Chapter 10
TESTING/QUALITY CONTROL

INTRODUCTION

Processors should keep quality under control and demand consistent materials that can be used with a minimum of uncertainty. Plant quality control (QC) is as important to the end result as selecting the best processing conditions with the correct grade of plastic, in terms of both properties and appearance. After the correct plastic has been chosen, its bleeding, reprocessing, and storage stages of operation need to be frequently or continuously updated. The processor should set up specific measurements of quality to prevent substandard products from reaching the end user (1-2, 290-316).

The properties of plastics are directly dependent on temperature, time, and environmental conditions, and these conditions can be related to raw material, processing, and part performance (Chapter 1). The most important testing is that done on the finished part. In turn, tests done on materials and during processing all must be related to part performance.

Unfortunately there is no single set of rules designating which tests are to be conducted in order to manufacture a part repeatedly with zero defects. The tests depend on the required performance. For example, if a part is to operate where any type of failure could be catastrophic to life, then extensive and usually expensive testing is necessary. This chapter has been prepared to make processors aware of some of the different tests that are available. How deeply one gets involved depends on the performance requirements. If all that is required is to weigh the part, that is all that one does.

Testing and QC are the most discussed but often the least understood facets of business and manufacturing. Many companies spend a high percentage of each sales dollar on QC. Usually it involves the inspection of components and parts as they complete different phases of processing. Parts that are within specifications proceed, while those that are out of spec are
either repaired or scrapped. The workers who made the out-of-spec parts are notified that they produced defective parts, and that they should correct “their” mistakes.

The approach just outlined is after-the-fact QC; all defects caught in this manner are already present in the part being processed. This type of QC will usually catch defects, and it is necessary, but it does little to correct basic problems in production. One of the problems with add-on QC of this type is that it constitutes one of the least cost-effective ways of obtaining a high-quality part. Quality must be built into a product from the beginning (as illustrated in Fig. 1-1); it cannot be “inspected” into the process. The closest any add-on, after-the-fact quality control can come to improving the quality built into a part is to point out processing defects to the departments or persons responsible for them. The object instead should be to control quality before a part becomes defective.

There are many different approaches to setting up QC. For example, mechanical properties can be considered the most important of all properties, and there are many factors that determine the mechanical behavior of plastics. As reviewed throughout this book, the factors that influence properties include the resin composition (fillers, molecular weight distribution, morphology, etc.), the processing method and machine controls, the capability of auxiliary equipment, and part performance requirements.

Considering what the critical areas of a process are, one can understand that sometimes a test or measurement of resin viscosity is all that is needed.

Industry specifications and standards are continually updated to aid processors in controlling quality and to meet safety requirements, and they are very useful to anyone who must choose tests and QC procedures. For example, ASTM and UL tests are among the most important tests. Organizations involved in specifications and standards preparation include the following:

ASTM: American Society for Testing and Materials (see reference 290)
UL: Underwriters’ Laboratories (see reference 291)
ACS: American Chemical Society
ANSI: American National Standards Institute
ASCE: American Society of Chemical Engineers
ASM: American Society of Metals
ASME: American Society of Mechanical Engineers
AWS: American Welding Society
BMI: Battele Memorial Institute
BSI: British Standards Institute
CSA: Canadian Standards Association
DIN: Deutsches Institut fur Normung, West Germany