

Ludwig's Applied Process Design for Chemical and Petrochemical Plants Vol. 1, 4th Edition

A. Kayode Coker, Gulf Professional Publishing/Elsevier, Burlington, MA,
1,024 pp., \$199, 2007, ISBN 13: 978-0-7506-7766-0; ISBN 10: 0-7506-7766-X

Completely revised and expanded, this fourth edition features new materials, including:

- a chapter covering the physical properties of liquids and gases, with tables of properties in an appendix
- a chapter on cost estimation and economical evaluation procedures
- discussions of hazard identification and analysis, and additional topics in design for safety (*e.g.*, inherent safety)
- an appendix on ethics in the engineering profession.

The book also comes with numerous computer applications and Excel spreadsheets. Explanations on how to use these tools are given in the book's preface. In total, there are nearly 50 process datasheets for equipment in either Excel-spreadsheet format or hard copies that can be readily accessed.

The author covers the topics in the book in detail and provides numerous references for material cited in the text, as well as references for further reading. He has done an admirable job of carrying on the excellent work started by Ernest E. Ludwig.

Chapter 0 is a compilation of rules of thumb for design of process equipment covered in this volume and past ones. Process planning, scheduling, and flowsheet design are covered in detail in Chapter 1, while Chapter 2 reviews cost estimation and economic evaluation. In Chapter 3, the author reviews physical property data for liquids and gases and presents Excel spreadsheet programs for estimating these properties for a range of temperature and correlation coefficients, which can be downloaded from the companion website.

Chapter 4 on fluid flow is quite extensive and discusses design procedures for single-phase flow for liquids and gases, two-phase liquid-gas flow, non-Newtonian flow and slurry flow. The sections on non-Newtonian flow and slurry flow are limited and could benefit with the addition of greater detail. Also, several references on pipe sizing methods for non-Newtonian flow did not correspond to the citations in the list of references at the end of the chapter. Similarly, the references in the section on slurry flow did not match the list of references at the end of the chapter.

Pumping of liquids is covered in Chapter 5. Most of the discussion deals with centrifugal pumps, with shorter sections on rotary and reciprocating pumps. This chapter could be improved with discussions on sealless (canned and magnetic-drive) pumps, as well as metering and diaphragm pumps, which are now widely used in the chemical and petrochemical industries. Two other topics that are not covered, and would have been very useful, are: mechanical seals and packings; and pump suction and discharge piping design, which has an effect on pump performance.

Chapter 6 on mechanical separations is a good review of process equipment for the separation of liquid particles from vapor/gas, liquid particles from immiscible liquid (decanters),

dust or solid particles from vapor/gas, and solid particles from liquids. Numerous example calculations are provided.

Mixing of liquids is covered extensively in Chapter 7, focusing primarily on liquid-liquid mixing. While it has a solid foundation in topics such as the theory of mixing and types of mechanical mixers, it lacks discussion on mixing and heat transfer in glass-lined reactors, which are commonly used in the manufacture of pharmaceuticals, fine chemicals and polymers. This chapter can also be improved with more in-depth discussion on gas-liquid mixing and non-Newtonian liquids mixing.

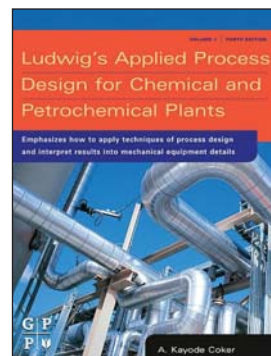
Chapter 8 is a good review of ejectors and mechanical vacuum systems. The major part of this chapter is taken up with steam ejector systems and covers many aspects of their design and operation. The rest of the chapter discusses various types of mechanical vacuum pumps and liquid-ring vacuum pumps. However, there is no discussion of dry mechanical vacuum pumps, which are typically used in the manufacture of pharmaceuticals and microchips.

Chapter 9 is an extensive discussion of process safety and pressure-relieving devices. Many topics are discussed in detail with example calculations included. Several topics should have been updated and more fully discussed, and others included, in my opinion. For example, the following is recommended for the next edition:

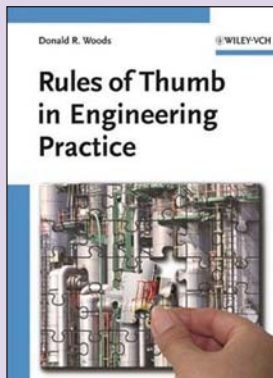
- expanding the section on flame arresters (see book "Deflagration and Detonation Flame Arresters")
- using the latest edition (2007) of NFPA 68 for the presently recommended method (method given for the design of vents for relief of deflagrations in enclosures is outdated and should not be used)
- expanding the section on static electricity, and citing references to NFPA 77 and the book "Avoiding Static Ignition Hazards in Chemical Operations"
- adding a new section on inerting (purging and padding) of storage tanks and process equipment
- adding a new section on electrical area classification.

Despite some shortcomings, this is an excellent book that will provide much useful information to chemical engineers in industry involved in process design. It also can be used as a classroom text for senior and graduate level chemical plant design courses.

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Rules of Thumb in Engineering Practice



Donald R. Woods, Wiley-VCH, Weinheim, Germany, 479 pp., \$120, Apr. 2007, ISBN: 978-3-527-31220-7

This handy, concise reference is designed to save engineers time and effort in solving design, process improvement, operation and troubleshooting problems. It begins with general rules of thumb about process equipment, physical and thermal properties,

corrosion, process control, batch vs. continuous processing, heterogenous phase contacting, economics, problem solving and creativity, goal setting, decision making, thermal pinch, "systems" thinking, design, process improvement, troubleshooting, environment, waste minimization, safety, communication, listening, people skills, team and group skills, performance reviews, leadership, entrepreneurship, e-business, mentoring, and self-management. Then, for each of more than 350 types of equipment, it covers five important aspects: applications (when to use it), sizing guidelines, capital costs (including difficult-to-find installation factors), principles of good practice, and causes for troubleshooting. The book is a synthesis of information from the author's experience, colleagues in industry, and hundreds of other sources. It covers not only the most familiar types of equipment, but also many less common ones, and extensive cross-referencing takes into account the fact that that some items are used for many different purposes.

Successful Trouble Shooting for Process Engineers

Donald R. Woods, Wiley-VCH, Weinheim, Germany, 444 pp., \$135, Mar. 2006, ISBN: 978-3-527-31163-7

A companion to "Rules of Thumb in Engineering Practice," this book introduces practicing engineers and students to the fascinating and important world of troubleshooting chemical, pharmaceutical and other production processes. Through 52 case studies, it teaches the mental problem-solving process, rules of thumb for troubleshooting process and equipment malfunctions, data gathering, and interpersonal skills. A CD containing appendixes, a self-test, feedback on the cases, coded answers for the case questions, and additional helpful supplementary material accompanies the book.

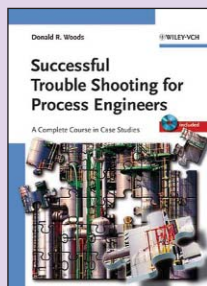


Plate Heat Exchangers: Design, Applications and Performance

L. Wang, B. Sunden and R. M. Manglik, WIT Press, Billerica, MA, 288 pp., \$190, Aug. 2007, ISBN: 978-1-85312-737-3

This latest book (Volume 11) in the *Developments in Heat Transfer* series starts with a general introduction to plate heat exchangers (PHEs) and gives some historical background. It then discusses construction and operation of PHEs (types, plate patterns, etc.), gives examples of PHEs in different applications, and addresses material issues related to the plates, gaskets and brazing. Most of the book is devoted to the basic design methods for both single-phase and two-phase flow, various flow arrangements, and thermal-hydraulic performance in single-phase flow and for PHEs operating as condensers and evaporators. Fouling problems are also covered. A section on extended design and operation issues covers the use of tools such as computational fluid dynamics (CFD). Unique features of PHEs are discussed throughout.



Rules of Thumb for Maintenance and Reliability Engineers

Ricky Smith and R. Keith Mobley, Butterworth-Heinemann, Burlington, MA, 336 pp., \$95, Oct. 2007, ISBN: 978-0750678629

Focusing on predictive maintenance, this book is a convenient guide to best practices for maintaining machinery and systems assets. It is handy collection of graphs, charts, calculations, tables, curves, and basic rules of thumb that any engineer working with equipment will need. The authors share a wealth of professional experience in pointing out the most important factors that affect successful maintenance programs and the keys to ensuring that manufacturing systems perform reliably over time. The books explains how readers can create and nurture a work culture that values predictive maintenance over reactive maintenance. It describes common technologies for performing predictive maintenance analyses, including vibration analysis, thermography, ultrasonics, and tribology analysis, and explains how to perform reliability analyses such as failure modes and effects analysis and root cause failure analysis. Common maintenance programs for mechanical and electrical components, including bearings, chain drives, belt drives, hydraulics, gears, compressors, packing seals, pumps, electric motors, and motor controls, are given. Also included are useful forms, checklists, and tips for checking maintenance schedules, inspections and tests.

