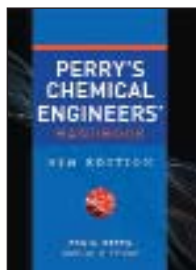


Perry's Chemical Engineers' Handbook, Eighth Edition

Don W. Green and Robert H. Perry,
McGraw-Hill, New York, NY, 2,400 pages, \$199, Oct. 2007,
ISBN: 978-0-07-142294-9



"Perry's" is many things. It's a collection of facts, theories, drawings of equipment, good advice — and, of course, correlations. Chemical engineers are famous for correlating virtually everything.

Perry's dates back to a decision by DuPont 80 years ago to help the chemical industry by providing more of a technical base. The first edition came out in 1934, with most of the authors from

industry, and one-third of those from DuPont.

The Eighth Edition contains some improvements over the seventh (which was issued in 1997). For example, in Chapter 2, the increases in transport property data and the increased discussion of prediction of physical properties are welcome. The inclusion of material on salt dome storage in Chapter 10 is also appropriate, as is the inclusion of wet surface air coolers in Chapter 12. Other very useful additions are the material on distillation column internals in Chapter 14 and the greatly expanded information on extractors in Chapter 15. I also like the addition of case histories and the expanded discussion of flammability in Chapter 23 (Safety).

But the allocation of space is puzzling. Two pages are devoted to thermodynamic properties of each of the four butylenes — as well as two pages each for carbonyl sulfide, neopentane, isopentane, isohexane, nonane, octane, decane, dodecane, heavy water, para hydrogen, krypton, neon, xenon, sulfur hexafluoride and nitrogen trifluoride. In contrast, the chapters on biochemical engineering and process machinery drives (motors, turbines, etc.), which appeared in the seventh edition, have been dropped.

Perry's remains a useful book because of the great array of pictures, tables and equations, but at the same time it is harder to use than it should be — or once was. If you don't know where information is located, there is a chance that you will never find it. The index has become sparser over time. There is no cross-referencing between sections. The quick reference

page that once faced the periodic table has disappeared. The good news is that the periodic table itself has reappeared — after its omission from the seventh edition.

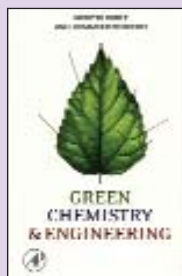
There is also a great deal of redundancy. This gives users several chances to find the information they are looking for, but they might give up before finding it. For example, if Chapter 5 (Heat Transfer) doesn't tell you about equipment, you could look for it in Chapter 11 (Heat Transfer Equipment). But there is no way to know that the information on wet surface air coolers will appear in Chapter 12 (Evaporative Cooling) unless you go to the index and guess that the terse phrase "wet-dry cooling," with a single page listed, will eventually lead you to a three-page discussion that precedes the listed page.

Redundancy escalates in Chapter 12, with six different versions of a psychrometric chart. Spray nozzles and spray contact are discussed in four different chapters. One can choose the Nukiyama-Tanasawa correlation in Chapter 14, or believe the wording of Chapter 12 that rates the correlation of "doubtful validity." Perhaps the high point in redundancy is devoting a quarter of page 18-10 to a poor drawing of a "high-shear-rate impeller," and then repeating the identical drawing, slightly enlarged, on page 18-31.

Perry's is an institution. Institutions change slowly. There are chapters that logically should be combined and subsections that should be better integrated within the chapters. Many of the 162 authors in this edition have been around for a long time. A few are even dead. Meanwhile, 14 new authors are listed for Chapter 18 (Liquid-Solid Operations and Equipment), though their contributions are not clearly attributed. In some cases, terms (like paste and dough) have been clarified, yet most of the material in Chapter 18 is unchanged. There is logic here; the wonderful equipment line drawings would be costly to replace and much of the equipment has probably remained the same. Still, the mystery of the contributions of all the new authors remains.

Chemical engineering is a multi-faceted craft, and Perry's illustrates that. Most of the chemical engineers I've talked with speak well of Perry's and have found some part of it useful. We all owe DuPont a debt of thanks for giving it a good start 80 years ago. But, like most 80-year-old institutions, it could stand some major freshening.

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Green Chemistry & Engineering

**Mukesh Doble and
Anil Kumar Kruthiventi,**
Academic Press, Burlington, MA,
381 pages, \$80, May 2007,
ISBN: 978-0-12-372532-5

In addition to leaving a cleaner, greener footprint on the planet, one of the key

goals of the "green engineering" movement is to be more resource-efficient and cost-effective. This engineering guide explores the ways that green chemistry can save organizations money in their processes, while also reducing emissions and environmental impacts.

Authors Mukesh Doble (whose article on green reactors is scheduled to appear in the Aug. 2008 issue of *CEP*) and Anil Kumar Kruthiventi present the science

The Management of Chemical Process Development in the Pharmaceutical Industry

Donald Derek Walker,
John Wiley & Sons, Inc., Hoboken, NJ,
416 pages, \$100, March 2008,
ISBN: 978-0-470-17156-1

Author Derek Walker of the Schering-Plough Research Institute draws from his experience working for several pharmaceutical companies to discuss the people, organizational processes, and disciplines that need to be integrated to develop a pharmaceutical product. A joint publication of AIChE's Center for Chemical Process Safety (CCPS) and Wiley, the book is based on a series of talks that Walker presented to his colleagues at Schering-Plough and to students interested in chemical process development careers.

After an introduction presenting his philosophy on process development, the author begins with the fundamental component of all work — the people. Early chapters address the vital importance of people in leadership roles, the influence of visionaries, the value of consultants, and the importance of recognizing and rewarding achievement. This is followed by a discussion of how to organize the work of scientists and engineers and how to integrate it with the work of other disciplines to achieve defined missions.

Process safety is covered in Chapter 4, with emphasis on identifying reaction hazards, including examples from industry. A concise review of environmental issues follows, with discussion of U.S. regulations, process emissions to the air, chemical handling and organic process wastes. Also presented are a good overview of U.S. Food and Drug Administration (FDA) requirements and cGMPs (current Good Manufacturing Practices).

The book then moves into patents, with information on patent content, forces leading individuals and companies to seek patents, factors influencing the value of a patent, and strategy in the timing of seeking patents. An interesting part of this chapter is a discussion of the



patent process surrounding the development and manufacturing of the antibiotic florfenicol.

A chapter on chemical engineering is succinct, but useful. In it, the author discusses many elements and functions of process equipment, including: heat exchange in reactors; agitation; extraction; distillation/evaporation; crystallization; filtration, washing and drying; milling, micronization and precipitation; pumping; flow measurement; and reactor volume measurement. Waste management, computer applications and plant maintenance are also addressed.

Again drawing from his own experience, the author provides examples of chemical process projects. One case involves the development of a commercial process for the manufacture of a cardiovascular drug, dilevalol hydrochloride, which reached the manufacturing and marketing stage, albeit briefly. A second case summarizes the early process research work carried out to identify a safe, low-cost process for the manufacture of the brain cancer drug temozolomide. This work never got beyond the laboratory phase, but the author felt that it was worth recounting the ideas and their progression.

Other case studies describing technical excursions in beta lactam antibiotics and steroids place chemistry in a historical perspective, illustrating how chemical process development is carried out and how this work is changing over time. These cases provide a picture of the excitement and variety of challenges that come with a career in chemical process development.

The book wraps up with a look to the future and a few of the endeavors that the author believes should be pursued to address today's realities. Topics include education, bureaucracy reduction, trends and technologies, and dealing with the consequences of past neglect.

Interesting and informative, this book contains many examples of pharmaceutical processes and relevant references. I believe that this book will not only be useful to process development chemists and chemical engineers in the pharmaceutical industry, but also to those in other sectors of the chemical process industries.

*Stanley S. Grossel (AIChE Fellow),
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and engineering principles behind green chemistry. The book focuses on techniques that chemists and chemical and process engineers can employ to generate less waste, while developing products and processes that are more atom- and energy-efficient, and environmentally sensitive. Chapters describe new manufacturing conditions, such as those using smarter organic-synthesis techniques and processes that maintain atom efficiency to temper the effects of chemical processes.

Detailed theory is supported by practical applications. Case studies illustrate applications in pharmaceuticals, chemical engineering, and process engineering. Other key topics include biocatalysis, process intensification and reactor design, and inherent safety.

The book concludes with a summary of likely future trends, and the challenges that will be faced by technicians, scientists and engineers striving for greener and more sustainable development.