Feedforward Control

CHAPTER 15

15.1 ■ INTRODUCTION

Feedforward uses the measurement of an input disturbance to the plant as additional information for enhancing single-loop PID control performance. This measurement provides an "early warning" that the controlled variable will be upset some time in the future. With this warning the feedforward controller has the opportunity to adjust the manipulated variable before the controlled variable deviates from its set point. Note that the feedforward controller does not use an output of the process! This is the first example of a controller that does not use feedback control; hence the new name *feedforward.* As we will see, feedforward is usually combined with feedback so that the important features of feedback are retained in the overall strategy.

Feedforward control is effective in reducing the influences of disturbances, although not usually as effective as cascade control with a fast secondary loop. Since feedforward control also uses an additional measurement and has design criteria similar to cascade control, engineers often confuse the two approaches. Therefore, the reader is urged to master the design criteria for feedforward control introduced in this chapter and be able to distinguish between opportunities for cascade and feedforward designs.

15.2 ■ AN EXAMPLE AND CONTROLLER DERIVATION

The process example used in this introduction is the same stirred-tank heat exchanger considered in Chapter 14 for cascade control. The control objective is still