

Inferential Control

CHAPTER

17

17.1 ■ INTRODUCTION

In all of the control methods considered to this point, the important variables have been measured, a situation which is desirable and most often possible. However, not all important variables can be measured in real time, that is, fast enough that timely control actions can be based on their measurements. There are various reasons for the lack of key measurements. First, some sensitive analyses have not been sufficiently automated to provide accurate, reliable measurements without human management of the procedure; thus, these measurements can be obtained only infrequently from a laboratory. There are even some properties that cannot be determined from intermediate material properties in a plant. Usually, these properties relate to the final use of the material; for example, some qualities of products such as soap, food products, or polymers depend on their application as final products and cannot be measured until the products are formulated and used. Second, even if the real-time measurement is possible, the cost of installing a sensor in the plant may not be justified by the potential benefits derived from the additional sensor, especially considering the alternative methods in this chapter. The cost is not typically high for conventional sensors for measuring temperature, pressure, flow, and level, but it may be prohibitive for an expensive analyzer with sample system and ongoing maintenance. Third, the sensor may not provide information in a timely manner. There are several reasons for slow feedback; for example, the analyzer may have a very long dead time because it must be located far downstream. Also, an analyzer may have a long processing time—one hour or longer—which would delay the feedback information. Finally, there may be no directly measurable