

attenuation of space radiation by the earth's atmosphere and the deflection of charged particles by the geomagnetic field.

Mission analysis studies are discussed in Chap. IX. After discussing the effect of mission timing on space radiation doses, the author summarizes some of the studies that have been conducted to estimate mission doses and shield requirements for both earth orbital missions and deep space missions. After brief discussions of shield weight optimization studies and of operational procedures for reducing the dose, the author concludes this final chapter by mentioning active shielding concepts.

The book contains 710 references, 113 figures, and 34 tables. References are listed at the end of each chapter. Since much of the material treated has been the subject matter of several books, it is difficult for an author to be an expert or even up-to-date in each of the areas. One example of this deficiency is the fact that there is no mention of the dose-equivalent concept or the quality factor. Besides its share of typographical errors and outdated material, the book suffers in some instances from a lack of preciseness. The book would have benefited if the manuscript had been subjected to critical reading prior to publication.

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About the Reviewer: Richard Madey is Professor of Physics at Clarkson College of Technology in Potsdam, New York. He teaches courses in nuclear physics and in space science and is engaged in research in these areas. Prior to coming to Clarkson, he was Chief of Applied Physics Research at Republic Aviation Corporation. Previously, he conducted research in high-energy physics at the Lawrence Radiation Laboratory at Berkeley and at the Brookhaven National Laboratory. He received his PhD from the University of California at Berkeley and a BEE degree from Rensselaer Polytechnic Institute.

Pressure Vessel Design and Analysis. By M. B. Bickell and Carlos Ruiz. St. Martin's Press (1967). xii + 578 pp. \$21.00.

The scope of the book is described best in a summary paragraph that appears on the jacket. It states: "The authors first deal with the establishment of Design Requirements and the Principal Codes; then treat in turn the Selection of Materials, Preliminary Layout, Elastic Stress Analysis, Cylindrical Shells, Spherical Shells, General Shells of Revolution, Applications to the more usual Vessel Components, Stress Analysis of Piping Systems; Survey of the Adequacy of the Design; and Potential Causes of Failure including Plastic Collapse, Fatigue and Incremental Collapse, Low Stress Brittle Fracture, Creep and Buckling."

There are too few books available devoted to both preliminary design and detailed analysis of pressure vessels. In this respect it fills a significant void. The material is

developed in a logical order; however, it is unfortunate that each major topic is not treated with equal clarity, depth, and sophistication. The first three chapters on preliminary design (design requirements, selection of materials, and preliminary layout) are extremely general and may be of limited value. Most of the remaining thirteen chapters contain a clear, well-organized, and sophisticated treatment of stress analysis and related subjects and make the book a useful addition to any pressure vessel designer's bookshelf.

The authors appear to have missed an important point concerning the basic purpose of national pressure vessel codes. Consequently, in a few instances, the presentation seems to be somewhat less than completely objective; one example is cited. Paragraph 3.2, which pertains to allowable design stresses, states in part: "An apparent inconsistency is thus brought to light, namely, the fact that for a given material, different design stresses may be considered acceptable depending on the Code chosen. . . . This wide difference is explained by a more cautious approach in the U.S.A. than in Germany, but it is not necessarily true that a vessel designed to the lower stress is safer than a vessel for which the higher limit is used. . . . In the U.S.A., the acceptance of higher design stresses for the A.S.M.E. Section III may, ultimately, lead to a gradual approximation to European practice. However, at present the designer has to resign himself to the anomalous situation that a vessel considered to be safe in one country would be deemed unsafe in another."

The reviewer would paraphrase the last sentence to: "However, at present the designer has to resign himself to the anomalous situation that a vessel which is accepted for use in one country might not be accepted in another." The same theme is repeated in a few other places in the book. It is believed that the rapport between authors and readers might have been increased had a more positive approach been taken. Specifically, national codes could have been discussed in the light of 1) purpose, 2) limitations, 3) areas which are technically weak and in need of improvement because of recent technological advances, and 4) what action code-writing bodies are taking to update the documents.

Finally, it is not always clear when a statement concerning a detail of construction, etc., is based on a code requirement or is the result of a fundamentally rigorous stress analysis. A detail of construction that complies with a code will usually be satisfactory but may not be the best and, in some instances, it may be completely unsatisfactory. Unfortunately, some readers may be caught off guard!

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