

containers, a double lobed tank, a hemispherical shell filled with liquid oxygen, and a spherical shell. In all cases, the results are shown to be in satisfactory agreement with exact solutions or experimental data. Finally, a BE formulation for the water impact problem developed by Geers *et al.* is presented. In this problem several formulations such as the MAC method and the FE method are available, and it is a pity that the author has not established conclusively his expectation that the BEM offers the opportunity to perform computations at reasonable cost, by comparing the CPU time requirements for these methods.

The last chapter, Chapter 8, is devoted to an application of BEM to viscoplasticity and creep. Three examples are considered: a simple supported deep beam under uniform load; a thin disc with a central rigid insert under constant external edge load; and a rectangular plate bonded on one edge to a rigid support and subjected to a sudden uniform temperature drop. The last example is particularly interesting since it demonstrates quantitatively that the BE results were obtained at less than half the CPU time required by a corresponding FE solution.

The text design quality is good and the book is very well printed and illustrated. The Editor did well to invite and collate all this interesting material in a single, handsome volume. The reviewer feels, however, that with slightly more editorial effort the styles of the presentations could have come closer together. Some inconsistencies and a certain incompleteness, as afore-mentioned, could have been eliminated and the book could have been a milestone in the development of the BEM. These small criticisms aside, the book can be thoroughly recommended to researchers in this field and to any practising engineer who is looking for new methods in solving his problems.

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M. S. SODHA, S. S. MATHUR and M. A. S. MALIK,
Reviews of Renewable Energy Resources. Vol. 1,
Wiley Eastern Lim., New Delhi, 1983, 368 pp.

THIS is the first volume of a series, an effort supported by the UN University Fellowship Programme at the Centre of Energy Studies, Indian Institute of Technology (IITD) Delhi. This volume, as well as the announced second volume only deals with subjects related to thermal solar energy. Other renewables like wind energy are not (yet?) covered.

The five reviews in this volume compromise topics on work done at IITD, often in cooperation with other countries. This means that on the one hand specific details of systems are related to those developed in India, on the other hand the references give a very complete coverage of the literature of a particular topic.

The first review covers plastic solar collectors. This is quite appropriate because from a cost point of view they are attractive for developing, but also for developed, countries, the authors mention lifetime expectations of 1–9 years compared to 3–15 years for conventional collectors. Both for water and air heating collectors much information has been given. The second review discusses solar collectors with integrated storage systems. Again attractive for developing countries because of the simplicity of the system. Solar ponds, shallow water systems and collector-cum-ground storage units are discussed and the thermal system design given. The discussion of solar ponds is restricted compared to the other examples.

Solar hot water systems and their thermal modelling are given in a separate review. From basic radiation and heat

transfer considerations as generally only found in textbooks, flat plate collector performance is derived. The practical applications considered are IITD systems and their performance. However, the equations have a general character and can be adapted for use in other systems.

Also solar absorption refrigeration and space conditioning are discussed. Only the ammonia–water cycle has been considered. This is surprising, because at the end of the review it is concluded that a single stage refrigeration cycle of this kind gives too low a C.O.P. for solar applications.

One wonders why the lithium-bromide cycle, which is much more attractive for solar air-conditioning, has not been discussed. The paper emphasizes the use of the ammonia–water cycle with the generator heated with solar energy as a heat pump for space heating.

However, much detailed information and many references are given on the thermodynamics and simulation of these systems, but few technical details on flows and conditions in an actual unit. The energy storage aspect is well covered and shown to be important.

Solar distillation is covered in the last review. Simple solar stills are reviewed. It is however, surprising that with the emphasis on topics related to developing countries this review is the shortest of the five. Especially so because the authors claim that this solar application is one of the most attractive on account of the fact that many tropical countries are in need of potable water. However, as a first introduction, with again a rather complete set of literature references this chapter will serve its purpose.

For this reviewer a drawback of many review books is that the topics covered are rather mixed and one's particular interest may go to only one or two of the topics covered. For those cases this volume gives a good review of the state of the art and refers rather completely to original papers. For a more general purpose in education the diversity of topics covered could restrict its use. For research and development institutes and groups working on thermal solar energy these reviews give important and useful information.

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J. TABOREK, G. F. HEWITT and N. AFGAN, **Heat Exchangers: Theory and Practice.** Hemisphere, Washington, DC, 1983, 992 pp., \$69.96.

THIS is a bound volume of eleven invited lectures and 30 papers by some 80 authors, selected from 70 papers presented at the 1981 Seminar of the International Centre for Heat and Mass Transfer. It is hardly, as the title suggests, a book on the subject.

The notice inside the paper cover says it is "an authoritative volume providing up-to-date information on the complete spectrum of heat exchanger application in industry" which is rather too much for the editors to claim. The up-to-datedness is not in question, but the volume is largely uncoordinated and is far from a complete 'spectrum' whatever the word means. The papers frequently lack comparisons with other published data, for example, on the widely important subjects of heat transfer and pressure drop in tube bundles the four papers, two from U.S.S.R. and two from Germany, refer scantily to other work; one paper has no references.

In these respects, the volume cannot be compared with the recent *Heat Exchanger Design Handbook* also published by Hemisphere, which is a more comprehensive, logically set out account of the subject.

These remarks are not intended to question the value of the individual papers, but it is comparatively easy to put together a volume of separate papers, and more difficult to write a balanced book, much though such a book or books are needed in a complex subject such as heat exchangers with its vast literature.

Before turning to the papers two minor criticisms could be made, both connected with a volume of collected papers. Firstly, several pages of space are wasted by each author giving a separate list of symbols and meanings. It is a pity that some coordination could not have been made. Secondly, the standard of printing is variable, from some pages such as p. 192 verging on the limit of legibility, to others such as pp. 299 and 311 which are very clear. Some diagrams such as Fig. 2, p. 57 are not very satisfactory.

Coming to the papers, the first group on evaporation and condensation, including 16 out of the 30 papers in the whole volume, is the most comprehensive. It contains very good papers on new experimental work and plant tests, and will be of value to everyone. The third group has two excellent papers on tube vibration, a very important subject, one on the basic phenomenon and the other on computer design for avoiding vibration.

The fourth group on air-cooled heat exchangers is a rather mixed one; the first two being mainly on noise limitation, the third on louvered surfaces, and the last on the special problem of systems with condensation and frosting.

Group five, on compact heat exchangers, has two papers on plate exchangers; one on the ceramic heat exchanger and the other on cryogenic systems, both interesting subjects.

Group six on fluidized beds is particularly useful and

topical, and group seven on regenerative heat exchangers has two good papers; one, a general paper and the other, on rotary regenerators.

Group eight is mainly concerned with techniques of design calculation and optimization, a field in which a good deal has recently been written; the second paper is different, being about heat exchangers in coal conversion systems, a welcome contribution.

Group nine has two invited lectures and six papers, and is headed heat exchangers in power systems, a very wide field which is not by any means covered, but the group is mainly on special topics such as PWR U-tube steam generators, once through boilers, failures of condenser tubes, direct contact steam water heat exchangers, plus a general theoretical paper on calculations for complex surface arrangements.

Group ten is on fouling and is a particularly well-presented and valuable contribution. It has papers on the mechanisms of different kinds of fouling and methods of removal, as well as comparison of different kinds of heat exchangers from the fouling point of view.

Lastly, there is a group on enhancement devices, with five good papers, mainly theoretical or model experiment, since not much is available yet on full scale trial, but this up-to-date account of the subject is welcome.

In conclusion, it is convenient to have this collection of very good up-to-date papers in one volume, which is a useful addition to the literature.

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