Journal of Solar Energy Engineering

Book Reviews

1) **Solar Applications in Industry and Commerce** by J. D. Meyers, Prentice Hall, Englewood Cliffs, NJ, 1984, price: $34.95.
2) **Solar Energy Fundamentals and Designs – with Computer Applications** by W. B. Stine and R. W. Harrigan, John Wiley and Son, Sommerset, NJ, 1985, price: $39.95.
3) **Active Solar Collectors and Their Applications** by A. Rabl, Oxford University Press, New York, NY, 1985, price: $59.00.

I have taken over the Book Review Editorship for this issue because one of the books reviewed below is authored by Dr. A. Rabl, who is normally in charge of book reviews for this journal. All three of the books reviewed below deal with the same general topic: solar energy conversion and its application. However, there is an enormous difference in the quality and approach of these three books.

The past decade has seen tremendous progress in solar technology. New types of collectors have been built and tested and relatively large central station solar power plants and solar co-generation systems have been placed into operation. The insolation data base has been improved and expanded worldwide, and powerful tools have been developed for the analysis of solar energy systems. It is, therefore, an appropriate time to summarize the status of solar thermal technology in a book for students and practicing engineers. This has been attempted by the authors of all three books, but whereas the books by Stine and Harrigan and by Rabl have specific goals, the book by John D. Meyers attempts to cover all aspects of solar energy including building design, active and passive systems, photovoltaics, and applications to commercial and industrial processes. Unfortunately, the author promises more than he delivers. Meyers relies extensively on reports previously published by various government contractors. Reading the book, I often get the impression that I have seen this material before in some form. But while the author attempts to cover the waterfront, the material is disjointed and fails to relate specific knowledge to the reader. The index is totally inadequate; many terms are not defined (e.g., discount rate); tables and figures are presented without sufficient description; and much of the work is so qualitative in nature that it does not provide the tools necessary for the reader to apply the information in another situation. Design recommendations for photovoltaic systems start with " . . . select array size and tilt . . . " without discussing the power requirements and system optimization. The example of passive system design does not give adequate background for the reader to calculate the solar saving fraction in another application. Although the author claims that the book can be used " . . . directly as a teaching text for course work in applications of solar energy," I cannot recommend the book either to a teacher or to a student.

In contrast to the first book, it is a pleasure to comment on the work of the other authors. Dr. Rabl's book is succinctly and clearly written, provides easy to follow examples, and builds from fundamentals to more complex problems. The author does an excellent job of explaining concepts, particularly in areas where he has done original research, such as insolation data analysis and the fundamentals of optics for solar collectors. The chapters that deal with optics, e.g., the application of tracking and nontracking concentrating collectors, are probably the best introduction to applied solar optics available in the teaching literature. There are also ample illustrations and references.

The chapter dealing with heat transfer in solar systems follows a traditional route, but some of the terminology (such as "front loss coefficient") is not used in the conventional heat transfer literature and some of the references, e.g., forced convection relations from McAdams' book of 1954, are outdated. Material on system performance and applications adequately covers flat plate collectors for water heating and swimming pools, as well as general considerations of industrial process heat applications. But less than five pages are devoted to electrical power generation by photovoltaic and solar central thermal systems. The nomenclature is uniform and the appendix presents a logical and self-explanatory systems of subscripts, which are kept to a minimum for the benefit of the reader. The chapter on economic analysis adequately covers most of the important methods to evaluate the economics of solar energy systems. I can wholeheartedly recommend Ari Rabl's book as a text for graduate courses in solar thermal engineering.

The book by Stine and Harrigan (S. and H.) is strongest in those areas that are weakest in Rabl's treatment. The authors adequately cover basic concepts of solar geometry and flat plate collector performance; their treatment of optics is satisfactory, but does not provide the depth of Rabl's analysis. On the other hand, the authors deal in depth with topics such as storage, power generation, co-generations systems, and the design of large solar thermal systems, topics that are covered only superficially by Rabl. The Shenandoah Solar Total Energy System and the Solar One Central Receiver System are covered in great detail by S. and H. The authors not only deal with engine performance, but also give detailed flow diagrams for the systems. They also included some of the most important computer programs that have been developed in connection with the design, construction, and thermal analysis of large solar thermal conversion and co-generation plants. Shortcomings of the book are the small scale of the insolation pages, which makes them difficult to read, and the mixed units used in some of the tables. Also, the treatment of solar ponds is cursory and superficial.

The contributions which S. and H. have made to the solar technical literature is all the more important because the design and engineering of Solar One has not been adequately documented in the peer reviewed literature. Despite the fact that taxpayers have invested many millions of dollars in the R&D leading to the successful design and construction of the 10 Megawatt Solar One power plant at Barstow, California, and the Solar Co-generation System at Shenandoah, Georgia,

the technical details of these projects have heretofore not been exposed to the scrutiny of the professional community at large. But the publication of Stine and Harrigan's book will go a long way to document the thinking and engineering that has gone into the design of these systems and I hope that the publication of this book will facilitate the widespread utilization of large solar thermal energy conversion systems. Rabl, Stine, and Harrigan have done the solar thermal community an enormous service by writing two benchmark books that authoritatively summarize the status of solar thermal conversion technology in a form accessible to engineers, students, and teachers.

Frank Kreith,
Boulder, Colorado