Understanding

Injection Mold Design

Herbert Rees

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Introduction to the Series

In order to keep up in today's world of rapidly changing technology we need to open our eyes and ears and, most importantly, our minds to new scientific ideas and methods, new engineering approaches and manufacturing technologies and new product design and applications. As students graduate from college and either pursue academic polymer research or start their careers in the plastics industry, they are exposed to problems, materials, instruments and machines that are unfamiliar to them. Similarly, many working scientists and engineers who change jobs must quickly get up to speed in their new environment.

To satisfy the needs of these "newcomers" to various fields of polymer science and plastics engineering, we have invited a number of scientists and engineers, who are experts in their field and also good communicators, to write short, introductory books which let the reader "understand" the topic rather than to overwhelm him/her with a mass of facts and data. We have encouraged our authors to write the kind of book that can be read profitably by a beginner, such as a new company employee or a student, but also by someone familiar with the subject, who will gain new insights and a new perspective.

Over the years this series of **Understanding** books will provide a library of mini-tutorials on a variety of fundamental as well as technical subjects. Each book will serve as a rapid entry point or "short course" to a particular subject and we sincerely hope that the readers will reap immediate benefits when applying this knowledge to their research or work-related problems.

E.H. Immergut
Series Editor

Preface

During the last fifty years I have been almost continuously working with molders, mold makers and mold designers, and in doing so learning the intricacies of designing of molds for many different products, from the early, simple compression molds to highly sophisticated injection molds. I have worked with them not only in North America, but also in Europe and Japan, and especially in the last 15 years, as consultant to those in developing countries who only recently started to seriously compete in the huge field of manufacturing molded plastic products.

During my discussions with these newcomers to the field, but also in earlier years, when talking to "old hands" in this field, I have often wondered how many of them really understood what they were doing when it comes to planning for and designing a new mold, and why they were doing it. In many cases I believe they took simply "the easy way out" by just imitating what they saw in other molds, and expanding on it, regardless of whether the molds used as "precedents" were for comparable conditions, for the same plastic, for similar molding machines, or for a similar production requirement. Another problem I saw was that in many mold making shops, here and everywhere, some designers were more intent on making "pretty pictures", in the shortest posssible time, rather than understanding that the job expected of a mold designer is to consider possible alternatives of how the planned mold could look, then make a practical and most suitable layout of a mold to produce the best quality product, at the lowest cost, and finally supply all pertinent information to the mold maker, the machinists, and asssemblers.

With the advent of computer aided designing (CAD), the technique of making mold designs and drawings has become much easier to handle, and in some cases where products are similar, it has become often so simple that the mold design can be performed almost automatically, by just following the prompts of the computer, by recalling older complete or partial designs from the CAD memory, and creating a new mold by just changing some dimensions. If you are brought up in this environment, you may be able to produce good

designs, based on the available good precedents, but you will be hard pressed to generate a good mold for which there is no precedent on file.

I undertook to write this book "Understanding Injection Mold Design" essentially to explain what is really important in the design of an injection mold, so that a good mold, best suitable for the application, can be created even if there is no precedent. It is meant to be used to guide the designer to think, and to frequently ask why, where, when, how, etc., when considering the many possible choices before settling on a final concept. Also, in my experience, the greatest obstacle to creating a good design has always been the reluctance of the designer to acknowledge the possibility that he or she may be wrong, and that there may be a better way than the first one proposed. The designer must never forget, it is always cheaper to change a design layout even if it adds some design time, than to change (re-machine or modify) a poorly designed but already built mold.

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Contents