Nuclear Power Plant Engineering

Author	James H. Rust
Publisher	Haralson Publishing Company (1979)
Pages	504
Price	$30.00
Reviewer	Kermit L. Garlid

This book is impressive, but also demonstrates the difficulty of writing a totally satisfactory textbook. Its purpose, as described by Rust in the Preface, is "to provide basic insight into some of the aspects of engineering analysis used in the design of nuclear reactor systems," and its subject matter is considered by him to be "suitable for a two- or three-quarter course on nuclear reactor system analysis for seniors or first-year graduate students in nuclear or mechanical engineering."

The contents are far-ranging indeed, illustrating the breadth of knowledge required for nuclear power plant engineering. Its nine chapters include: "Description of Nuclear Reactors," "Thermodynamics of Nuclear Power Plants," "Fluid Flow Concepts," "Fluid System Analysis," "Heat Generation in Nuclear Reactors," "Heat Transfer in Power Systems," "Reactor Thermal-Hydraulic Analysis," "Stress Analysis in Nuclear Reactor Systems," and "Fluid Transients."

Four appendixes ("Conversion Factors," "Abbreviated Steam Tables," "Properties of Reactor Coolants," and "Properties of Reactor Materials") and an index occupy the remaining pages. Chapter 9 was written by C. Samuel Martin, a colleague of Rust's at Georgia Tech.

There are many positive things that can be said about the book. One is that its range gives the user a good picture of the problems and approaches used in reactor engineering analysis. Another is that it contains a great deal of useful information, collected in one place. While the information explosion has affected all fields, nuclear engineering has been one of the most vulnerable, and while one can find hundreds of reports on each subject, it is difficult to find books that distill out essential material and are current. This book accomplishes those objectives quite well. For example, descriptions of core geometries, thermal and hydraulic characteristics, and design parameters for large pressurized water reactor, boiling water reactor, high temperature gas-cooled reactor, and liquid-metal fast breeder reactor systems are all included, as is an extensive description of both single- and two-phase flow complexities and calculation methods. Burnout phenomena and hot channel factors are treated thoroughly, and in Chap. 8, it is good to find the American Society of Mechanical Engineers Boiler and Pressure Vessel Code discussed and used.

Material has usually been chosen with engineering in mind rather than theoretical reactor analysis, and is presented in such a way that practical problems faced by engineers in designing and analyzing nuclear power plants are emphasized. Citations of appropriate references are extensive and current. The problem exercises at the end of each chapter are also comprehensive and should be useful for both students and instructors.

Reading Rust's book from cover to cover, however, is not an unmitigated pleasure. The writing appears hurried, without time having been taken either for careful expression or for adequate editing and proofreading. Some of the time, as for example when a succession of short, declarative sentences makes you feel as though you have been riding over a very bumpy road, this is only annoying. At other times, however, lack of precision or the casual introduction of new terms and notation is confusing.

This is especially evident in the chapter on thermodynamics, a field where elegance and precision can often be admired. The complete definition of a reversible process that is contained, for example, is:

> "A reversible process resulting in different thermodynamic states of a system is a process which could be reversed, returning the system and surroundings back to their respective initial states. As an example, heat might be taken from the surroundings and converted to work by a system. In order for this process to be reversible, the work produced by the system must be able to generate the exact amount of heat taken from the surroundings and return this heat to the surroundings."

This is followed by the statement, "An irreversible process is one that is not reversible."

Other examples could be cited where explanations and definitions are confusing or ambiguous, particularly in introductory sections laying the foundation for more advanced material. With more complex material the explanations often improve. Chapter 9, which is written smoothly and seems more logically consistent, is an exception to this criticism of precision and style.

Another negative factor is the exclusive use of English engineering units throughout the book. This seems hard to justify at a time when most national laboratories and professional journals require SI units and in a field where international cooperation is so significant.

Considering its scope and length, *Nuclear Power Plant Engineering* is reasonably priced. It would be a good choice as a supplementary reference in a nuclear engineering course, but as the principal text it would require amplification and clarification, especially where fundamental principles are involved.

Kermit Garlid is professor of nuclear engineering and chemical engineering and associate dean, College of Engineering, at the University of Washington, Seattle. His interests include nuclear reactor safety, two-phase flow, nuclear fuel cycles, interdisciplinary engineering, and music. He has been a consultant to industrial and government organizations, including the Advisory Committee on Reactor Safeguards, and is past-president of NORCUS.

Radiation Protection—Progress Report 1978

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Pages	854

Price $68.50

Reviewer Geoffrey G. Eichholz

This hardcover volume of 854 pages contains 2 to 3 page summaries of the various research projects sponsored by the Commission for the European Communities (EEC) in the field of radiation protection in all the EEC countries during 1978. The projects are grouped under the headings of dosimetry (25), environmental contamination (13), genetic effects of ionizing radiation (38), short-term (19) and long-term effects (29), and risk evaluation (2). Some of the reports contain results, some bibliographies, some merely restate objectives. In the nature of things, the information contained is obsolete by the time it reaches publication and any significant results will have been published in the journal literature in the meantime. The publisher suggests that this is an invaluable compendium of "who is doing what." A serious researcher would do better to scan the abstracts journals. It is difficult to see why the information contained in this volume would be of more than passing interest to anybody involved in health physics or radiobiology.

Geoffrey G. Eichholz is regents' professor of nuclear engineering at the Georgia Institute of Technology, which he joined in 1963. He obtained his PhD in physics at the University of Leeds, England, and was awarded the DSc degree in 1979. Dr. Eichholz is a fellow of the American Nuclear Society and a past chairman of its Isotopes and Radiation Division. He has edited the book Radioisotopes Engineering *and is the author of* Environmental Aspects of Nuclear Power *and* Principles of Nuclear Radiation Detection, *both published by Ann Arbor Science Publishers. His research interests include the migration of radioactive wastes, environmental surveillance problems, radiation detector development, industrial radiation application, nuclear materials technology, and the health physics of nonionizing radiations.*