BOOK REVIEW

Yu. M. Tarnopol'skii and T. Ya. Kintsis METHODS FOR THE STATIC TESTING OF REINFORCED PLASTICS*

Reviewed by S. V. Serensen and G. P. Zaitsev

The application of reinforced plastics as building materials for load-carrying highly stressed objects in modern technology urgently requires detailed and objective information on their physical and mechanical properties during multiparameter load-applying processes. The knowledge of the properties of composite materials is also required to predict the strength and resources of parts made of these materials, using a given form-giving technology and optimum packing of the reinforcing elements. This information can be obtained only when using objective, theoretically and experimentally sound methods for the mechanical testing of the materials. These requirements have been most fully reflected in the second edition† of the monograph "Methods for the Static Testing of Reinforced Plastics" by Yu. M. Tarnopol'skii and T. Ya. Kintsis.

The book under review is made up of six chapters. The first chapter contains basic specific data on the constructional characteristics of composite materials (glass, boron, and carbon fiber plastics) with different reinforcing structures. The effect of operational design, and technological factors is described, methods on how to estimate technological defects of the material are given, the concentration of stresses is assessed, and the attention drawn to the preparation of specimens for the testing and to the temperature and humidity conditions during testing. The following chapters deal with individual aspects of testing. The second chapter is devoted to the stretching of flat specimens, the third to compression and crumpling, the fourth to shearing, the fifth to bending, and the sixth to the study of the properties of wound composite materials with the use of annular specimens. In the presentation of the material related to the testing methods, the authors have essentially used a form applicable to many fields of use of reinforced plastics and constructions.

The second edition of the book reflects the significant volume of material, accumulated during the three years since the appearance of the first edition in 1972, printed only in 1500 exemplars. This material represents new theoretical and experimental data on the testing of modern types of composite materials with a polymer matrix. The first edition has been radically revised and enlarged. The authors have included new data on the crumpling test, the determination of various elastic characteristics, and enlarged the systematized data on the mechanical properties of constructional plastics with regard to the anisotropy of properties. Wide use has been made of the data obtained at the Institute of Polymer Mechanics, Academy of Sciences of the Latvian SSR, as well as of data from various articles and monographs in the Soviet and foreign literature. The literature references have been enlarged and revised. The list in the new edition includes 240 literature references, significantly more than in the first edition.

The modern and clear presentation of the material must be pointed out, as well as the thorough treatment, the proper analysis of the positive and negative aspects of the test methods, the discussion of recommendations, and the assessment of possible experimental errors.

The appearance of the second edition of the handbook is very timely, having in mind the progress in the application of reinforced plastics, the appearance of new types of composite materials as well as new

*2nd ed., Moscow (1975), 264 pp.

†1st ed: Methods for the Static Testing of Reinforced Plastics, Yu. M. Tarnopol'skii (editor), Zinatne, Riga (1972) [see review in Mekhanika Polimerov, No. 4, 764 (1972)].

Translated from Mekhanika Polimerov, No. 6, pp. 1134-1135, November-December, 1975.

concepts in the design, production, and testing of objects made of these materials. Some improvements for further editions can also be indicated. It would be desirable to introduce in the chapter on "Expansion" a discussion of the methods for the obtaining of deformation diagrams of reinforced plastics in the transversal direction, i.e., in the direction which is perpendicular to the layers, since this characteristic enters some of the new criteria for the strength and durability of thick-walled objects. Some modern criteria proposed by A. K. Malmeister, E. K. Ashkenazi, K. V. Zakharov, I. I. Gol'denblat, and V. A. Kopnov, Fisher et al. should be included in the section on the strength characteristics of the first chapter. This makes it possible to discuss in the book the shear stress characteristics which are included in the criteria for the function of tangential stresses. The testing of tubes should be treated in a separate chapter (in the book it is spread over three chapters). The section on crumpling could also be removed from the chapter on "Compression and Crumpling" as it represents primarily a characteristic of the contact strength of the material. The data on the concentration of stresses should be collected in a separate section or chapter, having in mind the increasing importance of the calculation of mechanical joints (including adhesive joints) between different elements made of reinforced plastics. A new edition should also account for the rheological properties of reinforced plastics, having in mind their importance in the calculation of strength and deformability of objects.

The book is a handbook for engineers, technologists, and designers of design-and-technological offices, creating new objects of high specific strength and rigidity. The book is equally important for those who design the testing of elements, parts, and whole constructions made of reinforced plastics, and develop new testing complexes consisting of machines and other equipment. The book is of interest to specialists working on the static testing of composite materials.