BOOK REVIEWS

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IMPACT SURFACE TREATMENT

Elsevier Applied Science Publishers, 1987, hardcover, 325 pages.

Containing the proceedings of the Second International Conference on Impact Treatment Processes, this volume is composed of 33 papers that address different aspects of surface treatment using impact techniques.

The first two papers address the different theoretical aspects of materials with residual stresses and are followed by four papers addressing the effects of shot peening on crack growth, contact fatigue and fretting fatigue behavior of steels and aluminum alloys used in both automotive and aerospace applications. A number of experimental graphs and tables are provided to emphasize the usefulness of this technique for real world applications. Some of the advantages of using shot peening to reduce stress-corrosion cracking are high-lighted in a separate paper that includes several case studies on materials such as high-carbon steel, Inconels, magnesium-base alloys, etc., for use in compressors, pump bodies, heat exchangers, steam generator piping, gears, pumpshafts and pressure switch diaphragms.

The use of shot peening to reduce tensile stresses and improve the fatigue life of complicated designs (e.g., landing gears) is described in a separate paper. The two following papers address the importance of process variables. Quantification through electronic process control is recommended as a viable short-term solution to enhance the overall usefulness of the technique. Other papers cover improvements to the properties of fabricated components upon shot peening, increases in heat-transfer rates by use of indents in hollow structures, and the improved performance of shot-peen-formed aircraft panels.

In recent times, it has been repeatedly demonstrated that any process technology can be enhanced by use of computers, and fivepapers address various aspects of designing shot-peen equipment and the application of these designs to armor-plate assemblies and in the aerospace industry. The concept of dry shot peening is also extended to the development of the wet-peening process, and appropriate process control through instrumentation is described in a separate paper. Other addressed parameters include the importance of determining the quality, nature and velocity of shots used in shotpeening surfaces. This concern is further exemplified by four papers that highlight the need for developing useful, unified specifications to be used with this technique. Several of the problems characteristic to a given application are highlighted, and the urgent need to consolidate efforts among researchers and engineers is emphasized.

The final five papers address the important subjects of surface preparation, removal and inspection of coatings that are frequently employed in various service applications to enhance either corrosion or wear resistance. Interesting experimental results are provided on the problems and advantages encountered in the different applications.

Impact Surface Treatment is organized effectively and should be of significant value to either a design or a shop floor engineer who is constantly dealing with process treatments to reduce stresses in structures. Therefore, it is a highly recommended addition to any engineering library.

Review by T.S. Sudarshan, Materials Modification Inc.
Published in the Journal of Metals, January, 1989

INTEGRATED COMPUTER-AIDED DESIGN OF MECHANICAL SYSTEMS

Elsevier Applied Science Publishers, 1987, 196 pages.

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This book is intended for mechanical, industrial and manufacturing engineers, design engineers and engineering managers. It is also intended for postgraduates undertaking mechanical, industrial, manufacturing and production engineering degrees. It is also useful for technologists, academics and researchers working in the field of CAD/CAM.

Whilst it is largely self-contained, readers are required to have some basic knowledge of design, analysis and manufacture; their awareness of computers will also be of value.

Some may feel that the title of this book does not impart the considerable depth and scope of its text, covering as is does the whole aspect of computer-aided engineering from design concept through to manufacture. I would agree with them, but it is preferable to a title that promises more than a book can offer.

In his introductory chapter the author makes several observations on the subject of design philosophy: two of which I feel it appropriate to quote:

(i) "In general, designing should not be confused with art, with science or with mathematics. It is a hybrid activity which depends, for its successful execution, upon a proper blending of all three and is most unlikely to succeed if it is exclusively devoted with any one."

(ii) "Design, in general terms, can be defined as the means by which solutions are contrived to people's problems and in response to a need."

No further comment is necessary except perhaps that these two observations set the standard of this book for me and what ensued did not bring disappointment.

The introductory chapter provides a very good foundation to the main text beginning with the developing design process, design methodology and a brief introduction together with the terminology used in the following:

(a) Computer graphics
(b) Computer-aided engineering
(c) Computer-aided design
(d) Computer-aided analysis
(e) Computer-aided draughting
(f) Computer integrated manufacture

and finally, Initial Graphics Exchange Specification (IGES).

Chapter 2 deals with automated modelling.

Chapter 3 provides a detailed account of the computer-aided design of two practical case studies involving the design of:

(i) a centrifugal peening equipment

(ii) a fluid coupling

Chapter 4 provides a truly practical introduction to the application of the finite element method to structural stress analysis of mechanical systems.

Chapter 5 provides a complete static stress analysis and dynamic