

Determining Controller Constants to Satisfy Performance Specifications

APPENDIX

E

This appendix presents a procedure for determining the tuning constants for feedback controllers that satisfy robust, time-domain performance specifications. The specifications involve the behavior of the controlled and manipulated variables and include measurement noise and variable process dynamics, as defined in Table 9.1. Because the goals are formulated to minimize the controlled-variable IAE subject to limitation on the manipulated-variable values, the tuning constants are determined using optimization principles. It is not possible to derive analytical expressions relating the tuning constants to the IAE and manipulated-variable transient response; therefore, the control system performance is determined by numerical solution of the model, and the best tuning values are determined using an optimization method.

E.1 ■ SIMULATION OF THE CONTROLLED SYSTEM TRANSIENT RESPONSE

The single-loop control system considered in this appendix is shown in Figure E.1. The real system consists of elements that are continuous and cannot be solved analytically. As an approximation, the closed-loop transient is determined by numerical solution of the equations that define the system. As discussed in