Introduction

The problem of manufacturing high-quality parts at low cost confronts many companies. The cost of processing information required in the manufacturing process is substantial. With the introduction of computer-aided manufacturing, computer-aided process planning, and flexible manufacturing systems, the need for accurate, reliable process and equipment data is great. This chapter describes some of the factors involved in process planning, illustrates the detailed knowledge required to perform typical precision grinding operations, and describes computer-generated grinding cycles and multioperation grinding.

The Grinding Process-Planning Problem

The process-planning problem starts with the part print or data base prescribing the part dimensions, the tolerances, requirements for concentricity, roundness, cylindricity or flatness, squareness, surface finish, surface integrity, cycle time, and production requirements. Those “software data” or geometric part-print data must be processed to select the appropriate machine tool(s), grinding cycle parameters, and inspection equipment to produce “hard finished parts” satisfying all of the imposed specifications, as illustrated in Fig. 1.1. Each machine tool/equip-
ment must be set up. Then, on each setup, for example, Setup No. 2, 1 or more operations may be performed. Each operation, in turn, requires a data processor, which converts the geometric part-print specs into feeds and speeds. Those data must then be fed to the machine tool (grinder) controller. In the case of a typical grinding machine, the relationships between the machine characteristics, the grinding-process characteristics, and the machine input variables are indicated in Fig. 1.2. Accordingly, the task for the machine tool information processor (performed by humans or computer) is to generate the proper feeds and speeds for the grinding-machine controller based upon a knowledge of the machine-tool characteristics, Grinding-Process Characteristics, and Workpiece random variables, as illustrated in Fig. 1.2.

**Grinding-Process Variables**

In planning grinding operations it is necessary to define the various inputs and outputs and to develop relationships between them. In order