this is not a major defect as the author stresses the need to verify designs by component and empirical coefficients, but this is not a major defect as the would have been welcome to justify the design formulas and to detailed structural arrangements of successful major mixtures, to complete design of a folded plate structure, and to structural elements. The last chapter delivers programming applications to engineering plasticity problems. Through a common terminology and notation, and a unified description of various approaches with common mechanical and mathematical bases, the editors have done a fine job to minimize the complexities in theoretical argument and subsequent computational development. While the close resemblance and connection between quadratic programming and the elastic-plastic finite element method is briefly discussed in the final chapter by Prof. G. Maier, the book would be appreciated more by finite element researchers if chapters devoted to the comparisons of mathematical programming to the finite element procedures using iterative intitial-strain and tangent-modulus methods were included. Certainly, the editors have succeeded in illustrating the close relationship between Engineering Plasticity and Mathematical Programming.


REVIEWED BY E. Y. ROBINSON

This book, one in a series on aspects of design and materials for construction, is a remarkably successful effort bringing together several widely dispersed areas of composite (GRP) materials and integrating them into a compact volume that covers constituent materials, micromechanics, testing, fabrication, structural forms, sandwich beams and panels, and finally provides a number of detailed numerical "case studies". It is intended to enable the engineer starting in the field to approach the design task, and to provide a generally useful survey of GRP in structural design.

The author presents very useful sections on standard material test techniques, applicable codes, and standard procedures which affect selection and verification of end use in civil engineering structures. Having established a technical base in the first four chapters he then devotes individual chapters to End Use Performance, Rigid Foam and Sandwich Constructing, and Structural Forms. The eighth chapter provides a summary of design methods for complete structures as well as component elements. The last chapter delivers fifteen worked problems ranging from simple composite law of mixtures, to complete design of a folded plate structure, and to detailed structural arrangements of successful major GRP structures.

The book is a worthwhile source of integrated information on GRP structural design. Data from actual structural testing would have been welcome to justify the design formulas and empirical coefficients, but this is not a major defect as the author stresses the need to verify designs by component and sub-scale structural testing.


REVIEWED BY NATHAN PROMISEL

It is now well recognized that the availability of non-fuel raw materials and resources presents complex problems of global proportions, affecting both industrialized as well as developing countries. The need for more efficient management and use of our resources, in the broadest sense, is clear. This book attempts to provide a proper perspective, emphasizing availability, usage and management of material resources in the context of the inter-relationships among energy, ecology, technology and global socio-economic-political factors. Accordingly, it is very timely and provides background for decision-makers in industry, salient technical details for the non-technologist, and statistics and broader understanding for the materials specialist. Understandably, specialists in various fields may identify certain omissions or debatable details; nevertheless, there is a surprising amount of information crammed concisely into this book.

The basic author, Professor Dr. Dieter G. Altenpohl, is eminently qualified for developing this thesis. A specialist in physical metallurgy, author of texts on aluminum technology, and previous director of an industrial research laboratory, in the past decade he has been involved in many international activities and has been increasingly concerned with "industry's total environment" and with the entire materials life cycle.

Chapter headings are descriptive of the book's themes and scope. Chapter 1 discusses the "Role of Materials in the World Economy" and sets the stage by discussing the total materials cycle: the interlocking traid of materials, energy and ecology; and several aspects of supply, demand and world economic growth. The author feels that problems other than physical lack of resources world-wide, such as energy, are the major issues and that most of these, although not yet always well-defined, can be solved by technology, provided that proper understanding and advanced planning are developed.

Chapter II deals with the "Present Structure and Future Trends in Key Materials Industries"; namely, iron and steel, aluminum, copper, cement and concrete, plastics, wood, and advanced materials (composites, ceramics, special alloys). In each case, there are discussion and data on availability and geographical distribution, properties and uses, processing (extraction, fabrication, scrap recovery, etc.), environmental and energy factors, future outlook and special considerations (such as economics, nationalization of mines, problems of developing countries). While the treatment is brief in some cases for the individual seeking comprehensive details, the author has provided an ample current bibliography. In his summary of the chapter detailing the many interdependent aspects impacting the materials industry, the author emphasizes innovation as a key issue.

Chapters III and IV deal with the now-essential process of technology planning, with emphasis on technology assessment, total energy accounting, substitution (a subsystem structure, a "substitution ladder," is presented), and...
conservation (recycling, redesign, extended product life, packaging). To arrive at appropriate technologies, says the author, it is now necessary to use systematic technology planning to supplement market forces and science push. Criteria and sequence for such planning are given, using an aluminum producer as a detailed example. Considerable attention is devoted to recycling (at the 3 main stages: production, manufacturing and post-usage, plus redesigning for recycling), and to packaging, as important elements of conservation.

Chapter V discusses research and development opportunities in the context of overall amelioration of supply, usage and conservation. A rather extensive “shopping list” of productive technical areas for research is provided under a number of headings roughly corresponding to the materials cycle, and including design.

Chapter VI concludes the book under the title of “Outlook.” This is a most interesting chapter since its aim is to integrate the many factors previously discussed into a perspective of future problems, issues and trends. The opposing materials availability forecasts of “cornucopia versus doomsday” and their harmonization are discussed at some length. The author concludes with pronounced optimism concerning basic materials for sustained industrial (and social) growth and confidence in man’s ingenuity to solve forthcoming problems, with an able assist from technology.

This “perspective” book makes very interesting, stimulating and informative reading, often uniquely presented, particularly for those desiring supportive statistics or a broader appreciation and understanding of the vital but complex role of materials and resources in the world’s future, and of the many factors that interact with it.