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Book Reviews

Turbomachines—A Guide to Design Selection and Theory, by O. E. Balje, Wiley-Interscience, New York, 1981, 528 pp. Price: $49.95.

REVIEWED BY DAVID JAPIKSE

A first perusal through this volume immediately reveals its greatest strength: a very wide diversity of machine types and performance information is reported. It may have been more appropriate to title the book "A Compendium of Fluid Machinery Performance."

It is impossible to give justice to every aspect of this volume; consequently attention was focused on the axial turbine, centrifugal compressor and diffuser sections for this review. Cited references are sufficient to support a very good text and are notable for their covering the international literature quite well. The author clearly works from his years of experience and success as a consultant. He has developed an approach which has been useful for him and for several design groups. The book follows this historical basis which stresses a foundation of similitude and the comprehensive mapping of basic performance characteristics according to the dimensionless parameters.

While it is fair to stress the comprehensive nature of the text, it should be pointed out that the material is not all inclusive. The author has not attempted to bring in other diverse viewpoints but has remained true to his basic work and theme. Beginners to this field should understand that this approach is used by a number of workers with satisfaction, whereas many other successful design groups avoid the approach and follow other design techniques which are not covered in this volume. Although the volume presents preliminary design techniques, little attention is given to actual blade layout and the consideration of the computational procedures necessary to establish detailed turbomachinery passage configurations.

Presentation of the physical foundation for the basic processes varies in quality from topic to topic. The presentation for diffusers is comparatively weak; by contrast, the explanation of the basic processes for the centrifugal compressor impeller is comparatively strong. To illustrate, the diffuser section was introduced by a single equation and then an attempt was made to show how the performance of the diffuser could be computed by using a boundary layer computation technique. After several pages of text, it was shown that the approach had its strengths and weaknesses. While the comparison was interesting to this reviewer, it must be noted that an essential design issue was neglected: excellent data has been prepared for broad classes of diffusers which should be the first source of information for designers. These data were not referenced and designers were not pointed in this important direction. Further, no mention is made of some of the very advanced diffuser computational work that is taking place today and is becoming part of our advanced computational tools within the next several years. As indicated, the treatment of the centrifugal compressor was comparatively strong with the very acceptable discussion of the basic processes which occur within the centrifugal compressor impeller.

This material can be used as an important reference source in advanced turbomachinery courses; however, it should be used as a textbook unless the instructor is thoroughly skilled in turbomachinery design and prepared to offer differing viewpoints and to supplement the students' understanding of the fundamental flow processes when necessary. The depth of material presented in this book is a remarkable resource and should be exploited in our advanced educational process.

Is the title appropriate? Yes, Dr. Balje fully meets the subjects mentioned in the title with principal emphasis on machinery selection, preliminary design layout and background theory when viewed as a compendium of valuable information from a seasoned expert in the field. Many workers should find this to be a very useful resource volume. In the opinion of this reviewer, it would be unwise for any worker in the field to work with this volume alone; to ignore the wealth of experience contained in this volume would be equally inappropriate.

Fundamentals of Gas-Particle Flow by G. Rudinger, Vol. 2 – Handbook of Powder Technology, Elsevier Scientific Publishing Company, 1980, 142 pages. Price: $53.75.

REVIEWED BY CLAYTON T. CROWE

This book serves as both a good introduction to gas-particle flows and an excellent source of reference material.

The book is essentially divided into two parts: the first part dealing with fundamental definition and phenomena of gas-particle flows and the second part with applications and experimental techniques. The first chapter introduces the reader to examples and definitions of gas-particle flow and points out features which distinguish gas-particle flows from flows of a homogeneous gas. The second chapter gives an excellent review of particle drag and heat transfer coefficients and concludes by defining equilibrium flows. The third chapter covers the dynamics of single particles in a variety of gas flow fields. The fourth chapter deals with the thermodynamics of gas-particle mixtures. One very important point discussed in this chapter is the fact that the pressure due to random motion of the particles is negligible, a point often confused in the analysis of gas-particle flows.

The remaining chapters deal with gas-particle flows in specific applications. Chapter five is concerned with steady flow in ducts and nozzles. Shock waves in gas-particle mixtures and method of characteristic solutions are covered in chapter six. Other important applications, gas-particle flow in