accident history reporting requirements to reflect a broader range of incidents being investigated assist in disseminating lessons learned across industry?

Response:

Yes, a modification of the accident history reporting requirements reflect a broader range of incidents being investigated may indirectly assist in disseminating lessons learned across industry. For example, broader range of incidents means more lessons learned and improved safety awareness. Improved safety awareness will help the disseminating process of lessons learned across industry.

However, disseminating lessons learned is a very essential goal for investigation. Therefore, strengthening dissemination methods is another aspect that EPA should emphasize. Currently, there are plenty of dissemination methods available, which can more directly and efficiently improve the dissemination of lessons learned, for example, List Server, DOE Lessons Learned Web Site and so on.

Supporting Information:
http://www.au.af.mil/au/awc/awcgate/lessons/sells/llinfo.pdf

h. Should EPA require facilities that have incidents or near-misses to conduct a full compliance audit under Sec. 68.58 and Sec. 68.79?

Response:

Currently, a full compliance audit under Sec. 68.58 and Sec. 68.79 is only required for Program Level 2 and Program Level 3. Based on the "Evaluate program levels for covered process" as shown in Support Information part, it can be figured out that there are some gaps for some

[255] http://www.epa.gov/ceppo/web/docs/chem/Appendix-A-final.pdf

incidents not involving regulated substances but caused some onsite injuries, environmental impact, on-site evacuation and so on. However, requiring a full compliance audit may create a perverse behavior or underreporting of incidents, particularly near-misses.

Support Information:

§68.58 Compliance audits.

(a) The owner or operator shall certify that they have evaluated compliance with the provisions of this subpart at least every three years to verify that the procedures and practices developed under the rule are adequate and are being followed.

(b) The compliance audit shall be conducted by at least one person knowledgeable in the process.

(c) The owner or operator shall develop a report of the audit findings.

(d) The owner or operator shall promptly determine and document an appropriate response to each of the findings of the compliance audit and document that deficiencies have been corrected.

(e) The owner or operator shall retain the two (2) most recent compliance audit reports. This requirement does not apply to any compliance audit report that is more than five years old.

§68.79 Compliance audits.

(a) The owner or operator shall certify that they have evaluated compliance with the provisions of this subpart at least every three years to verify that procedures and practices developed under this subpart are adequate and are being followed.

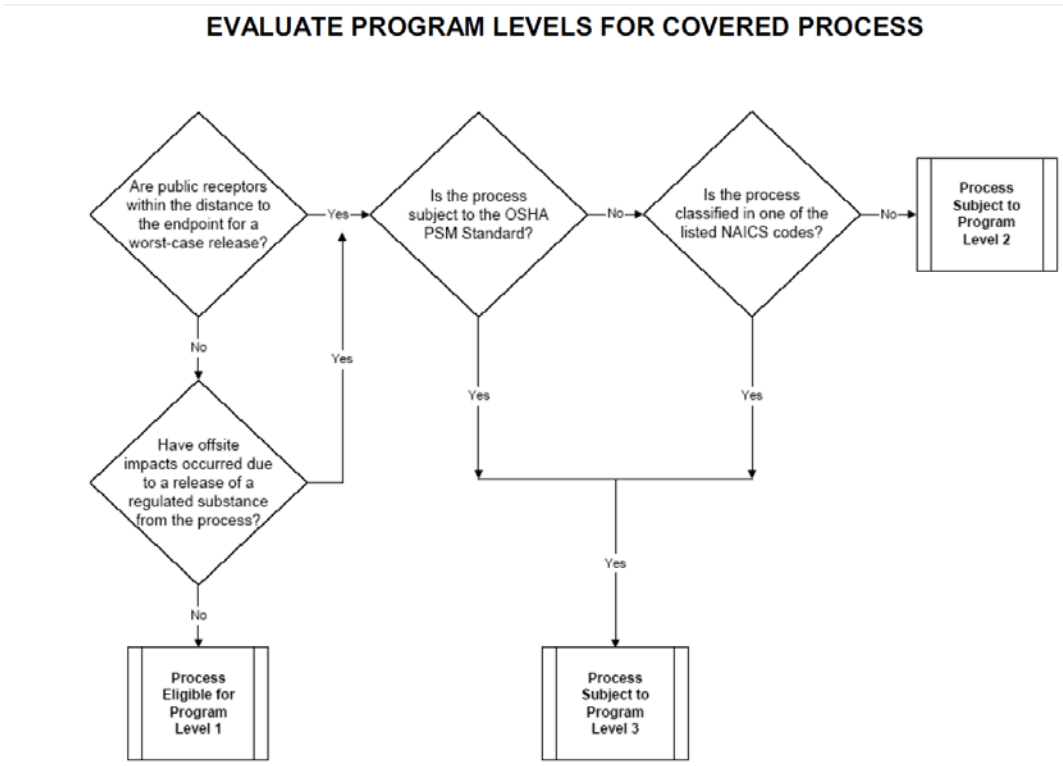
(b) The compliance audit shall be conducted by at least one person knowledgeable in the process.

(c) A report of the findings of the audit shall be developed.

(d) The owner or operator shall promptly determine and document an appropriate response to each of the findings of the compliance audit, and document that deficiencies have been corrected.

(e) The owner or operator shall retain the two (2) most recent compliance audit reports.

Compliance audit under Sec 68.58 is designed for Program Level 2 process while compliance audit under Sec.68.79 is designed for Program Level 3 process.



i. i1.Is it appropriate for facilities to share the results of accident investigations with the local community or alternatively a summary of the accident, and its root cause?
i2. Is there an appropriate role for the local community in conducting investigations?

i1. Is it appropriate for facilities to share the results of accident investigations with the local community or alternatively a summary of the accident, and its root cause?

Response:

It is crucial to have a good risk communication between facilities and their surrounding community. Based on the Clean Air Act's provision for public availability of RMPs, facilities should make the results of incident investigations available to the local community.

However, based on risk communication rules that the communication should be understandable for the local community, the company should make sure to make this information not too technical and make it easy to be understood. Besides, business secret and some other issues should also be considered when deciding the content to share.

i2. Is there an appropriate role for the local community in conducting investigations?

Incident investigations should be conducted by experienced subject-matter experts. However, the local community can act as witness and provide information to help investigations. Also,

the local community should be kept informed about the progress of the investigation and all findings, including interim findings.

Support Information:

CAA sections 112 (r) and 114 (c) require that RMPs be made available to the public, except for any classified or confidential business information contained in RMPs or the off-site consequence analysis (OCA) sections of RMPS (sections 2 through 5).

j. j1. Are there any special circumstances involving small entities that EPA should consider? j2. Would small businesses have the capacity to investigate near miss incidents?

j. j1. Are there any special circumstances involving small entities that EPA should consider?

Response:

No exemption should be allowed for small entities. Risk is risk and qualification of small entities should be checked to ensure their capability to manage the associated risks.

j2. Would small businesses have the capacity to investigate near-miss incidents?

Response:

Small businesses should be capable to investigate near-miss incidents to pass their qualification check. However, in some situation, for example, if comparatively complicated process was involved in this incident, then the investigation needs many experts to be involved; the scene needs to be secured to prevent further incidents; advanced analysis skill and equipment may be needed for root cause analysis. In above situations, small businesses may not have the capacity to fully investigate near-miss incidents, EPA should consider other means.

7. Worst-Case Release Scenario Quantity Requirements for Processes Involving Numerous Small Vessels Stored Together

a. Should EPA revise § 68.25(b) to require the owner or operator of any regulated process involving numerous small containers stored together to consider as the worst-case release quantity the sum of the quantity of all containers in the process, or a subset of such containers, or the containers within one storage area of the process?

Response:

First of all, deciding whether to regulate small vessels together or not depends on the risk-based methods. After the risk-assessment, if small vessels closed together have high risk that might

cause larger size of explosions when one of them failed, then these small vessels could be regulated together. If there is no high risk then these small vessels should not be regulated together.

If after risk assessment, it is decided to regulate small vessels together, then to sum the quantity of the substances in one stored area is reasonable. When a single vessel or a pipe broke, the explosion or the fire they caused may also influence the surrounding vessels or linked pipes. For example, on October 13, 2002, a 145-foot-tall chemical distillation tower exploded in Pascagoula, Mississippi. The explosion was due to the unnoticed decomposition of chemicals. Three workers were injured and several plant-equipment was damaged in the accident. A large piece of debris hit a crude MNT storage tank, which holds more than 100,000 gallons and caused fire that burned for 3 hours. Another piece of debris weighing six tons narrowly missed hitting a crude oil tank at an adjacent refinery. There were a number of other potential receptors, including chlorine cylinders and sulfuric acid tanks. If debris had hit this equipment, it is possible that the incident would have caused significant secondary releases of material and leading to more terrible consequences. So it is reasonable to sum the quantity of the substances in one storage area.

However, in some cases there may some protective barriers like barrier fire protection and sometime fires and explosion may not spread to all the containers in the whole process if they are located too far away or do not have connections. There are many factors that may influence the risk assessment of the process, and the worst-case release quantity should be decided after a thorough assessment of the risk under specific situations.

Supporting Information

1) § 68.25(b)
The worst-case release quantity shall be the greater of the following:
• For substances in a vessel, the greatest amount held at any time in a single vessel, taking into account administrative controls that limit the maximum quantity; or
• For substances in pipes, the greatest amount at any time in a pipe, taking into account administrative controls that limit the maximum quantity.

2) § 68.25(c) Worst-case release scenario: toxic gases.
• For regulated toxic substances that are normally gases at ambient temperature and handled as either a gas or handled as a liquid under pressure, the owner or operator shall assume that the quantity in the vessel or pipe, as determined under paragraph (B) of this rule, is released as a gas over ten minutes. The release rate shall be assumed to be the total quantity divided by ten unless passive mitigation systems are in place at the covered process.
• For gases handled as refrigerated liquids at ambient pressure:
(a) If the released substance is not contained by passive mitigation systems or if the release is contained and the contained pool would have a depth of one centimeter or less, the owner or operator shall assume that the substance is released as a gas in ten minutes;

(b) If the released substance is contained by passive mitigation systems in a pool with a depth greater than one centimeter, the owner or operator may assume that the quantity in the vessel or pipe, as determined under paragraph (B) of this rule, is spilled instantaneously to form a liquid pool. The release rate shall be calculated at the boiling point of the substance and at the conditions specified in paragraph (D) of this rule.

3) § 68.25(d) Worst-case release scenario: toxic liquids.

• For regulated toxic substances that are normally liquids at ambient temperature, the owner or operator shall assume that the quantity in the vessel or pipe, as determined under paragraph (B) of this rule, is spilled instantaneously to form a liquid pool.

(a) The surface area of the pool shall be determined by assuming that the liquid spreads to one centimeter deep unless passive mitigation systems are in place at the covered process that serve to contain the spill and limit the surface area. Where passive mitigation is in place, the surface area of the contained liquid shall be used to calculate the volatilization rate.

(b) If the release would occur onto a surface that is not paved or smooth, the owner or operator may take into account the actual surface characteristics.

• The volatilization rate shall account for the highest daily maximum temperature occurring in the past three years, the temperature of the substance in the vessel, and the concentration of the substance if the liquid spilled is a mixture or solution.

• The rate of release to air shall be determined from the volatilization rate of the liquid pool. The owner or operator may use the methodology in the "RMP Offsite Consequence Analysis Guidance" or any other publicly available techniques that account for the modeling conditions and are recognized by industry as applicable as part of current practices. Proprietary models that account for the modeling conditions may be used provided the owner or operator allows the director or the director's representative access to the model and describes model features and differences from publicly available models to local emergency planners upon request.

4) § 68.25(e) Worst-case release scenario: flammable gases.

The owner or operator shall assume that the quantity of the substance, as determined under paragraph (B) of this rule and the provisions below, vaporizes resulting in a vapor cloud explosion. A yield factor of ten per cent of the available energy released in the explosion shall be used to determine the distance to the explosion endpoint if the model used is based on TNT equivalent methods.

• For regulated flammable substances that are normally gases at ambient temperature and handled as a gas or as a liquid under pressure, the owner or operator shall assume that the quantity in the vessel or pipe, as determined under paragraph (B) of this rule, is released as a gas over ten minutes. The total quantity shall be assumed to be involved in the vapor cloud explosion.

• For flammable gases handled as refrigerated liquids at ambient pressure:

(a) If the released substance is not contained by passive mitigation systems or if the contained pool would have a depth of one centimeter or less, the owner or operator shall assume that the total quantity of the substance is released as a gas in ten minutes, and the total quantity will be involved in the vapor cloud explosion.

(b) If the released substance is contained by passive mitigation systems in a pool with a depth greater than one centimeter, the owner or operator may assume that the quantity in the vessel or pipe, as determined under paragraph (B) of this rule, is spilled instantaneously to form a liquid pool. The volatilization rate (release rate) shall be calculated at the boiling point of the substance and at the conditions specified in paragraph (D) of this rule. The owner or operator shall assume that the quantity which becomes vapor in the first ten minutes is involved in the vapor cloud explosion.

5) § 68.25(f) Worst-case release scenario: flammable liquids.
The owner or operator shall assume that the quantity of the substance, as determined under paragraph (B) of this rule and the provisions below, vaporizes resulting in a vapor cloud explosion. A yield factor of ten per cent of the available energy released in the explosion shall be used to determine the distance to the explosion endpoint if the model used is based on TNT equivalent methods.
• For regulated flammable substances that are normally liquids at ambient temperature, the owner or operator shall assume that the entire quantity in the vessel or pipe, as determined under paragraph (B) of this rule, is spilled instantaneously to form a liquid pool. For liquids at temperatures below their atmospheric boiling point, the volatilization rate shall be calculated at the conditions specified in paragraph (D) of this rule.
• The owner or operator shall assume that the quantity which becomes vapor in the first ten minutes is involved in the vapor cloud explosion.

b. Would revising the worst-case scenario quantity determination requirement in this manner better represent the true worst-case scenario for such processes?

Response:

Yes. As mentioned in the RFI, for certain categories of facilities, like chemical warehouses, large numbers of regulated chemical containers are stored closely together. It is more likely that more severe accidents may happen because of that scenario. It is not only the heat released by the first-ruptured container may cause the surrounding containers to have fire or explosion, it is also possible that the debris from the first container may hit the containers around it to cause the secondary fire or explosion, like the incidents discussed in the question C7.a.

So revising the worst-case scenario quantity determination requirement in this manner could better represent the true worst-case scenario for such processes, especially for the containers located closely to each other.

c. Would this change promote stronger process safety controls and help prevent accidents?

Response:
Yes. After revising the worst-case scenario quantity determination requirement, the assessed risk level of the overall process will increase and the sum of quantity of substances for

containers will become bigger than the threshold of RMP. More facilities will implement protective measures and higher level of emergency plans will be prepared. There will be better design and engineering of facilities, better maintenance of equipment, more effective control points, procedures and training.

Supporting Information

1) Risk Management Plan (RMP) Rule

The Risk Management Plan (RMP) Rule implements Section 112(r) of the 1990 Clean Air Act amendments. RMP requires facilities that use extremely hazardous substances to develop a Risk Management Plan. These plans must be revised and resubmitted to EPA every five years.

RMP includes:
• Hazard assessment that details the potential effects of an accidental release, an accident history of the last five years, and an evaluation of worst-case and alternative accidental releases;
• Prevention program that includes safety precautions and maintenance, monitoring, and employee training measures; and
• Emergency response program that spells out emergency health care, employee training measures and procedures for informing the public and response agencies (*e.g.,* the fire department) should an accident occur.

2) EPA Chemical Accident Prevention: Site Security
The Environmental Protection Agency (EPA) is issuing this Alert as part of its ongoing effort to protect human health and the environment by preventing chemical accidents. EPA is striving to learn the causes and contributing factors associated with chemical accidents and to prevent their recurrence. Major chemical accidents cannot be prevented solely through regulatory requirements. Rather, understanding the fundamental root causes, widely disseminating the lessons learned, and integrating these lessons learned into safe operations are also required. EPA publishes Alerts to increase awareness of possible hazards.

d. In situations where numerous small containers are stored together, are there any kinds of protective barriers or other methods of storage that would reduce the likelihood of a release from one container causing additional releases from adjacent or nearby containers? Should such barriers or storage methods be incorporated into the rule's worst-case scenario requirements, and if so, how? Would revising § 68.25(b) cause any type of additional burden on facilities where large amounts of chemicals are stored together?

Response:

Using cement wall is a worthwhile approach to help reduce the likelihood of a release from one container causing additional releases from adjacent or nearby containers.

These measures that could help to lower the risk should be incorporated into the rule's worst-case scenario requirements. More protective barriers or better storage methods could help to lower the risk of occurrence of accidents, and thus the corresponding worst-case scenario requirements could be lower than the facility without any protective methods.

However, it must be pointed out that additional burden will be added. For the newly regulated facility, they need to develop a Risk Management Plan. These plans must be revised and resubmitted to EPA every five years[256]. Thus, they need to consult experts to prepare for the reports and they need to upgrade their safety protective equipment and upgrade their emergency response.

Supporting Information

1) Methods may reduce the risk of the storage of hazardous substances.[257]

- Make certain to store flammable products in the recommended temperature range.
- Reduce the amount of hazardous materials in storage containers.
- Do periodic maintenance storage areas.

2) Storage and handling of flammable liquids (29 CFR 1910.106)[258]

- Warehouses or Storage Buildings

These structures are sometimes referred to as outside storage rooms. Practically any quantity of flammable and combustible liquid can be stored in these buildings provided that they are stored in a configuration consistent with the tables in this paragraph. Containers in piles shall be separated by pallets or dunnage where necessary to provide stability and to prevent excessive stress on container walls. Stored material shall not be piled within 3 feet of beams or girders and shall be at least 3 feet below sprinkler deflectors or discharge orifices of water spray, or other fire protection equipment.

Aisles of at least 3 feet in width shall be maintained to access doors, windows or standpipe connections.

- INDUSTRIAL PLANTS

This paragraph applies to those industrial plants where:
a) the use of flammable or combustible liquids is incidental to the principal business; or flammable or combustible liquids are handled or used only in unit physical operations such as mixing, drying, evaporating, filtering, distillation, and similar operations which do not involve chemical reaction.
b) This paragraph shall not apply to chemical plants, refineries or distilleries.

- Containers

Flammable or combustible liquids shall be stored in tanks or closed containers.

[256] http://www2.epa.gov/rmp
[257] http://www.wikihow.com/Store-Hazardous-Materials
[258] https://www.osha.gov/dte/library/flammable_liquids/flammable_liquids.pdf

The quantity of liquid that may be located outside of an inside storage room or storage cabinet in a building or in any one fire area of a building shall not exceed:
a) 25 gallons of Class IA liquids in containers
b) 120 gallons of Class IB, IC, II, or III liquids in containers
c) 660 gallons of Class 1B, 1C, II, or III liquids in a single portable tank.

e. If EPA were to revise § 68.25(b) to take into account numerous small vessels being stored together, what types/kinds of vessels should be covered? Should there be any limits on the size of containers subject to the aggregation requirement? What would such limits be based on? Similarly, should there be a specific distance between vessels established in order to consider them as grouped together for purposes of worst case scenario calculations? What would that distance be based on?

Response:

First of all, it is not the type of the vessels itself or the size of the vessels itself or the distance itself could be a factor on whether to regulate these small vessels all together. There are many parameters that influence the potential risk assessment of the process. Before deciding, a thorough risk assessment should be implemented considering the types of the vessels, their size and other parameters that could influence the risk-assessment result.

There are three major types of vessels that are used in Chemical Plant and Oil Refineries: Flash Drums, Surge Tanks, and Accumulators. Among these vessels, those that have the potential hazards should be covered in the regulation. Especially, the pressurized vessels and the vessels that contain the extreme hazardous substances like flammable and corrosive substances should be paid more attention.

The limits of the size of the small vessels and the distances between the vessels should be thoroughly investigated using risk assessment based mathematical methods. EPA could do thorough risk assessment of the whole process to decide the principles for the worst-case scenario using risk matrix, risk tolerance assessment, and other approaches.

<u>Supporting Information</u>

1) Vessels used in chemical plants and oil refineries:[259]

- Flash drums.
  Vessels into which flow a mixture of liquid and vapor. The goal is to separate the vapor and liquid. For design calculations it is normally assumed that the vapor and liquid are in equilibrium with one another and that the vessel is adiabatic (no heat lost or gained). One must simultaneously satisfy a material balance, a heat balance, and equilibrium.
- Surge tanks.

[259] http://people.clarkson.edu/~wwilcox/Design/veslsize.htm

These are storage tanks between units, and can serve a variety of purposes. They can dampen fluctuations in flow rate, composition or temperature. They can allow one unit to be shut down for maintenance without shutting down the entire plant.

- Accumulators.
  These are storage tanks following distillation column condensers. For partial condensers, this flow may be a mixture of vapor and liquid. A level controller may regulate the outlet flow in order to avoid the tank either flooding (liquid out the top) or going dry (vapor out the bottom).

2) Pressure Vessel[260]
   A pressure vessel is defined as "a vessel in which the pressure is obtained from an indirect source or by the application of heat from an indirect source or a direct source.

f. Should EPA revise § 68.25 to require the owner or operator of a regulated process to consider the potential for worst-case release scenarios to involve adjacent facilities or other nearby facilities that are interconnected through pipelines? Would this change raise any confidentiality or security issues? How would EPA adjust its worst-case scenario modeling requirements to account for such a change?

Response:

A risk-based approach should be applied to determine whether the owner/operator needs to consider adjacent facilities or nearby facilities that are interconnected through pipelines for the worst-case release scenarios. And it really varies on a case-by-case basis. In considering this change, EPA may also wish to consider the impact of other factors such as trade secrets, confidentiality, and/or security issues.

Supporting Information

1) OSHA 1910.1200 App E. Definition of trade secret.[261]

A trade secret may consist of any formula, pattern, device or compilation of information which is used in one's business, and which gives him an opportunity to obtain an advantage over competitors who do not know or use it. It may be a formula for a chemical compound, a process of manufacturing, treating or preserving materials, a pattern for a machine or other device, or a list of customers. It differs from other secret information in a business (see s759 of the Restatement of Torts which is not included in this Appendix) in that it is not simply information as to single or ephemeral events in the conduct of the business, as, for example, the amount or other terms of a secret bid for a contract or the salary of certain employees, or the security investments made or contemplated, or the date fixed for the announcement of a new policy or for bringing out a new model or the like. A trade secret is a process or device for continuous use in the operations of the business. Generally it relates to the production of goods, as, for

[260] http://www.nclabor.com/boiler/boiler_faq2.htm

[261] https://www.osha.gov/pls/oshaweb/owadisp.show_document?p_table=STANDARDS&p_id=10104

example, a machine or formula for the production of an article. It may, however, relate to the sale of goods or to other operations in the business, such as a code for determining discounts, rebates or other concessions in a price list or catalogue, or a list of specialized customers, or a method of bookkeeping or other office management.

2) OSHA Trade Secrets 1903.9[262]

- 1903.9(a)
  All information reported to or otherwise obtained by the Secretary or his representative in connection with any inspection or proceeding under this Act which contains or which might reveal a trade secret referred to in section 1905 of title 18 of the United States Code shall be considered confidential for the purpose of that section, except that such information may be disclosed to other officers or employees concerned with carrying out this Act or when relevant in any proceeding under this Act. In any such proceeding the Secretary, the Commission, or the court shall issue such orders as may be appropriate to protect the confidentiality of trade secrets." Section 15 of the Act is considered a statute within the meaning of section 552(b)(3) of title 5 of the United States Code, which exempts from the disclosure requirements matters that are "specifically exempted from disclosure by statute.
- 1903.9(b)
  Whoever, being an officer or employee of the United States or of any department or agency thereof, publishes, divulges, discloses, or makes known in any manner or to any extent not authorized by law any information coming to him in the course of his employment or official duties or by reason of any examination or investigation made by, or return, report or record made to or filed with, such department or agency or officer or employee thereof, which information concerns or relates to the trade secrets, processes, operations, style of work, or apparatus, or to the identity, confidential statistical data, amount or source of any income, profits, losses, or expenditures of any person, firm, partnership, corporation, or association; or permits any income return or copy thereof or any book containing any abstract or particulars thereof to be seen or examined by any person except as provided by law; shall be fined not more than $1,000, or imprisoned not more than 1 year, or both; and shall be removed from office or employment.
- 1903.9(c)
  At the commencement of an inspection, the employer may identify areas in the establishment which contain or which might reveal a trade secret. If the Compliance Safety and Health Officer has no clear reason to question such identification, information obtained in such areas, including all negatives and prints of photographs, and environmental samples, shall be labeled "confidential-trade secret" and shall not be disclosed except in accordance with the provisions of section 15 of the Act.
- 1903.9(d)
  Upon the request of an employer, any authorized representative of employees under §1903.8 in an area containing trade secrets shall be an employee in that area or an employee

[262] https://www.osha.gov/pls/oshaweb/owadisp.show_document?p_table=STANDARDS&p_id=9613

authorized by the employer to enter that area. Where there is no such representative or employee, the Compliance Safety and Health Officer shall consult with a reasonable number of employees who work in that area concerning matters of safety and health.

g. Are there any special circumstances involving small entities that EPA should consider with respect to worst-case scenario analysis?

Response:
No, as mentioned in response to other questions, risk is risk, and thus exemptions should not be made for risk-based issues on the consideration of the size of the entities.

Supporting Information
1) Definition of small entities.[263]
A small entity as used in this chapter means any party (person, small business concern, or nonprofit organization) under paragraphs (a)(1) through (a)(3) of this section.

- Person.
  A person, as used in paragraph (c) of this section, means any inventor or other individual (e.g., an individual to whom an inventor has transferred some rights in the invention) who has not assigned, granted, conveyed, or licensed, and is under no obligation under contract or law to assign, grant, convey, or license, any rights in the invention. An inventor or other individual who has transferred some rights in the invention to one or more parties, or is under an obligation to transfer some rights in the invention to one or more parties, can also qualify for small entity status if all the parties who have had rights in the invention transferred to them also qualify for small entity status either as a person, small business concern, or nonprofit organization under this section.
- Small business concern.
  A small business concern, as used in paragraph (c) of this section, means any business concern that:

(i) Has not assigned, granted, conveyed, or licensed, and is under no obligation under contract or law to assign, grant, convey, or license, any rights in the invention to any person, concern, or organization which would not qualify for small entity status as a person, small business concern, or nonprofit organization; and
(ii) Meets the size standards set forth in 13 CFR 121.801 through 121.805 to be eligible for reduced patent fees. Questions related to standards for a small business concern may be directed to: Small Business Administration, Size Standards Staff, 409 Third Street, SW., Washington, DC 20416.

- Nonprofit Organization.
  A nonprofit organization, as used in paragraph (c) of this section, means any nonprofit organization that:

(i) Has not assigned, granted, conveyed, or licensed, and is under no obligation under contract or law to assign, grant, convey, or license, any rights in the invention to any person, concern, or

[263] http://www.law.cornell.edu/cfr/text/37/1.27

organization which would not qualify as a person, small business concern, or a nonprofit organization; and
(ii) Is either:
(A) A university or other institution of higher education located in any country;
(B) An organization of the type described in section 501(c)(3) of the Internal Revenue Code of 1986 (26 U.S.C. 501(c)(3)) and exempt from taxation under section 501(a) of the Internal Revenue Code (26 U.S.C. 501(a));
(C) Any nonprofit scientific or educational organization qualified under a nonprofit organization statute of a state of this country (35 U.S.C. 201(i)); or
(D) Any nonprofit organization located in a foreign country which would qualify as a nonprofit organization under paragraphs (a)(3)(ii)(B) of this section or (a)(3)(ii)(C) of this section if it were located in this country.

2) Small Entity Definitions of EPA[264]

- Small Business

The RFA references the definition of "small business" found in the Small Business Act. The Small Business Act further authorizes the Small Business Administration (SBA) to define "small business" by regulation, which it does for each of the business categories listed in the North American Industrial Classification System (NAICS).
Up-to-date size standards are provided at SBA's website. For each NAICS code, SBA size standards are generally set by the number of employees or average annual receipts. For example, the recent SBA size standards table (11/5/2010) indicates "small" paper mills that produce newspaper are identified by NAICS code 322122 and are defined by those with 750 or fewer employees; whereas, potato farming is identified by NAICS code 111211 and is defined by annual receipts of $750,000 or less. Note: SBA definitions of small businesses apply to a firm's parent company and all affiliates as a single entity. The SBA's small business definitions are codified in the Code of Federal Regulations at 13 CFR 121.201, which is accessible via FDsys, a website managed by the U.S. Government Printing Office.

- Small Government

The RFA defines "small governmental jurisdiction" as the government of a city, county, town, school district or special district with a population of less than 50,000. The RFA also authorizes agencies to establish alternative definitions of small government after opportunity for public comment. Any alternative definition must be "appropriate to the activity of the agency" and "based on such factors as location in rural or sparsely populated areas or limited revenues due to the population of such jurisdiction." Any alternative definition must be published in the Federal Register. For the purposes of the RFA, states and tribal governments are not considered small governments but rather as independent sovereigns.

[264] http://www.epa.gov/rfa/overview.html

- Small Organization

The RFA defines "small organization" as any "not-for-profit enterprise which is independently owned and operated and is not dominant in its field." The RFA also authorizes an agency to adopt and apply alternative definitions, "which are appropriate to the activities of the agency" for each category of small entity (*i.e.*, small business, small organization and small governmental jurisdiction). To adopt an alternative definition, agencies must provide an opportunity for public comment and publish the alternative definition in the Federal Register.

3) Regulatory Flexibility Act (RFA)[265]

The Regulatory Flexibility Act (RFA), as amended by the Small Business Regulatory Enforcement Fairness Act (SBREFA), imposes both analytical and procedural requirements on EPA and other federal agencies. EPA must carefully consider the economic impacts its rules will have on small entities, and ensure that small entities have a voice in the regulatory development process. These requirements ensure that EPA carefully considers the effect its regulations may have on small entities. However, these analytical and procedural requirements do not require EPA to reach any particular result regarding small entities.

8. Public Disclosure of Information to Promote Regulatory Compliance and Improve Community Understanding of Chemical Risks

a. Should EPA amend the RMP regulation to require RMP-regulated facilities to post chemical hazard-related information on their websites (if they have one) such as RMP chemical names, chemical quantities, executive summaries, links to LEPCs, community emergency plans, Safety Data Sheets (SDS) for hazardous chemicals present on site, EPCRA Tier 2 reports, release notification reports, accident history and cause and other similar information? What requirements should be considered for facilities that do not have a website?

Response:

No. Most information is already been accessible online. Public can obtain RMP information without Off-site Consequence Analysis (OCA) via Freedom of Information Act (FOIA). Public can also obtain full RMP information by visiting Federal Reading Rooms. They can also obtain information by searching THE RIGHT-TO-KNOW NETWORK website, which includes RMP chemical names, chemical quantities, executive summaries, LEPC name, accident history and cause, etc.

Local Emergency Planning Committees (LEPCs) also have safety information, including community emergency plans, Safety Data Sheets (SDS) for hazardous chemicals present on site, EPCRA Tier 2 reports, release notification reports, etc. Concerned citizens can consult with LEPCs and even join their activities, and deliver their concerns to facilities. The effective risk

[265] http://www.epa.gov/rfa/overview.html

communication should involve local communities and facilities directly, while achieving the provisions of security of information from those not involved with developing or auctioning emergency response plans.

If the concerned citizens want to know the safety information, it would be not much difference that the information is accessible on companies' website or from above methods. Therefore, it is unnecessary to create additional burdens to facilities. Also, in considering this change, EPA must give weight to the fact that risk information is most useful at the local level. And thus encouraging dialogue at the local level and exchange of information at the local level should be the goal. Making information available on the website does not necessarily accomplish those local goals, but has the downside potential of creating security risks.

b. Would requiring facilities to make this information available on the company website promote improved regulatory compliance? What additional economic burden would be associated with such a requirement?

Response:

Requiring facilities to make this information available on the company website might promote improved regulatory compliance by creating community pressure. However, it may be only valid if the information is not accessible yet. Since the information is already available, it is not necessary to post chemical hazard-related information on their websites again. The key issue is how to utilize this information effectively.

LEPCs should promote risk communication between local communities, facilities, emergency responders, local officials and media. EPA can analyze their RMP incident database to identify communities with higher incident and risk, and then assist the LEPCs to improve regulatory compliance and promote safety.

<u>Supporting information:</u>
Emergency Planning and Community Right-to-Know Act (EPCRA) created State Emergency Response Commissions (SERCs), emergency planning districts, and Local Emergency Planning Committees (LEPCs). The act required LEPCs to receive hazardous chemical information in the communities, prepare community emergency plans based on the information, and provide chemical hazard-related information to local citizens and respond to public inquiries. The emergency plans should be developed by LEPCs and stakeholders. There are more than 3000 LEPCs currently in US. At a minimum, the LEPC members should include[266]:

- Elected state and local officials
- Police, fire, civil defense, and public health professionals
- Environment, transportation, and hospital officials
- Facility representatives

[266] http://www2.epa.gov/epcra/local-emergency-planning-committees

- Representatives from community groups and the media

LEPCs have information directly from local facilities or EPA under EPCRA, including[267]:

- Notification from facilities that have extremely hazardous substances (EHSs) in excess of threshold planning quantity amounts. This information is reported directly to the local emergency planning committee (LEPC). (EPCRA sections 302 and 303)
- Notification of emergency information about accidental releases of reportable quantities of EHSs and substances regulated under CERCLA (CERCLA hazardous substances). This information is reported to the LEPC's community emergency coordinator. (EPCRA section 304)
- Material Safety Data Sheets (MSDSs) – or lists of hazardous chemicals – from facilities that have threshold quantities of hazardous chemicals and that must have an MSDS under the Occupational Safety and Health Act, and annual inventory information on the quantity, hazard category, and location and storage conditions of hazardous chemicals at facilities at threshold levels. This information is reported directly to the LEPC. (EPCRA sections 311 and 312)
- Annual reports on total yearly releases of toxic chemicals from regulated facilities. This information is reported to EPA. EPA compiles this information in a database called the Toxics Release Inventory (TRI) and makes the information available to the public. (EPCRA section 313)

Under RMP, LEPCs can gain additional information:

- Facility hazard assessments, including worst-case release and alternative release scenarios;
- Facility accident prevention activities, such as use of special safety equipment, employee safety training programs, and process hazards analyses conducted by the facility;
- Past chemical accidents at a facility; and
- Facility emergency response programs and plans.

LEPCs can utilize the information to understand the risk in the communities and involve local facilities, local officials, SERCs, local citizens and EPA to have dialogues to improve regulatory compliance and promote safety. LEPCs may remind communities that they have such information available. By working with communities closely, the facility risk can be understood and the information can be disseminated to create community pressure.

c. Do RMP-regulated facility owners/operators have any safety or security concerns with posting the executive summary from the RMP, or linking to EPCRA reports and community response plans on the company websites? Please explain any concerns regarding specific elements of this information.

[267] RMPs Are on the Way, November, 1999

Response:

It is not necessary to post this information on their websites. While every effort should be made to provide risk information to the local community and by providing it in a direct manner, other objectives regarding follow-up questions and developing a close relationship with the community are also addressed. Putting information on the website does not allow any additional benefits but has the potential for being used for ulterior purposes by people meaning to do harm to the facility and/or surrounding public.

Supporting information:
The most security concerned information would be Off-site Consequence Analysis Information (OCA) and alternative scenario chemical accidents in sections 2 through 5 of submitted RMPs. Except authorized by law, disclosure or distribution of OCA and related data to public is prohibited for government officials and covered researchers[268].

Though a brief description of OCA was required in the Executive Summaries, this was amended in 2004 and companies are not required to do so anymore. To promote information disclosure while concern security, the OCA regulations published by EPA and DOJ allow the citizens to access limited and controlled OCA information. The whole RMP information is available for the public via the 50 Federal Reading Rooms, up to 10 facilities per calendar month and without geographical restrictions[269].

d. Would posting the RMP executive summary on a website cause facility owner/operators to remove important information from the executive summary? Does EPA need to better define the contents of an executive summary in order to allay security concerns?

Response:

Posting executive summaries on the internet does have potential for harm and misuse including, but not limited to, the following:

- Disclosure of trade secrets and/or confidential information
- Use of the information for criminal activities and other nefarious activities

Thus, posting the RMP executive summary on a website may cause the facility owner/operators to remove information from the executive summary.

Supporting information:
§68.155 Executive summary: a brief description of the following elements:

[268] Security Notice To Federal, State and Local Officials Receiving Access to the Risk Management Program's Off-site Consequence Analysis Information
[269] http://www2.epa.gov/rmp/federal-reading-rooms-risk-management-plans-rmp

(a) The accidental release prevention and emergency response policies at the stationary source;
(b) The stationary source and regulated substances handled;
(c) The general accidental release prevention program and chemical-specific prevention steps;
(d) The five-year accident history;
(e) The emergency response program; and
(f) Planned changes to improve safety.

e. Is there other information (web-based or otherwise) that would assist local communities, emergency planners, and responders in understanding facility risks that should be made publicly available? For example, would disclosure of the facility's PHA or compliance audit to local authorities such as the LEPC result in improved safety?

Response:

As mentioned above, we don't recommend posting the information on the websites. Some information could be made available to LEPCs since the effective risk communication should be made between local facilities and communities directly. However, documents such as PHA or compliance audits sometimes contain business secrets as well as complicated information. Best thing to do is make appropriate information available to the community on a direct basis through personal interaction, LEPC meetings, and CAP exchanges.

g. Are there other activities or measures that RMP-facility owner/operators can use to ensure that communities, planners, and responders have access to appropriate information?

Response:

The RMP-facility owner/operators can provide safety-related information to LEPCs completely and respond to their inquiries quickly. The facilities should also participate in LEPC activities to communicate with local communities and address their concerns.

h. Can the use of social media or other forms of community outreach be incorporated into hazard assessment, prevention, and response to leverage community involvement in oversight? For example, would increase public disclosure of RMP-related information, such as accidental releases, near misses, and subsequent safety enhancements, or increased community involvement in facility emergency response planning, lead to improvements in facility safety? Please identify aspects of the RMP rule where there are opportunities for community involvement.

Response:

Increased public disclosure of RMP-related information and increased community involvement in facility emergency response planning would lead to improvements in facility safety. However, as mentioned before, most safety-related information is already available online. The

issue is how to utilize it effectively. Disseminating information without proper explanation may create unnecessary concerns for local citizens. LEPCs should cooperate with focal facilities to have proper risk communication with local communities and remind them what information is accessible online and what information can be obtained from LEPCs. It is also important to let public understand what hazards may be present in their community and how the facilities address the hazard and keep the risk at or below the "acceptable level." When local citizens have adequate information and knowledge, facilities may improve their safety further due to the community pressure and oversight. While developing emergency response planning, LEPCs and facilities should also involve local citizens to let them understand the appropriate actions, which may reduce the public panic and let communities act quickly and appropriately.

9. Threshold Quantities and Off-site Consequence Analysis Endpoints for Regulated Substances Based on Acute Exposure Guideline Level Toxicity Values

a. Would revising the RMP rule to incorporate AEGL-2 and ERPG-2 values (when an AEGL is not available), as the basis for TQs and toxic endpoints make the RMP rule more protective of human health and the environment? Would it result in significant changes to the universe of RMP-regulated facilities due to potential changes in TQs? If so, what number and types of facilities would be most affected and what changes would occur?

Response:

The purpose of RMP rules is to protect human health and the environment. The RMP-rules incorporating both IDLH values and AEGL-2 values as the basis for TQs will accomplish this mission. However, based on the definition of the AEGL-2 and ERPG-2 values and the comparison with previous IDLH values, using AEGL-2 and ERPG-2 values are safety enhanced. Because most of the AEGL-2 and ERPG-2 values are lower than the IDLH values, which make the exposure concentration limit for employees lower if the AEGL-2 and ERPG-2 values are used as the basis for TQs.

As an example, consider carbon monoxide, which is one of the substances that is listed on IDLH list, AEGL list and ERPG list, has different TQ values. The IDLH value of carbon monoxide is 1,500 ppm while AEGL-2 (60 mins exposure) value is 83 ppm and ERPG-2 value is 350 ppm.

Substance	Original IDLH Value	Revised IDLH Value
Carbon monoxide	1,500 ppm	1,200 ppm

Table.1 Documentation for Immediately Dangerous To Life or Health Concentrations (IDLHs)

630-08-0 Carbon monoxide (ppm)

	10 min	30 min	60 min	4 hr	8 hr
AEGL 1	NR	NR	NR	NR	NR
AEGL 2	420	150	83	33	27
AEGL 3	1,700	600	330	150	130

NR = Not recommended due to insufficient data

Table.2 Complied AEGLs from EPA

Chemical (CAS Number)	ERPG-1	ERPG-2	ERPG-3
Bis (Chloromethyl) Ether (542-88-1)	ID‡	0.1 ppm	0.5 ppm
Boron Trifluoride (7637-07-2)	2 mg/m³✪	30 mg/m³	100 mg/m³
Bromine (7726-95-6)	0.1 ppm✪	0.5 ppm	5 ppm
1,3-Butadiene (106-99-0)	10 ppm✪	200 ppm	5000 ppm
n-Butyl Acetate (123-86-4) *	5 ppm✪	200 ppm	3000 ppm
n-Butyl Acrylate (141-32-2)	0.05 ppm✪	25 ppm	250 ppm
n-Butyl Isocyanate (111-36-4)	0.01 ppm	0.05 ppm	1 ppm
Carbon Disulfide (75-15-0)	1 ppm✪	50 ppm	500 ppm
Carbon Monoxide (630-08-0) *	200 ppm	350 ppm	500 ppm
Carbon Tetrachloride (56-23-5) *	20 ppm✪	100 ppm	750 ppm

Table 3. 2014 ERPGs value from NOAA

According to Goldstein (Dec 2008) "Carbon monoxide poisoning", the symptoms of carbon monoxide poisoning is shown below.

Concentration	Symptoms
35 ppm (0.0035%)	Headache and dizziness within six to eight hours of constant exposure
100 ppm (0.01%)	Slight headache in two to three hours
200 ppm (0.02%)	Slight headache within two to three hours; loss of judgment
400 ppm (0.04%)	Frontal headache within one to two hours
800 ppm (0.08%)	Dizziness, nausea, and convulsions within 45 min; insensible within 2 hours
1,600 ppm (0.16%)	Headache, tachycardia, dizziness, and nausea within 20 min; death in less than 2 hours
3,200 ppm (0.32%)	Headache, dizziness and nausea in five to ten minutes. Death within 30 minutes.
6,400 ppm (0.64%)	Headache and dizziness in one to two minutes. Convulsions, respiratory arrest, and death in less than 20 minutes.
12,800 ppm (1.28%)	Unconsciousness after 2–3 breaths. Death in less than three minutes.

The following accident involving carbon monoxide has proved that if the RMP rules are based on the AEGL-2 value, fatality could has been avoided. On December 5, 2008, an employee working on machinery maintenance was reported dead due to exposure to high concentration of carbon monoxide. In the incident scene, the fire department measured approximately 1,400 ppm of carbon monoxide in the room. According to the original IDLH value, the employee should be able to survive within 1 hr exposure time and recover without any irreversible health injury. However, the incident has proved that this value is higher than the limitation of employee. So AEGL-2 and ERPG-2 value should be considered to replace the IDLH to enhance safety.

Significant changes will be applied to the universe of RMP-regulated facilities if AEGL-2 values are used. Since AEGL-2 (ERPG-2) values are often, but not always, lower than the existing toxic endpoints, which will lead to the change of regulation about the exposure concentration limit and exposure time limit. Also safer design will be required so that employees can evacuate quick enough without exposure to toxic gas/liquid release and more alarm systems will be necessary for detection at lower concentration.

Supporting information

https://www.osha.gov/SLTC/emergencypreparedness/chemical/pdf/r-s-a_faqs-aegls_1_03.pdf
OSHA Frequently Asked Questions(FAQs) regarding Acute Exposure Guideline Levels (AEGLs) at CSEPP Sites

http://www.cdc.gov/niosh/idlh/intridl4.html
Documentation for Immediately Dangerous To Life or Health Concentrations (IDLHs)
Chemical Listing and Documentation of Revised IDLH Values (as of 3/1/95)

http://www.epa.gov/oppt/aegl/pubs/compiled_aegls_update_nov2013.pdf
AEGL Chemicals

http://response.restoration.noaa.gov/erpgs
Emergency Response Planning Guidelines (ERPGs)

https://www.aiha.org/get-involved/AIHAGuidelineFoundation/EmergencyResponsePlanningGuidelines/Documents/2014%20ERPG%20Values.pdf
Goldstein M (December 2008). "Carbon monoxide poisoning". Journal of Emergency Nursing: JEN: Official Publication of the Emergency Department Nurses Association 34 (6): 538–542.

https://www.osha.gov/pls/imis/accidentsearch.accident_detail?id=201262433
OSHA Accident: 201262433 - Employee Is Overcome By Carbon Monoxide, Later Dies

Inspection	Open Date	SIC	Establishment Name
312752249	12/05/2008	1711	Anchor Mechanical, Inc.

b. The IDLH values used for setting the existing TQs are based on an exposure period of 30 minutes. If the IDLH was not available, the acute toxicity data used to determine the equivalent IDLH varied depending on the chemical and actual study, and these numbers typically ranged from 1 to 8 hours. The ERPG-2 values used for the toxic endpoints represent

an exposure period of 1 hour. Given that AEGLs are established with five different exposure periods (10 minutes, 30 minutes, 1 hour, 4 hours, and 8 hours), which exposure time should be used if the AEGL is used to determine the TQs and/or toxic endpoints?

Response:

It depends on the exposure individuals and the toxicity of the hazardous material. The advantage of using AEGL value is that AEGL value can cover more sensitive individuals (such as the elderly, pregnant women, children or people with various health problems), reflect actual exposures to accidental airborne releases and reflect the concentration that could result in serious but reversible injury. The risk associated with the hazardous materials should be evaluated before determining any exposure time to be used. Generally, all of the exposure periods should be considered. However, usually only 1-hour exposure values are used, especially when comparing with the values of ERPG and IDLH.

Supporting information
According to the office of response and restoration, if final or interim AEGLs are available for the chemical you are modeling, ALOHA will provide the AEGL values with a 60-minute exposure duration as the default toxic LOCs. Even though AEGLs are available for five exposure durations, only the 60-min AEGLs are provided in ALOHA (because it models the release for 60 minutes from your start time).
http://response.restoration.noaa.gov/oil-and-chemical-spills/chemical-spills/resources/acute-exposure-guideline-levels-aegls.html

c. What should be the hierarchy for developing an alternative or equivalent LOC when an AEGL value has not been established for a toxic substance? Should ERPG values be used instead if they exist? If no ERPG value exists, should an LOC based on the IDLH value be used instead if it exists? If there is no IDLH value, how should the LOC be calculated for either the TQ or toxic endpoint? Is there an alternate method for establishing an equivalent LOC for those chemicals not having an AEGL or ERPG that will result in an appropriate TQ?

Response:

Due to the availability of the AEGL, ERPG and IDLH values, the Office of Response and Restoration (NOAA, US Department of Commerce) has offered the default LOC options based on this hierarchy:

• AEGLs (include 471 chemicals) are used preferentially, because they are the best public exposure LOCs to date. The development process and guidelines are thoroughly reviewed. Additionally, AEGLs are designed for nearly all members of the general public, including sensitive individuals (such as very young people).
• ERPGs (include 145 chemicals) are used next. They are developed from experimental data like the AEGLs—but ERPG values are only available for a 60-minute exposure duration and they

are not designed as guidelines for sensitive individuals. ERPGs have been defined for about 145 chemicals.
• IDLH limits (include 387 chemicals) are used when no public exposure guidelines are defined for a given chemical. An IDLH limit is a workplace exposure limit that is used primarily for making decisions regarding respirator use. In the 1980s, before public exposure guidelines were available for most common chemicals, the IDLH limit was used in public exposure situations.

Except the AEGLs, ERPGs and IDLH limits, other data regarding the threshold quantities include Protective Action Criteria for Chemicals (PACs), Temporary Emergency Exposure Limits (TEELs). TEELs estimate the concentrations at which most people will begin to experience health effects if they are exposed to a hazardous airborne chemical for a given duration. TEELs are used in similar situations as the 60-minute AEGLs and ERPGs and it is derived by the U.S. Department of Energy Subcommittee on Consequence Assessment and Protective Actions (SCAPA) according to a specific, standard methodology. While PACs dataset is a hierarchy-based system of the three common public exposure guideline systems: AEGLs, ERPGs, and TEELs.

Supporting information
http://response.restoration.noaa.gov/oil-and-chemical-spills/chemical-spills/resources/public-exposure-guidelines.html
• AEGLs are used preferentially, because they are the best public exposure LOCs to date. The development process and guidelines are thoroughly reviewed. Additionally, AEGLs are designed for nearly all members of the general public, including sensitive individuals (such as very young people). About 130 substances have final AEGLs as of mid-2013, and there are interim AEGLs defined for about 130 additional substances.
• ERPGs are used next. They are developed from experimental data like the AEGLs—but ERPG values are only available for a 60-minute exposure duration and they are not designed as guidelines for sensitive individuals. ERPGs have been defined for about 145 chemicals.
• PACs are used next. This dataset combines all three common public exposure guideline systems (AEGLs, ERPGs, and TEELs) and implements a hierarchy-based system for you. (AEGLs are used preferentially, followed by ERPGs, and then TEELs.) If ALOHA is defaulting to the PAC values, it means that there are no AEGL or ERPG values in the ALOHA chemical library for that substance. In this case, the PAC values will be the TEEL values. TEELs are derived using existing LOCs and by manipulating current data. This process is less intensive than the AEGL or ERPG process, and TEELs have been defined for more than 3,000 chemicals.
• IDLH limits are used when no public exposure guidelines are defined for a given chemical. An IDLH limit is a workplace exposure limit that is used primarily for making decisions regarding respirator use. In the 1980s, before public exposure guidelines were available for most common chemicals, the IDLH limit was used in public exposure situations. For example, the Technical Guidance for Hazards Analysis (which was developed in 1987 by the Environmental Protection Agency and other federal agencies to provide guidance for hazard planning) primarily used 1/10th of the IDLH limit. However, unlike the three-tiered public exposure guidelines, only a single IDLH value is defined for applicable chemicals.

Some chemicals are defined under multiple hazard classification systems. In these cases, ALOHA will provide the default value according to the above hierarchy, but it will also provide others as LOC options. Additionally, you can also specify your own LOCs.
http://response.restoration.noaa.gov/oil-and-chemical-spills/chemical-spills/resources/temporary-emergency-exposure-limits-teels.html

TEELs estimate the concentrations at which most people will begin to experience health effects if they are exposed to a hazardous airborne chemical for a given duration. TEELs are used in similar situations as the 60-minute AEGLs and ERPGs.

A chemical may have up to three TEEL values, each of which corresponds to a specific tier of health effects. The three TEEL tiers are defined as follows:

TEEL-3 is the airborne concentration (expressed as ppm [parts per million] or mg/m3 [milligrams per cubic meter]) of a substance above which it is predicted that the general population, including susceptible individuals, could experience life-threatening adverse health effects or death.

TEEL-2 is the airborne concentration (expressed as ppm or mg/m3) of a substance above which it is predicted that the general population, including susceptible individuals, could experience irreversible or other serious, long-lasting, adverse health effects or an impaired ability to escape.

TEEL-1 is the airborne concentration (expressed as ppm or mg/m3) of a substance above which it is predicted that the general population, including susceptible individuals, could experience notable discomfort, irritation, or certain asymptomatic, non-sensory effects. However, these effects are not disabling and are transient and reversible upon cessation of exposure.

TEELs are derived by the U.S. Department of Energy Subcommittee on Consequence Assessment and Protective Actions (SCAPA) according to a specific, standard methodology. The TEEL methodology uses available levels of concern and manipulates current data using a peer-reviewed, approved procedure in order to establish the TEELs.

AEGLs and ERPGs, on the other hand, are derived from extensive reviews of animal and human studies. Recognizing that AEGLs and ERPGs are better public exposure guidelines, the TEEL methodology prescribes replacing the TEEL value with those values when they become available. The 60-minute AEGL value is used preferentially, followed by the ERPG value. [Note: This hierarchy of values (60-minute AEGLs > ERPGs >TEELs) is implemented in the PACs dataset, which is provided by the TEEL developers].

However, the extensive review process for AEGLs and ERPGs that enhances the quality of those values also increases the amount of time it takes for chemicals to be defined under each system. As of mid-2013, only about 130 substances have final AEGLs and about 145 chemicals have

ERPGs. TEELs can be derived relatively quickly for almost any chemical; as a result, TEELs are available for thousands of chemicals. TEELs can provide a useful reference when no other public exposure guidelines are available[270].

The PACs dataset is a hierarchy-based system of the three common public exposure guideline systems: AEGLs, ERPGs, and TEELs. A particular hazardous substance may have values in any—or all—of these systems.

The PACs dataset implements the following hierarchy when choosing which values to use for the PACs:

- Final, 60-minute AEGL values (preferred)
- Interim, 60-minute AEGL values
- ERPG values
- TEEL values

The PACs dataset has a single set of values (PAC-1, PAC-2, and PAC-3) for each chemical, but the source of those values will vary. So, for instance, the PAC-3 value for one chemical might be an ERPG-3 and the PAC-3 value for a different chemical might be the TEEL-3. A hierarchical system can be helpful for choosing levels of concern for chemicals that are defined under two or more of the public exposure guidelines. The PACs dataset is created by the TEEL developers (Department of Energy, Subcommittee on Consequence Assessment and Protective Actions).

d. Currently, RMP worst-case scenarios can be based on 10-minute or 60-minute release times. Because many AEGL-2 values are established for 1-hour, 4-hour and 8-hour exposure periods, should requirements for determining the worst-case and alternative release scenarios also incorporate four and eight hour release times using the 4-hour and 8-hour AEGL-2 values for a particular toxic chemical?

Response:

No. One of the advantages of using AEGL value is that AEGL value can reflect actual exposures to accidental airborne releases and reflect the concentration that could result in serious but reversible injury. For certain type of hazardous chemicals, the worst-case scenarios (death or irreversible injury) can happen within 10min or 1hour, using 4-hour or 8-hour AEGL-2 values will only make the worst-case scenarios inaccurate (may underestimate or overestimate)[271].

[270] http://response.restoration.noaa.gov/oil-and-chemical-spills/chemical-spills/resources/protective-action-criteria-chemicals-pacs.html

[271] https://www.aiha.org/aihce04/handouts/po124bishop.pdf

e. Should EPA consider using AEGL-1 rather than AEGL-2 values for calculating reporting thresholds and toxic endpoints in order to address acute effects that are transient and reversible (such as discomfort and irritation)?

Response:

No, we believe that EPA should not consider using AEGL-1 rather than AEGL-2 values for calculating reporting thresholds and toxic endpoints. AEGL-2 is the airborne concentration (expressed as ppm or mg/m^3) of a substance above which it is predicted that the general population, including susceptible individuals, could experience irreversible or other serious, long-lasting adverse health effects or an impaired ability to escape. It means when below AEGL-2, there are only reversible effects, no impact on ability to self-escape, while above AEGL-2, the impact on medical resources will increase and may lead to mass casualty event. If AEGL-1 is used, it will increase the burden of the emergency response plan (more evacuation individuals, larger evacuation area, etc.) which in turn, increase the risk of the emergency evacuation[272].

f. What would be the economic impacts of recalculating TQs as discussed above? Are there any special circumstances involving small entities that EPA should consider with respect to recalculating TQs??

Response:

There will be considerable economic impact since the new AEGL-2 value for TQs and toxic endpoint will lead to the change of release scenario zone and worst-case analysis. In most cases, the lower AEGL-2 values are, the larger evacuation area is required for an emergency situation. So all of RMP-regulated facilities will be affected (safety design will need to change accordingly), unless the new TQs and toxic endpoints based on AEGL-2 and ERPG-2 values are very close to the previous ones. Thus we recommend that EPA should conduct a detailed risk-benefit analysis before making any changes regarding this issue.

10. Program 3 NAICS Codes Based on RMP Accident History Data

a. Should industry sectors represented in RMP data as those with the most accidental releases be used to update and replace the existing set of Program 3 NAICS codes with a new set?

Response:

Industry sectors previously in Program 3 but not in the current list are petrochemical, cyclic crude & intermediates, plastic resins, nitrogen fertilizers, pesticide & agriculture. New industry

[272] https://www.aiha.org/aihce04/handouts/po124bishop.pdf

sectors added into Program 3 are water supply, farm supplies, sewage, poultry processing, refrigerated warehousing & storage.

Removing the old sectors would result in less strict regulations on these sectors and may result in increased risk for accidental releases. When deciding the top ten industry sectors for Program 3, proper statistical analysis should be performed, as sometimes the percentage difference between the top ten sectors and the sectors just outside of the top ten might not be statistically significant. While reclassification of NAICS codes for Program 3 based on accident history data does not guarantee the cessation of accidental releases and on-site or public effects, the use of available data to identify where limited resources could best be suited to maximally reduce risk is a task that should be strongly considered. But the data must be utilized in a manner that accurately represents the true risks that face industry. When deciding the top sectors for Program 3, EPA must take into account many different factors that influence the risk; for example, number of sources, amount of each source, storage/usage conditions, severity of accidents, and near misses should all be taken into account when determining the Program 3 sectors.

Further, instead of deciding whether to enlarge or shrink the number of Program 3 NAICS codes arbitrarily, a risk-based approach should be taken to decide which of the NAICS codes should be present in Program 3. This risk-based approach should set a level of risk above which the industries would be included in Program 3 regardless of how many or how few fall into the category. The NAICS codes that are included in Program 3 should be updated on a fixed basis, perhaps every 5 years, and the risk level can be modified downward on a fixed basis based on improvements in safety management systems, technologies, and performance to reflect the contemporary safety climate at the time of the modification.

b. How can the RMP accident history data best be used to update the current list of NAICS codes that trigger Program 3 requirements? Should the agency take into account the number of sources in each sector, or the severity of reported accidents, or other factors, in selecting updated Program 3 NAICS codes? Is the methodology used to develop the SIC/NAICS code list applicable to the RMP accident history database?

Response:

The methodology used in the development of the SIC/NAICS code list, namely to use available data to determine the industries with the highest risk, while compensating so that a small number of sources with serious safety problems does not skew the data of the industry as a whole, is indeed applicable to the RMP database. Further, since the RMP database includes more information and, importantly, more pertinent information, the use of this database, in conjunction with any other trusted sources of data is recommended. RMP accident history data generally has information pertaining to the release such as source, on-site impacts, off-site impacts, weather conditions, initiating event, contributing factors, and changes introduced as a

result of incident. All applicable data should be normalized appropriately and used to update the current list of Program 3 NAICS codes.

As outlined in response 10A, a risk-based approach should be used to determine which NAICS codes are included in Program 3. As there are many components of data that can be taken into account, and the risk of an industry or a process may be difficult to quantify directly, a heuristic formula could be devised by EPA which accounts for the following factors (but not limited to the those listed below) in updating the Program 3 NAICS codes:

- Number of sources in each sector
- Amount of each of the source
- Storage/usage conditions of the various hazardous chemicals
- Severity of potential accidents
- Severity of reported accidents
- Near-misses

NAICS codes are generally six digits with the first two digits explaining the economic sector, the third, fourth, fifth and sixth digits designating subsector, industry group, NAICS industry, national industry respectively[273].

c. Would limiting the data analysis or the selection of NAICS codes to only those industry sectors represented in the RMP data provide a complete and accurate picture of high risk industry sectors?

Response:

Limiting the data analysis to only those industry sectors represented in RMP data may not give a complete and accurate picture of the high risk industry sectors. However, the completion of the accurate picture given by the analysis of all industry sectors may not justify the resources needed to analyze them. At a minimum, a proper statistical analysis on the relevant industry sectors should be done to determine the sectors with high risk based on RMP accident history database. Other databases should be referred to if they have better information regarding any particular incident. Databases that could be used are Toxic Releases (TRI) database, Spills and Accidents (ERNS) database, Hazardous Waste (BRS) database, Hazardous Waste-Violations and Permits database (RCRIS)[274].

The key idea should be to use as much data as possible as consistently as possible to determine the high-risk industry sectors, while not wasting resources chasing information that is either irrelevant or unlikely to be useful in identifying the sectors with the highest risks.

[273] https://www.census.gov/eos/www/naics/faqs/faqs.html
[274] http://www.rtknet.org/db/city/search

d. Should an analysis of the RMP data be combined with an analysis of other current accident history databases to inform any revisions/updates? If so, what other databases should be used? How much weight should be given to the RMP data set in comparison to other sources?

Response:

It is recommended to combine the analysis of RMP data with other accident history databases. This would help ensure that the analysis of the accidents is up-to-date and not subject to any bias based on the database. However, it must be ensured that the information that is taken from other sources be used in a consistent manner with the information that is taken from the RMP database. That is to say that the supplemental information should not unduly punish or bolster a sector based on the presence of extra data compared to a sector that has no supplementary data, but should only be used in a consistent manner with the analysis of the RMP data.

A selection of the databases that could be used along with the important information they provide are tabulated below[275]:

Database	**Information obtained**
Toxic Releases (TRI) database	Releases and transfers of toxic chemicals from facilities
Spills and Accidents (ERNS) database	Data on toxic chemical spills
Hazardous Waste (BRS) database	Data on generation, shipment and receipt of hazardous waste
Hazardous Waste-Violations and Permits database (RCRIS)	Data on hazardous waste handler permits and activities

A fixed pre-determined weight cannot be given specifically to RMP data set *per se*. The supplemental information from the other databases should be used consistently in a framework based on the RMP data. Data from different databases should be evaluated on a case-to-case basis based on which category the accident would fall into. In the situation of an oil spill, ERNS database would not have all the information regarding the spill. This could be a similar case with EPA RMP data. Hence, ERNS database could be combined with RMP data set. Further a fixed weight for the RMP data set is very subjective not only to the particular incident and the data availability related to that incident but also to the type of accident pertaining to that industry sector/facility.

e. Should the original NAICS codes continue to be included? Would not including the NAICS codes historically identified under Program 3 cause increase risks to those industry sectors by having them no longer subject to the more stringent measures?

[275] http://www.rtknet.org/db/city/search

Response:

There is indeed a probability that dropping certain sectors from Program 3 could lead to an increase in risk in those sectors due to relaxed oversight and less stringent safety measures. However, including the original NAICS codes based simply on the fact that they have historically been included is not recommended. As outlined in prior responses, the NAICS codes included should be based on risk analysis with no *a priori* judgments as to which sectors should be included. To continue to include a sector in Program 3 when the risk analysis does not identify it as high risk is inconsistent, unwarranted, and an inefficient use of resources when there are other sectors that could be better served with more oversight.

f. Should an analysis of accident history data be limited to a specific time frame?

Response:

The analysis of accident history data should not be arbitrarily limited to a specific time frame, but care should always be taken when using historical data as it often has decreasing relevance as it ages. Data from decades ago does not reflect the current state of risk management, but can be used to identify trends and improvements due to the implementation of new advances in safety technology and risk management systems. Thus, historical data, at a certain period, should not be used as a single point to make decisions about the current management systems, but should still be used in analysis of trends.

With regards to specific decisions that are made as to which sectors are placed in which Program level, there is no specific reason as to why the accident history data taken into consideration for deciding which Program the industry sector falls into is for 5 years. Also, the time frame of 5 years is not industry sector specific. Many factors which contribute to industry characteristics should be taken into account when deciding the time frame to be used. The time frame could be normalized for a specific type of industry sector.

g. Would it cause confusion within the regulated community to change the list of NAICS codes for which Program 3 is required?

Response:

Changing the list of NAICS codes in Program 3 could pose a difficulty for facilities classified into different Programs. It might be especially confusing for sectors that are moved to Program 3 from lower programs. For a sector not previously categorized as Program 3 but now included, there may be confusion and difficulty in immediately adapting to the more stringent regulations. There should be a grace period after the sector has been added to the Program 3 list for companies to adjust and develop their management systems to adequately handle the new regulation. This grace period may include oversight by EPA both to ensure that the management systems are being implemented at an acceptable rate and to confirm that the

systems will be compliant once implemented, but actual compliance with the Program 3 requirements should not be immediately enforced.

11. The "Safety Case" Regulatory Model

a2. What are the advantages and disadvantages of the safety case approach in comparison to the existing U.S. regulatory regime for chemical process safety?

Response:

Following are the advantages and disadvantages of safety case approach in comparison to the existing U.S. regulatory regime for chemical process safety:

Advantages

- With US regulations on OSHA & EPA, the operator is only required to carry out the mandated actions to discharge his legal responsibilities.
- The operator of facility is the best judge with sound technical knowledge and expertise to ensure the safety of their design, not the regulator.
- With OSHA & RMP, it may sometimes be difficult to keep updated with the latest best available technologies and practices.

Disadvantages

- Safety Case documents may be bulky and lengthy which may jeopardize the whole purpose of looking at the argument and ensuring system is safe to operate.
- It is often people who hold safety cases together. On a project there are usually key individuals who have in depth knowledge of the system and its safety. It is that knowledge, the assumptions and justifications underlying design decisions, that may get omitted from the case, or whose contribution to the overall safety argument is unclear.
- This approach involves large number of stakeholders like assessors, customers, regulators, operators, victims, designers and more. Each stakeholder has a different interest and this may lead to conflicting requirements for the safety case.
- Engineers always try to build safe systems and to verify to themselves that the system will be safe. The value that is added by system safety engineering is that it takes the opposite goal: to show that the system is unsafe. Otherwise, safety assurance becomes simply a paper exercise that repeats what the engineers are most likely to have already considered. It is for exactly this reason that Haddon-Cave recommended in the Nimrod accident report that safety cases should be relabeled "risk cases" and the goal should be "to demonstrate that the major hazards of the installation and the risks to personnel therein have been identified and appropriate controls provided" [Haddon-Cave, 2009], not to argue the system is safe.
- Safety case approach risk analysis does not use the worst-case scenario. Argument for the most likely case is not adequate. It is evident from past incidents that most incidents involve unlikely events, often because of wrong assumptions about what is likely to happen and about

how the system will operate or be operated in practice. Effective safety analysis requires considering worst cases.

Also, it should be noted that safety case regulatory regime requires more competent and skillful staff members in both regulator and regulated community for effective enforcement.[276,277,278,279]

a3. Is there any evidence that the safety case approach reduces the frequency and severity of accidental releases and near misses? If so, please provide any information, data, or studies to EPA that demonstrates these effects. How expensive is it for facility owners to implement the safety case approach in comparison to implementing RMP or PSM?

Response:

There is no clear evidence that the safety case approach reduces the frequency and severity of accidental releases and near misses. Any incident statistics study and analysis depends on various factors like increase in number of facilities, stringent regulations, normalization factors used and more.

Supporting Information:[280,281]
A report addressed the effectiveness of the UK onshore safety case regime set up in 1999 under the Control of Major Accident Hazard (COMAH) Regulations. It did so by comparing the major accident rate before and after the introduction of the safety case regime. The report stated:

"We found no direct evidence that COMAH is resulting in a reduction of the risk of major accidents. However as COMAH is designed to manage risks from rare events we would not expect to be able to see statistically robust evidence of an effect".

b. The CSB Draft Regulatory Report on the Chevron Richmond Refinery Pipe Rupture and Fire highlights the NRC as a U.S. regulator that has established a safety case approach for licensing and oversight of commercial nuclear power plants in the United States. The NRC oversees approximately 100 nuclear reactor and 3,000 nuclear materials facilities in the U.S.; the NRC has nearly 4,000 employees and an annual budget of over $1 billion. What

[276] Steinzor, Rena I. Lessons from the North Sea: Should "Safety Cases" Come to America. Rep. 417th ed. Vol. 38.N.p.: University of Maryland School of Law, n.d. Print
[277] Safety Case Development: Current Practice, Future Prospects S P Wilson, T P Kelly, J A McDermid HISE Group, Department of Computer Science, University of York, York, England
[278] White Paper on the Use of Safety Cases in Certification and Regulation, Nancy Leveson, MIT
[279] The Practicalities of Goal-Based Safety Regulation, J Penny, A Eaton CAA (SRG) PG Bishop, RE Bloomfield (Adelard)
[280] Fenning N and Boath M. Impact of the Control of Major Accident Hazards (COMAH) Regulations1999.
[281] Research Report 343. HSE 2006, p11

additional resources would be required by EPA and OSHA in order to establish and oversee a safety case regulatory regime for RMP and PSM-covered facilities?

Response:

As stated earlier, there is no evidence or data to support that the safety case regulatory regime is better than current US Process Safety regulations and also we cannot claim that safety case has reduced the number and magnitude of process safety events. Hence, we do not support the shift in regulatory regime to safety case structure. Further, we believe that nuclear industry cannot be compared with the petrochemical or refinery industry as the two are very different in terms of operational complexities.

However, if safety case regulatory regime is established, additional resources would be needed by EPA and OSHA to oversee safety case regulatory regime for RMP and PSM-covered facilities. These additional resources would depend on factors like:

- which facilities would be covered in the initial implementation phase,
- exact procedure for development and assessment of a safety case,
- timelines for the program implementation,
- competency development of regulatory staff members.

This would require strategic planning and establishment of goals for both budget and number of employees.

c. Is the safety case approach suitable for all RMP and PSM covered facilities, or, if adopted, should it be limited to only the most high-risk facilities, such as petroleum refineries and other high-risk chemical processing facilities?

Response:

As stated earlier, there is no evidence or data to support that the safety case regulatory regime is better than current US Process Safety regulations and also we cannot claim that safety case has reduced the number and magnitude of process safety events. Hence, we do not support the shift in regulatory regime to safety case structure.

d. What would be the economic impacts of moving to a safety case based regulatory regime for chemical facility safety? Are there any special circumstances involving small entities that EPA should consider with respect to safety case based approach?

Response:

In our view, no special circumstances involving small entities should be considered by EPA with respect to safety case based approach. Both the safety case methodology and PSM

regulation in US are performance-based and goal oriented approach. Hence, if safety case methodology is decided to be used/applied it should be risk-based for any type of entity whether small or big. This means it should take into consideration the potential high consequence and appropriate frequency.

12. Streamlining RMP Requirements

a. Are there steps that EPA could take to simplify the process of determining whether the RMP rule applies to particular facilities? Are there other potential revisions to the rule that would make it easier for regulated entities to comply with its provisions?

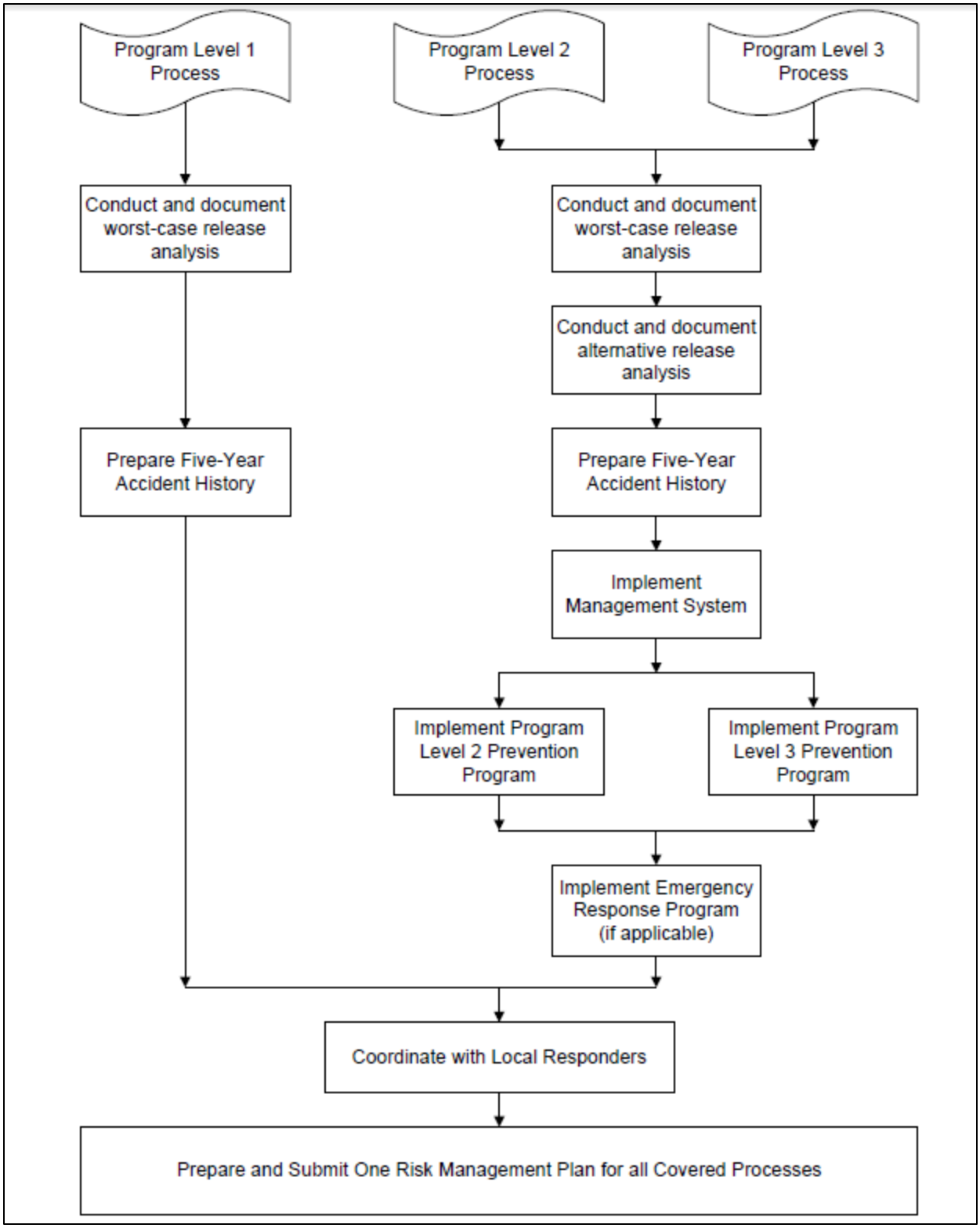
Response:

The process of determining which RMP submission procedure applies to a particular facility can sometimes be unclear and depends on whether the facility falls in Program 1 or Program 2 or Program 3. The flowchart below summarizes this process[282]:

RMP requires an analysis of consequence but not probability[283]; thus, it does not give a true representation of risk which combines both consequence and probability. A risk-based procedure could prove more informative for all regulated entities. Often, the worst-case scenarios that are called for by the regulation are improbable and may be less than useful to use as a planning basis. Meanwhile, other more reasonable scenarios that are not called for by the regulation may carry a higher risk due to the higher probability offsetting the lower consequence. That is not to say that the worst-case scenario should not be evaluated or that it is not useful under any circumstance, but rather to highlight that if the aim of the RMP is to lower risk, it is important not to discount one half of the risk calculation. And it has to be realized that the assessment of probability is even tougher than assessment of consequence in a consistent and appropriate manner.

[282] http://www2.epa.gov/sites/production/files/2013-11/documents/cd-chap-02.pdf

[283] Crowl, D.A., and J.F. Louvar, Chemical Process Safety Fundamentals with Applications, Third edition, Prentice-Hall, 2011.


Program Level 1 Process
Program Level 2 Process
Program Level 3 Process
Conduct and document worst-case release analysis
Conduct and document worst-case release analysis
Conduct and document alternative release analysis
Prepare Five-Year Accident History
Prepare Five-Year Accident History
Implement Management System
Implement Program Level 2 Prevention Program
Implement Program Level 3 Prevention Program
Implement Emergency Response Program (if applicable)
Coordinate with Local Responders
Prepare and Submit One Risk Management Plan for all Covered Processes

COMPARISON OF PROGRAM REQUIREMENTS		
Program 1	**Program 2**	**Program 3**
Worst-case analysis	Worst-case analysis	Worst-case analysis
	Alternative releases	Alternative releases
5-year accident history	5-year accident history	5-year accident history
	Document management system	Document management system
Prevention Program		
Certify no additional prevention steps needed	Safety Information	Process Safety Information
	Hazard Review	Process Hazard Analysis.
	Operating Procedures	Operating Procedures
	Training	Training
	Maintenance	Mechanical Integrity
	Incident Investigation	Incident Investigation
	Compliance Audit	Compliance Audit
		Management of Change
		Pre-Startup Review
		Contractors
		Employee Participation
		Hot Work Permits
Emergency Response Program		
Coordinate with local responders	Develop plan and program and coordinate with local responders	Develop plan and program and coordinate with local responders
Submit One Risk Management Plan for All Covered Processes		

b. Are there steps that EPA could take to simplify the RMP submission process? For example, are there advances in electronic reporting or information technology that EPA could use in order to make RMP submissions easier?

Response:

The online RMP submission process makes the process much easier than a paper-based submission. Also, the online interface allows for re-submitting, correcting, de-registering and withdrawing RMP. Also, the user help manual provides help with step-by-step procedure of the RMP submission process.

For online help regarding RMP eSubmit, instead of having an online question/comment submission interface, a "Chat with a representative/Live help over chat" function may be helpful in answering questions immediately. EPA could have a certain group of trained people who could be chat representatives and are qualified to answer simple questions regarding RMP submission process.

In the case of the online question interface, time may be wasted because of the time lag between asking questions and answering them. Hence, a tiered system for hotline questions and answers could be used:

1. When there are simple questions, a group (around 8-10 depending on number of users) of qualified representatives could answer.

2. For more difficult or unique questions, the questions could be re-directed to senior executive officers.

During RMP submission process, the Electronic Signature Agreement (ESA) should be printed, wet ink signed and sent to EPA to generate an AuthCode which will then be used to prepare RMP for each facility. The mailing of ESA would take couple of days, the approval of ESA and generation of AuthCode takes around a week. This results in a total lag of around 10 days, which can be avoided by online submission of ESA and online approval and generation of AuthCode.

c. Should EPA require that RMP submissions be certified by a senior corporate official, such as the Chief Executive Officer, Chief Financial Officer, Chief Operations Officer, or the equivalent to ensure corporate-wide awareness and accountability in the RMP submission?

Response:

That may be an option that EPA may consider. At the minimum, it raises the consideration of safety to a high level in the organization. A senior corporate official in a facility may be helpful to ensure corporate-wide awareness and accountability in RMP submissions. But such a senior

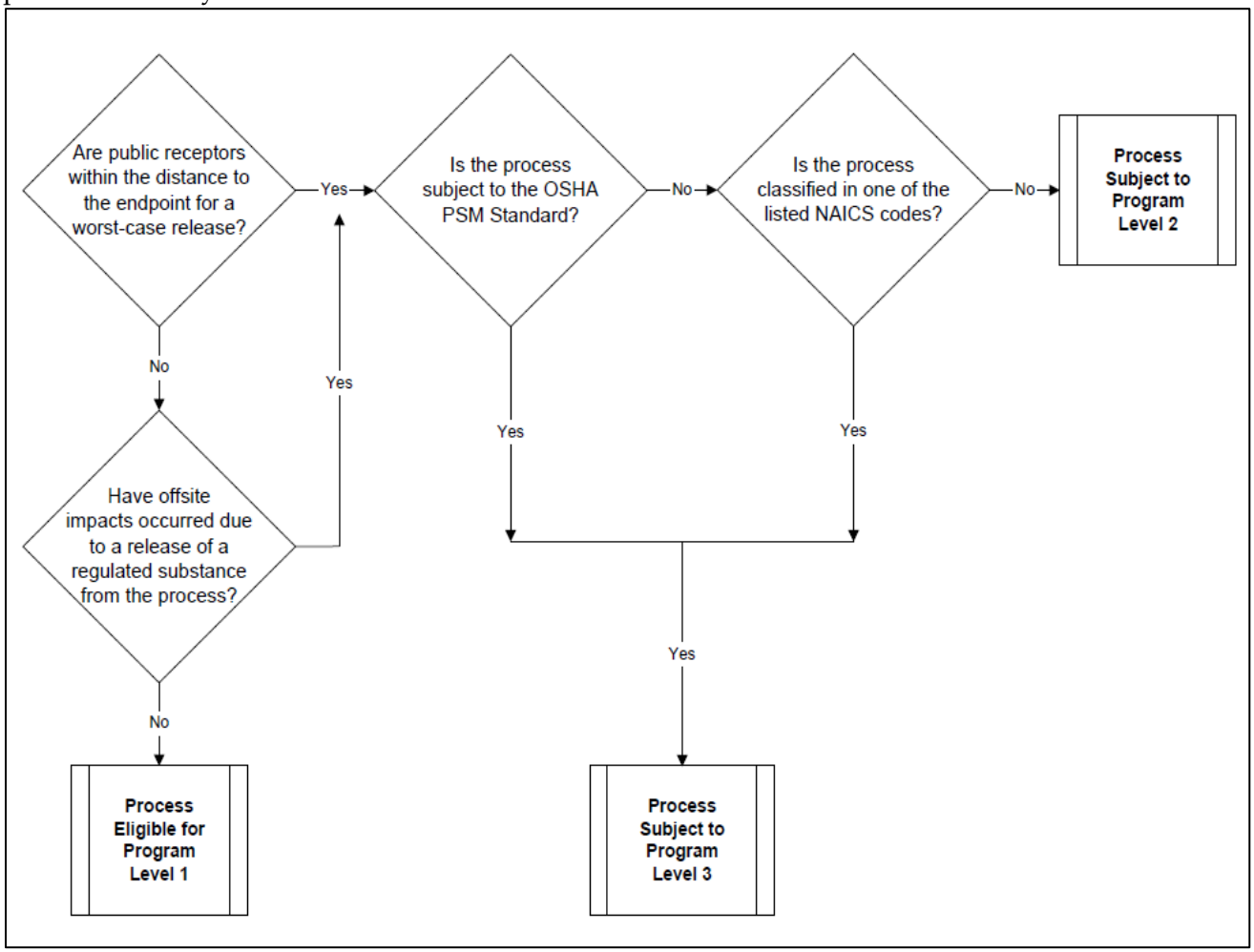
official might be busy and not be able to allocate time effectively on RMP submissions in certain situations. Moreover, just assigning a designated officer does not guarantee the required awareness and accountability.

Hence, it is debatable whether such a designated officer is necessary, but the most important concern should be encouraging the understanding that safety is everyone's responsibility, rather than the sole responsibility of some subject matter experts or senior corporate official.

d. Is the three-tiered program level structure of the RMP regulation appropriate, or should EPA consider simplifying the rule to make only two program tiers, or only a single prevention program applicable to all facilities?

Response:

The flow chart below briefly summarizes this process of determining which program level a particular facility falls under[284]:



[284] http://www2.epa.gov/sites/production/files/2013-11/documents/cd-chap-02.pdf

Using a single prevention program or only one program level might either under-regulate or over-regulate certain sectors. This is not recommended, as lower risk processes should be distinguished from higher risk processes so as to allocate resources more efficiently toward the processes that need more oversight. A two-tiered approach could be sufficient, as long as there is a risk-based cutoff that is evenly applied throughout industries.

e. Are the accident prevention program elements clearly defined? Should EPA further clarify any of the existing elements?

Response:

The accident prevention program elements are different for different facilities based on which Program they fall under. EPA has sufficient supporting documents and frequently asked questions with answers on accident prevention steps separately for each of three Program levels. This makes it easier for facilities to follow accident prevention steps based on their Program levels. The table below briefly summarizes the accident prevention program elements based on the Program[285].

There are supporting documents that EPA has made available separately for Program 2 and 3 accident prevention elements. These documents describe in a very detailed manner the accident prevention elements beginning with how to start and what do the terms mean and how to go ahead with the prevention elements.

1. Program 2 accident prevention program:
   http://www.epa.gov/ceppo/web/docs/chem/Chap-06-final.pdf
2. Program 3 accident prevention program:
   http://www.epa.gov/ceppo/web/docs/chem/Chap-07-final.pdf

[285] http://www2.epa.gov/sites/production/files/2013-11/documents/cd-chap-02.pdf

EXHIBIT 2-4 COMPARISON OF PROGRAM REQUIREMENTS		
Program 1	**Program 2**	**Program 3**
Worst-case analysis	Worst-case analysis	Worst-case analysis
	Alternative releases	Alternative releases
5-year accident history	5-year accident history	5-year accident history
	Document management system	Document management system
Prevention Program		
Certify no additional prevention steps needed	Safety Information	Process Safety Information
	Hazard Review	Process Hazard Analysis.
	Operating Procedures	Operating Procedures
	Training	Training
	Maintenance	Mechanical Integrity
	Incident Investigation	Incident Investigation
	Compliance Audit	Compliance Audit
		Management of Change
		Pre-Startup Review
		Contractors
		Employee Participation
		Hot Work Permits
Emergency Response Program		
Coordinate with local responders	Develop plan and program and coordinate with local responders	Develop plan and program and coordinate with local responders
Submit One Risk Management Plan for All Covered Processes		

f. Are the regulatory terms and definitions contained in section 68.3 sufficiently clear? Are there additional terms that EPA should define in this section?

Response:

Following terms defined in section 68.3 are not sufficiently clear

1. Accidental Release:

Definition: Unanticipated emission of a regulated substance or other extremely hazardous substance into ambient air from a stationary source.

Accidental releases need not be always into ambient air. There could be releases into surrounding water bodies and soil. Hence, this definition could be modified to include any water sources and soil apart from ambient air.

2. Replacement in kind:

Definition: A replacement that satisfies the design specifications.

During most of the situations of replacement, the "performance specifications" like operating conditions (*e.g.,* pressure, temperature, materials used) might remain the same but the "design specifications" like mechanical integrity inspection frequency need not be the same. Hence, proper care should be taken to take design specifications also into consideration[286].

3. Stationary source:

In the definition of stationary source, the following part should be written in a more clear way.

"The term stationary source does not apply to transportation, including storage incident to transportation, of any regulated substance or any other extremely hazardous substance under the provisions of this part. A stationary source includes transportation containers used for storage not incident to transportation and transportation containers connected to equipment at a stationary source for loading or unloading."

The definition gets very ambiguous and is difficult to assess whether a container which would be used for storage purposes but being transported is considered a stationary source or not.

[286] http://www.safteng.net/index.php?option=com_content&view=article&id=1361&Itemid=178

4. Typical meteorological conditions:

Definition: The temperature, wind speed, cloud cover, and atmospheric stability class prevailing at the site based on data gathered at or near the site or from a meteorological station.

"Precipitation" and "wind direction" could be added to this list of typical meteorological conditions as they play an important role during any release.

5. Worst-case release:

Definition: The release of the largest quantity of a regulated substance from a vessel or process line failure that results in the greatest distance to an endpoint

This definition only considers the distance but does not take into account other parameters like number of people injured, number of deaths, property damage etc. All these could be included into this definition to make it more meaningful. Also, the definition for worst-case release should be extended to include the case in which there are more than one regulated substances.