

The EPA's process safety management program for preventing accidental chemical releases (40 CFR 68)

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The provisions of the new EPA regulation require additional resources and increase the formal documentation and record keeping requirements beyond those of the older OSHA regulation. The paper industry should look for ways to integrate the requirements of the two regulations into a single management system.

Section 304, "Chemical Process Safety Management," of the Clean Air Act (CAA) Amendments of 1990 required the Occupational Safety and Health Administration (OSHA) to develop a complete integrated process safety management program regulation. In February 1992, OSHA published rule 29 CFR 1910.119, "Process Safety Management of Highly Hazardous Chemicals." This was a formal introduction to the concept of process safety management for many U.S. pulp and paper mills.

The 1990 CAA Amendment section 112(r), "Prevention of Accidental Releases," required the Environmental Protection Agency (EPA) to establish measures for owners and operators of facilities processing or handling hazardous materials to prevent accidental releases of regulated substances and other extremely hazardous substances to the air. Additionally, it required the consequence of releases to be minimized by focusing preventative measures on those chemicals that pose the greatest risk. Section 112(r) begins with a general duty clause requiring owners and operators to:

- Identify hazards that may result from releases
- Design and maintain a safe facility
- Minimize the consequences of releases when they occur.

Another provision of section 112(r) is the requirement to promulgate a list of at least 100 substances, including threshold quantities, that are known to cause, or may be reasonably anticipated to cause, injury or serious adverse effects to human health or affect the environment when released to air. The list and threshold quantities would be used as a basis to determine which facilities would be required to comply with the accident prevention regulations. Other requirements were "reasonable

regulations and appropriate guidance" to provide for the prevention and detection of accidental releases and for pre-planned responses to such releases.

The enabling legislation for Section 112(r) of the CAA was published as proposed rule 40 CFR 68, "Risk Management Programs for Chemical Accidental Release Prevention," in the October 20, 1993, Federal Register. The proposed rule was scheduled to be finalized and promulgated on February 20, 1994. Due to the number of the testimonies given at two EPA public hearings, the EPA has stated that it is doubtful that all issues will be resolved this year. The comments from the hearing held in Houston on January 6, 1994, alone amounted to over 1000 typed pages. The EPA, however, did publish the final revised list (Appendix C of the proposed rule) of regulated chemicals and threshold quantities on February 2, 1994. In the revised list, the EPA decreased the number of regulated toxic chemicals from 100 to 77, but kept the same number (66) of flammable chemicals. The EPA also raised some of the threshold quantities substantially (e.g., the threshold quantities for chlorine were more than doubled). Table I lists some of these regulated substances from Appendix C that are frequently found in pulp and paper mills. The proposed regulation would establish requirements for a Risk Management Program organized into the following three major categories:

1. Hazard Assessment
2. Prevention Program
3. Emergency Response Program.

I. Regulated substances which could be found in pulp and paper mills

<i>Chemical</i>	<i>CAS no.</i>	<i>OSHA</i>	<i>EPA (Final '94)(Original'93)</i>	<i>EPA</i>
Aqueous ammonia (>20%)	7664-41-7	15,000	20,000	5,000
Anhydrous ammonia	7664-41-7	10,000	10,000	1,000
Chlorine	7782-50-5	1,500	2,500	1,000
Chlorine dioxide	10049-04-4	1,000	1,000	500
Hydrogen peroxide (>52%)	7722-84-1	7,500	----	5,000
Hydrogen sulfide	7783-06-4	1,500	10,000	1,000
Hydrochloric acid	7647-01-0	----	15,000	5,000
Methane	74-84-0	----	10,000	10,000
Nitric acid	7697-37-2	500	10,000	5,000
Propane	74-82-8	----	10,000	10,000
Ozone	10028-15-6	100	----	----
Sulfur dioxide (liquid)	7446-09-5	1,000	5,000	1,000
Sulfur dioxide (gas)	7446-09-5	----	----	----
Sulfuric acid	7664-93-9	----	----	5,000
Methanol	Flammable liquid	10,000	----	----
Turpentine	Flammable liquid	10,000	----	----

Hazard assessment

One of the major differences between the present OSHA Process Safety Management regulation and the proposed new EPA Risk Management Program regulation is the hazard assessment requirement. The OSHA regulations address incidents where the effects of the consequences would be contained within the boundaries of the facility, whereas the EPA regulations are concerned with possible effects to life, property, and the environment outside the boundaries of the facility. In addition, the OSHA hazard assessment requirements can be satisfied by a qualitative analysis of potential consequences where the EPA will require a quantitative analysis. In order to comply with the proposed EPA regulation, a hazard assessment will need to be conducted for each regulated substance as follows:

- Determine a worst-case scenario assuming that "all of the regulated substance in the process is instantaneously released and all mitigation systems fail to minimize the consequence of the release."
- Identify other more likely significant release scenarios where the regulated substance is manufactured, processed, used, stored, loaded, or unloaded.
- Analyze the off-site consequences of the worst-case scenario and other more likely significant release scenarios for both the worst-case meteorological conditions (i.e., least turbulent atmospheric condition, F stability and 1.5 m/s wind speed) and the meteorological conditions most often occurring at the mill. The analysis is to estimate the distance from the point of release where significant damage may occur to the surrounding population or environment. Then the extent of damage is evaluated by determining off-site exposure

to the vapor cloud, pressure wave, or flying debris that may occur from the incident. For pulp and paper mills, the potential for off-site exposures would probably be limited to toxic effects associated with vapor clouds of chlorine, sulfur dioxide, and ammonia. Explosions in the pulp and paper industry that could result in off-site effects are not common. In so doing, the analysis identifies the populations, sensitive ecosystems, migration routes, vulnerable natural areas, and critical habitats for threatened or endangered species that may be affected.

- This hazard assessment is to be reviewed and updated at least once every five years or within 60 days of any changes to the process that affect the process safety information.

- The mill is also to prepare and maintain a five-year history of all incidents involving regulated substances and processes. Reports on significant accidental releases are to include the date, time, substance, quantity, duration, concentration, and any off-site consequences such as fatalities, injuries, hospitalizations, medical treatments, evacuations, sheltering in-place, and off-site environmental impacts such as soil, groundwater, or drinking water contamination, fish kills, and vegetation damage.

The significance of the EPA's worst-case scenario definition may not be fully appreciated until mills begin performing process hazard assessments using these criteria. One example that illustrates the order of magnitude of such a release is a paper mill that uses chlorine in the bleaching process. It is not uncommon for two or more rail cars, each containing 90 tons of chlorine, to be connected to the process system as the prime chlorine storage vessel(s). Even if this criterion involved only one of the rail cars, the order of magnitude of an instantaneous release of 90 tons of chlorine is almost inconceivable. The likelihood for an instantaneous loss of containment under these conditions seems remote compared to a possible derailment during shipment. In cases such as this, the worst-case scenario provides very little benefit in reducing the risk associated with handling hazardous materials. More than anything, it increases the cost of complying with additional regulations and, in many cases, may result in unwarranted concern by the surrounding general public.

The EPA's justification for the definition of a worst-case scenario, even if it is highly unlikely to occur, is that it will inform the public near the facility of the worst incident that could occur. The EPA thinks this will encourage mills to develop more credible cases for study and thus identify methods to reduce the risks associated with the process and handling of hazardous materials. EPA will require that the results of all hazard assessments be made available to local Emergency Plan-

ning Committees and the general public.

Prevention program

The proposed prevention program of the regulation consists of the 10 basic elements listed in Table II. Each element is discussed below and compared to the corresponding OSHA process safety management program element. The numbers in parentheses at the end of each heading are the corresponding 40 CFR 68 section number for the element. Table III provides a cross-reference between the two regulations.

Management system (68.22)

The EPA will require mills that have regulated substances present at or above the threshold quantities to develop a management system to oversee the implementation of the risk management program elements, to ensure that all elements of the risk management plan are implemented and that the assigned responsibility for each program element is clear. EPA will require the mill program to be administered by one person responsible for the managing of the development, implementation, and integration of the risk management program requirements. The OSHA regulation does not directly address requirements for a formal management program. However, successful implementation and management of the OSHA requirements requires an organized effort. Most mills have implemented process safety management programs to ensure compliance with the OSHA requirements that would probably comply with this section. However, these programs will need to be updated to include the additional provisions and changes required by the EPA regulation.

Process hazard analysis (68.24)

Process hazard analysis (PHA) is one of the elements of the proposed EPA regulation that differs from the corresponding OSHA regulation. Again, the OSHA regulation is primarily concerned with hazards that could result in on-site consequences; the EPA regulation addresses off-site concerns. It is obvious that not all incidents capable of resulting in undesirable on-site consequences will necessarily result in any off-site consequences. Those most likely to affect both on-site and off-site are releases of large quantities of liquefied petroleum gas (LPG) and highly toxic materials such as chlorine.

Some of the hazard identification techniques acceptable to the EPA are identical to those listed in the OSHA regulation: Hazard and Operability (HAZOP) studies, What-if Analysis, Checklists, etc. The most popular technique being used by a

II. Prevention program elements

Topic	40 CFR no.
Management system	68.22
Process hazard analysis	68.24
Process safety information	68.26
Standard operating procedures	68.28
Training	68.30
Maintenance	68.32
Pre-startup review	68.34
Management of change	68.36
Safety audits	68.38
Accident investigation	68.40

III. Compliance audit criteria

Accident history of the site
Accident history of other sites in the same industry
Quantity of regulated substances at the site
Location of the site relative to the public or sensitive environments
Presence of specific regulated substance
Hazards identified in the RMP
Plan for neutral, random oversight

wide range of industries and some mills to meet the OSHA requirements is the HAZOP study procedure. Its popularity stems from a structured and thorough approach to hazard identification that has a proven track record of producing meaningful results.

The proposed EPA regulation requires the plant owner to complete a PHA for each regulated substance within three years of the regulations effective date and repeatedly for each process every five years thereafter. Any PHAs that meet the requirements of the regulation and that were completed up to five years prior to the effective date also will be acceptable as an initial analysis. PHAs are to be conducted by a team which includes mill employees who are knowledgeable in the operation of the process. The team is to be led by an individual with experience in conducting PHAs. The scope of the PHA team's work will be to identify in their analysis:

- Hazards of the process, previous significant incidents with off-site consequences
- Any off-site consequences that could result from failure of engineering or administrative controls

- Possible health and safety effects on the surrounding public from a failure of controls, etc.

It should be noted that the main difference in the above EPA PHA scope and that of the OSHA regulation is the concern for off-site rather than on-site consequences. All of the recommendations generated by the PHA team are to be addressed by the mill in a timely manner. Documentation of the recommendations and their resolutions are to be maintained for the life of the process.

Process safety information (68.26)

The EPA recognizes that any effective process safety management program begins with a complete, accurate and up-to-date data base of process safety information. Several of the other PSM elements, such as PHAs and operating procedures, will depend on the accuracy of the process safety information. The EPA's requirements for process safety information on regulated substances and the associated processes can be fulfilled by meeting the 29 CFR 1910.1200(g) process safety information requirement. Paper mills will be required to maintain detailed information pertaining to the regulated substance and technology of the associated processes including:

- Material safety data sheets (MSDS) for the chemicals and materials being processed and handled
- Process chemistry
- Process flow diagrams (PFDs)
- Minimum and maximum operating conditions, etc.

Other typical process safety information includes hazards related to the process operation, and information on the process equipment. Of particular interest is the equipment necessary for the safe operation of the process. Some of the documentation that would satisfy the above requirements are:

- Piping and instrument diagrams (P&IDs)
- Listing of maximum inventories
- Material and energy balances
- Design data for safety and pressure relief systems
- Listing of applicable design codes and industry practices.

The requirement to maintain process safety information is common to both the EPA and OSHA regulations.

Standard operating procedures (68.28)

There do not appear to be any major differences between the EPA and OSHA requirements for operating procedures. Both regulations require a complete set of procedures to cover all modes of operation. Also, the procedures are required to define the steps needed to correct deviations from normal operations and are to address operating limits, safety and health considerations, and associated safety systems and their functions. These procedures are to be reviewed as often as necessary (i.e., at least once a year) to ensure that they are up to date and accurately

reflect the current operation of the process. Safe work practices, such as lockout/tagout and confined space entry, necessary to control hazards during the operation of the process are also covered in this section of the regulation.

Training (68.30)

The proposed EPA requirements for training are basically the same as those contained in the OSHA regulation. The EPA regulation would require initial training, refresher training, and documentation that affected employees have received the appropriate training and understand the material presented. An additional requirement of the proposed regulation is periodic evaluations of the adequacy of the training program including a schedule for reviews and implementation of any revisions.

Maintenance (68.32)

The maintenance program section of the proposed EPA regulation parallels the "mechanical integrity" section of the OSHA regulation. The program is to cover equipment, which in the event of a failure would result in a significant accidental release. The equipment covered includes—but is not limited to—pressure vessels, tanks, pumps, piping systems and components, pressure relief and vent systems, emergency shutdown and control systems, critical monitors, sensors, interlocks, and alarms. The maintenance program will be required to include provisions for scheduled maintenance inspections and testing of all covered equipment. The frequency and methods of inspection are to be consistent with manufacturer's recommendations, good engineering practices, and actual experience. The regulation will require paper mills to maintain formal documentation of all test, inspection, and maintenance procedures. The proposed EPA requirement that maintenance employees be trained in the same manner as process operators is the major difference between the EPA and OSHA regulations for this element.

Pre-startup review (68.34)

The proposed EPA regulation stresses the need for conducting pre-startup safety reviews of any new or modified process facility. It requires that pre-startup reviews be conducted for all new or modified facilities, where there may be a significant change in the process safety information. The scopes of the proposed EPA requirements for a pre-startup review are identical to those of the OSHA regulation with the exceptions that EPA adds the following requirements:

- Maintenance personnel are to be trained prior to the startup of a process
- All employees are to be trained on any new emergency response procedures.

Management of change (68.36)

The proposed EPA requirements for a management of change program are virtually identical to those of the OSHA regula-

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tion. The mill is required to establish and implement formal written procedures to ensure certain reviews and checks are performed before any change is made to the process. One minor difference is the requirement to evaluate the impact of the change on the likelihood of a significant accidental release.

Safety audits (68.38)

The proposed EPA requirements for safety audits to evaluate the effectiveness of the overall process safety management program are identical to the compliance audit requirements of the OSHA regulation. Mills are to certify at least once every three years that they are in compliance with the provisions of the regulation. The audit procedure is to include provisions for a formal report of the findings and recommendations. The mill is required to promptly address the findings of the audit. The two most recent safety audit reports are to be kept on file as part of the mill's documentation.

Accident Investigation (68.40)

There are some differences between the EPA proposal and the existing OSHA regulations for the accident investigation element. The EPA proposal specifically requires written procedures and the OSHA regulation does not. However, most mills should have developed written procedures as a means of documenting compliance with the OSHA regulation. Both regulations require the investigation to begin as soon as possible (no later than 48 hours) after the incident (OSHA) or significant accidental release (EPA). Both also require that the investigation identify the cause(s) of the incident and make appropriate recommendations for corrective actions. The proposed EPA regulation goes one step further and requires root causes to be determined. The recommendations and findings of the investigation are to be documented in a formal report. The report is to be reviewed with any employee, including contractor employees, that were or could have been involved in the incident. The procedure is to include provisions for tracking and follow-up of recommendations that resulted from the investigation. Accident investigation reports are to be maintained for five years.

Other issues

There are four basic elements included in the OSHA regulation that are not covered by the proposed EPA regulation:

1. Employee participation
2. Contractors
3. Hot work permits
4. Trade secrets.

The first three are directly related to activities conducted within the facility and therefore are not within EPA's jurisdiction. However, deficiencies in any one of these three elements could have a potential for causing an incident capable of resulting in off-site consequences. Compliance with the re-

quirements of the OSHA regulation for these three elements should reduce any concerns of their omission from the EPA proposal. The Trade Secrets element is covered by EPA in 40 CFR 2.

Emergency response program

Emergency response plans are required by several different regulatory agencies to deal with the accidental release of hazardous materials. There are no significant differences in the proposed EPA risk management program requirements for emergency response planning and other existing regulations. Some highlights of the emergency response and planning program requirements include:

- Planning for evacuation routes of employees not directly involved in responding to the emergency
- Procedures for responding to the incident
- Procedures for informing the public and outside emergency response agencies
- Written procedures for performing first-aid and emergency medical treatment in the event of human exposure to any regulated substance present at the site.

The proposed regulation would require mills to perform routine drills to test the effectiveness of emergency response equipment and the written plan. These drills are to be documented in writing and include any findings that indicate changes should be made to the equipment or plan. A schedule to address follow-up on implementation of any recommended changes also will be required.

Audits and support documentation

Documentation for each element of the program will need to be maintained at the mill and is necessary in the event of an EPA audit. The documentation requirements for each program element are covered under the appropriate sections of the regulation.

Registration

One basic provision of the proposed EPA regulation that differs from the OSHA PSM regulation is the requirement for registration (68.12) of each regulated substance. The schedule for registration is within three years after publication of the regulation and thereafter within six months after a mill begins to process or store any regulated substance in quantities exceeding the threshold limit. The registration is to include basic information for each regulated substance and the mill. The mill will be required to certify that the information submitted is true, accurate, and complete. If any changes are subsequently made to the process that result in a change in the registration information, the mill will be required to submit an amendment notice of the change to the EPA administrator within 60 days.

IV. EPA/OSHA cross reference

Section	EPA	OSHA
Employee participation		c
Contractor control		h
Safe work practices		k
Registration	68.12	--
Hazard assessment	68.15	e
Prevention program - management system	68.22	--
Prevention program - process hazard analysis	68.24	e
Prevention program - process safety information	68.26	d
Prevention program - standard operating procedures	68.28	f
Prevention program - training	68.30	g
Prevention program - maintenance	68.32	j
Prevention program - pre-startup review	68.34	i
Prevention program - management of change	68.36	l
Prevention program - safety audits	68.38	o
Prevention program - accident investigation	68.40	m
Emergency response program	68.45	n
Risk management plan	68.50	--
Record keeping requirements	68.55	
Audits	68.60	
NOTES: EPA 40 CFR 68 - Accidental Release Prevention Provisions of the 1990 Clean Air Act Amendments. OSHA 29 CFR 1910.119 - Process Safety Management of Highly Hazardous Chemicals		

by the mill's representative (an individual contact)

- A summary of the hazard assessment and analysis of off-site consequences and accident history as required in the "Registration" section
- A description of the major hazards and the consequence of a failure to control each individual hazard
- A summary of all actions taken to control these hazards and the degree to which the consequences are reduced
- A summary of the emergency response plan including: procedures taken to inform the public, a schedule of simulation drills to be made at the site, description of a coordination plan with the local emergency planning committee, and a description of the risk management program to implement the various process safety elements contained in the regulation.

The mill will be required to maintain, at the site, all reports and documents produced as a result of implementing the requirements of the risk management program, including a copy of the risk management plan. Examples of reports include, but are not limited to, those resulting from process hazard analyses, incident investigations, and safety audits. The records are to include the findings and recommendations resulting from PHAs, safety audits, and accident investigations including the resolution of any action items. Up-to-date copies of all operating, maintenance, emergency response, management of change, and accident investigation procedures are also to be maintained at the mill.

Risk management plan

The mill will be required to submit a Risk Management Plan (RMP) to the following agencies: State Emergency Response Commission, Local Emergency Planning Committee with jurisdiction for the area where the mill is located, and the Chemical Safety and Hazard Investigation Board. The RMP report is to include:

- A copy of the updated registration form including: names, CAS Nos., and Standard Industrial Classification (SIC) codes(s) for all regulated substances present in greater than regulated quantities at the mill; a Dunn and Bradstreet number; a Risk Management Plan (RMP) certification signed

Compliance audits

The EPA will periodically audit mills to ensure compliance with the regulation. The criteria EPA will use in selecting a mill for an audit are summarized in Table IV.

After an audit, the EPA may issue a preliminary written report of recommendations necessary for compliance. Within 90 days of receipt of the revisions, the mill is required to either submit a timetable for implementing the recommendations of the EPA's report, or a justification for the rejection of the recommendations. If the mill decides to contest the recommended revisions to its program, the EPA will discuss the

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recommendations with the mill's representative, and then issue a final written report of mandated changes. After the issuance of the final report, the mill will be deemed in violation of the requirements if the mandated changes are not completed and proper documentation submitted to the EPA within 30 days of the issuance of the final EPA report.

Conclusion

Over the past two years, many mills have struggled to meet the requirements of the OSHA 29 CFR 1910.119, "Process Safety Management of Highly Hazardous Chemicals," regulation. For many mills, the concept of process safety management was new and major changes were required to meet the intent of the regulation. However, the regulation also imposed additional requirements on mills that were familiar with the concept of process safety management and had semiformal PSM programs in place. The proposed EPA 40 CFR 68, "Risk Management Programs for Chemical Accidental Release Prevention," regulation will create additional regulatory compliance burdens on many mills. In fact, some mills that were not covered by the OSHA regulation will be required to comply with the new EPA regulation. This is a result of substances on the EPA's list of "Regulated Toxic Substances" that are not on the OSHA

list of "Highly Hazardous Chemicals, Toxics and Reactants."

The major difference between the two regulations concerns the areas affected by the potential release of a regulated substance. The OSHA 29 CFR 1910.119 regulation limits the concern to incidents that could result in an exposure to employees within the boundaries of the facility. The proposed EPA 40 CFR 68 regulation will address significant accidental releases that have a potential for off-site effects on humans and the environment.

When the EPA published the proposed rule 40 CFR 68 in October 1993, it stated that companies which were in compliance with the OSHA 29 CFR 1910.119 regulation at that time would not incur any additional requirements as a result of 40 CFR 68. Although there are a large number of parallel requirements between the two regulations, additional requirements do exist. Some additional requirements of the proposed EPA regulation are those of quantitative hazard assessments and the increased scope of a process hazard analysis. PHAs would need to include a detailed evaluation of operating procedures, estimate of likelihood for incidents, and analysis of offsite consequences including environmental impact. Covered facilities are required to have a formal written risk management program which includes registration of each regulated substance and the filing of a risk management plan (RMP).

The provisions of the new EPA regulation would require additional resources and increase the formal documentation and record keeping requirements beyond those of the older OSHA regulation. The pulp and paper industry should look for ways to integrate the requirements of the two regulations into a single management system. This will ease the burden of compliance with the regulations and ensure that the proper documentation is available in the event of an audit. **□**

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