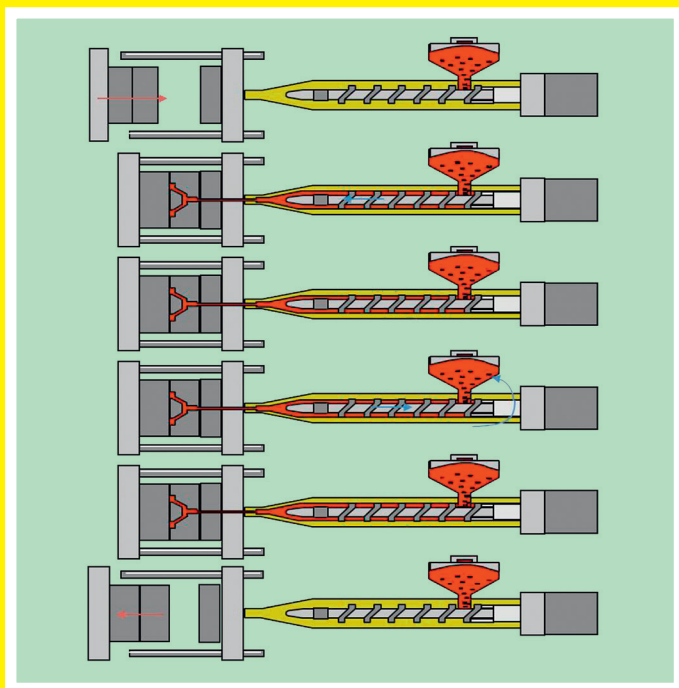


INJECTION MOLDING

PROCESS CONTROL, MONITORING, AND OPTIMIZATION

Yi Yang, Xi Chen, Ningyun Lu, Furong Gao
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**Injection Molding Process Control,
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Injection Molding Process Control, Monitoring, and Optimization

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Distributed in the Americas by:

Hanser Publications

6915 Valley Avenue, Cincinnati, Ohio 45244-3029, USA

Fax: (513) 527-8801

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www.hanserpublications.com

Distributed in all other countries by:

Carl Hanser Verlag

Postfach 86 04 20, 81631 München, Germany

Fax: +49 (89) 98 48 09

www.hanser-fachbuch.de

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Cataloging-in-Publication Data is on file with the Library of Congress

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© Carl Hanser Verlag, Munich 2016

Editor: Cheryl Hamilton

Production Management: Jörg Strohbach

Typesetting: Manuela Treindl, Fürth

Coverconcept: Marc Müller-Bremer, www.rebranding.de, München

Coverdesign: Stephan Rönigk

Printed and bound by Hubert & Co GmbH, Göttingen

Printed in Germany

ISBN: 978-1-56990-592-0

E-Book ISBN: 978-1-56990-593-7

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Foreword

The polymer and plastics industries have had a profound techno-economic impact on society for almost a century. In fact, it has been suggested that the advent and use of polymers and plastics products have represented a revolutionary technological change. They are used in packaging, furniture, construction materials, automotive, aerospace, sporting goods, biomedical, electronics, communications, and so on. More importantly, they have adapted to the ever changing social and technological demands. Thus, many of the current popular products, such as smart phones, computers, and other technological innovations would be difficult to contemplate in the absence of polymers. It does not seem likely that the foreseeable future will see a reduction in the important role that polymers and plastics will play in future technological development.

Cognizant of the role that polymers played and will continue to play in our lives, a group of polymer scientists and engineers from various countries around the world founded the Polymer Processing Society (PPS) in March 1985 at the University of Akron, Akron, Ohio, USA. According to its constitution, the goal of the PPS is to foster scientific understanding and technical innovation in polymer processing by providing a discussion forum in the field for the worldwide community of engineers and scientists. Thus, PPS has attempted to achieve this goal using the following mechanisms:

1. Organization of annual and regional conferences rotating among the various regions of the world and the dissemination of technical content of the conferences in the form of proceedings.
2. The publication of the International Polymer Processing (IPP) Journal.
3. The publication of the Progress in Polymer Processing (PPP) Series.

So far, these activities have allowed the PPS and its members to exchange information and ideas about the evolution of the principles and methods of polymer science and engineering and their application to the generation of innovative products, processes and applications.

Since the formation of PPS, eleven PPP volumes have been published. Four distinguished leaders in the polymer processing field have served as series editors:

Leszek Utracki, Warren Baker, Kun Sup Hyun, and James L. White. Two years ago, in Nuremberg-Germany, I was asked by the Executive of PPS to serve as PPP series editor. At the time, I indicated that with the help of the Advisory Editorial Board, our colleagues in the polymer processing field, and Hanser Publications, we would aim to publish at the rate of about one book every year. So far, we are meeting this goal. Already, we have two books under preparation for publication during the next two years, in addition to discussion with other potential authors/editors for subsequent years. Of course, we would be happy to produce more than one excellent book per year, if the opportunity arises. I encourage prospective authors to contact me or any of the Advisory Board members with their ideas and suggestions.

Injection molding is the most versatile, flexible, and dynamic plastics production operation. It has been used to manufacture products from practically all thermo-plastic polymers, blends, composites, and nanocomposites. The versatile injection molding process can be used to manufacture, repetitively at high rates, products with complex shapes, micro to large sizes, multilayers and colors, with or without inserts. The injection molded products must satisfy a multitude of specifications relating to shape, dimensions, dimensional and shape stability, strength, surface characteristics, and other specifications associated with functionality and the requirements of the intended application. The large number of products, molders, and machinery manufacturers has led to varying types and sizes of machines and to the development of various optimum strategies for manufacturing products meeting the required specifications.

A critical aspect for the success of the injection molding process depends on understanding and control of the various steps of the injection molding process, the thermo-mechanical history experienced by the polymer throughout the process, and the impact of this history on the characteristics of the final product. As many of these interactions and concepts are complex, it is very important to develop a monitoring strategy that permits the identification of the status and responses of the critical process variables. Overall, a successful injection molding process must be coupled to a successful process monitoring, optimization, and control strategy.

In view of the above, it is a pleasure to introduce this year the important book entitled *Injection Molding Process Control, Monitoring, and Optimization*. I am confident that the book will represent a major contribution to the science and practice of injection molding. It should satisfy some of the critical needs of injection molding machine manufacturers, mold and product designers, and molders. Moreover, the book should be helpful to researchers and teachers in the fields of injection molding and process control.

Finally, on behalf of the Polymer Processing Society and the PPP Editorial Advisory Board, I would like to express our sincerest thanks and appreciation to the authors for the intensive effort they made to prepare this valuable and important book.

We owe a lot of thanks to Dr. Mark Smith and Ms. Cheryl Hamilton and other Hanser staff for their efforts to ensure a timely completion of this project and for the organization of the copyediting and production of the book.

Musa R. Kamal

Series Editor

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