Module # 1.5

INTRODUCTION
Process Control: Major Steps

Lectures on

CHEMICAL PROCESS CONTROL
Theory and Practice

Formulating a Control Problem

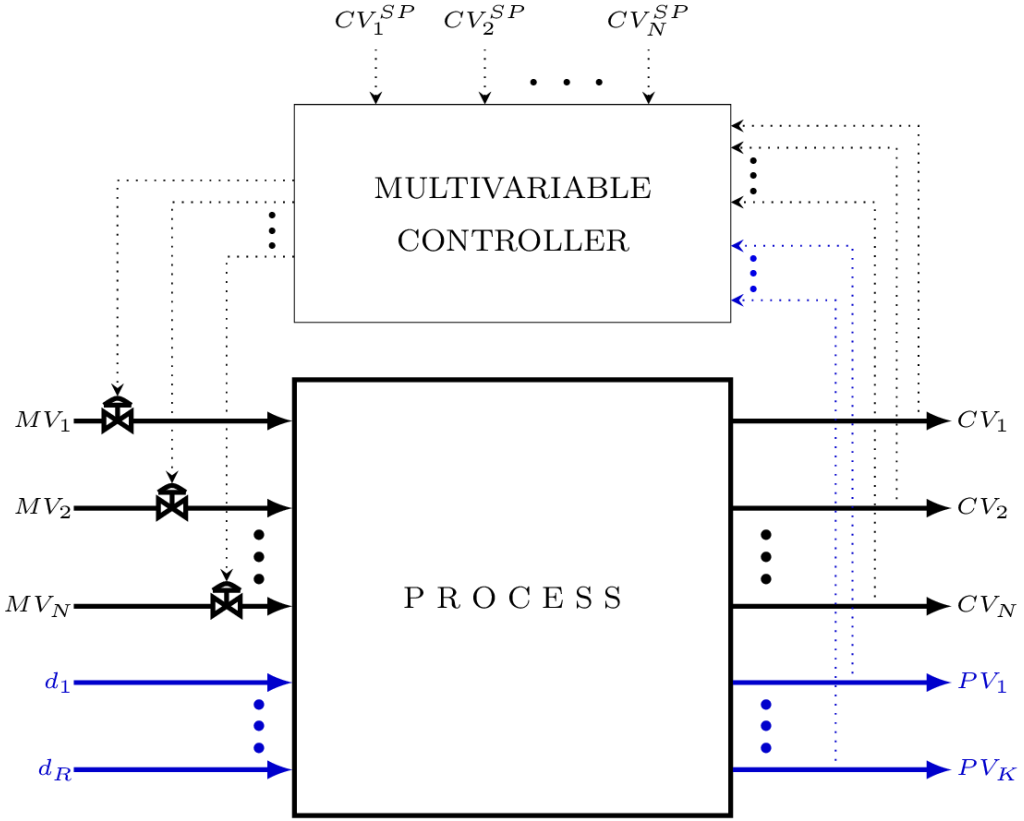
- Concretize an abstract idea into quantifiable metrics
  - User comfort = ‘Right’ temperature and humidity
- Clearly articulate desired state of output PVs
  - What PVs to control
  - Setpoints and acceptable deviation around setpoints
- Properly account for control dofs
  - Gets complicated for chemical processes
- One MV controls one CV
  - Controlled PV may shift from one to another PV
- Clearly prioritize control objectives
  - # of constraints >> # of MVs
  - Fixes what PVs are controlled and what PVs float

Solving the Control Problem

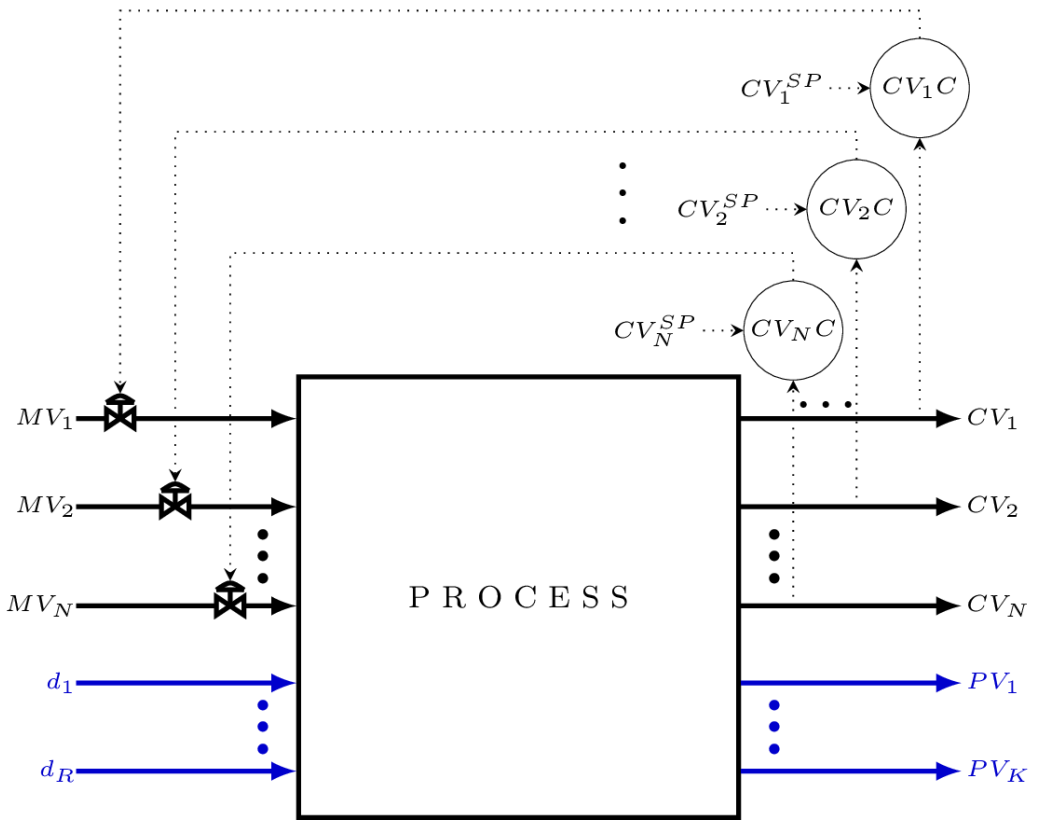
- Control a PV using an MV with ‘strong’ and ‘predictable’ response
  - Close-by pairing
- Use output PV feedback for control
- Prefer simplest control system that achieves the objectives
  - Simple is robust
  - Complex is fragile
  - Multiple SISO controllers with enhancements
- Control using PV feedback is simple and effective
- Good economics = Proper choice of CVs and setpoints
  - Active constraints
  - Invariants

Centralized vs Decentralized Control

CENTRALIZED CONTROL



DECENTRALIZED CONTROL



ENHANCED DECENTRALIZED CONTROL

Decentralized + local enhancements (feedforward, model based etc)

Enhanced Decentralized Control

- Formulation of Prioritized Control Objectives
  - What PVs to control
  - Degree-of-tightness of control (loose vs tight)
  - Prioritization
- Enhanced Decentralized Control System Design
  - Control structure design (CV-MV pairing)
  - Targeted enhancements to decentralized control structure
  - Individual controller design (algorithm and parameter tuning)
- Process understanding is the key to good control