Environmental Systems Optimization


The author presents an introductory overview of optimization and related techniques that can be used to help solve environmental problems. The book leans rather heavily towards general concepts in systems analysis, linear programming, search techniques, dynamic programming, and integer programming. The author makes a commendable effort to link these techniques with output from mathematical simulation models.

This linkage provides one of the major keys to practical applications involving optimization. Examples are included, which are extracted for the most part from real-world situations. However, anyone intending to use these should realize that the author has included extremely simple modeling algorithms for the processes involved. Since results obtained from the overall optimization study can be no better than the modeling outputs, care must be taken in interpreting findings based on these models.

The book would have been strengthened by one or more chapters dealing with the selection of suitable model input algorithms and optimization output sensitivity, using different degrees of process model sophistication. The book does provide an excellent introduction to optimization techniques and their application to real-world problems. Modelers, graduate students, environmental engineers, applied researchers, and planners should all gain an appreciation for how optimization techniques might be used to solve practical problems in their areas of interest. Suitable process models can then be selected to provide the inputs for the optimization study.

The book is well-written and -edited, with a full-page format. The type and figures are easy to read. The hard cover and good-quality binding should make the book durable with time. Exercise problems are presented at the end of each chapter to further challenge the reader, but solutions are not given and some problems require the use of a computer to solve. A subject index is included to make referencing easier.

Some of the major environmental areas addressed in the book include waste-water management, pesticide management, nonpoint-source water pollution, and land use-planning. A chapter is also included on transportation models. This reviewer can recommend the book as an excellent source for overview information on environmental systems optimization.—MARVIN J. SHAFFER, USDA-ARS, University of Minnesota, St. Paul, MN 55108.

Natural Systems for Water Pollution Control


This book, written by an environmental quality specialist, is intended for the technical community with the hope that younger engineers and scientists will find it a useful tool to further develop natural treatment systems.

The seven chapters include a brief overview of waste-water treatment as well as specific coverage of treatment ponds, wetland systems, and land treatment. Approximately two-thirds of the book is devoted to the discussion of stabilization ponds. Brief chapters on other natural systems cover wetland systems and land treatment of waste waters and sludges.

The book closes with a brief discussion of some integrated natural systems. The intended audience will find the book to be of greatest interest for its coverage of research studies on the flora and fauna of treatment ponds.

The short opening chapter touches on the history of waste-water treatment while defining those natural treatment systems to be covered in the text. This somewhat philosophical chapter covers the roles that nutrients, light, temperature, health considerations, and economics play in the management of waste water for a rapidly increasing world population.

The next three chapters of the book come into technical research information with practical comments on the design and operation of stabilization ponds. In chapter 2, the definitions for several types of stabilization ponds come from one school of thought without discussion of other equally accepted methods for categorizing pond systems. Aerated ponds are excluded from discussion in the book. The reader who is familiar with other sources on design of stabilization ponds will find the brief sections on actual design lacking for specific information.

The discussion of pond flora in chapter 3 is dominated by the coverage of research on water hyacinths. The chapter also includes some information on duckweed, ferns, submersed plants, and emergent vegetation. Chapter 4, on the fauna of stabilization ponds, also focuses on life forms that have been researched extensively. These are daphnia, brine shrimp, and fish species, including tilapias, carp, minnows, and mollies. Other life forms are mentioned at the end of the chapter. Those with an interest in the flora and fauna of stabilization ponds will find excellent coverage of these subjects.

The chapter on wetlands gives a brief review of recent research on this topic. It does not compete with other, more detailed, publications on the current design and operational reliability of wetland systems.

The chapter on land treatment of waste waters and sludges is introductory in scope and is not a resource for knowledgeable readers. It alerts the reader to the fact that land treatment of waste water is an old and proven technology, while introducing the current classification of the technology that is becoming standardized in major texts on the subject. Coverage of sludge application to the land touches on land spreading, sludge farming, and composting. Sludge stabilization by earthworms receives the most attention in this section of the chapter.

This book will be useful to readers with specific interests in the culture of selected species in stabilization ponds. Its greatest strengths are the sections on water hyacinths, daphnia, filter-feeding fish, and earthworm stabilization of sludges—R. E. THOMAS, U.S. Environmental Protection Agency, Washington, D.C.

Acid Rain Information Book


The book was evidently completed in the fall of 1980. At the time it was completed it would have made a good update for those in the field. The field, however, is so dynamic that reviews such as this tend to be outdated within six months. The report lacks depth, especially in some aspects, i.e., atmospheric transformations and transport, and effects on terrestrial ecosystems. However, it should serve as an excellent overview for the newcomer in the field or for someone who has been away from the field for several years.

A more appropriate title would be the Acid Deposition Information Book; at the very least, "precipitation" should have been used instead of "rain." The book does meet its goal of covering the major aspects of the acidic precipitation problems as they existed in 1980. The Table of Contents serves as an excellent and simple index to the book and the Executive Summary highlights the primary issues raised in the text. The approach is mechanistic in that it covers subjects in the order in which they must eventually be understood. The section on atmospheric chemistry is probably the weakest in the book. Some general concepts that should be covered in the atmospheric chemistry chapter are discussed in the section on sources (i.e., the role of O3 in SO2 and NO3 formation, and the role of airborne particulates in catalytic oxidation of SO2 to sulfates). The summary of issues, uncertainties, and further research needs is a usable summary of several available documents, and is still basically complete.