

Preface

As the technology of plastics continues to develop, extending from formulation to processing to design, the number of plastic products, especially those replacing metals, increases in parallel. Resin manufacturers create new formulations with improved properties, molds and dies are highly optimized for maximum part performance, and designers have a plethora of new computer aided tools at their disposal. Although it would seem that such technological advances would serve to reduce plastic product failures, the additional complexity involved in modern designs, as well as the constant push for performance at the edge of the material envelope, seems to moderate failure rate reduction.

Plastic product failures can be divided into three discrete arenas - improper design, improper manufacturing (including processing and assembly), and improper use of the end product. One way to reduce plastic product failures is to disseminate the knowledge, on a wide variety of topics, which has been accumulated by plastics researchers and practitioners. Such is the purpose of this book, and by sharing the work presented at a number of SPE ANTEC conferences, we hope to answer a wide range of questions that have arisen and anticipate those topics that may present themselves in the future.

The first three chapters introduce the reader to a variety of failure mechanisms, starting more generically with ductile failure, fatigue, and oxidation in Chapter 1 and advancing through failures related to processing, assembly and environmental effects in Chapters 2 and 3. All of these are important mechanisms for consideration, as even a well designed part can fail prematurely if it is not processed properly or it is exposed to environments that degrade its mechanical properties.

Chapter 4 discusses fractography and morphology of plastics, which can often be confusing to the uninitiated if they attempt to directly translate techniques established for metals; plastics are known to share some features with metals but are often distinctly different. Nonetheless, examination of fracture surfaces is a valuable tool that can provide insight into product loading history, environmental exposure and even processing conditions.

The next 5 chapters in the book were selected to help the reader with a proactive approach in failure prevention. Examination of failure and material models, determination of product life, test methods, design aids and case studies are all presented, and we hope that this information will prove to be useful to product design engineers, mold designers, failure analysts, and general plastics practitioners in all phases of product design and development.

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