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Gas-Assist Injection Molding

Principle and Applications

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Preface

New technologies always attract interest, especially when they promise to solve many of the problems associated with the manufacture of products and performance issues. Gas-assist injection molding is no different. This process has been utilized commercially to produce plastic components for almost 20 years. During this time, it has been clouded in legal disputes and secrecy. In the late 1980s and early 1990s, fear of litigation prevented many companies from using it. Only within the last 5 years have these clouds begun to clear.

My initial exposure to this process was in 1987. At that time, grand claims were made, but applications were mostly of the closed-channel type such as handles. They provided the capability for weight reduction but did little to demonstrate the true value of gas-assist injection molding. Productivity and cost pressures enticed creative product designers and molders to begin using this process. As they became more experienced, the results validated the claims of simplified molds, enhanced product performance, and reduced cost. One of the drawbacks has been the lack of published guidelines for gas-assist injection molding. Unlike injection molding, structural foam molding, and blow molding, few guidelines have been published. This has been partially due to the reluctance of the gas-assist injection molding technology suppliers to give away their ''secrets.'' The feeling is that the technology would be practiced without the proper licenses. Additionally, molders that have invested their resources to develop expertise, are reluctant to ''give it away'' to their competition.

The industry thirst for information on all aspects of this process—design, tooling, process, troubleshooting—resulted in a wide range of courses and seminars, but no in-depth resource. The result is this book: *Designing for Gas-Assist Injection Molding* or *What You Need to Know About Gas-Assist Injection Molding.* The intent is to provide practical information that will help industrial designers, product designers, toolmakers, and molders to design and manufacture higher value, more cost-effective products. It should also benefit students who are interested in plastics product design and processing and product managers and sourcing professionals who need additional information on this process.

I hope that some of my enthusiasm for gas-assist injection molding and the untapped innovation and creativity that it can bring to product design show through. The opportunities are endless. The only limitations are creativity and persistence.

Jack Avery

Acknowledgments

Many individuals have contributed to the development of gas-assist injection molding into a mainstream manufacturing process. Before I acknowledge them, I must acknowledge the contributing chapter authors. It is a tribute to these individuals and to their employers that they found the time to complete this project amid their daily demands. I also want to thank them for their patience as I made liberal use of my editorial license in requesting additional information and clarification in both text and illustration. Their efforts have fulfilled a significant need in the area of gas-assist injection molding as well as filling a gap in the literature on the manufacture of plastic products.

Now, I would like to recognize some of the individuals who played significant roles in the development of gas-assist injection molding technology as we know it today, as well as those that have been instrumental in its acceptance as a commercial manufacturing process. First, the technology developers are Jim Hendry, Inder Baxi, Eric Erickson and Siebolt Hettinga. Next those individuals who were involved in commercialization of this technology are Steve Jordan, John Heasman, Terry Pearson, Ed Hunerberg, Mike Ladney, Tom Betts, Steve Johnson, Steve VanHoeck, Jon Erickson, Bill Nelson, Lih-Sheng Turng, and Giorgio Bertacchi. Finally, those that played significant roles in the use of this technology in applications are Mike Caropreso, Dave Bank, Karl Berdan, and Suresh Shah. This represents only a few of the many individuals who have made contributions. Undoubtedly, this list will increase significantly in the future.

It is also appropriate to recognize two academic groups that are continuing the research efforts in gas-assist injection molding. Professor Dr. Walter Michaeli and students at the Institute of Plastics Processing in Aachen, Germany, have been active in the continued development and the translation of this technology to nontraditional materials and processes. Dr. Taylan Altan and students at The Engineering Research Center for Net Shape Manufacturing at The Ohio State University have been active in characterizing the process, developing, and understanding design guidelines.

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