

INTRODUCTION TO FUNDAMENTALS FOR THE TECHNICIAN



The two fundamental drawers of the Toolbox, *Fundamental Skills and Polymer Science* and *Fundamentals of Machine Operations*, have been included to provide you with an overview of many of the fields that are relevant to understanding how plastics do what they do in the process you are using. The material is applicable to all technicians for all processes. For example, when running an injection molding machine you do not just push the “on” button, pour in the raw materials and hold your breath in the brave hope that nothing goes wrong. You need to possess an intimate understanding of your process and your materials. This intimate understanding is a huge task to approach from the outside.

To begin with, you need to have an historical reference of how the product and process was built through designed experiments. You should also understand the fundamental properties of the material you are molding so you need to know a little bit about polymer chemistry and fluid dynamics. You need to understand how the injection molding equipment works, how a computer is used in manufacturing with your process and how a mold clamps at the pressures it does. Therefore, you should understand the principles of electricity, circuitry, computer integrated manufacturing and hydraulics. It is useful to understand how materials cool, so you will need to look at heat transfer from your plastic

and through your cooling medium. You are naturally concerned about the quality of the material that you produce and the meaning of the quality parameters tested at your site. So, the understanding of quality systems and plastics testing are critical to your understanding of the whole process.

Since you are also responsible for handling the issues that arise during production, you should be aware of methods for solving problems encountered during your day with your process and the details of how to know more about your equipment through print reading. And to implement your learnings, you must have the language of mathematics to assist in your interpretation and comprehension of the process you are responsible for. And hovering above it all like a large umbrella is the issue of safety—your success on the job includes every member of your operation making it home safely!

As you see, this understanding requires an enormous amount of learning! Since it is such an immense undertaking to learn all the facets of your process, we have designed these fundamental drawers in this toolbox for you! Each section is written by professionals who are passionate about their content and who have had experience on the floor, with the material. We recommend that you treat the Fundamentals drawers as a resource. It has been shown, over and

over again, that information is retained and successfully utilized when there is a specific question at hand. (For an analogy—how much do you learn by reading a VCR manual from cover to cover? What about when you are trying to figure out how to record from the television when you are watching a different show?) When you have a question, read the chapter that is relevant to your question. Just a warning, what is likely to happen is that as you learn more you will discover you have even more questions meaning that you will need to read even more! A vicious cycle—but imagine the benefits!

The two drawers have been separated into *Fundamental Skills and Polymer Science* and *Fundamentals of Machine Operations* on the premise that there are things that are just fundamental to using plastics and others that are fundamental to using machines. In the drawer *Fundamental Skills and Polymer Science*, the

following topics are covered: mathematics, problem solving, experimental design, polymer chemistry and testing, quality, and computer integrated manufacturing. In the *Fundamentals of Machine Operations* drawer, you will find information on: safety, heat transfer, print reading, electricity, fluid dynamics, hydraulics and circuits. There could be many arguments over why a chapter was put in one drawer and not another, but this ordering was a compromise made amongst us all with the goal of trying to best arrange the information for you, the reader.

We wish you the best of success with your work and your learnings and hope that your time spent with the Toolbox is both personally and professionally rewarding.

Plastics Technician's Toolbox®
Steering Committee and Technical Editors

