



## Book reviews

*Expert systems in process safety, A Concept Book*, by B.R. Rodger and F.S. Petry, Center for Chemical Process Safety, American Institute of Chemical Engineers, 345 E. 47th St., New York, N.Y. 10017, 51 pages, 1995, (\$50 (American and Canadian Orders;)) (\$70 elsewhere.) Published Sept. 1995, ISBN 0-8169-0680-7.

As announced in the title, expert system is a computer-assisted program that relies on knowledge and reasoning, within a narrow field, to perform a difficult task, usually assigned to a highly trained scientist or engineer.

The first section of the volume defines the symbol as an expert system (computer program) that relies on knowledge and reason to perform a difficult task. A table is presented to compare expert systems with conventional programming. Expert systems shells are now available and are relatively simple and inexpensive alternatives to using the conventional programming languages. Language such as C or Pascal, or a high level language such as Smalltalk or C + + may be used. A general plan is developed and refined several times until a detailed plan is reached. Debugging Near-right plans furnish constraint satisfaction.

The second chapter discusses tools of expert systems, while the text notes that knowledge based reasoning knowledge representation, and expert system shells, and programming languages are important for the expert system. Expert system shells may increase the cost, but reduce the time involved in the preparation. Prolog is an AI Language, and is claimed to be faster than Prolog, Lisp and Smalltalk. Reusable code is a major advantage of Smalltalk, which is available on most platforms, including DOS, Windows, UNIX and VMS. C + + has become the most widely used object-oriented language. Visual Basic is an event-driven package with the BASIC programming language as a base that incorporates some object processing capabilities. Programming is done by designing the user interface screens first using a toolbox. The controls and buttons for the interface form can be moved from the toolbox and placed anywhere on the screen being designed.

Chapter II, Applications of Expert Systems in Chemical Engineering, reviews process safety related applications, where the most active area at present is in process hazards analysis. Conclusions of the CCPS survey covers ten companies that reported on a total of nineteen process-related expert systems Nineteen process-related hazards of safety and health reports are noted.

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 features 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 dimensions 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.

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*Understanding Atmospheric Dispersion of Accidental Releases, A CCPS Concept Book*, by G. DeVaul, 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