BOOK REVIEWS

Selection of books for review is based on the editors' opinions regarding possible reader interest and on the availability of the book to the editors. Occasional selections may include books on topics somewhat peripheral to the subject matter ordinarily considered acceptable.

MHD Power Generation: Engineering Aspect

Author G. J. Womack

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Reviewer Fritz W. Mezger

Writing a book on MHD for engineers is not an easy task. If everything is derived from first principles, the result is not an engineer's book. On the other hand, there is not enough of an empirical basis to choose only those simplified theories which are known to work. As the author himself states in his preface, "Unfortunately, the engineering aspects of MHD are still very much in their infancy . . ." Thus, any book written at the present time is likely to be a survey and, as such, can be a useful educational tool, for both the author and the reader.

The hazards of a survey becoming dated are illustrated in the Introduction by the author's attempt to outline the prospects for MHD in just a few pages. The summary commendably relates the author's conclusion to fundamental considerations, but he tries to cover too much too quickly. Womack writes "The high temperature gases may be produced by a gaseous fission or fusion reactor or by a high-energy combustor; and to increase the electrical conductivity of the gases, it is necessary to 'seed' them with an easily ionizable substance such as potassium or caesium." Fusion MHD just isn't at a stage where definite conclusions such as this can be drawn. On a more general note, this survey did not anticipate the current interest in man's environment and which type of power plant will degrade it least. A more thoughtful and current evaluation of MHD prospects can be found in the June 1969 report of the President's Office of Science and Technology, "MHD for Central Station Power Generation: A Plan for Action."

The technical part of the book (Chap. 2) starts with a discussion of ionization according to Saha and charged particle motion according to Spitzer. Conductivity calculations are made and compared with experiment, and the important concept of nonequilibrium ionization is introduced. In Chap. 3 the Hall effect is introduced, and the current field relationships are presented as a prelude to discussing different types of Faraday and Hall MHD channels. In Chap. 4 the fluid dynamic aspects of MHD channels are introduced and combined with the modified Ohm's law and the Maxwell equations, resulting scopic MHD equations. This is the basis for discussing various MHD channels classified by their fluid flow characteristics. Chapter 5 consists of a brief discussion of many MHD power generation cycles. The short descriptions contain some oversimplifications, largely as a result of trying to be definite. The section on nuclear MHD power generation is inadequate and, again, suffers from forced conclusions. For example, the advantage of a nuclear MHD system is stated to be "reduction . . . in capital cost of plant." This is by no means clear. At the same time, the urgency of converting from fossil to nuclear fuel is ignored, as is the fact that nuclear power plants should be as efficient as possible and yield essentially no air pollution. Chapter 6 on MHD Power Generator Plant Components correctly recognizes that engineering and economic feasibility are, in fact, the key questions pacing the development of fossil-fueled MHD. Various types of air heaters are competently discussed, as are combustion chambers and the MHD channel and its electrodes and insulating walls. The state-of-the-art for conventional and superconducting magnets is presented.

All in all, the book is a useful and provocative survey of the MHD field as it stood at the time of the July 1966 International MHD Symposium in Salzburg. It is not, and perhaps could not be, a careful, scholarly study which will stand the test of time.

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