Environmental and Economic Considerations in Energy Utilization

Authors Joseph P. Reynolds, William N. McCarthy, Jr., and Louis Theodore

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Reviewer Donald A. Daavettila

The proceedings of the Seventh National Conference on Energy and the Environment held in Phoenix on November 30–December 3, 1980, have been published and include 60 papers divided among 11 sessions.

The Preface points out that the proceedings should be of interest to the technologist, engineer, scientist, and a host of others involved with or interested in interactions among the areas of energy, environment, and economics. Most of the papers are on specific interactions such as plume visibility in the energy source recovery or conversion of oil shale, coal, synthetic fuels, uranium, and solar. The rest are on industrial energy usage and conservation, material resource policy, the feasibility of synthetic fuels development, the effect of regulations in developing a price that measures the "true cost to society," and the socio-economic impacts of energy development on Indian reservations.

The point to be made is that a broad range of subjects is covered in the proceedings. Of course the real-life situation is very broad; whereas an individual is either a technologist, engineer, scientist, or one of the host of interested others working in a much narrower area. Hence, when you pick up the book, a quick review simply reminds you of the immensity of interaction phenomena; however, genuine professional interest in more than three sessions is not likely.

It would be a good book to have if one had attended the actual conference where the interactions with the authors and attendees could have put a perspective on articles not directly in one's professional detailed interest area. But for those who did not attend the conference, finding the articles of interest requires scratching around a bit in the table of contents. It's a great book to have in the company library, but likely not so useful (worthwhile) as an individual purchase.

Since 1964, Donald A. Daavettila has been a teacher of nuclear power related courses at Michigan Technological University where he is an associate professor of physics. After receiving his master's degree from Michigan Tech in 1958 through a cooperative thesis program with Argonne National Laboratory, he attended and taught at the International School of Nuclear Science and Engineering at Argonne. Then, following a year as an experimental physicist at the Enrico Fermi Nuclear Plant, he joined the Tech faculty. His interests include environmental effects of power production, radiation measurements, and nuclear waste disposal.

Applied Thermoluminescence Dosimetry

Editors M. Oberhofer and A. Scharmann

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Pages 170

Price $87.50

Reviewer James M. Hevezi

There seems to be a flurry of monographs surfacing on the topic of thermoluminescent dosimetry (TLD). A. F. McKinley's *Thermoluminescence Dosimetry* published in 1980 concentrated chiefly on the medical dosimetric application of TLD, pioneered by Farrington Daniels and, later, John Cameron at the University of Wisconsin. Others have concentrated on various and sundry aspects of TLD such as theoretical mechanisms, research applications, etc. The present work is based on two sets of Ispra (Italy) lectures held at the Joint Research Centre in 1977 and 1979 by well-known experts in the field of TLD. For the wide variety of topics covered and personalities involved in its production, I was pleasantly surprised at the continuity the book possessed and the most recent information contained in each chapter. Although each chapter presented a survey of the targeted topic, an extensive, updated bibliography at the chapter's end suggested more in-depth coverage for the reader. Liberal cross-referencing by co-contributors in the document were such that it exhibited a cohesiveness seldom found in such edited works. The flow in the early chapters (History, Theory, Instrumentation, Operational Aspects) set the groundwork for the later extensive discussions concerning applications from medical to archaeological dating. Especially apropos to the present audience were the chapters concentrating on applications to reactor engineering, neutron and high-level flux dosimetry, and, possibly, environmental and personnel monitoring. The place of thermoluminescence relative to other solid state detection methods was surveyed in a separate chapter, and, especially appealing, was a good discussion of precision and accuracy in TLD measurements.

Few of us will be synthesizing our own thermoluminescence crystals soon (we'll buy them from the vendor list on pp. 64 and 65), but an informative chapter on the preparation and properties of the most frequently utilized materials, liberally interspersed with appropriate glow curves, helped put some perspective on the production of these materials. If there is a negative criticism of the work, it is in its attempt at the breadth of coverage of a burgeoned field. However, this is just the stated aim of the editors in presenting recent knowledge of the field, and the book would be well utilized as a survey or reference instrument for users or students. The cost may be somewhat prohibitive for most personal libraries, but it would be money well spent in this case.

James Hevezi received his PhD in 1969 from the University of Notre Dame in experimental neutron physics and has since worked in medical physics at the University of

Wisconsin, M. D. Anderson Hospital in Houston, and, most recently, at the University of Arizona Health Sciences Center in Tucson. His current interests include interstitial hyperthermia and the development and dosimetry of new implantable radionuclides for cancer therapy. Hevezi is a board certified radiological physicist and consults for several industrial firms.

Flow Visualization II

Editor	W. Merzkirch
Publisher	Hemisphere Publishing Corporation, Washington, D.C. (1982)
Pages	803
Price	$90.00
Reviewer	Clifford J. Cremers

This volume contains the published proceedings of the Second International Symposium on Flow Visualization. The symposium was held September 9-12, 1980, in Bochum, Federal Republic of Germany. It was actually the seventh consecutive conference on flow visualization since the Japanese started the series in 1973; their fifth domestic symposium being immediately succeeded by the International Symposium on Flow Visualization in 1977 (proceedings published as *Flow Visualization*, T. Asanuma, Ed., Hemisphere, 1979). That the series is providing a needed forum for researchers is evidenced by the fact that there were 55 papers in *Flow Visualization* and 114 in *Flow Visualization II*. The editor reports that participants from 30 countries were in attendance at the Second International Symposium.

The volume leads off with two review articles. F. J. Weinberg surveys the application of optical methods to combustion research. This discussion is quite informative, but there are no accompanying illustrations, which, in a publication of this sort, detracts considerably from its usefulness. A second article by W.-J. Yang concerns flow visualization techniques in medical and biological applications. This should be particularly useful to workers in that field because of the relative paucity in the literature of good work in biomedical fluid mechanics.

There is also a fine review article buried in the last part of the book. This is a survey of schlieren techniques, particularly those using color. The article is authored by G. S. Settles who wrote a prize-winning undergraduate paper on the subject in 1970 and has been pursuing the topic ever since. This article contains 68 citations and should be most valuable for anyone wishing to investigate the topic further.

The remainder of the volume is divided into two general categories. The first of these, the one that occupies most of the space, is dedicated to the application of flow visualization techniques. About a third of this section comprises material that would be of significance to nuclear engineers working with flow problems. The chapters of interest here are: Heat Transfer, Heat Exchangers; Pipe and Channel Flow; Flow Separation; Wakes and Vortices; Boundary Layers; and Multiphase Flow. The second section emphasizes methods of flow visualization but the distinction is not sharp. The four chapters here are: Surface Flow; Tracers; Optical Methods; and Instrumentation. Within the two sections, a wide variety of geometries and techniques, both traditional and new, are discussed.

Several of the newer methods should be of interest to readers of *Nuclear Technology*. For example, there is the pulse-luminescence technique. Here optically excitable microparticles made by combining an appropriately active chemical with neutrally buoyant particles are excited to luminescence in a flow section by an external laser beam. The method is applied to visualize the flow near a screw blade. Another interesting approach is the application of holography to multiphase flow problems. It appears to be quite suitable for the counting and sizing of liquid droplets in airstreams and vapor bubbles in liquid streams. In general, this noninvasive technique apparently permits the spatial mapping and recording of many rapid multiphase phenomena with the information stored on film for postexperiment analysis. It is easy to see how this method could be used to study the transient behavior of a flashing liquid/vapor mixture in a loss-of-coolant accident experiment.

Another new approach is that of flow visualization using a unique electrochemical method. The application was to the study of flow near the surface of a rotating disk. Here electrodeposition of zinc from a zinc chloride solution carried an imprint of the adjacent hydrodynamic flow. For the rotating disk experiment, the topography of the deposition shows surface flow patterns as predicted by theory. The same is shown to be true in the case of free convective flow on a vertical flat plate. This article is one of the relatively few in the book that are well illustrated, which seems strange considering the topical matter.

Another interesting method, which departs from one's concept of flow visualization as being a real time technique, is the application of computerized data acquisition for visualizing flows. There are two interesting articles on using transduced outputs of both dynamic pressure probes and hot-wire probes with computers to develop computed velocity profiles based on the probe measurements. Given the rapidly increasing availability of micro-and minicomputers in laboratories, one would expect to see much more of this sort of thing in the future.

On the whole, the book is an interesting reference for researchers wishing to visualize complex flows. As the state of the art advances beyond flow geometries that one can treat theoretically, researchers will need to become increasingly dependent on the computations of these complex flows relying heavily on flow visualization to substantiate calculations. The book does have two weaknesses, however, both of which hinder its usefulness. One is that the material is photographed from author-supplied manuscripts and tends to be in serious need of editing. Another is that it is lacking in good pictures. Perhaps an excellent companion volume for the book would be the recently published collection of classical flow visualizations called *An Album of Fluid Motion* (M. Van Dyke, Ed., Parabolic Press, 1982).

Clifford J. Cremers is currently professor and chairman of the Department of Mechanical Engineering at the University of Kentucky, where he has been since 1966. Before