

Practical Design Calculations for Groundwater and Soil Remediation, Jeff Kuo, Lewis Publishers, Boca Raton, FL, 1998, \$69.95, 263 pp., ISBN: 1-56670-238-0

This book was written as a practical manual to allow engineers (and other technical remediation practitioners) to perform the needed calculations for remedial design. It is based on the author's industrial (consulting) experience that includes design and installation of air strippers, activated carbon adsorbers, flare/catalytic incinerators, and biological systems for groundwater and soil remediation.

The book was written for practicing engineers to assist them in performing design calculations — and, in my estimation, it does this well. Kuo has written a book much different from the average text — minimization of theory; maximization of example calculations. This is not to say he does not present the theoretical background to the topic; he does, but in minimum space. First comes the discussion of the topic; next the theory; and finally example calculations/problems. The latter are clear, numerous, concise, and understandable.

The book has seven chapters as follows:

- Introduction
- Site Assessment and Remedial Investigation — In this chapter, Kuo discusses the calculations necessary to determine partitioning of contaminated mass in different phases.
- Groundwater Movement and Plume Migration — Aquifer test data interpreting and estimation of the age of groundwater plume are discussed.
- Mass Balance Concept and Reactor Design — Described are how to determine rate constant, removal efficiency, optimal arrangement of reactors, required residence time, and reactor size for specific applications [it is here the author's chemical engineering training is evident].
- Vadose Zone Soil Remediation — This chapter discusses design calculation for commonly used “in situ or above ground” soil remediation techniques such as soil vapor extraction, soil washing and bioremediation.
- Groundwater Remediation — Described are design calculation for capture zone and optimal well spacing as well as calculations for commonly used in situ and ex situ groundwater remediation techniques including bioremediation, air sparging, air stripping, advanced oxidation process, and activated carbon adsorption.
- VOC-Laden Air Treatment Remediation — This chapter discusses the treatment of off-gasses, contaminated with organics. Treatment processes presented are activated carbon, adsorption, direct incineration, catalytic incineration, IC engines, and biofiltration.

This book, in my estimation, is an excellent one. It does bridge the gap between theory and practice. Although it may not be adopted as *the* text for a university course, it would make an excellent second book for the practical aspects of a course, i.e. problem assignment.

The readers, however, will be practicing engineers, not students. They should find the book invaluable, as they strike out into new remediation areas.

My only criticism is that the book is too short. I would have liked a few more pages devoted to such topics as biofiltration and advanced oxidation techniques. Also, I would

have preferred a few more key references throughout the book [the reviewer's academic bias is revealed here].

GARY F. BENNETT

PII: S0304-3894(99)00065-5

Hazardous Wastes: Sources, Pathways, Receptors. Richard J. Watts, Wiley, New York, 1998, US\$89.95, 764 pp., ISBN: 0-471-00238-0

This book was written to be used as a text "...to provide senior and engineering M.S. students with the scientific principles of hazardous waste management and engineering." To this end, the author develops material covering the following topics:

- terminology, nomenclature, and properties of hazardous wastes and materials;
- behavior of hazardous chemicals in surface impoundments, soils, groundwater, and treatment systems;
- assessment of the toxicity and risk associated with exposure to hazardous chemicals;
- strategies to find information on nomenclature, transport and behavior, and toxicity for hazardous compounds; and
- application of the scientific principles of hazardous wastes to their management, remediation, and treatment.

Watts divided the book into four major sections:

- Sources
- Pathways
- Receptors
- Management and Design Applications

In the preface, the author states his goal was "...to develop material that would be fundamental in nature and tried to design a text that would be an educational document rather than a training manual". In my estimation, he has succeeded in meeting that goal.

The book is comprehensive in its treatment and goes well beyond most texts in its treatment of the basic science underlying hazardous waste generation, treatment, and disposal. Indeed, I was surprised by the depth of treatment in several areas, but I will cite only three here:

- the comprehensive discussion of organic chemistry,
- the discussion of nuclear waste, and
- the treatment of microbes, microbial reactors and biochemical pathways.

All three topics were uniquely and comprehensively discussed. The unique aspect is that few, if any, texts I have reviewed treat all three of these topics in such depth, i.e., in a most comprehensive manner.

Watts has discussed both remediation and disposal in the last two chapters, but he has limited his treatment of this topic as (I am informed) he is authoring another text entitled *Hazardous Wastes; Minimization, Remediation, Treatment and Disposal*, with its focus on engineering design.

Pedagogical techniques that enhance the book's utility as a text include:

- preamble to each chapter outlining its contents;