HANSER

Preface

Natti S. Rao, Nick R. Schott

Understanding Plastics Engineering Calculations

Hands-on Examples and Case Studies

ISBN: 978-3-446-42278-0

For further information and order see

http://www.hanser.de/978-3-446-42278-0

or contact your bookseller.

# Preface

The plastics engineer working on the shop floor of an industry manufacturing blown film or blow-molded articles or injection-molded parts, to quote a few processes, needs often quick answers to questions such as why the extruder output is low or whether he can expect better quality product by changing the resin or how he can estimate the pressure drop along the runner or gate of an injection mold. Applying the state of the art numerical analysis to address these issues is time-consuming and costly requiring trained personnel. Indeed, as experience shows, most of these issues can be addressed quickly by applying proven, practical calculation procedures which can be handled by pocket calculators and hence can be performed right on the site where the machines are running.

The underlying principles of design formulas for plastics engineers with examples have been treated in detail in the earlier works of Natti Rao.

Bridging the gap between theory and practice this book presents analytical methods based on these formulas which enable the plastics engineer to solve day to day problems related to machine design and process optimization quickly. Basically, the diagnostical approach used here lies in examining whether the machine design is suited to accomplish the desired process parameters.

Starting from solids transport, melting and moving on to shaping the melt in the die to create the product, this work shows the benefits of using simple analytical procedures for troubleshooting machinery and processes by verifying machine design first and then,if necessary, optimizing it to meet the process requirements. Illustrative examples chosen from rheology, heat transfer in plastics processing, extrusion screw and die design, blown film, extrusion coating and injection molding, to mention a few areas, clarify this approach in detail.

Case studies related to melt fracture, homogeneity of the melt, effect of extrusion screw geometry on the quality of the melt, classifying injection molding resins on the basis of their flow length and calculating runner and gate pressure drop are only a few of the topics among many, which have been treated in detail. In addition, parametric studies of blown film, pipe extrusion, extrusion coating, sheet extrusion, thermoforming, and injection molding are presented, so that the user is acquainted with the process targets of the calculations.

The same set of equations can be used to attain different targets whether they deal with extrusion die design or injection molds. Practical calculations illustrate how a variety of goals can be reached by applying the given formulas along with the relevant examples.

In order to facilitate easy use, the formulas have been repeated in some calculations, so that the reader need not refer back to these formulas given elsewhere in the book.

This book is an example-based practical tool not only for estimating the effect of design and process parameters on the product quality but also for troubleshooting practical problems encountered in various fields of polymer processing. It is intended for beginners as well as for practicing engineers, students and teachers in the field of plastics engineering and also for scientists from other areas who deal with polymer engineering in their professions.

The Appendix contains a list of easily applicable computer programs for designing extrusion screws and dies. These can be obtained by contacting the author via email (raonatti@t-online.de).

We are indebted to Dr. Guenter Schumacher of the European Joint Research Center, Ispra, Italy for his generous help in preparing the manuscript. Thanks are also due to Dr. Benjamin Dietrich of KIT, Karlsruhe, Germany for his cooperation in writing the manuscript. The fruitful discussions with Dr. Ranganath Shastri of CIATEQ Unidad Edomex, Mexico are thankfully acknowledged.

The permission of BASF SE for using the main library at Ludwigshafen Rhein, Germany is thankfully acknowledged by Natti S. Rao.

*Natti S. Rao*, Ph. D.

*Nick R. Schott*, Ph. D.