



Book reviews

Green Engineering: Environmentally Conscious Design of Chemical Processes

David T. Allen, David R. Shonnard, Prentice Hall PTR, Upper Saddle River, NJ 07458, 2002, ISBN: 0-13-061908-6

Pollution prevention is becoming an important part of environmental engineering practice. This topic is being covered in many engineering courses. The book will be helpful to environmental professionals as well as the students.

The book is divided into three parts. The first part focuses on the issues, regulations, risk concepts and environmental responsibility. The second part of the book expands on the approaches and evaluation of processes involved in pollution prevention. The third part deals with the concepts that could be applied beyond the plant boundary to prevent pollution.

The book is written in a simple and easy to understand language. The work is heavily influenced by the research projects carried out by the US Environmental Protection Agency. Multiple authors have written the chapters. Integration among various chapters is excellent. The book is filled with industrial examples.

The above material is covered in 14 chapters and 6 appendices. The book contains numerous tables, graphs, references, and problems. A brief description of each chapter is as follows.

Chapter 1 emphasizes on various environmental issues including ecology and natural resources. Stress has also been laid on pollution prevention strategies in describing the issues. The environmental issues cover global as well as local aspects. Discussion of various criteria pollutants has enhanced the focus on air quality related issues.

Chapter 2 covers the concept of risk. A brief overview on risk assessment concepts along with short notes on its importance in engineering profession and on risk-based environmental laws has made the discussion interesting. National Research Council's model has been followed in describing risk assessment.

Chapter 3 provides a brief overview of environmental regulations related to environmental waste and pollution prevention. This chapter also expands on the Pollution Prevention Act's definition of pollution prevention.

Chapter 4 reminds chemical engineers about their responsibilities in design and operation of chemical production facilities.

Chapter 5 presents approaches for evaluating environmental fate based on chemical structure. Qualitative as well as quantitative methods are discussed. One could determine the chemical structures with low hazard using these approaches.

Chapter 6 gives the methods for estimating exposure of chemicals. Indoor and outdoor releases of the chemicals are considered.

The purpose of **Chapter 7** is to discuss ways in which chemical products and processes are designed so that the use and generation of hazardous substances is either reduced or eliminated.

Chapter 8 classifies environmental performance tools into three groups to assist the process engineer in designing chemical processes. The first group of tools is simple to apply on basic information available on processes. The second group of tools includes emission rate estimation methods, energy consumed during production, and total pollutants per unit of production. The last group is based on a series of indicators that are explained in **Chapter 11**.

Chapters 9 and 10 document methods for improving environmental performance of conceptual processes.

Chapter 11 deals with environmental fate of emissions and wastes. A detailed description on multimedia compartment model and tier 3 environmental assessments has been given. This chapter in addition also discusses several important hazard indexes for human health. These can also be used in ranking different technologies and several other engineering applications.

The tools available for estimating environmental costs are given in **Chapter 12**. All the cost components are described. The emphasis of **Chapter 13** is on life-cycle assessment. A methodology for tracking energy, materials, and waste is presented in this chapter.

Chapter 14 on industrial ecology explains the integration of other processes and material flows in determining the environmental performance of chemical processes. The topic is explained with the help of several case studies.

Appendix A provides an overview of nine federal statutes related to toxic chemicals and pollution prevention. The calculations for the first order molecular connectivity are given in **Appendix B**. The equations for calculating emissions from storage tanks are available in **Appendix C**. Tables for four environmental impact potentials are given in **Appendix D**. Methods for estimating the regulatory costs required by RCRA for hazardous waste generation are given in **Appendix E**. A summary of web resources, online databases and software are documented in **Appendix F**.

An index appears at the end of the book. Overall, the book will be helpful to those involved in pollution prevention. Readers will benefit from the new approaches discussed in the book. The material will also be helpful in stream lining pollution prevention work.

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The Handbook of Hazardous Materials Spills Technology

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