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Safety and Security Training for the Chemical Industry

INTERNATIONAL CHEMICAL THREAT REDUCTION DEPARTMENT

Sandia National Laboratories' International Chemical Threat Reduction Program (ICTR), in association with the U.S. Department of State's Chemical Security Engagement Program (CSP), is pleased to offer a five-day training course in industrial chemical safety and security.

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CONTENTS

INTRODUCTION

The CSP seeks to develop and facilitate cooperative international activities that promote best practices in chemical security and safe management of hazardous chemicals. This course fulfills one of the CSP objectives which are to "provide technical expertise and training to improve security and safety best practices, such as those reflected in the Responsible Care® Security Code and Responsible Care Management System.

Description: This training covers a broad range of industrial chemical safety and security topics. Each training session can be tailored to address the following chemical industry sectors.

- Fertilizer and Agricultural Chemicals
- Petroleum and Petrochemical
- Pharmaceuticals

Please see the summary of industry sectors, and the curriculum and agenda that follows this section.

Audience: This training is designed for chemical industry operations or facilities managers, plant safety and health managers, R&D managers, QA/QC managers, and regulatory affairs managers.

Venue: Training will be conducted at suitable locations and will include field visits and practical exercises.

SUMMARY OF INDUSTRY SECTORS

Fertilizer and Agricultural Chemical Industry.

Chemical safety and security concerns center on the methods employed to produce the raw materials for primary fertilizers, and processing of the final product. For example, natural gas (methane), which is highly flammable, is required to produce ammonia as a source of nitrogen. Ammonia stored in tanks poses an inhalation hazard to workers or to the surrounding community, if accidently or intentionally released. Inorganic acids, including nitric acid, sulfuric acid and phosphoric acid are used in fertilizer processes and pose a health hazard to workers via skin and eye contact or potential inhalation of acid mist. Acids must be stored away from incompatible materials. Ammonia, ammonium nitrate, and methane may be targets of theft or sabotage by disgruntled employees, political activists, or terrorists due to their respective toxic, reactive, and flammable properties. Large quantities of acids pose a similar threat. Rotating drums employed for granulation and blending are potential sources of worker injury if not guarded adequately.

Petroleum and Petrochemical Industry.

The petroleum refining and petrochemical industries are a major segment of the process industries. Industrial hazards associated with this industry include large scale high pressure and temperature reactors and separations equipment containing highly flammable chemicals. Processes including catalytic cracking, hydrotreating, alkylation, isomerization and reformation involve use of various reactants including high pressure hydrogen, caustics and hydrogen fluoride. Toxic gas emissions include hydrogen sulfide, phenols, ammonia, cyanides as well as various volatile hydrocarbons. Petrochemical solvents vary in their toxicity and potential for exposure to workers, with highly volatile solvents presenting the greatest potential for inhalation exposure. In addition petroleum and petrochemical processing includes thermal, high pressure, reactive and confined space hazards. Toxic and flammable solvents and the high pressure reactors, distillation columns and separation units that produce them need to be protected from accidents as well as industrial sabotage. Safe and secure operation of these facilities is an essential aspect of their operation.

Pharmaceuticals/Plastics and Resins Industries.

Both of these industries use a wide variety of chemicals, some in large quantities. Pharmaceuticals have unique health hazards in that these compounds are intended to produce a biological effect. These clinical effects are not desirable in the work environment and workers need to be protected from exposure with engineering controls and appropriate personal protective equipment. Solvents that generate peroxides; for example, ethers, tetrahydrofuran, and dioxane; as well as aliphatic or aromatic chlorinated solvents may be used in these industries, but should be substituted with less reactive and toxic substances if processes permit. In the plastics and resins industry, large amounts of formaldehyde are used to produce phenolic resins. Formaldehyde is listed by several regulatory bodies as a confirmed or suspected human carcinogen. Exothermic reactions are a potential safety hazard in free radical initiated polymerization processes. A

process hazard analysis is required in the United States, and is advisable when scaling up a manufacturing process in the plastics/resins sector.

General Industrial Safety Hazards.

General safety hazards in all of the aforementioned industries include, but are not limited to, high or low temperature and high pressure processes, energized electrical work, elevated platforms/fall hazards, hot work, confined spaces, and ergonomic or repetitive stress hazards.

CHEMICAL SAFETY & SECURITY WORKSHOP CURRICULUM

Day 1:

Chemical Management: Proper implementation of a chemical management system enables the safe management of chemicals from procurement to disposal, and ensures that workers, the public, and the environment are protected from unreasonable risk resulting from accidental and intentional chemical releases. The module will cover international management system standards, as well as chemical storage, inventory systems, labeling, safety data sheets, industry-specific health and safety hazards, and occupational exposure limits. Participants will have the opportunity to tour a chemical facility storage area.

Day 2:

Process Safety: Accidental releases from chemical processes pose a serious threat both to workers, facilities, and the surrounding community. This module covers the fundamentals of process safety including how to identify, classify, and analyze process hazards through the use of such tools as HAZOPS, What-If, and Checklists. Preventative techniques such as process equipment inspection and testing, evaluating chemical reactivity hazards, operating procedures, and inherently safer design will be covered. The participants will be led through a hazard analysis exercise.

Day 3:

Chemical Security: Violence, vandalism, and terrorism are prevalent in the world today. Managers and decision-makers must have a reliable way of estimating risk from intentional theft and sabotage of highly hazardous chemicals in order to help them decide how much security is needed at their facility. This module will review the current international standards and guidance available, including the American Chemistry Council's Responsible Care Security Code. The principles of security, protection system design, and security vulnerability analysis will be covered. In addition, participants will participate in a hypothetical security vulnerability assessment of a chemical facility.

Day 4:

Hazard Control and Risk Management: How do you keep workers safe? Preventing worker injury and illness may be controlled through implementing controls such as operating procedures, hazard-specific training, safety equipment, engineering controls, and personal protective equipment. Human factors which affect a worker's propensity for injury, as well as behavior based safety program development are included in this module. Preventing accidents and incidents is essential for corporate sustainability. Accident investigation and reporting are covered as methods for learning from past incidents and implementing continuous safety improvement.

Day 5:

Emergency Response & Hazardous Waste: Whether a chemical is released accidently or intentionally, adequate planning in emergency response is essential. Pre-planning through training and written procedures will be covered as well as modeling and responding to releases. This last training module also will cover the final stage of product life cycle including waste disposal and recycling, best practices, and novel approaches for treating and disposing of waste. Time will be allotted for discussion, next steps, and participant feedback.

CHEMICAL SAFETY & SECURITY WORKSHOP AGENDA

Day 1: Introduction, Chemical Safety Management

Time	Topic
0900	Welcome, Purpose, Goal, and Overview of Workshop
0915	Introductions of Staff, and Participants
0930	Chemical Safety and Security Overview
1000	Tea Break
1030	Principles of Chemical Safety
1100	International Health and Safety Management Systems
1200	Lunch
1300	Chemical Management: Storage/Inventory Systems/Labeling/Safety Data Sheets.
1400	Chemical Health and Safety Hazards/Exposure Limits/Calculations
1515	Tea Break
1530	Tour chemical / industrial facility
1800	Adjourn for Day

Day 2: Process Safety

Time	Topic
0900	Process Safety Overview/Standards
0930	Identification of Hazards and Potential Consequences
1030	Tea Break
1045	Process Equipment Inspection and Testing/Procedures/Schedules
1145	Lunch
1245	Inherently Safer Design
1415	Tea Break
1430	Hazard and Risk Analysis
1600	Exercise/case study
1700	Adjourn

Day 3: Chemical Security

Time	Topic
0900	Chemical Dual-Use Awareness and International Standards
0930	Safe/Secure Transport of Chemicals
1030	Tea Break
1045	Principles of Security/ACC Responsible Care Security Code
1145	Lunch
1245	Security Vulnerability Assessment (SVA) Overview
1345	Tea Break
1400	SVA Exercise
1600	Leave for Sightseeing and Group Dinner

Day 4: Hazard Control and Risk Management

Time	Topic
0900	Human Factors/Why do workers act unsafely?
1000	Chemical Safety Programs
1045	Tea Break
1100	Behavior Based Safety
1200	Lunch
1300	Accident/Incident Investigation and Reporting/Near Misses
1400	Management of Change
1500	Tea Break
1515	General and Local Exhaust Ventilation
1600	Personal Protective and Safety Equipment
1700	Adjourn

Day 5: Emergency Response, Hazardous Waste

Time	Topic
0900	Emergency Planning/SOPS, Training
0930	Emergency Response/Modeling and Reporting
1030	Tea Break
1100	Emergency Response Demonstration
1200	Lunch
1300	Waste Management and Disposal
1400	Recycling and Waste Treatment Technologies
1500	Tea Break
1515	Questions and Answers, Open Discussion
1600	Feedback Form
1700	Leave for Group Dinner and Certificate Presentation