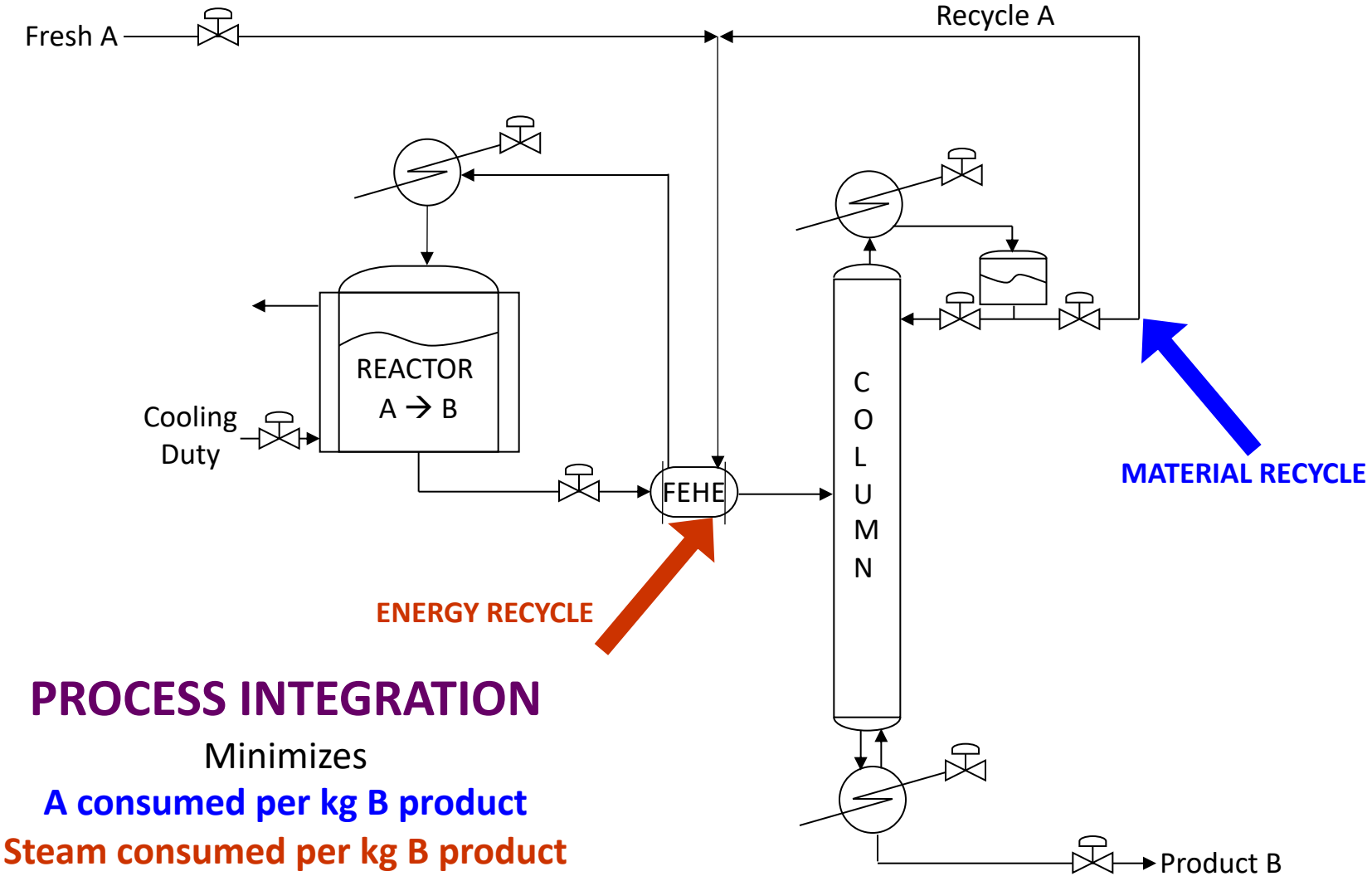
Module # 1.6

INTRODUCTION
Chemical Process Control

Lectures on

CHEMICAL PROCESS CONTROL
Theory and Practice

A Simple Chemical Process



PROCESS INTEGRATION

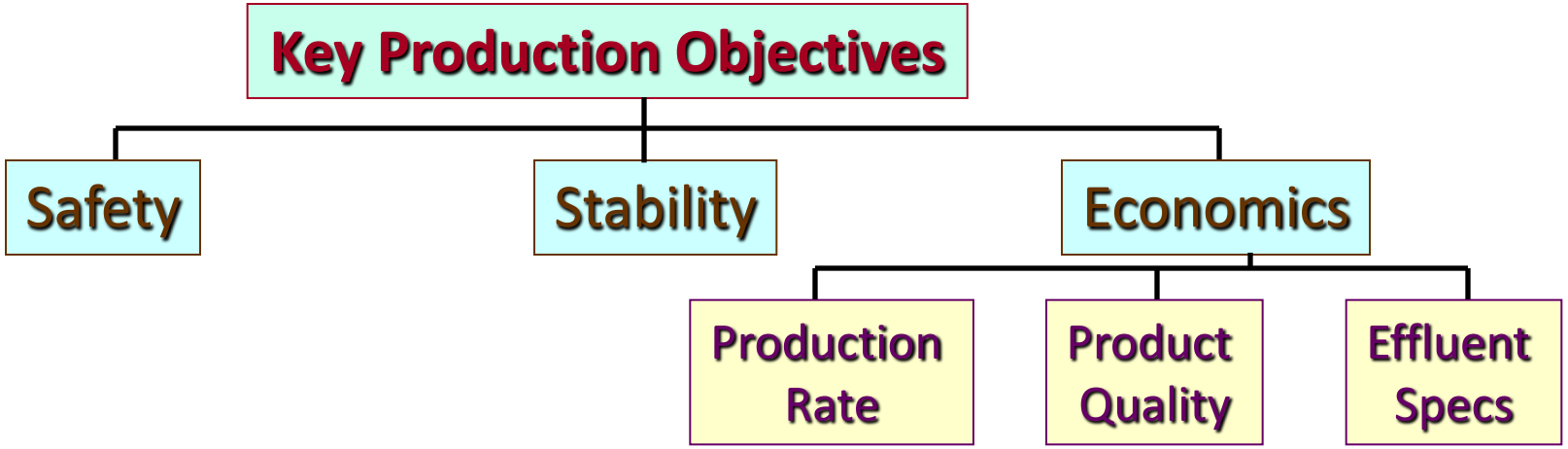
Minimizes

A consumed per kg B product

Steam consumed per kg B product

ENHANCES PROCESS PROFITABILITY

Chemical Process Operation



Operate plant to meet production objectives 24X7

Production Objective Itself Can Change

Process Disturbances

- Ambient Conditions
- Raw material Quality
- Sensor Noise
- Equipment Characteristics

Process Control: Basic Objectives

Safety

Stability

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Operate Process at Steady State

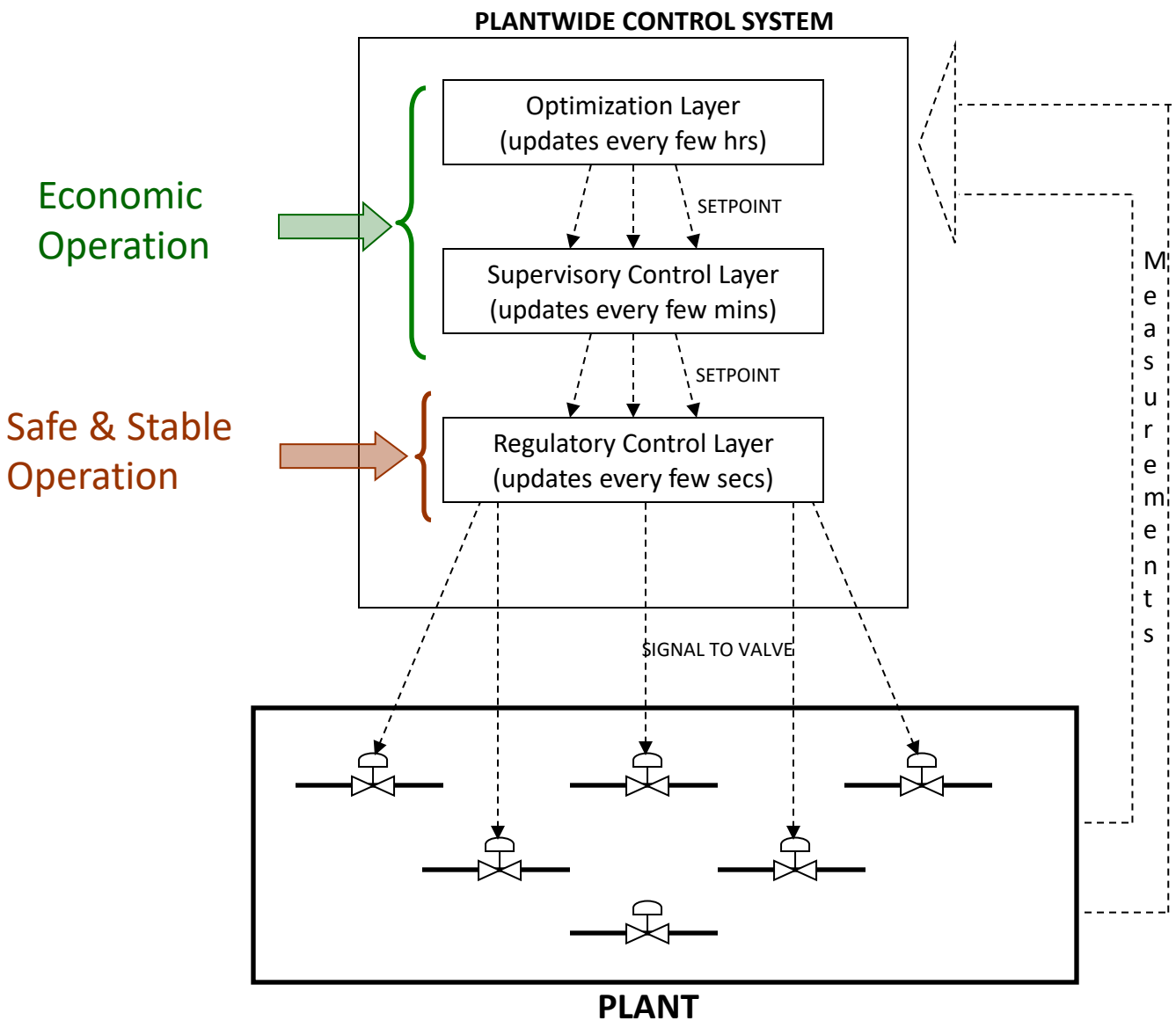
Need control system to drive accumulation of all independent inventories to zero

PWC Basics

- Regulatory Control System
  - Drives all inventory accumulation terms to zero
  - Ensures plant operation around a steady state

- What steady state to operate at
  - Economic Optimum
    - Minimize expensive utility consumption
    - Maximize production

Plantwide Control Hierarchy



Process Control System Design: Key Issues

- Why
  - Stabilization (safety and stability)
  - Economic optimal operation
- What to control
  - Independent inventories
  - Key indicators that ensure economic operation
    - Not a trivial problem (e.g. marathon run vs 100 m sprint)
- What to manipulate
  - Too many options unlike aero or mech systems

} Requires process understanding

- Quantitative algorithms for manipulation

} Control Theory

Course Outline

- Control Theory
  - Material available in all text books
- Control Structure Synthesis
  - What to control and why
  - What to manipulate and why
  - Much more obscure

- This course covers both aspects in sufficient detail

Example Cumene Process