Being a chemical engineer, it is a pleasure to review a book written by chemical engineers who cite the literature I am familiar with, especially the early papers dealing with the theory underlining pollution control processes, i.e. Whitman's original discussion of the two-film theory of absorption in Chem. Metal. in 1923. This book appears to have emanated from the professional development course entitled "Design of Air Pollution Control Systems" which the authors teach for the American Institute of Chemical Engineers.

"This book is written [the preface states] to serve as a reference handbook for the practicing engineer or scientist who needs to prepare the basic process engineering and cost estimation required for the design of an air pollution control system." It does that very well.

The authors have comprehensively but not exhaustively covered the essentials of air pollution control. Each control technology is discussed beginning with theory and ending with control application. Basic design equations are supplied, and in several cases worked examples are given.

The coverage (in 24 separate chapters) is comprehensive in scope, though not exhaustive in content. That comment should be explained. Schnelle and Brown start by providing a basic primer on air pollution control with separate chapters discussing: (1) history of the development of clean air regulations, (2) the controlling law (Clean Air Act), (3) new source permitting, (4) atmospheric diffusion modeling, (5) source testing, (6) ambient air quality and continuous emission monitoring, (7) cost estimating, (8) process design and strategy of process design, and (9) engineering economics. The foregoing material occupies the first 108 pages of the text. The remainder of the book is devoted to a discussion of air pollution control systems: absorption, adsorption, thermal oxidation, condensation, biofiltration, membrane separation technology, NO*x* control, SO*x* control, and particulate control (cyclones, wet scrubbers, bag houses, and electrostatic precipitators). The latter section on particulate control is preceded by a short chapter of the fundamental processes underlying particulate control and one on hood and duct design.

To say the least, the coverage of air pollution control equipment design is comprehensive. No important air pollution control technology is omitted and each topic is covered well, albeit succinctly. This book is an excellent source book (as advertised) for air pollution control technology and is highly recommended.

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G.F. Bennett

Air Pollution Control: A Design Approach, 3rd Edition

C. David Cooper and F.C. Alley (Eds.), Waveland Press, Prospect Heights, IL, 2002, 738 pp., US$ 74.95, ISBN 1-57766-218-0

It is always a pleasure to pick up a book by an author with whom you are familiar. Such was the case, when I began to review Cooper and Alley's third edition of their textbook *Air Pollution Control*. I am now retired, but while I was teaching an air pollution course in a Department of Chemical Engineering, I utilized the first edition of this excellent book. I adopted the text because the content in its sequence followed the format of my lectures. It

was an excellent choice. Subsequently, each edition has become progressively better. I only regret that I am retired and not actively using the book.

The promotional brochure supplied by the publisher describes the new features of this edition:

- biofiltration control discussion;
- indoor air quality chapter;
- updated data on air quality trends;
- professional engineering examination problems and solutions.

The authors discuss the purpose of their text in the preface. "Our text has two main objectives. The first is to present information about the general topic of air pollution and its control. The second, perhaps most important objective is to aid in the formal design training and instruction of engineering students. Design of equipment and systems has often been under-represented in air pollution books; however, it is a key function of engineers, and should be emphasized in engineering curricula."

In my opinion, the authors' purpose was achieved in each and every edition of the book. The material is provided in a logical, easy-to-follow format. All relevant air pollution control topics are discussed beginning with a review of the problem and description of the solution. In Chapter 1, the authors start with antiquity noting that air pollution was recognized as a problem in London as early as 1285 A.D. A more modern description of pollution follows with an especially excellent review of the potential impact of carbon dioxide on global warming. Chapter 1 also contains a short discussion of the US law and the permitting process, and the fundamentals underline air pollution control (ideal gas law and its applications and flow measurement). Chapter 2 is an excellent introduction to process design. It is introduced by a quote from Max Peters, who, with Timmerhaus, authored *Plant Design and Economics for Chemical Engineers*. Every chapter is preceded by some interesting, relevant quotation. Discussed in this chapter are the basics of engineering economics and cost estimation. Equipment cost indexes that are utilized to update air pollution control equipment costs are given.

Pollution control devices are described in the subsequent chapters. Chapter 3 introduces particulate matter as a pollutant. Included here is a discussion of the behavior of particulate matter in fluids; that discussion includes computation of gravitational settling rates of particulates. This introductory chapter on particulates is followed by chapters on particulate control, each one dealing with a separate technology: cyclones, electrostatic precipitators, fabric filters, and particulate scrubbers. Each chapter has the same format: introduction, theory, design considerations, costs, problems, and references. The particulate chapters are followed by a discussion of "auxiliary equipment, hoods, ducts, fans, and coolers." The particulate control discussion is ended by a chapter describing a particulate problem with numerous questions to be answered by the student.

To the extent that I remember the content of prior editions, the foregoing chapters follow them reasonably closely. The references of the main, older chapters, too, are, generally reported without updates. I understand the discussion of this base material changes little with time, but I would have liked a few references, if appropriate, to more recently published articles.

The second major section of the book deals with the problems of gases and vapors. Chapter 9, "Properties of Gases and Vapors," discusses the fundamentals such as: vapor

pressure, diffusivities, gas–liquid and gas–solid equilibria, and chemical reactions (kinetics and thermodynamics). VOC control by incineration, gas adsorption, gas absorption, and biofiltration are the subjects of the next three chapters. As noted, the chapter on biofiltration was added to this edition. Control of sulfur oxides and nitrogen oxides are the topics of the next two chapters. These chapters clearly have been updated as evidenced by the recent reference citations. As with particulates, a control problem (this time for vapors) follows the gas control section.

A chapter on mobile sources is followed by an extensive chapter on air pollution meteorology and one on atmospheric dispersion modeling. The book ends with a chapter on indoor air quality control.

Each chapter contains problems to be worked by students. A new addition is found in the appendix: practice problems (with solutions) in air quality for the P.E. examination in environmental engineering. Solutions and tips to be considered are given.

To say the least, I am enamored by this book. It is one of the best text books I have ever utilized and like, good wine, it improves with age.

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Gary F. Bennett

Hazardous Air Pollutant Handbook: Measurements, Properties, and Fate in Ambient Air

Chester W. Spicer, Sydney M. Gordon, Michael W. Holdren, Thomas J. Kelly, R. Mukund, 2002, Lewis Publishers, Boca Raton, FL, 240 pp. US$129.95

The term “toxic air pollutant” has evolved in the United States in both the legislative and regulatory processes. The term “Hazardous Air Pollutant (HAP)” appeared in the U.S. Clean Air Act of 1970. It represents a group of 188 air pollutants capable of causing adverse health effects.

“This book represents the consolidation of a series of studies conducted by the authors to support the EPA’s mission of understanding and quantifying the health risks from HAPs. The studies were focused on the various aspects of the presence of HAPs in ambient air, and addressed chemical and physical properties, currently available measurement methods, the current database of information on the measured ambient concentrations of HAPs in urban areas of the U.S., and our current understanding of the atmospheric transformation products and lifetimes of the HAPs. In contrast to other published handbooks and reference literature on the HAPs, this book is focused on presenting the current state of information on the presence of the HAPs in ambient air, as distinct from information on HAPs emission sources, emission measurement methods, control technology and regulatory initiatives and policy. The purpose of this book is to provide readers with a convenient compilation of the information currently available, enabling them to assess the risks posed by HAPs in ambient air, to conduct qualitative comparisons between measured ambient levels of HAPs at specific sites, to guide in understanding the basic chemical and physical properties of the HAPs, and to identify critical research needs at this juncture.”

“This book begins (Chapter 2, Classification and Basic Properties) with a grouping of the HAPs into classes of compounds. Following the division of the 188 HAPs into organic