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hopes that the success of this work will continue in future (and necessary) editions.

J. H. Olson

Chemical Reaction Engineering, International Series of Monographs on Chemical Engineering, Vol. I, K. Rietema, editor. Pergamon Press, New York (1957). 200 pages. $12.50.

This volume contains papers presented at the First European Symposium on Chemical Engineering held in Amsterdam in May, 1957, under the auspices of the European Federation of Chemical Engineering. It provides a comprehensive survey of the problems encountered in applying the fundamental concepts of chemical kinetics, heat and mass transfer, and fluid dynamics, especially degree of mixing, to the design of industrial chemical reactors. The papers are predominantly theoretical in nature and all are by authors prominent in the field of applied reaction kinetics. There are a total of thirteen papers, which are divided into five groups: Introductory Papers, Transport Phenomena in Heterogeneous Reactions, Nonuniform Concentration Distributions, Reactor Efficiency and Stability, and Reactor Development.

The first group of papers presents (1) a classification of the various types of chemical-reaction systems and the multitude of reactors in which they are being conducted and (2) brief summaries of classical chemical reaction kinetics and of the treatment of the physical factors present in any practical reactor design.

The second group of papers includes a summary of the general principles of mass transfer through films and within porous solids. Rate data involving both absorption and chemical reaction in a stirred vessel and in a wetted-wall column are presented and analyzed in terms of the separate chemical and physical rate processes.

The third group of papers treats the nature of mixing in continuous agitated vessels from the standpoint of both the scale of mixing and the residence-time distribution. The point is stressed that the performance of continuous tank reactors can be predicted from batch-reaction data and the estimated residence-time distribution only for a first-order reaction unless the mixing is perfect on a molecular scale. The behavior of heterogeneous liquid systems in various types of staged reactor vessels involving both concurrent and countercurrent flow is discussed, and applications to the nitration of benzene and the production of furfurol from xylose are shown.

The fourth group of papers considers the problem of (1) obtaining the maximum yield of a desired product of a complex reaction system by proper control of the temperature gradient and (2) analyzing the performance of autothermal processes, where the exothermic heat of reaction serves to maintain the reaction temperature. A simple and very useful means of establishing the possibility of stable operation of an autothermal system is presented by Dr. van Heerden. The performance of a commercial ammonia oxidation reactor is used to illustrate the principles of treating autothermal processes.

The last group of papers is concerned primarily with the application to commercial reactor design of the principles enumerated earlier, with special emphasis being placed upon the utilization of pilot plant data.

A valuable addition to the literature in chemical-reactor design has been provided by this work though it is not recommended for the uninitiated. An increased amount of research in this important area should result from the ideas presented. The appeal of the book to American engineers is reduced somewhat by the fact that one of the papers is written in French and four of them are written in German.

John M. Woods

Elements of Water Supply and Waste-Water Disposal. G. M. Fair and J. C. Geyer. John Wiley and Sons, New York (1958). 615 pages. $8.95.

This book, like its predecessor, "Water Supply and Waste-Water Disposal" (Wiley, 1954), is directed to students of civil and sanitary engineering. In this reviewer's opinion, many chemical engineers must be or should be within this category, because of the well-recognized importance of water as a raw material and waste product of the process industries. The two books are essentially similar, but the present edition has been greatly abridged in order to meet the time and financial limitations of undergraduate students (twenty chapters in 615 pages instead of thirty in 973; $8.95 instead of $16.00).

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The first ten chapters of the "Elements" deal with civil engineering aspects of water utilization. Such topics as rainfall, run off, and the population growth of cities are of slight interest to the average chemical engineer, but other sections like the chapters on water distribution and waste-water collection are valuable. The first half of this book provides good reference material for chemical and process engineers.

The second ten chapters relate to the processing of water for use or after use and cover a field of considerable interest to the chemical engineer. A joint discussion of water and wastes is possible because the authors have based their work on principles rather than practice. The latter, however, has not been ignored, and the book is a useful reference for the practicing engineer. The significance of test methods and test results is described adequately, without detailed outlining of the procedures.

The authors describe "unit operations" of water and sewage treatment; this term is not used in the conventional chemical engineering manner but includes also chemical and biological processing. Screening, sedimentation, flotation, and filtration (sand filters) receive detailed consideration, as do chemical- and biological-treatment methods. This half of the book should be particularly useful to chemical engineers. The section on industrial water and industrial wastes is brief, but perhaps it is felt that this field belongs particularly to the chemical engineer and that adequate reference books are already available.

Fair and Geyer have done an excellent writing job on the civil and sanitary aspects of water, and one or the other of their two books is recommended to all chemical engineers concerned with water and waste.

C. Fred Gurnham

Applied Mathematics in Chemical Engineering, 2 ed., Harold S. Mickley, Thomas K. Sherwood, and Charles E. Reed. McGraw-Hill Book Company, Inc., New York (1957). 413 pages. $9.00.

About twenty years ago Sherwood and Reed, recognizing that most advanced mathematics texts for engineers had the example problems divided among several fields of engineering, directed the first edition of this book specifically toward problems in chemical engineering. These included reaction kinetics, and unsteady state mass balances, heat transfer fluid flow, and diffusion. Now the authors, in this second edition, have reorganized the book and added new topics which reflect advances in the profession. The primary objective of the text continues to be the formulation and solution of problems which involve differential equations, but also included are chapters on the treatment and interpretation of engineering data, which serve as a natural introduction to the primary objective. Since the mathematics presented in this text is considered as a tool for the solution of problems, much of the rigor found in texts written for mathematicians has been omitted or simplified.

The second edition may be divided roughly into three sections: treatment and interpretation of engineering data, ordi-

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