

Introduction to Process Control

CHAPTER

1

1.1 ■ INTRODUCTION

When observing a chemical process in a plant or laboratory, one sees flows surging from vessel to vessel, liquids bubbling and boiling, viscous material being extruded, and all key measurements changing continuously, sometimes with small fluctuations and other times in response to major changes. The conclusion immediately drawn is that the world is dynamic! This simple and obvious statement provides the key reason for process control. Only with an understanding of transient behavior of physical systems can engineers design processes that perform well in the dynamic world. In their early training, engineering students learn a great deal about steady-state physical systems, which is natural, because steady-state systems are somewhat easier to understand and provide appropriate learning examples. However, the practicing engineer should have a mastery of dynamic physical systems as well. This book provides the basic information and engineering methods needed to analyze and design plants that function well in a dynamic world.

Control engineering is an engineering science that is used in many engineering disciplines—for example, chemical, electrical, and mechanical engineering—and it is applied to a wide range of physical systems from electrical circuits to guided missiles to robots. The field of *process control* encompasses the basic principles most useful when applied to the physicochemical systems often encountered by chemical engineers, such as chemical reactors, heat exchangers, and mass transfer equipment.