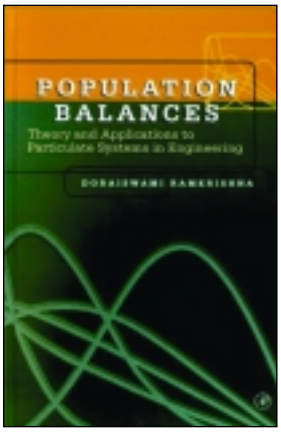
Books

Population Balances Theory and Applications to Particulate Systems Engineering

Doraiswami Ramkrishna, Academic Press, San Diego, CA, 355 pp., $115, 2000

Although the Boltzmann equation, which already foretold the technique, is more than a century old, the application of population balances for a variety of engineering problems began only less than 50 years ago. The author of the book was among the first who worked in this field. Since investigating biological populations at the University of Minnesota in the early 1960s, he has continued his association with the subject directly, through his students, and by different collaborations, particularly with the Indian Institutes of Technology (IIT), Kanpur, and Science (IISC), Bangalore, as well as the Jawaharlal Nehru Centre (JNC) for Advanced Scientific Research, Bangalore, with additional funding by the Transfer of Knowledge Through Expatriate Nationals (TOKTEN) program of the United Nations, the National Science Foundation, and Purdue University, where Professor Ramkrishna teaches and works.



Contrary to other books that deal with population balances and focus on relatively narrow applications, such as crystallization or aerocolloidal systems, this book is a general treatment of population balance concepts. It refers to systems containing particles as dispersed phase or particulate systems regardless of the precise role of the particles in them. This ends the past compartmentalization of knowledge and teaches that there is a common body of concepts and techniques that apply to a large domain of different, very important processes and situations.

Analysis of particulate systems seeks to explain the behavior of the population of particles described by the density of a suitable variable, most often the number of particles. A distinguishing feature of the systems referred to in this book is that they contain particles that are continually created and/or destroyed by such processes as agglomeration or breakage. The population balance equation accounts for various ways in which particles of a specific state can either form ("birth" processes) in or disappear ("death" processes) from the system. Birth of new particles can occur due to breakage, splitting, aggregation, or nucleation, etc. However, breakage and aggregation also contribute to death processes since, following the event, a particle that either breaks or aggregates with another one no longer exists as such. Particles may also interact with the continuous phase in which they are dispersed.

As expected from the subject, the book is highly scientific and mathematical. However, after covering the framework of population balances, including basic equations and the formulation of models, as well as the birth and death functions, throughout the book many examples describe their applications for evaluating actual breakage and aggregation systems. Methods for the solution of population-balance equations are presented and their self-similarity behavior is considered. The subject of inverse problems for the identification of population balance models is treated whereby the exploitation of self-similar solutions by inverting experimental data is of particular interest.

Finally, the statistical foundation of population-balance models is covered. It deals with the average behavior of the system and the fluctuations around it. For this, master density and stochastic equations are formulated and closure approximations are presented.

The particular merit of this book is that it covers the theory and applications of population balances as they relate to particulate systems in engineering. Therefore, it is a valuable addition to the reference library of any person engaged in the characterization of size reduction or enlargement processes involving solid particles.

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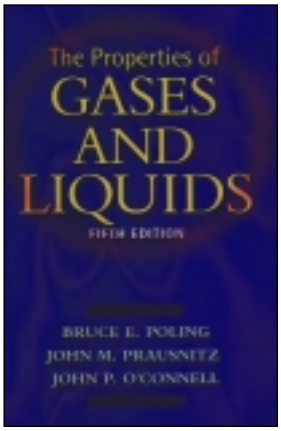
The Properties of Gases and Liquids, Fifth Edition

Bruce Poling, John Prausnitz and John O'Connell, McGraw Hill Professional, New York, NY, 768 pp., $115, 2001



Ever since the first edition of this work was published in 1958, it has been a "must have" in the reference library of chemical engineers, particularly those engaged in process design. It has long been the primary reference for anyone who must estimate the physical or thermodynamic properties required for equipment design knowing little more than the chemical formula of the materials to be handled. The main value of this book compared with a simple bibliography that can now be generated by a computer search, is that the authors continue the practice started in the first edition of

publishing tables that compare the results of using the various estimation methods to each other and experimental data, when available, and then make recommendations as to which method seems to work best under various conditions.

The need for regular updating was succinctly stated by Reid and Sherwood in their preface to the second edition in 1966, when they commented that the half-life of estimation correlations seemed to be about four years. Although there are now more fundamentally based properties estimation methods than there were then, the authors note in their preface to the new edition that "...most estimation methods rely heavily on empiricism..." Thus, the need for periodic updating of this work continues

Space does not permit listing chapter by chapter the significant differences from the previous edition, but they are substantial. The properties databank in Appendix A has been completely revised.

This new edition should be added to the library of anyone who must estimate physical properties of materials to be processed.

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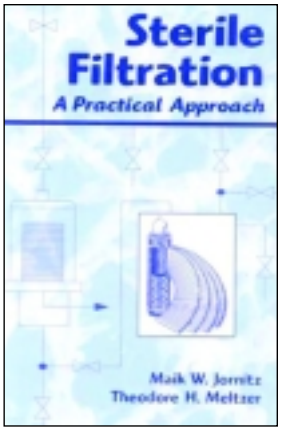
Sterile Filtration A Practical Approach

Maik W. Jornitz and Theodore H. Meltzer, Marcel Dekker, New York, NY, 623 pp., $195, 2001,



In 1987, Dekker published Meltzer's massive, 1,091-pp, 6.75×10-in., "Filtration in the Pharmaceutical Industry," with chapters provided by eight other authors.

The present book with Jornitz, although shorter than the 1987 book, includes recent citations. While still addressing theoretical aspects, the book reviews methods of characterizing microporous membranes meant to stop different-size microbes. Such membranes are built into cartridges employed in the final filtration of a liquid, or in the filtration of a process gas

Further, since test microbes used to measure the filtration efficiency of membranes frequently change names, the modern, updated names are identified.

Aside from how to pre-test a sample of a membrane that would be built into a cartridge, this book outlines instructions, provided by regulatory agencies, for tests that: assure the membrane-containing cartridge is itself sterile; the correct membrane is present; and no fluid leaks past the assembly.

The book also addresses the capacity of a membrane — the required area of the membrane surface for the volume of liquid to be filtered. This text, with its many illustrations, is a necessary guide for workers in the pharmaceutical industry.

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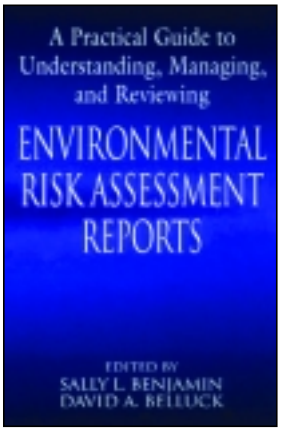
A Practical Guide to Understanding, Managing, and Reviewing Environmental Risk Assessment Reports

Edited By Sally L. Benjamin and David A. Belluck, Lewis Publishers, Boca Raton, FL, 655 pp. 2001



The public demands not only that the environmental sins of the past are remedied, but also that no future environmental sins occur. Environmental risk assessments are done to determine how much is required to clean up an existing "sin" and to prevent new "sins." They can be quite expensive. This book describes in excellent detail the development of risk assessment reports from the initial statement of need, through gathering of the required information and to writing and dissemination of the results.

This book is an excellent treatise on environmental risk for: business people who are required to do an assessment; project managers who have to lead; concerned public persons, such as environmental organizations and local elected officials; and state and federal regulators.

Note that at the top of p. 309, a plan in Appendix A is referenced; however no such plan exists.

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