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Book review

***Sources and control of air pollution*, Robert Jennings and Robert Lynn Kabel, Prentice-Hall, Inc., Upper Saddle River, NJ (1999), [ISBN No.: 0-13-624834-9] US$105**

According to the authors in the Preface of this textbook, "this book is the most comprehensive yet written in addressing not only rigorous engineering principles of air pollution control…". While this statement may be correct, the statement could be incorrectly interpreted. For example, radionuclide emissions, and their subsequent control, which are regulated under the National Emissions Standards for Hazardous Air Pollutants (NESHAPs, 40 CFR 61), are omitted from the text and would be included in a comprehensive text.

The primary goals of this text are for engineers to identify and analyze the different air pollution sources and the application of air pollution control practices to minimize air pollution. This textbook was written for utilization by undergraduate seniors and first-term graduate engineering and meteorology students.

The first two chapters of this text, which comprise Section I, provide background information on risk, engineering fundamentals review, and exponential population growth. Chapters 3 through 6, the basis for Section II, discuss the air quality regulations, the impact of air pollution on human health and aesthetics, and the interaction of air pollution and the environment. The engineering mechanics utilized to calculate the impact and reduction of air pollution are delineated in Chapters 7 through 13, or Section III.

In the Introduction, or Chapter 1, background information on risk evaluation and elementary chemical engineering principles is provided to establish a basis for subsequent chapters. The authors point out that some notations and conventions are not constant throughout engineering, and use the designation of x, or mole fraction in liquid phase, and y, or mole fraction in the gaseous phase, as an example. A similar caveat should be included when the authors state that the standard temperature is 25°C = 298.5 K = 77°F = 537 R. The US Environmental Protection Agency (EPA) often uses 68°F as the standard temperature, while chemists utilize 0°C, or 32°F as the standard temperature.

The air quality regulations cited in Chapter 3 are concise, but accurate, despite the changes that have been implemented, and are being proposed, on the federal, state, and local levels. The regulatory content is sufficient for a basic understanding of the air quality regulations when changes are implemented. Future national ambient air quality

standards (NAAQS) will include the regulation of fine particulate ($PM_{2.5}$), which the text states, although the only particulate NAAQS cited are for PM_{10}. The student would be able to comprehend the future $PM_{2.5}$ regulations, if the student understands the current PM_{10} regulations. The text does state that there are 189 hazardous air pollutants (HAPs) listed in Title III of the 1990 Clean Air Act Amendments, however, in 1996 caprolactum was removed from the list.

The detailed impact of chemical kinetics in pollution formation from combustion is well documented and informative. The authors, however, state that thermal nitrogen oxide (NO) formation is governed by the extended Zeldovitch mechanism:

$$N_2 + O^{\cdot} = NO + N^{\cdot}$$

The extended Zeldovitch mechanism also includes the following equations, which also show NO formation:

$$N^{\cdot} + O_2 = NO + O^{\cdot}$$

$$N^{\cdot} + OH = NO + H^{\cdot}.$$

There is no mention of polychlorinated dibenzo-*p*-dioxin (PCDD) or polychlorinated-dibenzofuran (PCDF) formation resulting from combustion. Although additional information is discovered or hypothesized on a continuous basis, a brief synopsis should be included because of the environmental regulations regarding PCDD and PCDF formation.

In Chapter 8, air pollution estimating and measuring are discussed. Although many techniques were discussed adequately, the only mention of stack, or source, testing was an abridged listing of the Methods 1–28 from 40 CFR 60. The calculations involved during, and after, source testing are complicated, and a sample calculation of one of the more common test methods, Method 5 (*Particulate mass emissions*) should be included in lieu of merely mentioning it in 12.1.3. There are also other locations for different test methods, such as 40 CFR 51, 61, and 63, SW-846, and the Boiler and Industrial Furnace (BIF) regulations.

Chapter 12 provides an excellent explanation of the theory of the control of particulate matter. Other textbooks on the market, however, provide more application examples of control methods such as cyclones, multiclones, filters, etc. The author stated that "for simplicity, the Lapple standard cyclone will be used in this text as a representative example of the configurations presented by Calvert and England." A comparison chart of dimensions for other cyclones, such as high efficiency high and throughput cyclones could have been added and not taken from the simplicity approach.

The cost estimation section, Chapter 13, provided more information than some of the other textbooks on the market which adds to the usefulness of this textbook. Some textbooks provide as little as one chart or equation to determine the cost of air pollution control equipment. The Odor Thresholds listed in Table A-II, is another useful tool not always cited in other similar textbooks.

Overall, this textbook is a good addition to the professional environmental engineer's library, as well as containing technical information on a variety of air pollution topics

and enough theoretical information to make it a good textbook for both undergraduate and graduate students.

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