Pages ix plus 448 (including a 26-page index)

Price $19.00

Reviewer A. Boltax

The editors of this book have assembled material that was the outgrowth of a UCLA Engineering Extension Division short course entitled "Ceramics for Aerospace Technology." The lectures and additional material are presented in two books, *Ceramics for Advanced Technologies* (reviewed here) and *Modern Ceramics: Some Principles and Concepts.* The editors acknowledge a small amount of overlapping among the subjects presented in the two books.

Ceramics for Advanced Technologies can be discussed by dividing the contents into two parts. The first part treats various classes of ceramic materials (oxides, graphite, intermetallics, glass, and selected refractory composites) and emphasizes the relationship between microstructure, fabrication techniques, and properties. The second part examines applications of these materials to some of the more advanced technologies such as re-entry, rocket nozzles, nuclear reactors, energy conversion systems, and space environment effects. In general, the material in both sections is introductory in nature and would be useful to students or engineers interested in a broad prospectus of the field of ceramics and advanced applications. The book, prepared by 13 authors, is well written and can be read quite rapidly, since it does not penetrate the subject matter in great detail. Although much of the information presented is relatively current (to 1964), the rapid growth of information in related fields will soon outdate the book. One particularly attractive feature of the book is an excellent index which should be useful to the non-ceramics-oriented individual who is faced with the prospect of learning the language of ceramics.

For the materials engineer interested in expanding his knowledge of ceramics, and the sophisticated design engineer, this reviewer recommends the other book, *Modern Ceramics: Some Principles and Concepts*, prepared by the same editors and publisher. This book has the same good features of the first book and has considerably greater technical content. *Modern Ceramics:* etc. does not cover ceramic applications, but its treatment of basic phenomena, fabrication, test techniques, and properties is presented in a highly competent and interesting manner. It also is backed up by fairly extensive references which would aid more detailed studies.

Alvin Boltax is Manager of Fuel Development at Westinghouse Astronuclear Laboratory where for the past five years he has been involved in the development of graphite-matrix fuel elements for nuclear rocket applications. Prior to joining Westinghouse, he was Group Leader and Project Manager at Nuclear Metals, Inc., where his work involved fabrication and development of metallic fuel elements and basic research on radiation damage and precipitation-hardening alloys. He received his BS and ScD degrees from the Massachusetts Institute of Technology in physical metallurgy in 1951 and 1955.

EXCELLENT AND USEFUL

Title Boiling Heat Transfer and Two-Phase Flow

Author L. S. Tong

Publisher John Wiley & Sons, Inc., 1965

Pages xiii + 242

Price $14.00

Reviewer P. Griffith

This book does two things of value for the person working on the hydraulic design of water-cooled nuclear reactors. It looks into the physics of the processes of boiling, void formation, burnout, and pressure drop, and collects the currently-used equations for computing these quantities. The value of this book to a reactor designer is enhanced by the up-to-date bibliography. Though there are equations which can be used for fluids other than water, the bulk of the data and most of the equations are only appropriate for water at elevated pressures. Except for hydraulic stability, all the questions a reactor designer is likely to ask about hydraulic design are answered in this book in some form.

One question which almost every designer using the book will have to face is: Which of the several ways given to compute something is best? In general, more than one way is given with only broad guidance as to when each method is to be used. This makes use of the book difficult. If this is a criticism, it is more of a criticism of the field than the book, however, as most of the authors of correlations do not clearly state the limitations of them, nor do they compare their results with anyone else's.

In summary, this is a useful book of current interest to the designer of water-cooled nuclear reactors and an excellent introduction for someone just entering the field.

Peter Griffith is Associate Professor of Mechanical Engineering at Massachusetts Institute of Technology where he has worked, written, and lectured on boiling and two-phase flow for the past fourteen years. In addition to his work at MIT, he has conducted research in the field at Argonne and Bettis and for Thompson-Ramo-Woolridge, and lectured at the Institutt for Atomenergi, Norway. His BSME (1950) is from New York University, MSME (1952) from the University of Michigan, and his ScD (1956) from MIT.

SHOW ME – AND THEY DID

Title Remote Handling of Mobile Nuclear Systems

Authors D. C. Layman and G. Thornton

Publisher USAEC Division of Technical Information

Pages vii + 649

Price $4.50

Reviewer James R. Lilienthal

To quote from the preface, "The technology described in this book was developed during the Aircraft Nuclear Propulsion program, a program jointly sponsored by the U. S. Atomic Energy Commission and the U. S. Air Force . . . . Although recent advances in other nuclear programs have made further significant improvements in remote-handling technology for mobile nuclear systems, the operations during the Aircraft Nuclear Propulsion program were so extensive that they represent a milestone in remote-handling development which serves as a useful reference point for engineers who either are entering or are already engaged in the field of remote handling."

When one reads a statement about "a milestone in remote-handling development," there is an immediate reaction of doubt and a mental note is made that the authors will have to "show me." After reading this book I am happy to report that the authors did show me, and I agree wholeheartedly that the ANP program did develop a milestone in remote-handling technology.

The book describes the direct-air-cycle nuclear turbojet engine that was being developed by the General Electric Company and the facilities, tools, and supporting equipment required for the maintenance of the engine. Most of the facilities had been completed before the ANP program was terminated. These facilities were located at the Idaho Test Station operated by the General Electric Company.

The philosophy for the design of the entire complex was based on procedures and equipment developed for conventional aircraft engines; that is, only minor servicing would be done in place and the entire engine would be removed from the aircraft for major servicing. This philosophy resulted in massive shielded structures and extremely large remote-handling fixtures and tools. The detailed planning was based on two different prototype aircraft nuclear propulsion systems; one of these was over 42-ft long and the other had an overall length of about 36 ft.

In one respect, the first part of the book may be regarded as just giving a description of the engines, facilities, and equipment for the ANP program, which, in itself, I found to be interesting. But through it all, the authors have maintained a thread of basic ideas relevant to any remote-handling problem; the facts of the problem in each case, the various alternatives, and, ultimately, the final decision about which path to follow. The illustrations and drawings are numerous and well done. Anyone who has ever worked in the remote-systems field will be greatly impressed with the work and thought that went into the project.

I was particularly interested in two of the chapters: Chapter 5, "Related Services"; and Chapter 6, "Mechanical Parts." The "Related Services" chapter describes a shielded locomotive, mobile shields, a detailed description of the Beetle, transfer casks, and decontamination techniques. Since I would use this book as a reference, I consider it valuable to have all this information in one volume.

The chapter on "Mechanical Parts" has a good discussion on captive nuts and bolts and associated fixtures and tools for remote assembly and disassembly. Some interesting and useful information is given about electrical and fluid connectors which should prove valuable to anyone who has ever been plagued by these problems in hot-cell work.

It is not my intention to slight the other chapters in the book which also contain a wealth of information for anyone in the remote-systems-design field. I was intrigued by the brief description of the shielded locomotive, all 215 tons of it. Not many of us would get the chance to design one.

The other chapters discuss just about everything that would be of interest to a design engineer. The section on closed-circuit television describes experiences with stereoscopic viewing, both in color and black-and-white. A two-page Table lists the operational suitability of manipulators for jobs ranging from handling test tubes to moving a 500-lb rack assembly. The Table of operational suitability is part of the discussion about manipulators which reviews all types of manipulators from hand-operated tongs to powered cranes and booms.

The last part of the book, some 270 pages in fact, covers shielding calculations, radiation effects, and health physics. The references given at the end of each of these chapters should be a good source of additional information. The shielding calculations chapter presents several approximate methods of calculation with tables and graphs that should be helpful to engineers. Two appendixes refer to the chapter on shielding calculations and it is not clear why the authors did not include this information in the chapter itself. One Appendix is entitled "Methods of Calculating Induced Activity" and the other is called "Radiation Calculations."

This book deserves a place in the library of every engineer working in the field of remote handling.

James R. Lilienthal is Group Leader of CMB-7, Instrumentation and Engineering Development, at Los Alamos Scientific Laboratory, Los Alamos, New Mexico, where he has been since 1947. He is one of the seven charter members of the "Hot Laboratory Committee," the informal group that organized the first six annual Conferences on Hot Laboratories and Equipment. This group, forerunner of the present Remote Systems Technology Division, antedated the American Nuclear Society itself. Lilienthal has also been very active in ANS affairs: He is a member of the Board of Directors; Chairman of the Publications Committee; past Chairman of the RST Division; and Program Chairman of the Eighth Conference on Hot Laboratories and Equipment. A registered Professional Engineer in New York and in New Mexico, he obtained his BS degree (naval architecture and marine engineering) from the Webb Institute of Naval Architecture (1938).