Int. J. Heat Mass Transfer. Vol. 7, pp. 279–280. Pergamon Press 1964. Printed in Great Britain

BOOK REVIEWS

The Science of Flames and Furnaces: M. W. THRING, Second Edition.

THE book represents the first comprehensive treatment of furnace technolcgy after the classical work of Schack, for many years a mainstay of this important branch of engineering. The great contribution of Thring is the fact that he brought the subject into the realm of current scientific approach. His text is full of useful information conveyed in the form of clearly stated principles, sharp definitions of basic concepts, and clear guidance through many specific problems of practical nature.

My present task is to report on the second edition of this volume, the first having been published in 1952, exactly ten years ago. The format remained the same, the approach and the organization of the subject matter were unaltered, but the second edition is some two hundred pages longer than the first.

The new material includes some twenty-seven pages of, what the author calls, "Furnace Ancillary Equipment" which consists of combustion air preheaters and gas producers.

A particularly important modification consists of the novel presentation of the fundamentals of the combustion process. Especially noteworthy with respect to solid fuels is the description of kinetics of heterogeneous reactions based on the consideration of chemisorption and desorption processes of oxygen molecules. After giving some attention to the effects of diffusion, the author proceeded then to demonstrate how one can deduce from basic principles an expression for the speed of the rate controlling reaction. The treatment of the combustion of liquid fuels has been enhanced similarly by a more careful consideration of heterogeneous systems. Whereas before this was only a short descriptive résumé, now it became a valuable exposition of the progress made over the last decade in the understanding of these complex phenomena. Altogether the new material on combustion occupies about eighty pages of the text.

Greatly enlarged as well has been the consideration of heat-transfer phenomena. The principal contributing factor here has been the seventeen page extension of the section on the "Mechanism of Heat Transfer" based mostly on the findings of the International Flame Research Foundation and its trials at Ijmuiden in Holland.

Besides a few minor modifications, the chapter on the "Aerodynamics of Hot Systems" has been amplified by a ten page section concerned explicitly with air pollution, containing specific information on the design of effective chimney stacks and the determination of ground level concentration of gases and smoke.

The chapter on the "Science of Furnace Construction" has been expanded by some thirty-five pages devoted to a more detailed consideration of testing techniques of refractories, as well as their production and physical properties. Finally the chapter on the "Application of the Scientific Method to Furnaces has been increased by about ten pages concerned primarily with the clarification of the subject matter.

All in all, the book has become more authoritative and informative. The main drawback, from the point of view of a critical reader, is the somewhat encyclopedic treatment of the analysis; this, however, in a book of such a comprehensive character would be, indeed, quite difficult to improve.

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Multicomponent Distillation: CHARLES D. HOLLAND. Prentice-Hall International Series in the Physical and Chemical Engineering Sciences. Prentice-Hall Inc., New Jersey, 1963, 506 pp. + xiii.

THIS book is primarily concerned with numerical methods for determining the number of plates and the operating conditions required to give a specified separation of a multicomponent mixture by distillation. It is not concerned, as the title may imply, with the mass and heat transfer processes or the mechanical design of multicomponent distillation columns.

The calculation methods are devised so that they are suitable for programming on a digital computer. The main problem is that of convergence of the solutions for plate compositions or temperature at each stage. After the introductory chapters (1–6), which also deal with material and enthalpy balances, only one convergence technique is used, namely the "θ-method", in combination with one plate-to-plate calculation method, that of Thiele and Geddes. Chapters 7, 8, 12 and 13 deal with complex columns, systems of columns, and sidestreams, while calculations for limiting conditions, total and minimum reflux ratio, appear in Chapters 9, 10 and 11. Means by which the plate efficiency can be accounted for in the calculations are introduced in Chapter 14 and Chapter 15 deals with the determination of plate efficiencies from operating data. In Chapter 16 the thermodynamics of the vapour–liquid equilibria of multicomponent mixtures are discussed and, finally, Chapter 17 is concerned with the determination and correlation of K-values.

Much of the text has already been published as a series of articles, mainly in the *Petroleum Refiner*. The assembly of these papers with other relevant material will make the book indispensable to anyone concerned with the process design of distillation columns. In parts the explanatory material seems difficult to follow and this may be due to the rather complex style of the author. But the algebraic expression of the calculations is clear and this, with the numerous worked examples, should make the text easy to use. However, whilst it is in no way a fault of the book, the reader may reflect whether the detail and accuracy of the calculation methods suggested can be justified, in view of the sparsity of data and lack of basic understanding of the mechanism of multicomponent distillation.

W. SMITH