

BOOKS

Pump Handbook, I. J. Karassik, W. C. Krutzsch, W. H. Fraser, and J. P. Messina. McGraw-Hill, New York, 1,102 pages, 1,008 illustrations, \$34.50.

The key word in design today is *systems*, and this is truly a pump systems handbook. The contents are especially suited to the engineer involved with process plant design, operation, and maintenance. Rather than treating solely the hydraulics or the mechanical design of pumps, the authors discuss all aspects of pumping systems at length. For example, there is extensive treatment of instrumentation and pump controls, including all types of valving. Not only are various prime movers discussed, but every aspect of their application such as couplings, gears, belts, and clutches is included. Separate sections are devoted to the chemical, petroleum, paper, food, and mining industries.

The technical treatment is comprehensive but at a level easily understood by the practicing engineer. It is likely that the reader will find assistance in analyzing most of his liquid transport problems somewhere in the book.

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Dynamics and Control of Continuous Distillation Units, O. Rademaker, J. E. Rijnsdorp and A. Maarleveld, Elsevier, Scientific Publishing Company (1975), 726 pages, \$58.50.

This book, marked by a unique perspective that results from the extensive industrial experience of the authors, will be a valuable reference for engineers concerned with the dynamics and control of distillation columns. The detailed treatment of the subject and the level at which some of the material is presented, coupled with the absence of problems, render the book unsuitable for use as a textbook. However, it was *not* the authors' intention to write a textbook!

The approach adopted throughout the book is immediately evident to the reader in Chapter 1, which introduces the dynamics portion of the book. Tray dynamics are treated in the 54 pages of Chapter 2. Although the table of contents lists only sections 2.1 through 2.9, the first page of the chapter gives a more detailed listing, which contains twenty-six subheadings within the orig-

inal nine headings! This pattern, which applies to all chapters, is an unnecessary annoyance in that a detailed table of contents at a single location is most desirable in view of the very limited four-page index. In Chapter 2 one first encounters the use of the frequency rather than the Laplace domain representation. In Appendix I the authors comment that the frequency response method is used since fewer readers are probably familiar with the Laplace transform method. The exact opposite is most likely to be the case for chemical engineers educated in North America. Also in Chapter 2 the reader is first exposed to the expression "partial mass-flow balances," which are nothing more than component balances! This chapter contains some numerical results from a typical industrial deisobutanizer, which is used as an example throughout the book. It is this column that is used as a basis for Chapter 3. Utilizing the expressions developed in the previous chapter, the authors give the frequency response of column sections for pressure, composition, vapor and liquid flow disturbances. Unfortunately, the excellence of the analysis will not be readily apparent to those readers not familiar with passive electrical networks, polar plots, and Bode diagrams, not to mention the underlying frequency response considerations that are employed in the discussion. Obviously, for these readers, presentation of some transient responses would have been most welcome.

The title of Chapter 4, "Inherent Regulation, Dynamics of Auxilliary Equipment," would lead the reader to believe that dynamic models of reboilers, condensers, etc., would be found here but the reader is referred to Chapter 6 for typical models. A 30 m ethane-ethylene splitter containing 91 trays, 0.9 m in diameter, is used as an example in Chapter 5, which presents experimental verification of the predicted frequency response behavior for disturbances in reflux rate and vapor-valve setting. The title of Chapter 6, "Simulation of Distillation Dynamics and Control by means of Electrical Networks," is indicative of the content. Because of the networks some readers will tend to ignore this chapter and not be aware that detailed models for a complete column, including condenser, reboiler, etc., are presented. Chapter 7 is the literature tabulation on distillation dynamics except for more recent literature listed in Appendix IV. The

review of literature not published in the English language that occurs in this chapter and throughout the book is certainly a valuable feature.

The reader will find in Chapter 8, "Correcting and Controlled Conditions," a superb introduction to the many facets of distillation column control. Various mass balance, temperature, pressure, and quality control systems are analyzed for their suitability in Chapter 9. A section dealing with the criteria for locating the detecting element in the column concludes the chapter. After having covered the basic control schemes, the authors turn in Chapter 10 to discussing ratio control, feedforward, two-quality and finally optimizing control. Further modifications to the basic control schemes, e.g. ways of adjusting the condensation rate, vaporous top product columns, columns with circulating reflux, etc., are treated in Chapter 11, entitled "Other Distillation Units and Plants."

Chapters 12 and 13 are concerned with the dynamic and quasi-static analysis of many of the basic control configurations discussed in the previous chapters. In the dynamic analysis, the authors again use passive analog networks and polar plots. The steady state considerations of mass balance and temperature control systems are treated in Chapter 13. Further information on steady state considerations is given in Appendix III. The final chapter contains the bibliography on the control of distillation columns.

In summary, anyone who examines this book can readily appreciate the authors' comment on page 2 "... it might never have been written at all if it had been realized beforehand how complicated the task was going to be." For a publication of this nature it contains few typographical errors although in the copy of the book provided for this review, pages 413 and 414 were interchanged. Readers not familiar with the frequency response method and passive electrical networks will unfortunately not gain maximum benefit from the presentation in some parts of the book. Notwithstanding this limitation, this reviewer has no doubt that this book will become the basic reference on the topic of distillation column dynamics and control.

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