
EMERGENCY RESPONSE TO CHEMICAL ACCIDENTS

PLANNING AND COORDINATING SOLUTIONS



JAMES T. O'REILLY

Emergency Response to Chemical Accidents

Planning and Coordinating Solutions

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Preface

“Chemophobia,” the fear of exposure to chemicals, is an unfortunate side effect of the modern age. You have voluntarily exposed yourself to the complex chemical mixtures which make up the ink on this page, and the residual pulp chemicals contained in its paper, in order to obtain useful information. The benefits you derive from these and all other exposures *do* outweigh the risks you incur. But the decisions about exposure that you will make today, next week, or next year should not be framed by unreasonable fears. This book is oriented toward information sharing, so that the community, and we as individuals, can reduce risks and reduce fears.

The risk that chemicals pose in an accidental discharge, spill, or fire is of a greater degree, but a much smaller likelihood, than the vague fear of exposures in everyday life. The odds against an individual person suffering physical harm from a chemical accident are very large. The fact that relatively few such accidents of significant size occur each year is offset by the exceptional public sensitivity to chemical accidents. The Bhopal, India, tragedy in 1984; the Institute, West Virginia, scare in 1985; and the evacuation of 40,000 from Miamisburg, Ohio, in July 1986 attracted the national media's most fervent attention.

This text project had its genesis in my work on the formation of the first tri-state chemical hazards response unit and on the formation of a task force on chemical emergency response for the county civil defense authorities in the Cincinnati area. Local involvement with the nationwide Chemical Awareness and Emergency Response program and Ohio state programs were invaluable experiences. After more than a dozen years working on safety and regulatory issues, and with the success of my earlier McGraw-Hill book Federal Regulation of the Chemical Industry, I undertook to cover this new and dauntingly complex assignment. I hope other areas will benefit from some of these insights which originated in Cincinnati.

I would like to express special appreciation to the inspirational leadership of Tom Evans of St. Louis, who has spent a career promoting chemical industry safety efforts. Al Haberer and Bud Zorb of Procter & Gamble provided insightful and much appreciated advice. Fire Chiefs Mike Gunn, Charles Collini, and Bob Stegemann have helped me to understand the fire service perspective on emergency response equipment and organizational needs, and Gary Miller of the Red Cross has been a leader in disaster response planning. Chris Cathcart and Joe Kelly of the Chemical Manufacturers Association

deserve special praise for their stewardship of the innovative CAER project. Janis Adkins, Dr. Laurie Ramonas, Joe Hollingsworth, and Pat Waldo of Washington, D.C., provided helpful information about the Superfund legislative developments. Cincinnati chemical safety experts Gerry Osterman and Don Tischbein gave helpful technical advice. Numerous professionals from EPA, DOT, Coast Guard, and FEMA offered publications and other assistance. The conclusions and opinions expressed are those of the author alone and not those of any institutions.

I also want to thank my research assistants, Phyllis Brown, Libby McCord, and Katrina L. Patton, for assembling materials for inclusion in the text, and Sarah Winesett for logistical support. Finally, I appreciate my family's support over the months which this project consumed. The author would welcome suggestions for additions to future editions, sent to me at P.O. Box 599, Cincinnati, Ohio 45201.

If and when the remote chance of a chemical accident occurs, your experiences and your hard work will determine the safety of your community. Good luck with your planning and implementation of the response planning tasks!

James T. O'Reilly

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About the Author

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CHAPTER 1

Introduction

The chemical cloud which rises from a burning chemical truck or factory is a rare sight. When it appears, it poses an imminent safety and environmental problem for neighboring residents. Television has recounted the hazard on an almost monthly basis from some corner of the nation, but it may be hard to accept that it could be occurring in the community where the emergency is actually happening. That realization that the cloud is coming your way should be followed by immediate response according to a plan. If you face the accident, and face the cloud, and have no plan, it is too late to open this book and learn how to plan.

The cloud over the community in that brief moment is probably less threatening than the cloud of uncertainty about safety of exposure to chemicals, which lingers for months or years over some communities. Dispersing the cloud of a particular chemical can be handled by time, skillful response workers, and favorable wind conditions. The people residing in the community can do little other than to get out of its way. By contrast, the dispersing of the symbolic cloud of uncertainty and safety concerns about chemicals will require that the people of the community must come out, become educated about the risks they actually face, if any, and become involved in the solution. Denial of a problem or insistence on a drastic elimination of the source of chemical problems would be inappropriate strategies. Society needs chemicals, workers need the employment opportunities which innovation provides, and consumers benefit from the plastics, aluminum, glass, and consumer goods which result from safe use of industrial chemicals.

This book is a step in the direction of solutions. It is intended to

help the community plan for the local response to chemical hazards. It takes no position on whether one particular city or county needs a particular type of plan more than any other community will need one, or whether the fears of one group about one chemical are justified in the context of a particular plant site. Instead, the book recognizes that each community must prioritize according to the needs and feelings of its citizens. The selection of plan options and details requires careful tailoring to the needs of the community. Planning is expensive in paid and volunteer time, and chemical response planning is particularly likely to be expensive because of the scarcity of truly competent chemical emergency planning experts.

A community which adamantly refuses to plan for a chemical emergency may be reminiscent of the tranquil beauty of tropical villages around a volcano. Their chiefs may deny the existence of a problem until the eruption blasts their communities downhill. The presence of unanticipated chemical exposures from small factories, rail or highway transportation, or even abandoned waste sites will destroy the comfortable feeling that one does not need to plan because there is no big toxic chemical manufacturing site in the vicinity.

Comfortable self-assurance that one is safe from chemical accidents may be just a foolish miscalculation; transportation accidents, rapid growth in small chemical processing firms, and new plant openings can alter the basis on which the comfort was drawn. If a person feels comfortable with his or her insurance, it may be because there has never yet been a need to use it. Preparedness, like insurance, is appreciated most when it was overlooked. If a community declines the opportunity to plan, it may be taking comfort from ignorance of the many risks which surround it. For that reason, planning and inventories are tied together throughout this text.

Two aspects of the chemical safety controversy, process safeguards and human error, deserve special attention. First, safety precautions within the chemical plant should assure that the process of manufacturing will be safe. Within the local community around the plant, these process-oriented safeguards are the community's primary line of defense. A safely designed and properly managed plant is a community asset which keeps people employed and adds to the local tax base. Incentives like continued profitability, avoidance of lost production time, and lower insurance premiums encourage the plant to practice safety. Risk

management, a subspecialty of the insurance industry, routinely questions whether a facility has a sufficiently safe design for counteracting unexpected release situations. Physical safeguards, such as double valves or dikes around potentially leaking storage tanks, are designed into the more modern chemical-handling facilities.

The emergency response planner is not required or expected to be a chemical process engineer. Responding to emergencies is a defined task separate from the task of assuring the safest feasible design for a storage tank farm, chemical pipe system or reaction vessel. Groups outside the plant will be aware that a reactive response exists. They may not be aware that the plant itself works to design safe practices into the plant's workplace procedures.

The competent handling of chemical operations within the plant is the first line of defense, overseen by managers who have profitability incentives not to waste assets. Those managers pay attention to safety objectives and to insurance risk management inspections. The external aspects of chemical plant safety will interact with internal process matters on some occasions, but a high-quality chemical emergency response program should not be seen as a justification for lessening the attention to safe chemical processing steps within the chemical plant. It is not recommended that local or municipal groups start into contingency planning by the evaluation of the process safety side of chemical handling.

The second factor is that human error is inevitable and machinery cannot prevent every human mistake. One cannot expect that perfection will be possible on systems operated or designed by fallible people. But modern high volume manufacturing reduces costs with some corresponding reduction in the redundancy of humans checking up on other humans. Human error may bypass the machines set up to catch inadvertent flaws. Mechanical and electrical safeguards should be in place but a people-watching function beyond the ability of a computer is also important. Training is vitally important, but as long as humans are involved, one must assume that a certain irreducible level of accidents will occur.

Adjusting to human frailties and accidents is part of modern economic life. The community which has multiple highway and rail connections is particularly familiar with the accidents which human error can cause. The response plan is an outgrowth of the community's recognition that problems will occur, and of the community's desire to mitigate those problems before they become very damaging.

It should also be clear from the outset that collective, community action does not lessen the need for individual efforts. As this book explains, each individual player has a role in the team and also has individual responsibility for the plant or other facility with which he or she is associated. Though much of this book calls for group efforts and interactions, the chemical safety of the individual plant is a role and responsibility which depends on people to make it work.

Defining the Problem

POTENTIAL HAZARDS

The problem which this book addresses is that of maintaining the safety of the community from accidental releases of potentially hazardous materials. The word "potentially" includes hazards arising from fires, floods, vehicle or rail accidents, process spills, accidental vapor escapes, and explosions. The premise of this discussion is that one must plan well before the potential danger becomes a real danger.

The hazardous materials addressed in this text are industrial chemicals, factory-use chemicals known as intermediates or process aids, and consumer-used products which include chemicals. The emergencies to be considered include accidents with bulk chemicals, radioactive materials, petroleum products such as gasoline, plastics, gases, and other potentially hazardous items which are commonly found in our modern workplaces and in our transportation systems. The problem of maintaining safety recognizes that the normal state of events is safety, not hazard; yet it also recognizes that accidents are inevitable.

The problem of risks from large-scale industrial accidents, such as chemical fires, exists and has existed for decades. The pattern of human error or process design flaws which has been publicized in recent years is actually improved over the older times of more independent, less safety-sensitive chemical design. New crises -- such as the Bhopal, India gas release deaths -- focus more public attention on solving the problem at the community level. Regardless of your home or work location, this issue of chemical accident safety is your problem, though not everyone recognizes the severity, or even the existence, of the problem.

National Issue

The national issue in the public sector is leadership, especially the need to educate and train leaders who are equipped and capable of minimizing damage to the public when an inevitable chemical spill, leak, fire, or other accident occurs. Leadership in attacking the incident promptly with the right equipment and technical knowledge generally rests with the local government body which coordinates emergency matters, such as a fire department or local emergency management agency. The incentives which the national government level offers are grants, Environmental Protection Agency (EPA) training courses, and directives for the formation of local emergency response committees. The EPA has been active in working with local environmental authorities, but it is safe to postulate that local leadership has not universally been present. The focus of the EPA field directives process was the Superfund legislation of 1986, discussed in Chapter 3.

Local Issue

The primary local issue is to get the task of emergency preparedness finished, so that it is tailored to what will be needed and so that trained personnel can accomplish what needs to be done as quickly as it must be done at an incident site. The organizational need will be to obtain the cooperative work of many segments of the community against a common goal of avoiding injuries from toxic chemicals. The lofty goal of achieving total safety from toxic materials incidents is meaningless unless those who share the goal can pool their knowledge and plan their resource needs. Agreeing on the objective should be easy. The local group will want to address the potential risk of hazardous materials incidents in the community's factories, storage yards, roads, or rails.

This book recognizes that the solutions must be locally prepared plans, not uniform solutions from "on high." Planning is a local issue by virtue of the fact that no national plan can cover the variety of communities, plant-site problems, and political arrangements which exist among 50 states and thousands of municipal governments. Cooperation at the

local level on common problems is an American tradition going back to the Pilgrims. A side effect of that need for cooperation is the need for community participation in decisions, a task as American as the traditional New England town meetings.

Toxic chemical accidents are not a pleasant theme for public participation meeting discussions, but they must be discussed beforehand -- as they certainly will be discussed if and when they occur. The public must have a say in the communitywide safety plan. It is not solely the elected officials who will be evacuated from the square mile downwind of a burning tank truck, for example. The opportunity to learn and to be heard concerning the community's emergency response plan is useful to reinforce the legitimacy of the whole program.

Private Sector

The problems of reaching agreement on problems and solutions in the private sector arise because it is more diverse than the public sector and therefore is less likely to come to unified decisions. The public sector official has one constituency, one "market" with voters as the consumers. Like industry's consumers (and more so), voters are wary of the price of government programs. The public sector person interested in "selling" the benefits of a plan must be cognizant of the costs of the additional safety features of the plan. A few segments of the private sector chemical-handling industries are very well prepared for potential release incidents; some segments and smaller firms are not ready and will be ready only when mandatory requirements begin to be felt.

Incentives to improve the chemical industry's emergency preparedness have had tremendous success. Chemical manufacturing plants have received a great deal of encouragement from major industry groups, but the industry has many small to midrange firms that have not been listening to the advice and instruction. Ideally, all private firms would interconnect voluntarily with the emergency response plan, and each would be ready to come to the aid of any other plant.

Again, the problem does not vanish when a community decides that it has no chemical manufacturing plants in the area. Segments of consumer goods manufacturing, specialty sales, waste disposal and storage-distribution markets have the potential to be "surprise

contributors" to a hazardous substances emergency. Barges, trucks, rail cars, and airport depots can be affected by incidents. The fact that a local farm supply store does not recognize the potential chemical injuries which could result from ignition of its stored fertilizer and chemicals does not make such a site a less important contributor to chemical accidents.

Coordination of Public and Private Sectors

Private sector involvement with government agency coordination appears to have fared better on the issue of chemical emergency planning than on the issues of regulatory clearance of new chemicals, labeling of workplace containers with detailed worker safety precautions, and other recent regulatory requirements of statutes such as the Toxic Substances Control Act and the Occupational Safety & Health Act (OSH Act). More local groundwork has been done, more companies chose to involve themselves, and less friction has resulted when the subject was the protection of the community from chemical emergencies.

In the chemical emergency field, virtually all manufacturing and processing sites have fire inspections performed on a periodic basis. Chemical safety information has been passing from plants to fire departments with increasing frequency as the fire officials become more sensitive to potential complications of fire situations resulting from the presence of potentially toxic chemicals. Most of the rail carriers have an excellent understanding of chemical safety, and the situations of chemical hazard are usually attributable to collision or derailment rather than to defects in the railroad's handling of the hazardous product itself. Trucking firms vary in the degree of training provided to their drivers, and in special handling precautions for chemicals. In accident situations, the collision often occurs despite the training, with only limited ability to use whatever preventive safeguards had been prepared.

Discord and debate are aspects of the public policy discussion which accompanies any new initiative when money, lives, and health are at stake. Dealing with chemical emergencies is not new, but systematic planned response is a costly but worthwhile initiative. Information flow is the best way to reduce suspicion and discomfort. Much of the solution to fear of chemical spills and fires is better public communication about the

problem. As this book addresses the issue, the reader will see frequent suggestions for getting the data flow going and moving participants toward the common goal of planned safety and risk reduction.

DEFINING THE LOCAL PARTICIPANTS

Local Government

Government at the local level has the greatest share of responsibility to respond to chemical emergencies within its local community. Tradition upholds the independence of fire and police units from "outside" control beyond the political boundaries of the municipality. Freedom to conduct the public safety work of the community includes freedom to reject outside control. Community planning for chemical emergency response is a community-based process rather than a system universally adopted at each specific, uniform local site. Local autonomy is very important. But local independence in responding to chemical emergencies, if carried to reckless extremes by independently ignoring a high risk of chemical accidents, would have harmful consequences. Reputation, recognition of quality public services, and the more tangible avoidance of death or injury are objectives worthy of protection. Early budgeting saves the costs of paying for damages later. The cliché of a "stitch in time saving nine" would translate to developing an easy-to-read plan which saves elected officials from nine hours of hostile media criticism of the community's lack of preparedness.

Fire Service

When an explosion or fire occurs, local officials expect the local response unit to handle the emergency with speed and courage. It will do so. Unfortunately, the slow, cautious, and double-checked means by which chemical emergency issues are to be addressed are not self-evident to a person who has not been trained to consider chemical reactions, explosivity, or gas clouds. A chemical crisis differs from the more anticipatable structural fire "crisis" in a typical residence or office building because the "enemy" is different. The involvement of chemicals in