Chapter 6 gives the methods for estimating exposure of chemicals. Indoor and outdoor releases of the chemicals are considered.

The purpose of **Chapter 7** is to discuss ways in which chemical products and processes are designed so that the use and generation of hazardous substances is either reduced or eliminated.

Chapter 8 classifies environmental performance tools into three groups to assist the process engineer in designing chemical processes. The first group of tools is simple to apply on basic information available on processes. The second group of tools includes emission rate estimation methods, energy consumed during production, and total pollutants per unit of production. The last group is based on a series of indicators that are explained in **Chapter 11**.

Chapters 9 and 10 document methods for improving environmental performance of conceptual processes.

Chapter 11 deals with environmental fate of emissions and wastes. A detailed description on multimedia compartment model and tier 3 environmental assessments has been given. This chapter in addition also discusses several important hazard indexes for human health. These can also be used in ranking different technologies and several other engineering applications.

The tools available for estimating environmental costs are given in **Chapter 12**. All the cost components are described. The emphasis of **Chapter 13** is on life-cycle assessment. A methodology for tracking energy, materials, and waste is presented in this chapter.

Chapter 14 on industrial ecology explains the integration of other processes and material flows in determining the environmental performance of chemical processes. The topic is explained with the help of several case studies.

Appendix A provides an overview of nine federal statues related to toxic chemicals and pollution prevention. The calculations for the first order molecular connectivity are given in **Appendix B**. The equations for calculating emissions from storage tanks are available in **Appendix C**. Tables for four environmental impact potentials are given in **Appendix D**. Methods for estimating the regulatory costs required by RCRA for hazardous waste generation are given in **Appendix E**. A summary of web resources, online databases and software are documented in **Appendix F**.

An index appears at the end of the book. Overall, the book will be helpful to those involved in pollution prevention. Readers will benefit from the new approaches discussed in the book. The material will also be helpful in stream lining pollution prevention work.

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The Handbook of Hazardous Materials Spills Technology

Merv Fingas (Ed.), McGraw-Hill, New York, NY, 2002, US$ 125.00, 1004 pp., ISBN 0-07-135171-X

Having published my own handbook on hazardous materials spills with McGraw-Hill in 1982, I eagerly awaited the publication of Fingas's book.[1]

This book has over 1000 pages, 10 major sections, and 45 chapters contributed by 54 experts from a dozen different countries. As noted, the book is divided into major sections as follows (with the number of chapters in each section shown in parentheses following the section title):

1. Hazardous Material Programs (8)
2. Nuclear Emergencies (1)
3. Risk Assessment (3)
4. Spill Countermeasures (4)
5. Spill Modeling (11)
6. Dispersion (2)
7. Safety (2)
8. Perspectives on Specific Chemicals (8)
9. Case Histories (4)
10. Chemical Spill Data (2)

In the preface, Fingas notes that while interest in chemical spills has only developed since 1970 (the US EPA held its first Hazardous Materials Spill Conference in 1972; I was conference chair and edited the Proceedings of the Second Spills Conference in 1974), much has changed in the field, especially in the sophistication of modeling. He notes that "It is very important then to capture the knowledge and developments of an era so they can be transmitted to the next group of spill responders to focus their attention on problems with hazardous materials spills. This handbook will, we hope, fulfill that role." In my opinion, it certainly has.

To attempt to comprehensively report on the contents of this massive book in a review such as this would be futile. Let me, rather, focus on three major sections (I must admit they are the ones of most interest to me personally). First of these two sections to be reviewed is the one on countermeasures. It contains four chapters:

1. Containment and Confinement of Hazardous Chemical Spills
2. Cleanup of Chemical Spills Using Air Sparging
3. Sorbents for Chemical Spill Treatment
4. Analysis of Hazardous Materials Using Equipment in Vehicle-Portable (Level 3) Spill Response Vehicles

Strong (a consultant) has written a very interesting, albeit in my opinion a little too short, chapter, on containment and confinement of spills. He covers the essential topics (including dams, barriers, and patches) but given the importance of the topic, I would have wished for more information. The author writes with the authority of one who has much personal knowledge of the field, but he includes no references to other publications. Such would be useful.

[1] It should be noted that Fingas is a member of the Editorial Board of this journal. As Chief of the Emergencies Sciences Division of Environment, Canada, he is eminently qualified to have been this book's editor.

The second chapter in this section (actually chapter 14 of the book) was authored by Reddy and Adams. This chapter, entitled "Cleanup of Spills Using Air Sparging," digresses from the normal area of open water spills to address remediation of sites that have been contaminated with petroleum products and chlorinated chemicals as a result of accidental spillage and leakage of underground storage tanks. Reddy and Adams present a comprehensive review of the topic, covering both the practical and theoretical aspects. In contrast to the prior chapter, they cite over 100 references to the literature. The topic of land-based (as opposed to water-based) spill cleanup is a major area that is the subject of many books. Reddy and Adams only begin to "scratch the surface" of soil remediation.

McKay and Ng co-authored the third chapter in this section entitled "Sorbents for Chemical Spill Treatment." This technique, which most often utilizes activated carbon, can be highly effective for removing organics from water (I must note that there is a plethora of other adsorbents such as silica gel, bone char, and bagasse; several of these are discussed in the chapter). Both theoretical and practical aspects of contaminant adsorption are discussed. Abundant references are given. Interesting also, is their provision of a list of useful web sites related to the topic.

The final chapter in this section (Chapter 16) is by Lee and Fingas. Its title aptly describes the chapter focus: "Analysis of Hazardous Materials Using Equipment in Vehicle-Portable (Level 3) Spill Response Vehicles." In this chapter, the authors discuss on-site analysis of TPHs, PAHs, and PCBs.

The second major section I will review is the longest (most chapters): Spill Modeling. It contains 11 separate chapters. Not surprisingly, gas dispersion modeling occupied much of the space—and as a member of our county's local emergency planning committee, I am in contact with our emergency services organizations and their use of computer dispersion modeling programs such as ALOHA). That topic is covered in Chapter 17, entitled "Practical Use of Air Plume Modeling in Chemical Emergencies." The author covers the topic well, beginning with a discussion of North American emergency guidelines based on the aforementioned ALOHA computer program. Subsequent chapters in this section (among others) deal with the spreading of Cold Dense Clouds (very theoretical), Evaluation Methodologies for Dense Gas Dispersion Models, Contaminant Concentration Fluctuations, and Modeling Atmospheric Dispersion of Heavier-Than-Air Clouds Containing Aerosol. The foregoing chapters range, as noted, from the practical to the very theoretical with the latter being understandably the most theoretical sections in the text.

Two chapters deal with the infamous BLEVE and one discusses debris from an underground storage facility explosion. There is a chapter discussing water spills. It is entitled "Modeling Oil Spills on River Systems: Evaluation of Aqueous Concentrations."

Finally, let me focus on Part 8 which has 8 chapters under the heading "Perspectives on Specific Chemicals." Fingas participated in writing most of these chapters with co-authors. Chemicals discussed are: ammonia, chlorine, MTBE, sulfuric acid, PCBs, sulfur trioxide and oleum, pentachlorophenol, and sodium cyanide.

General information is given for each chemical on its industrial uses, physical and chemical properties and guidelines, manufacture (industrial aspects and production), chemical and environmental fate and behavior, human and environmental toxicity, description of past spills, lessons learned and countermeasures utilized, and environmental concentrations and standards.

This review is much longer than most reviews I write, but given the massive amount of material in the book, the importance of the topic, and my personal interest in the field, the review is too short. The text really deserves a much longer one. Fingas and his contributors are to be congratulated on producing a superb book.

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