

CSB Reactive Hazards Study

Survey of Industry Practices

The CSB is updating its 2002 Reactive Hazard Management Study. As part of this process, the CSB will be submitting the below survey to OMB for review. Interested persons are invited to submit comments regarding this proposal. When commenting on the proposed information collections, please reference the document identifier or OMB control number. To be assured consideration, comments and recommendations must be received by the OMB desk officer via one of the following transmissions within 30 days of publication of this notice: OMB, Office of Information and Regulatory Affairs, Attention: Chemical Safety Board Desk Officer, Fax Number: (202) 395-5806 *OR*, Email: OIRA_submission@omb.eop.gov.

BACKGROUND

The United States Chemical Safety and Hazard Investigation Board (CSB) is surveying chemical manufacturers with the goal of examining industry practices on the topic of reactive hazard safety and management. Your company/facility was randomly selected to participate in a survey of industry practices involving the evaluation and management of risks associated with storing, handling, and processing chemicals prone to reactivity.

The CSB is an independent federal agency whose statutory mandate is to investigate incidents/accidents at stationary sources (fixed facilities) that result in both a release of an extremely hazardous substance (or regulated substance) into the atmosphere, and a fatality, serious injury, or substantial property damages.¹ The CSB also promotes the prevention of major chemical incidents/accidental releases at industrial facilities.² The CSB is a scientific investigation organization. The CSB's principal roles are to investigate accidents at fixed facilities, determine the conditions and circumstances that led up to an event, identify the causes, issue safety recommendations, study chemical safety issues, and evaluate the effectiveness of governmental policies and actions involved with industrial chemical safety.

Occasionally, while conducting incident investigations, the CSB is alerted to significant safety problems that exceed the scope of any one particular investigation. As a result, the CSB conducts

¹ 42 U.S.C. 7412(r)(6)(C)

² 42 U.S.C. 7412(r)(2)(A)

a hazard investigation or safety study to better understand the nature and causes of more pervasive and systemic safety problems. To update the 2002 report, [“Improving Reactive Hazard Management,”](#) the CSB has contracted with the Federal Research Division (FRD), a research and analysis unit within the Library of Congress, to conduct a new hazard investigation of reactive chemical process safety. This study will include a number of different research tasks, including this survey, which will be similar to the one used in the CSB’s 2002 report. Survey responses will be used to examine industry practices associated with the prevention of reactive chemical incidents.

OVERVIEW OF REACTIVE CHEMICAL HAZARD STUDY

This updated reactive chemical hazard study (1) reviews and evaluates historical trends involving reactive chemical incidents, and (2) examines industry practices associated with the prevention of reactive chemical incidents.

The objectives for the new hazard study include:

1. Determining the historical trends and impacts of recent reactive chemical incidents;
2. Examining how industry, OSHA, and EPA currently address reactive chemical hazards;
3. Determine the differences, if any, between small/medium and large companies with regard to reactive chemical policies, practices, in-house reactivity research, testing, and process engineering; and
4. Developing recommendations for reducing the number and severity of reactive chemical incidents.

The recommendations from the hazard investigation may take a variety of forms, and these would not necessarily be recommendations for regulatory action. The CSB has, in the course of previous investigations, urged industry associations and companies to address numerous safety concerns through a variety of nonregulatory actions.

The FRD, on behalf of the CSB, is conducting a voluntary survey of companies concerning industry practices involving hazardous reactive chemicals and reactive chemical incidents. You may find the following definitions helpful in understanding the scope of the survey.

Reactive Hazard

The CSB is aware that industry uses a variety of ways to classify/evaluate the chemical reactivity of a substance; however, for this survey, the CSB broadly defines a reactive chemical hazard as:

*A situation with the **potential** for an uncontrolled chemical reaction that can result in harm to people, property, or the environment, through the release of heat, energy, or hazardous byproducts.*

For the purposes of this survey, the CSB classifies a **reactive chemical** as any pure substance or mixture that has the capability/potential to create a reactive chemical incident.

Reactive Chemical Incident

A sudden event involving a reactive hazard with abrupt and significant increases in temperature, pressure, and/or gas evolution that has the potential to cause, or has caused, serious harm to people, property, or the environment.

SURVEY INSTRUCTIONS

The purpose of the survey is to identify the range of practices in place in industry involving the evaluation and management of risks associated with storing, handling, and processing chemicals prone to reactivity. We are surveying 24 randomly selected companies (representing a spectrum of the industry) to see what practices are being routinely employed in reactive chemical management—so, your thorough and timely response is appreciated! The information from the survey data will be used to determine whether the CSB needs to issue new recommendations to industry regarding reactive hazard management.

We request that someone in your company/facility who is knowledgeable about reactive hazard management practices complete this voluntary survey. Some of the questions may deal with activities conducted by your company at a corporate or central location. Other questions will require the respondent to focus on activities performed at a plant. The survey is a combination of multiple-choice, yes/no, and short-answer questions. The time it takes to complete the survey will depend upon the complexity of your reactive chemical hazard management practices/program and your knowledge of the survey topics. The survey has been approved by the Office of Management and Budget and has met the conditions of the Paperwork Reduction Act. It is estimated that the survey can be completed in four to eight hours. However, the time can be shortened somewhat if you submit your company's/facility's reactive chemical hazard management written program; the survey could take longer if the survey respondent is not familiar with the survey issues or does not have access to the people who do. If you are providing documentation, please do not include any personal information.

CSB and FRD request that all survey responses are completed within 60 days. Please return the completed survey and any accompanying documents to us by **[INSERT DATE WHEN AVAILABLE]**. We will contact you one week before the survey results are due to see if you have any questions and to check your progress. Please feel free to contact Rebecca Beeson Etzel at retzel@loc.gov or

202-707-1527, and Lauren Grim at Lauren.Grim@csb.gov or 202-407-5282 if you have questions about the survey.

Neither FRD nor the CSB are making promises of confidentiality for information provided in your responses to the survey or any additional documentation that you provide. Such information will be subject to the Freedom of Information Act (FOIA) and Privacy Act as appropriate.

SurveyMonkey

SurveyMonkey is not a government website and is controlled and operated by a third party. Neither FRD's nor the CSB's website policies apply to SurveyMonkey. By completing this survey, respondents may be providing non-government third parties access to the information provided in the survey. For more information on FRD please see <https://www.loc.gov/services/federal-research-division/about-this-service/> and for FRD's Privacy Policy please see https://www.loc.gov/legal/#privacy_policy. For more information on the CSB please see <https://www.csb.gov/> and for CSB's Privacy Policy please see <https://www.csb.gov/privacy-policy/>.

SURVEY QUESTIONS

Survey Respondent Information

1. Company Name:
2. Division/Facility:
3. Number of Employees at the Company:
 - ≤50
 - 51–100
 - 101–500
 - 501–999
 - 1,000–2,999
 - 3,000–4,999
 - 5,000–9,999
 - ≥10,000
4. Number of Employees at the Facility:
 - ≤50
 - 51–100
 - 101–500
 - 501–999
 - 1,000–2,999
 - 3,000–4,999
 - 5,000–9,999
 - ≥10,000
5. Respondent's Name:
6. Respondent's Job Title:
7. Respondent's Role in Process Safety
 - Process Safety Management (PSM) Coordinator
 - PSM Specialist
 - Engineer
 - Chemist
 - Management

Other (please specify): _____

8. Facility Street Mailing Address:

9. Work Daytime Telephone Number:

10. Work Email Address:

Facility Characteristics

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Reactive Chemical Incident

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For the following questions, CSB classifies a reactive chemical as any pure substance or mixture that has the capability to create a reactive chemical incident. If uncertain, please use the incompatibility matrix from the Chemical Reactivity Worksheet.³

11. Which of the following characterizes the number of reactive chemicals at your facility?

- Seldom are used
- A few (2–5) reactive chemicals are used
- Some (6–10) reactive chemicals are used
- Many (>10) reactive chemicals are used

12. Which of the following characterize(s) the level of hazard associated with the reactive chemicals used at your facility? Check ALL that apply.

- None are used

³ If uncertain, use the matrices in AiChE's Chemical Reactivity Worksheet to determine which chemicals have the potential to create a reactive hazard incident. For more information on the Chemical Reactivity Worksheet and how to install the program, see: <https://www.aiche.org/ccps/resources/chemical-reactivity-worksheet>.

- Minimally reactive chemicals are used
- Moderately reactive chemicals are used
- Highly reactive chemicals are used

13. Which of the following characterizes the frequency of changes in the number, type, or hazard level of reactive chemicals used at your facility?

- Rarely changes (e.g., less than once every few years)
- Infrequently changes (e.g., less than once per year)
- Occasionally changes (e.g., several times per year)

14. Which of the following characterize(s) the type of operations involving the use of reactive chemicals at your facility? Check ALL that apply.

- Storage/handling of containers of reactive chemicals
- Transfer/repackaging of reactive chemicals
- Blending of reactive chemicals
- Manufacturing of products using intentional chemical reactions
- Other (please specify): _____

Management System

The following definitions may be helpful for you in understanding the scope of the survey.

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For the purposes of this survey, the CSB classifies a **reactive chemical** as any pure substance or mixture that has the capability/potential to create a reactive chemical incident.

Reactive Chemical Incident

A sudden event involving a reactive hazard with abrupt and significant increases in temperature, pressure, and/or gas evolution that has the potential to cause, or has caused, serious harm to people, property, or the environment.

15. Which of the following general reactive chemical hazard management practices are conducted at your company/facility? Check ALL that apply.

- Chemical reactivity data collection and hazard identification
- Reactive chemical testing
- Reactive chemical qualitative hazard evaluation
- Identification of controls/risk management options (including specifying hardware, software, procedural/administrative controls, and management system elements)
- Documentation of reactive chemical risks and management decisions
- Communication and training on reactive chemical hazards
- Investigating reactive chemical incidents, and review, auditing and improvement of reactive chemical hazard management practices/program

16. Is there a written program document, officially approved by company senior management, which describes the formal management system(s) that specifically addresses reactive chemical hazards?

- Yes
- No

If "yes" to question 16, SurveyMonkey will go through the questions as normal. If "no" to question 16, SurveyMonkey will skip to question 21 and continue on from there.

If "yes" to the previous question...

17. Are you willing to share these written documents? You may email/submit these documents to retzel@loc.gov.

- Yes
- No

18. Which of the following management system features do the written program document(s) address? Check ALL that apply.

- Purpose of the program
- Scope of application of the program (e.g., process life-cycle phases, what type/specific substances or circumstances)
- Intended practices
- Identified procedures for the practices (e.g., a testing protocol to ensure high-quality work)
- Specified inputs for each practice (e.g., reactivity test results prior to beginning a Process Hazard Analysis (PHA))
- Intended outputs of each practice (e.g., decomposition temperature for a substance or a situation)
- Designated roles and responsibilities (e.g., Process Development Chemist is responsible for all reactive chemical testing)
- Anticipated schedules, targets, or deadlines for executing work (e.g., all testing work must be completed prior to commencing detailed engineering design)
- Designated resources (e.g., budget, materials, equipment, and personnel)
- Means for auditing or improving the system
- Other (please specify): _____

19. Which of the following best describe(s) how the program was developed? Check ALL that apply.

- Developed by the corporate office
- Developed by the business group level in the organization
- Developed by the plant/facility
- Developed from scratch
- Adapted from a corporate program to meet local facility needs
- Modeled after an industry peer company example
- Assembled from good industry practice from a variety of sources
- Adapted from a regulation (e.g., applied OSHA PSM to all reactive substances)

If modeled after an industry peer company example, assembled from good industry practices from a variety of sources, and/or adapted from a regulation, please specify the peer company name, sources used, and/or regulation used:

20. How long have the practices/programs been in existence?

- More than 10 years
 - 6 to 10 years
 - 1 to 5 years
 - Less than 1 year
-

21. Which of the following best describes the relationship between your reactive chemical hazard management practices/program and related regulatory requirements in OSHA PSM and EPA RMP?

- Company programs driven nearly exclusively by regulatory applicability
- Company programs PRIMARILY driven by regulatory applicability, but SOME nonregulated hazards/chemicals included
- Company programs SOMEWHAT driven by regulatory applicability, but MANY nonregulated hazards/chemicals included
- Company programs are not at all driven by regulatory applicability

22. What position, department, or job function is primarily responsible for implementing your reactive hazard management practices?

- In the section below, please list the position, department, and title of the individual(s) responsible for implementing each reactive hazard management practice, as applicable.
- When entering multiple job titles, list the positions in order from most to least involved in your reactive hazard management practice.
- Avoid acronyms or abbreviations, and provide additional context where appropriate, especially if you use a term that might not be industry standard.

Hazard Management Practice/Activity	Position, Department, Title
Chemical Reactivity Data Collection and Hazard Identification	
Reactive Chemical Testing	
Reactive Chemical Qualitative Hazard Evaluation	
Identification of Controls/Risk Management Options	
Documentation of Reactive Chemical Risks and Management Findings	
Communications and Training	
Reviews and Audits	

23. Based on the previous question, what job function corresponds with the individual responsible for each reactive hazard management practice?

- In the section below, please indicate with BROAD JOB CATEGORIES the role falls under. List all that apply and separate by commas as necessary. We have listed options below:
 - Corporate, Technical/Engineering, Outside Contractor, Research & Development, Safety, Management, Production, Design
- Avoid acronyms or abbreviations, and provide additional context where appropriate, especially if you use a term that might not be industry standard.

Hazard Management Practice/Activity	Broad Job Categories (List all that apply) (Corporate, Technical/Engineering, Outside Contractor, Research & Development, Safety, Management, Production, Design)
Chemical Reactivity Data Collection and Hazard Identification	
Reactive Chemical Testing	
Reactive Chemical Qualitative Hazard Evaluation	
Identification of Controls/Risk Management Options	
Documentation of Reactive Chemical Risks and Management Findings	
Communications and Training	
Reviews and Audits	

24. Are there any other reactive hazard management practices not mentioned in the previous question that your facility engages in? If so, please name the practice(s) and list the position, department of the individual responsible for each practice. Also indicate which BROAD JOB CATEGORIES the role falls under. List all that apply. We have listed options below:

- Corporate, Technical/Engineering, Outside Contractor, Research & Development, Safety, Management, Production, Design

Include multiple job titles when appropriate; when entering multiple job titles, list the position in order from most to least involved in your reactive hazard management practice.

Avoid acronyms or abbreviations, and provide additional context where appropriate, especially if you use a term that might not be industry standard:

25. When assessing the potential hazards of a chemical process, does your facility involve experts from an environmental, health, and safety group?

- Rarely or never
- Sometimes

- Often
- Always

Corporate/Facility Relationship

The following definitions may be helpful for you in understanding the scope of the survey.

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Reactive Chemical Incident

A sudden event involving a reactive hazard with abrupt and significant increases in temperature, pressure, and/or gas evolution that has the potential to cause, or has caused, serious harm to people, property, or the environment.

26. Rank the three MOST important reasons for the original basis for development and implementation of the reactive chemical hazard management practices/program at your facility. Select the TOP three statements and MARK them as 1, 2, or 3. Mark the remainder as N/A.

- Our experience (including near misses) using reactive chemicals for a long time taught us that we had to carefully manage the risk of reactive chemicals
- We had a major accident involving reactive chemicals and that caused us to start a program
- There was a major accident involving reactive chemicals elsewhere in industry that caused us to start a program
- We became aware of evolving industry practices and resources—we thought it would be a good idea (e.g., through a professional or trade association)
- Voluntary industry process safety initiatives encouraged us (e.g., ACC's Responsible Care Process Safety Code)
- A customer/supplier requested/required us to have a program
- Regulatory compliance motivated us (e.g., OSHA PSM standard)

27. Are there any other reasons for the original basis for development and implementation of the reactive chemical hazard management practices/program at your facility that were not listed in the previous question?

If so, please list the reason(s) below:

28. Which of the following best describes the driving force or responsibility for making sure the program is implemented on an ongoing basis?

- Corporate management oversight
- Business group management oversight
- Local management oversight
- Combined management oversight
- No formal oversight, but strong safety culture exists
- Other (please specify): _____

29. To what type of projects do you apply reactive chemical hazard management practices/programs? Check ALL that apply.

- New large capital projects
- New small capital projects
- Modifications to existing process equipment
- Modifications to existing process chemistry
- New products planned for manufacture in existing equipment
- Subsequent campaigns for the same product in the same equipment
- Changeover from one existing product campaign to another existing product campaign using the same equipment
- Transfer of production to a contract (toll) manufacturer

Chemical Reactivity Data Collection and Hazard Identification

The following definitions may be helpful for you in understanding the scope of the survey.

Reactive Hazard

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For the purposes of this survey, the CSB classifies a **reactive chemical** as any pure substance or mixture that has the capability/potential to create a reactive chemical incident.

Reactive Chemical Incident

A sudden event involving a reactive hazard with abrupt and significant increases in temperature, pressure, and/or gas evolution that has the potential to cause, or has caused, serious harm to people, property, or the environment.

30. The following are different approaches to gathering or generating reactive chemicals hazard data. How valuable do you find each of these to be in implementing your reactive chemical hazard management program? Check ONE in each row for ALL items that apply.

	Extremely Valuable	Somewhat Valuable	Not Valuable
Literature surveys	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Vendor/supplier information (including, but not limited to, safety data sheets)	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Vendor/supplier technical service representative	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Evaluation of chemical structure (looking for known unstable groups)	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Thermodynamic calculations	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Computer programs (e.g., CRW, CAMEO, CHETAH, etc.)	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

In-house expert opinion	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Use of outside consultants	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Existing company databases	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Chemical reactivity testing	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

List other approaches (please specify) and indicate whether each is extremely, somewhat, or not valuable:

31. The following are recognized sources of information on reactive chemical hazard management practices. How valuable do you find each of these to be in implementing your reactive chemical hazard management program? Check ONE in each row for ALL items that apply.

	Extremely Valuable	Somewhat Valuable	Not Valuable
OSHA PSM/EPA RMP regulatory requirements	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
OSHA PSM/EPA RMP non-mandatory guidance documents	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Guidance documents from technical societies (e.g., CCPS, ACS)	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Guidance documents from chemical manufacturer/distributor	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Standards and best practices from technical societies (e.g., ASTM, NFPA)	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Guidance documents from trade associations (e.g., ACC, SOCMA)	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Contracted specialists or consultants outside of your company	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Peer contacts outside of your company	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Internal company experts and other resources	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Papers presented at technical meetings and symposia	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Journal articles	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

	Extremely Valuable	Somewhat Valuable	Not Valuable
Reference texts (e.g., Bretherick's, Sax's) ⁴	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

Other sources (please specify) and indicate whether each is extremely, somewhat, or not valuable:

32. Does your company/facility site use the National Fire Protection Association (NFPA) Instability Rating System (NFPA 704) when evaluating reactive chemical safety issues (other than for emergency response planning)?

- We seldom use the NFPA Instability Rating System to address reactive chemical safety issues
- The NFPA Instability Rating System is optionally used as the analyst sees fit to address reactive chemical safety issues
- We have site/corporate standards requiring the use of the NFPA Instability Rating System in addressing reactive chemical safety issues

33. If your company/facility site uses the NFPA Instability Rating System (NFPA 704) indicate the response that best describes your experience using the system. Otherwise, select N/A if your company does not use the NFPA System.

- It is often useful
- It is occasionally useful
- It is seldom useful
- N/A

34. Additional comments regarding the use of the NFPA Instability Rating System, as applicable:

35. Does your company/facility site use the Stoessel Criticality Classification when evaluating reactive chemical safety issues (other than for emergency response planning)?

- We seldom use the Stoessel Criticality Classification to address reactive chemical safety issues

⁴ *Bretherick's Handbook of Reactive Chemical Hazards and Sax's Dangerous Properties of Industrial Materials.*

- The Stoessel Criticality Classification is optionally used as the analyst sees fit to address reactive chemical safety issues
- We have site/corporate standards requiring the use of the Stoessel Criticality Classification in addressing reactive chemical safety issues

36. If your company/facility site uses the Stoessel Criticality Classification, indicate the response that best describes your experience using the system. Otherwise, select N/A if your company does not use the Stoessel Classification.

- It is often useful
- It is occasionally useful
- It is seldom useful
- N/A

37. Additional comments regarding the use of the Stoessel Criticality Classification, as applicable:

38. Does your reactive chemical hazard management program include the use of a chemical incompatibility (chemical reaction) matrix?

- Yes
- No

If "yes" to question 38, SurveyMonkey will go through the questions as normal. If "no" to question 38, SurveyMonkey will skip to question 41 and continue on from there.

If "yes" to the previous question...

39. Indicate below the scope of application of the matrix. Check ALL that apply.

- Combinations of process chemicals
- Combinations of process chemicals and materials of construction (including gaskets)
- Combinations that include credible, inadvertent substitutions (e.g., stainless steel for Hastelloy)
- More than binary combinations

If more than binary combinations, please describe how this is accomplished:

40. If you use chemical incompatibility (chemical reaction) matrices, what data sources are used in completing the matrix? Check ALL that apply.

- Safety data sheets (SDSs)
 - Opinions of company experts
 - Opinions of outside experts
 - References such as Bretherick's or Sax's
 - AiChE's Chemical Reactivity Worksheet
 - Reactive chemical testing results
 - Other (please specify): _____
-

Reactive Chemical Testing

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Reactive Chemical Incident

A sudden event involving a reactive hazard with abrupt and significant increases in temperature, pressure, and/or gas evolution that has the potential to cause, or has caused, serious harm to people, property, or the environment.

41. If you use reactive chemical testing as a source of chemical reactivity hazard data, who performs the testing? Check ONE in each row for ALL items that apply.

	Nearly All the Time	Some of the Time	Very Infrequently
We use our own onsite testing capabilities	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
We use our corporate or business group testing capabilities	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
We use a contractor for our testing	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

42. If you use reactive chemical testing, indicate the likelihood that you would obtain thermal stability data for each of the following. Check ONE in each row for ALL items that apply.

	Very Likely	Likely	Very Unlikely	N/A

Feed materials	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Intermediates	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Other products	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Equipment cleaning materials	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Maintenance materials	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Byproducts and waste streams	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

43. Are written guidelines provided for reactive chemical testing methodologies or protocols to help ensure consistent and high-quality results? Check ALL items that apply.

- Yes, corporate guidelines are provided
- Yes, business unit guidelines are provided
- Yes, site guidelines are provided
- Yes, apparatus manufacturer or vendor-supplied procedures
- No

44. The following are typical approaches/methods used to generate data in a reactive chemical testing program. If you use reactive chemical testing, indicate the likelihood that you would seek this data. Check ONE in each row for ALL items that apply.

	Very Likely	Likely	Very Unlikely
Screening to determine thermal stability of process materials	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Screening to determine compatibility of process materials	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Screening to identify undesired side reactions including thermal decomposition	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Calorimetry to determine runaway onset temperatures	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Calorimetry to determine maximum adiabatic reaction temperatures	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

Calorimetry to determine reaction kinetics	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Testing to determine gas evolution and pressure rise rates	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Testing to determine emergency relief requirements and flow characteristics	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Screening to determine impact (shock) sensitivity of process materials	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Testing to determine whether specific credible process upsets (e.g., agitation loss, cooling loss, double-batching) could result in runaway reactions	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

List other reactive chemical testing approaches/methods (please specify) and indicate the likelihood of you using it (very likely, likely, unlikely):

45. Have you identified key parameters (e.g., onset temperature) and established quantitative criteria (e.g., 50°C safety margin above the maximum operating temperature) for categorizing reactive chemical hazard "levels" when interpreting the results of tests checked in the previous question?

- Yes
 No

If "yes" to question 45, SurveyMonkey will go through the questions as normal. If "no" to question 45, SurveyMonkey will skip to question 47 and continue on from there.

If "yes" to the previous question...

46. Please give a few parameters/criteria in categorizing reactive chemical hazard "levels" when interpreting the results of tests:

47. Listed below are a number of classes of reactive chemical testing apparatus or analytical techniques that are incorporated in reactive chemical hazard management practices/programs. Indicate for each the frequency with which it is used in support of your reactive chemical testing program. Check ONE in each row for ALL items that apply.

	Frequently Used	Occasionally Used	Seldom Used	N/A
TGA, thermogravimetric analysis	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
DSC, differential scanning calorimetry	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
DTA, differential thermal analysis	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
ARC, accelerating rate calorimeter	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
VSP, vent sizing package	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
RC1, reaction calorimeter	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
RSST, reactive system screening tool	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
IST, isothermal storage test	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
C-80	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
SIKAREX, RADEX, and/or SEDEX	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
APTAC, automatic pressure tracking adiabatic calorimeter	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Carius (ICI) Sealed Tube Test	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
PHI-TEC	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

List other analytical techniques (please specify) and indicate the frequency with which it is used in support of your reactive chemical testing program:

48. Where are reactive chemical testing results archived so that they are accessible and can be searched by users? Check ALL items that apply.

- Corporate or business group electronic/cloud database
- Corporate or business group hard copy files
- Facility electronic/cloud database

- Facility hard copy files
- Not kept after project is complete
- Other (please specify): _____

Qualitative Hazard Evaluation

The following definitions may be helpful for you in understanding the scope of the survey.

Reactive Hazard

The CSB is aware that industry uses a variety of ways to classify/evaluate the chemical reactivity of a substance; however, for this survey, the CSB broadly defines a reactive chemical hazard as:

*A situation with the **potential** for an uncontrolled chemical reaction that can result in harm to people, property, or the environment, through the release of heat, energy, or hazardous byproducts.*

For the purposes of this survey, the CSB classifies a **reactive chemical** as any pure substance or mixture that has the capability/potential to create a reactive chemical incident.

Reactive Chemical Incident

A sudden event involving a reactive hazard with abrupt and significant increases in temperature, pressure, and/or gas evolution that has the potential to cause, or has caused, serious harm to people, property, or the environment.

49. We want to know how likely you are to perform a reactive chemical hazard evaluation in a number of common situations. These evaluations may be performed with qualitative analysis methods only (i.e., using well-known methods, such as brainstorming, checklists, what-if analysis, HAZOP analysis, or others), or these evaluations may be supplemented with quantitative reactive testing data. If you are required by a site or corporate program to perform such an evaluation, or are likely to do so, check the first or second column, as most appropriate. Otherwise, check the third column.

	Required	Not Required but Likely	Not Required or Unlikely
Research phase for a new processor product (e.g. laboratory)	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Development phase for a new process or product (e.g. pilot plant)	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Design phase for a new process or product	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Evaluating a proposed modification to an existing process or product	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

As part of an incident or near-miss investigation	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Periodic reevaluation of an existing process	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Evaluation of an existing process that has not been previously evaluated	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
In preparation for abandoning a process or decommissioning a process unit	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

List other evaluations (please specify) and whether you are required by a site or corporate program to perform such an evaluation, or are likely to do so:

50. Are there certain criteria that necessitate either a process hazard analysis or a higher level of scrutiny at your company or facility? Check ALL that apply.

- scale-up of chemical activity
- presence of highly energetic reactions
- presence of highly energetic functional groups
- gas evolution
- use of highly corrosive and/or hazardous materials
- presence of pyrophoric reagents
- past history
- literature precedent

51. Which of the following qualitative analysis methods do you use for your reactive hazard evaluations? Check ALL that apply.

- Brainstorming
- Checklists
- What-if analysis
- HAZOP analysis
- N/A
- Other (please specify): _____

52. What means or sources are used to ensure that reactive chemical hazard information is considered when conducting a Process Hazard Analysis (PHA)? Check ALL items that apply.

- Safety Data Sheets (SDSs)
- Stoessel Criticality Classification
- NFPA (National Fire Protection Agency) Instability Rating System
- Computer programs and other chemical databases (e.g., CRW, CAMEO, CHETAH, etc.)
- Chemistry descriptions in process manuals
- Detailed process technology packages
- Participation by process development chemist or engineer
- Participation by plant technical specialist
- Participation by site reactive chemicals expert
- Participation by manufacturer/supplier/vendor technical service representative
- Other (please specify): _____

53. How many people are involved in conducting reactive chemical qualitative hazard evaluations for each process life-cycle phase? Check ONE in each row for ALL items that apply.

	One Individual	Collaborative Team	N/A
R&D (including laboratory, conceptual design/pilot plant)	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Detailed engineering design	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Commercial process operation (including start-up)	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Decommissioning (including maintenance turnarounds)	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

Other (please specify) and indicate how many people are involved (one individual, collaborative team, N/A):

54. Which of the following describe(s) the ways in which you ensure that all significant reactive chemical scenarios are considered in your reactive chemical testing and qualitative hazard evaluation activities? Check ALL items that apply.

- Brainstorming
- Literature survey
- Manufacturer/supplier/vendor technical service information
- Previous plant/company incidents

- Review of industry incident databases
- Checklists
- Material incompatibility matrix
- Other (please specify): _____

55. Do the following personnel receive formalized training in identifying and applying reactive chemical hazards management practices (commensurate with their job roles and responsibilities)? Check ONE in each row for ALL items that apply.

	Yes	No
Research & Development	<input type="checkbox"/>	<input type="checkbox"/>
Technical/engineering	<input type="checkbox"/>	<input type="checkbox"/>
Design	<input type="checkbox"/>	<input type="checkbox"/>
Corporate	<input type="checkbox"/>	<input type="checkbox"/>
Safety	<input type="checkbox"/>	<input type="checkbox"/>
Management	<input type="checkbox"/>	<input type="checkbox"/>
Production	<input type="checkbox"/>	<input type="checkbox"/>

Other personnel type (please specify) as applicable:

56. Are the nature and severity of reactive chemical hazards in a process considered in determining the interval between performing periodic qualitative or quantitative hazard evaluations for the process (e.g., are PHAs for processes with "higher" reactive hazards updated/revalidated more often than for processes with "lower" assessed reactive hazards)?

- Yes
- No

If "yes" to question 56, SurveyMonkey will go through the questions as normal. If "no" to question 56, SurveyMonkey will skip to question 58 and continue on from there.

If "yes" to the previous question...

57. Please describe how the nature and severity chemical hazards are considered in determining the interval between performing periodic qualitative or quantitative hazard evaluations for the process:
-

Identification of Controls/Risk Management Options

The following definitions may be helpful for you in understanding the scope of the survey.

Reactive Hazard

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*A situation with the **potential** for an uncontrolled chemical reaction that can result in harm to people, property, or the environment, through the release of heat, energy, or hazardous byproducts.*

For the purposes of this survey, the CSB classifies a **reactive chemical** as any pure substance or mixture that has the capability/potential to create a reactive chemical incident.

Reactive Chemical Incident

A sudden event involving a reactive hazard with abrupt and significant increases in temperature, pressure, and/or gas evolution that has the potential to cause, or has caused, serious harm to people, property, or the environment.

58. Which of the following means are used by your reactive chemical hazard management practices/program at your site to ensure a thorough review is undertaken to determine the safe design for the following items? Check ALL that apply.

Safety Enhancement	Hazard Evaluation Activity						
	Does Not Apply	Peer Practice	Codes & Standards	Design/P&ID Review	Qualitative Hazard Evaluation	Consequence Analysis or QRA	Other
Emergency pressure relief capability	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Safe disposal of materials relieved	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Emergency Cooling systems	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Quench/dump systems	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

Safety Enhancement	Hazard Evaluation Activity						
	Does Not Apply	Peer Practice	Codes & Standards	Design/P&ID Review	Qualitative Hazard Evaluation	Consequence Analysis or QRA	Other
Basic process control system	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Alarms Safety interlocks	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Automation to prevent human error	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Inherently safer design alternatives	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Safe operating limits definition	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Emergency ventilation systems	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Secondary containment	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Personal protective equipment	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

List other good practices and design features (please specify) and indicate where it applies (Peer Practice, Codes & Standards, Design/P&ID Review, Qualitative Hazard Evaluation, Consequence Analysis or QRA, Other):

59. At your facility/company, what outcomes would require a change in the process or prevent a process from moving forward? Check ALL that apply.

- Stoessel classification above a certain rank
- Large exotherm
- Decomposition detected at or close to the operating temperature
- Uncontrolled gas generation
- Potential for explosion
- Other (please specify): _____

60. Does your facility have an emergency plan of response in case of a reactive chemical incident with the following entities?

	Yes	No	N/A
Local first responders	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Local Emergency Planning Committee	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Local Department of Emergency Management	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Other local government entities	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
State Emergency Response Commission	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
State Department of Emergency Management	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Other state government entities	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Local businesses/residents	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

If other local or state government entities, please specify:

61. Which of the following best describes the performance of your emergency response plans after reactive chemical incidents?

- Our facility has never had a reactive chemical incident.
- Our emergency response plans generally operate according to plan in the case of a reactive chemical incident.
- Our emergency response plans sometimes operate according to plan in the case of a reactive chemical incident.
- Our emergency response plans rarely operate according to plan in the case of a reactive chemical incident.

62. Which of the following best characterizes the frequency of updates to your facility's emergency response plans?

- Rare updates
- Occasional updates

Regular updates

63. Does your facility have access to a notification system to alert community members in the case of a reactive chemical incident?

Yes

No

Communication and Training

The following definitions may be helpful for you in understanding the scope of the survey.

Reactive Hazard

The CSB is aware that industry uses a variety of ways to classify/evaluate the chemical reactivity of a substance; however, for this survey, the CSB broadly defines a reactive chemical hazard as:

*A situation with the **potential** for an uncontrolled chemical reaction that can result in harm to people, property, or the environment, through the release of heat, energy, or hazardous byproducts.*

For the purposes of this survey, the CSB classifies a **reactive chemical** as any pure substance or mixture that has the capability/potential to create a reactive chemical incident.

Reactive Chemical Incident

A sudden event involving a reactive hazard with abrupt and significant increases in temperature, pressure, and/or gas evolution that has the potential to cause, or has caused, serious harm to people, property, or the environment.

64. Which of the following describe(s) the primary way(s) in which the findings from reactive chemical hazard management practices are communicated among corporate departments and facility management, engineering, and production, and between the company and outside parties? Add other examples in the comment box, if needed. Check ALL that apply.

Communication Pathway

Communication Means	Corporate (or Business Group) to Facility	Engineering (or Technical) to Production	Management to Employees	Outside Party to Company/Facility
Simple letter/memo	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Informal presentation	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Project book/data files	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Formal report	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Official action item	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

Communication Means	Corporate (or Business Group) to Facility	Engineering (or Technical) to Production	Management to Employees	Outside Party to Company/Facility
Safety bulletin	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Informal discussion	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Required reading file	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Documented training	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Operating instructions	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Regular safety meetings	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Incident reports	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

List other communication means (please specify) and indicate the pathway of communication [Corporate (or Business Group) to Facility Engineering (or Technical) to Production Management to Employees Outside Party to Company/Facility]:

65. Do the following personnel receive formalized training in identifying, evaluating, and controlling reactive chemical hazards (commensurate with their job roles and responsibilities)? Check ONE in each row for ALL items that apply.

Personnel	Yes	No
R&D	<input type="checkbox"/>	<input type="checkbox"/>
Design	<input type="checkbox"/>	<input type="checkbox"/>
Plant technical/engineering	<input type="checkbox"/>	<input type="checkbox"/>
Operations supervision	<input type="checkbox"/>	<input type="checkbox"/>
Operators/technicians	<input type="checkbox"/>	<input type="checkbox"/>
Maintenance/personnel	<input type="checkbox"/>	<input type="checkbox"/>

Other personnel (please specify) and indicate whether they receive formalized training in identifying, evaluating, and controlling reactive chemical hazards:

Renewal and Continuous Improvement

The following definitions may be helpful for you in understanding the scope of the survey.

Reactive Hazard

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For the purposes of this survey, the CSB classifies a **reactive chemical** as any pure substance or mixture that has the capability/potential to create a reactive chemical incident.

Reactive Chemical Incident

A sudden event involving a reactive hazard with abrupt and significant increases in temperature, pressure, and/or gas evolution that has the potential to cause, or has caused, serious harm to people, property, or the environment.

66. What job position in your company/facility is responsible for the ongoing implementation and improvement of the reactive chemical hazard management practices/program?

67. How often are the reactive chemical hazard management practices/program reviewed or audited for improvement?

- Never
- Rarely
- Occasionally, when prompted after an incident
- At regular intervals

68. Does your site report and track reactive chemical incidents (including near misses?)
Check ALL that apply.

- At site level

- At corporate or business group level
- Industry-wide
- Do not track on a consistent basis

69. Does your site ensure that reported/tracked chemical incident information is communicated company-wide and retained as part of corporate memory? Please explain.

70. Do you share data regarding reactive chemical incidents (including near misses) with trade associations, suppliers/customers, or other manufacturers in your industry?

- Yes
- No

71. How is incident data used within your site and company-wide to improve safe design, operation, and maintenance of reactive chemical processes and reactive chemical hazard management practices/programs? Please explain.

Future Needs

The following definitions may be helpful for you in understanding the scope of the survey.

Reactive Hazard

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*A situation with the **potential** for an uncontrolled chemical reaction that can result in harm to people, property, or the environment, through the release of heat, energy, or hazardous byproducts.*

For the purposes of this survey, the CSB classifies a **reactive chemical** as any pure substance or mixture that has the capability/potential to create a reactive chemical incident.

Reactive Chemical Incident

A sudden event involving a reactive hazard with abrupt and significant increases in temperature, pressure, and/or gas evolution that has the potential to cause, or has caused, serious harm to people, property, or the environment.

72. Does your company see the need for an industry-wide database on reactive chemical incidents? (One that is easily accessible to those who need it.)

Yes

No

If "yes" to question 72, SurveyMonkey will go through the questions as normal. If "no" to question 72, SurveyMonkey will skip to question 75 and continue on from there.

If "yes" to the need for an industry-wide database on reactive chemical incidents...

73. Would your company be likely to contribute to such a database?

Yes

No

74. Who should maintain such a database?

75. Does your company see the need for an industry-wide database on reactive chemical *testing*? (One that is easily accessible to those who need it.)

Yes

No

If "yes" to question 75, SurveyMonkey will go through the questions as normal. If "no" to question 75, SurveyMonkey will skip to question 78 and continue on from there.

If "yes" to the need for an industry-wide database on reactive chemical testing...

76. Would your company be likely to contribute to such a database?

Yes

No

77. Who should maintain such a database?

78. Does your company see the need for further industry guidance on reactive chemical hazard management issues?

Yes

No

If "yes" to question 78, SurveyMonkey will go through the questions as normal. If "no" to question 78, SurveyMonkey will skip to question 80 and continue on from there.

If "yes" to the need for further industry guidance on reactive chemical hazard management issues...

79. Who has a need for this guidance and how might it be developed? Please explain.

80. Would your company be willing to participate in further discussions concerning reactive chemical hazards and management practices/programs?

Yes

No

Additional Comments & Feedback

Please let us know about your experience filling out this survey.

81. How satisfied were you with the clarity of intent of questions?

- Very Satisfied
- Somewhat Satisfied
- Neither Satisfied nor Dissatisfied
- Somewhat Dissatisfied
- Very Dissatisfied

82. How easy was it to collect information to complete the survey?

- Very Easy
- Somewhat Easy
- Neither Easy nor Difficult
- Somewhat Difficult
- Very Difficult

83. Usefulness of the survey to you (e.g., new ideas, benchmarking)

- Very Useful
- Somewhat Useful
- Neither Useful nor Unhelpful
- Somewhat Unhelpful
- Very Unhelpful

84. What other comments or questions do you have that you want us to know?

End of Survey

Thank you for your participation in the CSB Reactive Hazards Survey. Your feedback from this survey will greatly help in improving reactive hazards management and safety practices.

If you have any questions about this survey or the reactive hazards study, please contact Rebecca Beeson Etzel at retzel@loc.gov or 202-707-1527, and Lauren Grim at Lauren.Grim@csb.gov or 202-407-5282.