MHD


REVIEWED BY STEWART WAY

The author, who through his own pioneering contributions is eminently qualified, has brought out a most useful and welcome book on MHD power generation.

The book is clearly written and will be useful to graduate students, practicing engineers, and MHD specialists. Greatest value will accrue by reading the book from start to finish, but it will also be very valuable as a reference work.

Chapter 1 introduces one to the elementary ideas of the MHD generator in simplest terms, with appropriate reference to the role and significance of the magnetic Reynolds number. Equilibrium ionization and conductivity are discussed in the second chapter, with consideration of the generalized ohm's law, Hall effects, and ion slip. Chapters 3 and 4 go into a thorough discussion of flow phenomena in the MHD generator, engineering consequences of the Hall effects, electrode segmentation, load circuits, finite electrode effects, and influence of nonuniformities in conductivity.

An entire chapter is devoted to the most important subject of nonequilibrium ionization, the conditions for its realization, and the problems and difficulties it may lead to. Another chapter deals entirely with magnets, their optimization and coil design considerations, with discussion also of superconducting magnets. The last two chapters take up design and engineering considerations including brief but good treatments of sidewalls and electrodes. Power plant arrangements using MHD generators are also treated, including central station systems, rocket-driven generators for short bursts, and nuclear-heated plants for commercial and space power applications. Additional useful reference information on conductivity properties, physical constants, etc., is given in appendices.

Though this book tends to be oriented more toward generators using seeded noble gases than combustion products, it is quite general and lucid treatment of generator fundamentals and problems, and will therefore be highly useful to investigators of all types of MHD power systems.

Electric Propulsion


REVIEWED BY F. A. LYMAN

This book was written as a text for a graduate course in electric propulsion. Thus it stresses physical principles rather than technology.

The first five chapters, comprising about 90 pages, briefly outline the province of electric propulsion and provide some background in electromagnetic theory, ionization and collision phenomena, and elementary plasma physics. The central theme of the book is developed in the remaining four chapters, which describe the main types of electric acceleration (electrothermal, electrostatic, steady and unsteady electromagnetic). The role of electric propulsion as dictated by power supplies and missions is briefly discussed in an appendix. As befits a textbook, problems are included at the end of each chapter.

The book appears to fulfill its intended introductory role quite well. The presentation is well balanced, and the exposition is clear. In his explanation of acceleration processes, Professor Jahn places extensive reliance on simplified theoretical calculations and order-of-magnitude estimates in order to convey a physical understanding of the processes without becoming bogged down in details. This aspect of the book should make it useful to the student or researcher who is unfamiliar with the field and who wants an overall picture of the physics of these devices. The book will be less useful to those seeking detailed information on the analytical and experimental investigations, for which they will have to consult the many cited references (up to 1966), or turn to more recent literature.

Behavior of Liquid


REVIEWED BY H. F. BAUER

The behavior of liquid in a moving container as well as the interaction of the dynamics of the liquid with the container itself constitute a class of problems which have become of increasing practical importance during the past two decades. The author has given a rather detailed mathematical foundation of the treatment of such problems as liquid sloshing and hydroelastic liquid motions.

In the first chapter, velocity potential and fluid pressure as well as forces, moment equation, and moments of inertia are developed.

The second and third chapter present the equations of motion of an elastic body partially filled with liquid and the basic boundary value problem. The motion of an elastic body partially filled with ideal fluid could be described by a system of twelfth-order integrodifferential equations.

In the fourth chapter about vibrations of an elastic body containing fluid masses, the qualitative investigation of the motion under the action of a specified system of forces is treated. Natural vibrations, stability of the motion, and uniqueness of solution have been studied.

In the fifth chapter the special case for the elastic body being symmetrical has been investigated.

The presentation of the material is very mathematical due to the complex aspects of the general subject at hand. Unfortunately the author did not choose to perform any detailed numerical evaluation of the problem, thus leaving the practicing engineer without practical results for design purposes. On the other hand, the reviewer feels that the book is of importance to many scientists and engineers interested in a more rigorous treatment of such problems, and makes Russian references available in the field.