

BOOKS

Convective Boiling and Condensation, Second Edition, John G. Collier, McGraw-Hill, 1981, 435 pages, price \$59.50.

Collier has worked for 22 years in nuclear engineering, specializing in heat transfer and two-phase flow. At present he is Head of the Atomic Energy Technical Unit, Harwell, England. A major strength of the book is its emphasis on heat transfer and flow problems related to nuclear power. Engineers concerned with such aspects will find the book invaluable. Persons concerned with the chemical process industries or the petroleum industry will find the book to be helpful but incomplete. For example, the Colburn design method for condensation in the presence of noncondensables is compressed to less than two pages. Dropwise condensation is covered in 3 pages, a very small fraction of the published material in this field.

The first edition appeared in 1972. The second edition, again 12 chapters, has been lengthened by 3%. Most of the changes are modest, consisting of the substitution of selected new material for old. Only the final chapter, on multicomponent boiling and condensation, has been rewritten completely. The first 9 pages of this chapter explain Henry's Law, Raoult's Law, and similar concepts which are familiar to chemical engineers but unfamiliar to other engineers.

The book starts with a description of flow patterns including the flow maps of Baker; Hewitt and Roberts; and Taitel and Dukler. This is well written and an excellent introduction to the difficulties of two-phase flow. Next comes 83 pages on the basic and empirical models for two-phase flow, from Martinelli (1948) through Bouré (1978). Collier concludes that none of the models works accurately; each must be used with caution.

The treatment of bubble nucleation, bubble growth, and the critical heat flux has been brought up to date by inclusion of 9 additional references such as those by Blander/Katz, Griffith, Zuber, and Lienhard. Subcooled nucleate boiling heat transfer, void fraction, and ΔT during subcooled boiling have shown little progress, if we judge from the references in those chapters. Only one reference occurs after 1968.

Saturated boiling heat transfer is covered in 42 pages. Laboratory reports and these

comprise 32 of the 76 references. This is a real advantage to readers with limited access to reports. At the same time it is a disadvantage in that reports have not been refereed and may be of unknown quality. Subjects of limited interest in nuclear engineering, such as compact heat exchangers and programmed heating, have been omitted. Surprisingly, quenching has been omitted. The correlation of J. C. Chen is stated to be the best for saturated boiling heat transfer with forced flow. This section makes no mention of Kutateladze, perhaps the best known worker on boiling heat transfer in the U.S.S.R.

Chapter 8 is a large collection of equations and tables for the critical heat flux for water in forced-flow-boiling inside vertical tubes uniformly heated. Explanations, evaluations, and criticism are scanty. The reader is told that this is the "current status". The information is of great value to any worker who stays within the limits of data for each correlation. No guidance is given for extrapolation. Other geometries and other liquids are covered in Chapter 9. We are warned that any correlation for water will not apply to other liquids.

Condensation is covered in 46 pages. An understandable preference is shown for U.K. references rather than those of Japan, the U.S.S.R., or the U.S.A. This chapter is well written and should be very helpful for anyone working on filmwise condensation. The section on liquid metals in the first edition has been deleted. A chapter of 34 pages considers methods of improving the heat flux. Artificial nucleation sites such as provided with Highflux or Thermoexcel commercial surfaces are described. Swirl flow, curved tubes, high gravity, and Vapotron finned surfaces are discussed. Electric fields, vibrating tubes, and trace additives are mentioned briefly, as are fouling and corrosion.

The book can be used as a text for a graduate course. Collier has so used it while a visiting professor in the U.S.A. About half of the chapters include one or two example problems with their complete solutions. A total of 41 homework problems are distributed through the book.

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Energy, Combustion, and Environment by Norman Chigier, McGraw-Hill, 1981, 496 pages, \$44.95.

This is a monograph inspired by and assembled with topics related to generation of energy from fossil fuels.

The book is well organized, scholarly and contains a wealth of information of practical use and significance to both researcher and engineering analyst.

The material for the manuscript has been organized and assembled around the topic of "Combustion" as the focal point. Overview on energy at the front and pollution related data plus one last chapter on analytical equipment and techniques at the very end are presented in that sequence more or less justifying the title.

In view of the composition and length of the chapters the book is really about combustion somewhat incidentally related to energy and environment. In that, the manuscript suffers the common and understandable ailment which befalls most book writers; detailed and well organized chapters in areas of direct personal knowledge, superficial and lighter treatment in areas and topics apparently not related to personal experience.

The chapters on energy overview, and fossil fuels are reasonably factual, informative but not in depth. Those on combustion, flames, turbulence and atomization are much better written. These chapters constitute the main contribution of the book. They are well balanced in theory and experimental data. Illustrations are clear. Photographs are superb. These chapters contain much practical information for the research engineer and scientist.

The chapters on pollution, combustion chambers and "Diagnostic Techniques", are reasonably well written and contain practical information and data of more introductory nature.

As a textbook the manuscript lacks diversity in pedagogical attributes such as problems, synopses, reviews, literature and research suggestions.

Overall, the book is timely, relevant and meaningful. It is a good reference.

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