

# Multiloop Control: Effects of Interaction

## CHAPTER

# 20

### 20.1 ■ INTRODUCTION

Multivariable control occurs in nearly all processes, because production rate (flow), inventory (level and pressure), process environment (temperature), and product quality are normally controlled simultaneously. The *multiloop* approach, using multiple single-loop controllers, was the first approach used for multivariable control in the process industries. Through decades of research and experience, many successful multiloop strategies have been developed and continue to be used.

One advantage of multiloop control is the use of simple algorithms, which is especially important when the control calculations are implemented with analog computing equipment. A second advantage is the ease of understanding by plant operating personnel, which results from the simplicity of the control structure. Since each controller uses only one measured controlled variable and adjusts only one manipulated variable, the actions of the controllers are relatively easy to monitor. A third advantage is that standard control designs have been developed for the common unit operations, such as furnaces, boilers, compressors, and simple distillation towers. This does *not* mean that a single control design functions well for all unit operations of the same type. However, several general structures are in common use, and selection among alternatives can be based on analysis and experience. Considering these advantages, one could conclude that multiloop designs will continue to be used extensively, although not exclusively.

An example of multiloop control of a flash process is given in Figure 20.1. Let us consider the behavior of the system when the feed flow rate increases. An initial effect is an increase in the amount of vapor entering the drum, although the