

Centralized Multivariable Control

CHAPTER

23

23.1 ■ INTRODUCTION

The first three chapters in this section on multivariable control retained the proportional-integral-derivative (PID) control algorithm. This approach is generally preferred for its simplicity when it provides good performance, which is often the case. However, some especially challenging process control objectives are difficult or impossible to achieve using multiloop PID control. In this chapter, one centralized method for controlling multiple input-output processes is introduced. The term *centralized* denotes a control algorithm that uses all (process input and output) measurements simultaneously to determine the values of all manipulated variables. In contrast, multiloop control, also called *decentralized* control, involves many algorithms, with each using only one process output variable to determine the value of one manipulated variable. Further discussions on the need for centralized control are presented in Cutler and Perry (1983) and Prett and Garcia (1988).

In addition to all measurements, centralized controllers use a dynamic model of the process in the control calculation. The most common approach to using a model explicitly in the control calculation is the model predictive control structure described in Chapter 19. Since the discussions in this chapter are based on an understanding of the model predictive structure, the reader is advised to review Chapter 19 thoroughly before proceeding with this chapter.

This chapter begins with a straightforward extension of the model predictive controller to a multivariable system. This extension demonstrates the limitations in applying the analytical model inverse, which was easily determined for single-variable systems, to the multivariable case. Then, one approach to determining a