

## System Safety for the 21st Century

By Richard A. Stephans, Wiley-Interscience, Hoboken, NJ, 2004, 385 pp., \$85.95.

This is an updated and revised edition of *System Safety 2000* by the same author. Like its earlier version this book intends to present the field of system safety to interested managers and engineers, including those who have no prior experience in the subject. Except for some obvious updating, the main difference with the earlier version is the addition of a part on process safety in the chemical industry. In total there are six parts in the present book. The first one is a substantial introduction (56 pp.) to the subject. All safety problems should be tackled systematically, and the "system view" should provide a logical strategy for that. Nevertheless, system safety is normally distinguished from general safety: at this moment, the system safety community overlaps only partially with the general safety community. At any rate, the systems approach is essential knowledge for all safety professionals. Therefore, Part I should be useful literature for all concerned. This part, like the remainder of the book, reflects the intention of the author to provide practical guidance for new professionals in the field. The underlying fundamentals of safety system are covered in a mere 14 pages. Definitions are given for the basic concepts and for safety system as such. They are not explained or discussed further, even when slightly different definitions for the same terms are quoted at various other places in the text. Also, the definition that is given for intrinsic safety is quite different from the one used in process safety. A discussion of the basics would have been very useful to provide other safety professionals with a better understanding of the system safety approach that can be used in their own work.

From Chapter 1, which deals with the history of system safety, it is obvious that the book is essentially based on the situation in the United States. The same can be seen in Chapter 3 where the current approaches are dealt with. This chapter is based on the specifications issued by the U.S. governmental bodies that specifically require a system safety approach. The chemical industry has been added here, but only with the

Hazop technique. From a professional perspective this focus on the United States might be adequate, although in a textbook it could be regretted.

Part II presents to the reader a systematic overview of how a system safety program is set up. The generic model used is primarily aimed at applications that are only marginally complex, thus making it possible to give a concise overview of the general principles governing the development of such a program. Unfortunately, it also means that it cannot be applied as such to safety in the chemical industry per se.

Parts III and IV cover, respectively, "Analytical Aids" and "System Safety Analysis Techniques." Part III has three short chapters: one on analytical trees, one on risk assessment and risk acceptance, and the third one on human factors. The common treatment of analytical trees is very useful. It is not clear why event trees have not been included here, although they are mentioned in Part IV under "Other analytical techniques." The discussion on risk assessment and risk acceptance logically reflects the approach used in the system safety community. This differs substantially from what chemical engineers and the chemical industry have to consider, with societal risk acceptance as an important factor. The short chapter on human factors is a very useful introduction to the subject. It is in this chapter that the author also discusses the very important hierarchy (or strategy) of safety measures under "System safety precedence." Chemical engineers will note the similarity with the LOPA (layers of protection analysis) levels. Contrary to the strategy commonly used in industrial safety, no distinction is made here between barriers aiming at the source of the hazard and those aiming at the potential victim. This causes difficulties in positioning such measures in the strategy, as pointed out by the author.

Part IV contains a short description of a number of techniques that are used in system safety analysis. Some of the more generally applicable techniques are presented. Quantitative risk analysis (QRA), as presently used in industrial safety, is not included. Most likely, the author has considered it outside the scope of this introductory book, although just making the reader aware of the existence of QRA and its present status would have been useful.

Part V is the novel part in this revised edition of the book. It deals with process safety as practiced in the chemical industry. This is covered in four short chapters, dealing consecutively with OSHA's Process Safety Management, EPA's Risk Management Program, the implementation of these programs, and safety audits. It is remark-

able how much information has been squeezed into 53 pages. The use of regulations as the guiding principle for this part is in line with the other parts of the book and reflects the practical approach followed by the author. The (U.S.) regulatory basis of this part probably also explains the statement that "process safety is a fascinating new and important specialization area to the safety professional and to process industry practitioners" (p. 275). This statement will probably cause surprise among some of the professionals, inside and outside the United States, who have been developing and using systematic strategies for process safety for many years. In this respect it is also a pity that more references are not given to the extensive literature on process safety. A few CCPS books of AIChE are mentioned, whereas the basic reference book of Frank Lees<sup>1</sup> is not. The security issue is briefly discussed but no reference is made to the developing area of Vulnerability Analysis.

In the last part the author gives some advice on professionalism and professional development in his field, with three appendices related to this topic. The last of these lists safety-related organizations, mainly American ones.

In conclusion, this book provides a first introduction to system safety and practical guidance for people starting in this field. It is concise and easy to read. There are very few errors in the book: Figures 2.3 and 2.4 have been exchanged; a few times the reader is referred to Chapter 17 for hazard analysis techniques that are not discussed there. It is highly commendable that the author attempts to bridge the still existing gap between system safety and process safety professionals; however, the overview of process safety is rather limited. The book will be useful to chemical engineers to learn the basis of the system safety approach, given that this is normally not considered in books on process safety in the English language. For that purpose a more thorough discussion of the concepts and strategies of system safety would have been very helpful.

## Literature Cited

1. Lees FP. *Loss Prevention in the Process Industries*. 3 vols. London: Butterworths; 1996.

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