ADVENT used the expert system shell LEVEL 5 OBJECT employing both forward and backward chaining. Backward chaining is used for vent area calculations, whereas forward chaining is used for data validations, input queries, and range checks. A 650-record data base was maintained in dBase III in order to calculate the deflagration vent area. The database contained mostly explosive characteristics data on combustible gases and dusts. The Microsoft Windows graphical environment feasures color-coded menus and instructions that provide a user-friendly interface for both novice and experienced users.

Building an Expert System is the final chapter, which notes that the expert's domain changes daily, and therefore the system must change dynamically as necessary to stay abreast of new information and techniques. The stages of development of an expert system application generally follow:

a. Planning — giving the expert system form

b. Selecting the "world" of the expert system — giving the expert system boundaries

c. Selecting the knowledge reservoir — giving the expert system teachers

Develop the relevant knowledge — giving the expert system intelligence

Program development — giving the expert system function

Implementing the system — giving the expert system communication capabilities. The production rules, known as "if-then", are applied.

Expert system shells come with a variety of features, and should be carefully reviewed. A small prototype should be designed that can be used rapidly as a pattern to develop the set of final choices rapidly as a pattern to develop the set time should be considered in terms of importance to the application. Vendors of expert system shells should be carefully reviewed, as well as software selection of dimentions along which expert systems software may be compared and classified. The five levels of these systems are noted.

The SUMMARY chapter concludes the book, followed by a Glossary of Terms Used in Expert Systems (pages 36–40) and an Annotated List of Selected Software (pages 41–48) and a bibliography (pages 49–51).

This book is a valuable and important addition to the studies of safety in operations, and will doubtlessly be used and enlarged.

HOWARD H. FAWCETT, P.E.

Understanding Atmospheric Dispersion of Accidental Releases, A CCPS Concept Book, by G. DeVaull, J. King, R. Lantzy and D. Fontaine, Published by the Center for Chemical Process Safety of the American Institute of Chemical Engineers; 345 East 47th St., New York, NY 10017, 44 pages, ISBN 0-8169-0681-5, Priced in U.S. and Canada $50; elsewhere $70.

Most people, whether or not scientific, who have worked in or near chemical operations will attest to the importance of gas and vapor releases, and the necessary control measures, including dense-vapor and high momentum releases, boiling and evaporating liquids, multiphase flow, vessel blowdown and aerosol transport. To identify

the source of an odor or leak may require more time than available. As part of the more comprehensive context of overall risk analysis and risk management, vapor dispersion is an important part of the risk control and safety management.

A description of the processes involved in an accidental or emergency release and the resulting downwind transport, with dilution of the chemical or mixtures is the first overview in the introduction, and is supplemented by charts and graphs on source and environmental parameters needed to define release conditions and in predicting downwind including stages in an accidental environment release and the downwind dispersion. Concentration isopleths (lines of constant concentration) on diagrams or maps are useful, but since wind direction cannot be easily estimated a priori, the radius of exposure estimate should be carefully considered. In addition, the volume has another series of plots to help zero in on distance vs concentration.

Since meteorology is the study of releases in the atmosphere, Section 2 covers turbulence in the atmosphere. Within a 10- to 60-minute time period in the atmosphere, wind speed, wind direction, atmospheric turbulence and weather conditions usually can be assumed to have relatively constant time averages. A formula is presented for mean wind velocity and the variance in the mea wind.

Mechanically generated turbulence, surface friction and interwind shear retards the flow near the ground.

The vertical wind profile, which results in roughness height from large urban centers to deserts or seas, is clearly chartered to make the reader aware of the effects.

The Pasquill-Gifford stability classification scheme requires only simple estimates of wind speed, solar insolation (in day) and cloud cover (at night). Vertical density and temperature profiles are reflected in graphs.

Another series of graphs show daily variations in the atmospheric boundary layer.

The ability to estimate sources, such as leaks and ruptures, especially in a pressurized tank, discusses phase changes in released fluids. A large leak or catastrophic vessel failure is notes that pressure and gravity waves can vary rapidly in time and space, including in long high-pressure pipelines.

Liquid pools, both boiling liquid pools and volatile liquids, in addition to evaporation of relatively nonvolatile liquids are noted in Chapter 4. Chapter 5 discusses buoyant and dense-gas jet releases if the release density is much different than the air density. Chapter 6 discusses low-velocity dense-gas releases, including source specification, the source area region (supplemented by drawing of dilution and transport in a low-velocity dense-gas release) and passive dispersion region.

Chapter 7, Passive Dispersion, discusses the mechanics of turbulent releases, both from normal and elevated releases. The COMPLEX FLOW CONSIDERATIONS, Chapter 8, discuss and shows building wake influence on an elevated plume. Aerosol rainout is another form of the material with liquid droplets, vapor, and air. Fanning plumes and subsidence is another aspect which must be understood and can change from nighttime stable conditions to daytime convective conditions.

Chapter 9, Hazard Evaluations, discusses the source and status of chemical toxicity, as well as flammability. Chapter 10, Computer Models, suggests sources of software which are specifically useful to the subject. Three pages of bibliography are given to conclude the book.

The volume is a most interesting exploration to the "real world" of releases of gases, vapors, and solids.

H. FAWCETT

Barrier Containment Technologies For Environmental Remediation Applications, by R.R. Rumer and M.E. Ryan, (Eds.), Wiley, New York, NY, 1995, 170 pp., ISBN 0-471-13272-1

Although brief, this is perhaps the most comprehensive text available describing technologies that can be applied to construct containment barriers for environmental remediation. The book begins with a brief introduction identifying the potential niche for containment technologies as aids to pump and treat remedies, as well as temporary solutions for those sites where no satisfactory alternatives exist or where time is needed to complete development of an in situ destruction method. The niche is described without being defensive and no attempt is made to persuade the reader. Rather, the statement is made and it is left to the reader to determine if containment makes sense for any given application.

The second chapter describes contaminant transport mechanisms and how they can be addressed to successfully contain plumes. Both convective and diffusive transport are considered. The text then turns to a discussion of site geologic and hydrogeologic features that may facilitate or hinder application. Specific focus is directed to stratigraphy, seismic activity and areas of recharge/discharge.

The third chapter is focused on the variety of barriers that are available to construct vertical walls. Different approaches for slurry walls, grouts and cutoff walls are described along with the relevant parameters that determine effectiveness, test methods to determine if objectives are likely to be met, compatibility considerations, backfill design for slurry walls, documentation of performance, and quality control. The information provided is quite detailed and uses numerous recent references that capture the results of the latest research.

The fourth chapter describes the installation of floors. The authors note from the outset that this is a fledgling technology with the best results obtained at sites that have a natural floor already in place. However, grouted bottoms and several very new experimental methods are described. An analysis is conducted to show the economic trade off between going deeper to find a natural floor and putting in a floor. Guidelines are provided to find the depth and radius of the containment where the decision changes.

The fifth chapter describes the design of caps for sites and presents a thorough discussion of the advantages and disadvantages of alternate materials for each of the five layers in a standard design. Conclusions are made in the final chapter. A glossary and index are included.

This is an excellent reference for practitioners who may need to design containment barriers. It does not include case studies which would be helpful, but the treatment is relatively even-handed and the information very up-to-date. I recommend this book for anyone responsible for evaluating remedies where conditions suggest that containment may be advisable.

JAYNOR DAWSON