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Preface

Jordan Rotheiser

Joining of Plastics

Handbook for Designers and Engineers

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Foreword

The Society of Plastics Engineers is pleased to sponsor *Joining of Plastics Handbook for Designers and Engineers* by Jordan I. Rotheiser. Mr. Rotheiser is a practicing plastics engineer and industrial designer, with more than 35 years of experience in the design of plastic products and a well respected member of SPE. He has held numerous seminars on assembly methods for plastics. His concise book will help the reader to determine the most cost-effective joining method for any given application.

SPE, through its Technical Volumes Committee, has long sponsored books on various aspects of plastics. Its involvement has ranged from identification of needed volumes and recruitment of authors to peer review and approval and publication of new books.

Technical competence pervades all SPE activities, not only in the publication of books, but also in other areas such as sponsorship of technical conferences and educational programs. In addition, the Society publishes periodicals including *Plastics Engineering, Polymer Engineering and Science, The Journal of Injection Molding Technology, Journal of Vinyl & Additive Technology* and *Polymer Composites* as well as conference proceedings and other publications, all of which are subject to rigorous technical review procedures.

The resource of some 36,000 practicing plastics engineers, scientists, and technologists has made SPE the largest organization of its type worldwide. Further information is available from the Society at 14 Fairfield Drive, Brookfield, Connecticut 06804, USA.

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Preface

When plastics first emerged as a viable material from which products could be manufactured, parts were designed and assembled in the same manner as those of existing materials. In time, the unique characteristics of this family of materials and the processes used in their manufacture became known. Creative designers and engineers soon recognized that plastic products could be marketed at substantially reduced price over those made of traditional materials.

A large portion of the reduced costs achieved through the use of plastics in the design of products is attained through a reduction in the number of parts required and the efficiency attained by many of the joining methods used with these materials. However, it is more complicated to design with plastics than with metals because the physical properties of plastics are significantly affected by changes in temperature and chemical environment within the normal range of usage. Furthermore, the available joining methods vary with the material and with the processing method used to create the parts.

In his design and engineering practice over the years, the author has observed that the relationship between the assembly methods, the materials, and the plastics manufacturing processes is generally neglected in the available references. Rather, it is left for the readers to discover through experience. In this book, the assembly method limitations for a given molding process can be found in Chapter 6, "Assembly Method Selection by Process." Chapter 5, entitled "Assembly Method Selection by Material," will provide the methods that can be used with a given plastic resin along with the acceptable fitment tolerances where available. The assembly processes also have size limitations, which are addressed in the respective chapters.

The theoretical ultimate in assembly method efficiency is the complete elimination of all joining operations in the creation of a one-piece product. Part reduction not only eliminates assembly labor, it reduces the purchasing, inspecting, warehousing, capital requirements, and piece part costs as well. While the ultimate goal is rarely achieved, a significant reduction in the number of parts used can often be attained. Most often, this objective is attempted by combining design elements in the process currently being used to manufacture the product. This sometimes results in a part so complicated that it is more expensive to make than the ones it replaced – with their assembly cost included. Many of the author's most successful cost reduction programs have involved changes in both process and material, and he felt it important that this approach be included in the book. There is also a table to provide guidance to the range of product size attainable with each process.

The book also contains sections on the design of assemblies for disassembly and recycling. In addition, it provides the basic design for manufacturability fundamentals necessary to create parts which are not warped or distorted such that they cannot be efficiently assembled. Concurrent engineering practices are further developed to a level we refer to as the "holistic design of plastic parts."

Following the design chapters, there are the assembly method chapters which basically constitute most of the balance of the book. Reference value is enhanced by a full chapter devoted to each of the 14 principal fastening and joining methods used to assemble plastic products today. This is very much a "how to" book, with a great deal of hard-to-find detailed design information and a large number of illustrations. It is intended to be both a handy desk reference and a design guide.

In the accelerated pace of today's design environment, engineers rarely have the time to read at leisure. The author often finds himself reaching for a reference book and looking for the shortest path to the information needed. When he scans the table of contents of a book, he is looking to see if it is the kind of book he can use in that manner. He believes other engineers do the same, so this book is designed to accommodate the practice. In Chapter 1, "Rapid Guidelines for the Assembly of Plastics and the Efficient Use of This Handbook," the reader can scan the various joining methods and determine which ones are most likely solutions for the problem at hand. He or she can then go on to read only those chapters. To further this objective, each of the assembly chapters begins with a list of the advantages and disadvantages of that particular assembly method. The author hopes this effort results in quick and appropriate joining solutions for his readers.

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