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Cover; Title page; Copyright page; Contents; Preface; 1: Introduction; 1.1. Categories of Processes; 1.1.1. Continuous Processes; 1.1.2. Batch Processes; 1.1.3. Semi-Batch Processes; 1.2. The Industry; 1.2.1. Intellectual Property; 1.2.2. Manual Operations; 1.2.3. Driving Force for Change; 1.2.4. Product Specifications; 1.2.5. Automation Technology for Batch; 1.2.6. Safety and Process Interlocks; 1.2.7. Safe State; 1.2.8. Safety Issues Pertaining to the Product; 1.3. The Ultimate Batch Process: The Kitchen in Your Home; 1.3.1. Recipe from a Cookbook; 1.3.2. Home Kitchen versus Commercial Bakery; 1.4. Categories of Batch Processes; 1.4.1. Cyclical Batch; 1.4.2. Multigrade Batch; 1.4.3. Flexible Batch; 1.5. Automation Functions Required for Batch; 1.5.1. Basic Regulatory Control; 1.5.2. Discrete Device Drivers; 1.5.3. Step Programmers; 1.5.4. Sequence Logic; 1.5.5. Recipe Management; 1.5.6. Production Control; 1.5.7. Scheduling; 1.5.8. Software Issues; 1.6. Automation Equipment; 1.6.1. Analog; 1.6.2. Hardwired Logic; 1.6.3. Distributed Control System (DCS); 1.6.4. Programmable Logic Controller (PLC); Reference; 2: Measurement Considerations; 2.1. Temperature Measurement; 2.1.1. Resistance Temperature Detectors (RTDs); 2.1.2. Thermocouples; 2.1.3. Thermistors; 2.1.4. Thermowells; 2.1.5. Accuracy versus Repeatability; 2.1.6. Multiple Probes; 2.2. Pressure Measurement; 2.2.1. Atmospheric; 2.2.2. Vacuum; 2.2.3. Establishing Vacuum; 2.2.4. Flow to Vacuum System; 2.2.5. Pressure as a Function of Time; 2.2.6. Valve Opening as a Function of Pressure; 2.2.7. Leaking Agitator Seal; 2.3. Weight and Level; 2.3.1. Level; 2.3.2. Load Cells; 2.3.3. Noise; 2.3.4. Lag Filters; 2.3.5. Material Transfers; 2.3.6. Noise on Vessel Weight Measurement; 2.3.7. Moving Average Filter; 2.3.8. Vessel Weight during a Material Transfer; 2.3.9. Least Squares Filter; 2.4. Flow Measurements; 2.4.1. Mass Flow; 2.4.2. Coriolis Meters; 2.4.3. Density; 2.4.4. Heating or Cooling Media Flows; 2.4.5. Coriolis Meters versus Load Cells; 2.5. Loss-in-Weight Application; 2.5.1. Weight to Flow; 2.5.2. Exponential Smoothing; 2.5.3. Least Squares Filter; 2.5.4. Control Alternatives; References; 3: Continuous Control Issues; 3.1. Loops That Operate Intermittently; 3.1.1. Zero Flow; 3.1.2. Stopping the Flow; 3.1.3. Final Control Element Issues; 3.1.4. Flow Measurement Issues; 3.1.5. Discrete Logic; 3.1.6. Windup in Flow Controller; 3.2. Emptying a Vessel; 3.2.1. Feed Tank; 3.2.2. Ascertaining That a Vessel Is Empty; 3.2.3. Driving Force for Fluid Flow; 3.2.4. Transfer Piping; 3.3. Terminating a Co-Feed; 3.3.1. Ratio to Master Flow Set Point; 3.3.2. Terminating Master Flow But Not Co-feed Flows; 3.3.3. Cross-Limiters; 3.4. Adjusting Ratio Targets; 3.4.1. Interval for Taking Corrective Actions; 3.4.2. Flow Meter Deemed to Be Most Accurate; 3.4.3. Weight Measurement Deemed to Be Most Accurate; 3.4.4. Compensating Ratio Targets; 3.4.5. Flow Correction Factors

Gives a real world explanation of how to analyze and troubleshoot a process control system in a batch process plant Explains how to analyze the requirements for controlling a batch process, develop the control logic to meet these requirements, and troubleshoot the process controls in batch processes Presents three categories of batch processes (cyclical batch, multigrade facilities, and flexible batch) and examines the differences in the control requirements in each Examines various concepts of a product recipe and what its nature must be in a flexible batch facility