

# The PID Algorithm

## CHAPTER

# 8

### 8.1 ■ INTRODUCTION

Continuous feedback control offers the potential for improved plant operation by maintaining selected variables close to their desired values. In this chapter we will emphasize the control algorithm, while remembering that all elements in the feedback loop affect control performance. Engineers should fully understand the algorithm for three reasons. First, the performance of the entire feedback system depends on the structure of the algorithm and the parameters used in the algorithm. Second, all other elements are process equipment and instrumentation, which are costly and time-consuming to alter, so a key area of flexibility in the loop is the control calculation. Third, while engineers use only a few algorithms, as will be explained, they are responsible for determining the values of adjustable parameters in the algorithms.

In this chapter, we will learn about the *proportional-integral-derivative* (PID) control algorithm. The PID algorithm has been successfully used in the process industries since the 1940s and remains the most often used algorithm today. It may seem surprising to the reader that one algorithm can be successful in many applications—petroleum processing, steam generation, polymer processing, and many more. This success is a result of the many good features of the algorithm, which are covered initially in this chapter and expanded on and evaluated in later chapters.

This algorithm is used for single-loop systems, also termed single input–single output (SISO), which have one controlled and one manipulated variable. Usually, many single-loop systems are implemented simultaneously on a process,