

Book review

Mannan Sam (Ed.), *Lees' Loss Prevention in the Process Industries: Hazard Identification, Assessment and Control*, third ed., Elsevier Butterworths Heinemann, Burlington, MA, 2005, three-volume set, 0-7506-7857-7 (vol. I), US\$ 476.00 (for three-volume set), 1439 pp., ISBN 0-7506-7555-1.

This book is the first of a three-volume series which, given its size (3671 pages), demands a separate review of each volume. However, no review I could write describing this effort can adequately express my admiration of the scope and coverage of the topic. The amount of information contained in each book is almost incomprehensible.

The first edition of this book series appeared in 1979. It was written by Frank Lees who based it on lectures given to students at Loughborough University (UK) over a period of years. This edition had 28 chapters with appendices discussing incidents at Flixborough and Seveso.

Between the first and second editions, the release of methyl isocyanate at Bhopal and the incident at San Carlos, Mexico, occurred. These accidents resulted in new laws and regulations in many countries that govern chemical plant operations. Appearing in the new edition are chapters on new hazards, albeit in brief, on nuclear power and oil and gas platforms.

The editorship moved from the UK across the ocean to the United States to Sam Mannan of the Chemical Engineering Department at Texas A&M University. He writes, "This third edition of *Loss' Prevention in the Process Industries* represents a combination of appropriate revisions of the essential compilations put together by Frank P. Lees, along with several new chapters and additions on new areas that deserve attention and discussion. The third edition includes five new chapters and three new appendices. The five new chapters address incident investigation, inherently safer design, reactive chemicals, safety instrumented systems, and chemical security".

Mannan notes that safety is no easy task, but it makes sense economically by reducing workman compensation payout and other accident related benefits.

Volume I has 16 chapters (listed below) of varying lengths:

1. Introduction
2. Hazard, incident and loss
3. Legislation and law
4. Major hazard control

5. Economics and insurance
6. Management and management systems
7. Reliability engineering
8. Hazard identification
9. Hazard assessment
10. Plant siting and layout
11. Process design
12. Pressure system design
13. Control system design
14. Human factors and human error
15. Emission and dispersion
16. Fire

In the first chapter, the following discussion is found: "Over the last three decades there has been developed in the process industries a distinctive approach to hazards and failures that cause loss of life and property. This approach is commonly called loss prevention. It involves putting much greater emphasis on technological measures to control hazards and on trying to get things right the first time. An understanding of loss prevention requires some appreciation of its historical development against a background of heightened public awareness of safety, and environmental problems, of its relation to traditional safety and also to a number of other developments". The author then refers to selected references.

The above notes that references are given on a variety of safety and loss prevention topics. References are a key component of this book and copious numbers are found throughout it in each and every section. Given in the text itself for each reference are simply the author and year of publication. Full reference citations are found in Volume III.

The two longest chapters in Volume I come at the end. They are by title and size, respectively: Emission and Dispersion (348 pages) and Fire (307 pages). Having lectured for years on air pollution topics, I was delighted to see the chapter on Emission and Dispersion.

Emissions of chemicals from processes are an important safety consideration as the three major chemical plant hazards, fire, explosion, and toxic chemical release are involved. A chemical release from containment usually followed by vaporization and dispersion often occur. This chapter treats all release modes.

As an example of the literature covered, I cite the categories of selected air emission references: liquid, gas and vapor flow; coefficient of discharge; friction factor; slow leaks;

vessel drainage times; bund pipelines; two-phase flow; vessel venting, blowdown; pressure release valves; bursting discs; vessel rupture; pipeline rupture; fugitive emissions.

This chapter was indeed a comprehensive coverage of the topic. By itself, it would make a substantial book, a book based on theory and practice. Indeed, the theoretical (mathematical) treatment of the topic is one of the most extensive I have seen recently. For example, two-phase flow (a topic I have not looked at since my graduate study days) is discussed (it is also extensively referenced). Other topics include vessel depressurization, pressure relief valves, vessel blowdown, pipeline rupture, vaporization, etc. Generally, each section contains a list of references in addition to the list I noted above.

Conventional topics such as plume behavior and Pasquill's stability categories and dispersion modeling are discussed, not surprisingly. All discussions are well supported by excellent diagrams and mathematical analysis. As a final point of emphases to describe the comprehensive coverage of this chapter, I note that it has 81 tables, 161 figures and 24 pages of notation.

The second larger (and also the last) chapter in the first volume deals with Fire Safety, which the author notes is the first of the major hazards in plants as it causes more serious acci-

dents than explosions or toxic releases, although the former generally results in the most deaths. Especially of concern are vapor cloud fires.

The coverage of fires, their impact, and prevention is extensive, starting with, not surprisingly, the fire triangle. Just to indicate the coverage, I will report the titles of the first few sections of the chapter: flammability of gases and vapors; combustion phenomena; flammability of aerosols; ignition sources; self-heating; static electricity, etc.

In conclusion, I will state what is probably obvious from my review: this is not simply a book of advice on safety programmes. It is a comprehensive treatment of all, and I mean all, aspects of plant safety, which this review is all too short to do justice to it.

Gary F. Bennett*

*University of Toledo, Department of Chemical and
Environmental Engineering, Mail Stop
305, Toledo 43606-3390, USA*

*Tel.: +1 419 531 1322; fax: +1 419 530 8086

E-mail address: gbennett@eng.utoledo.edu

1 March 2005

Available online 18 April 2005