

# Multi-Product Batch Plant

From: VHS CS 7

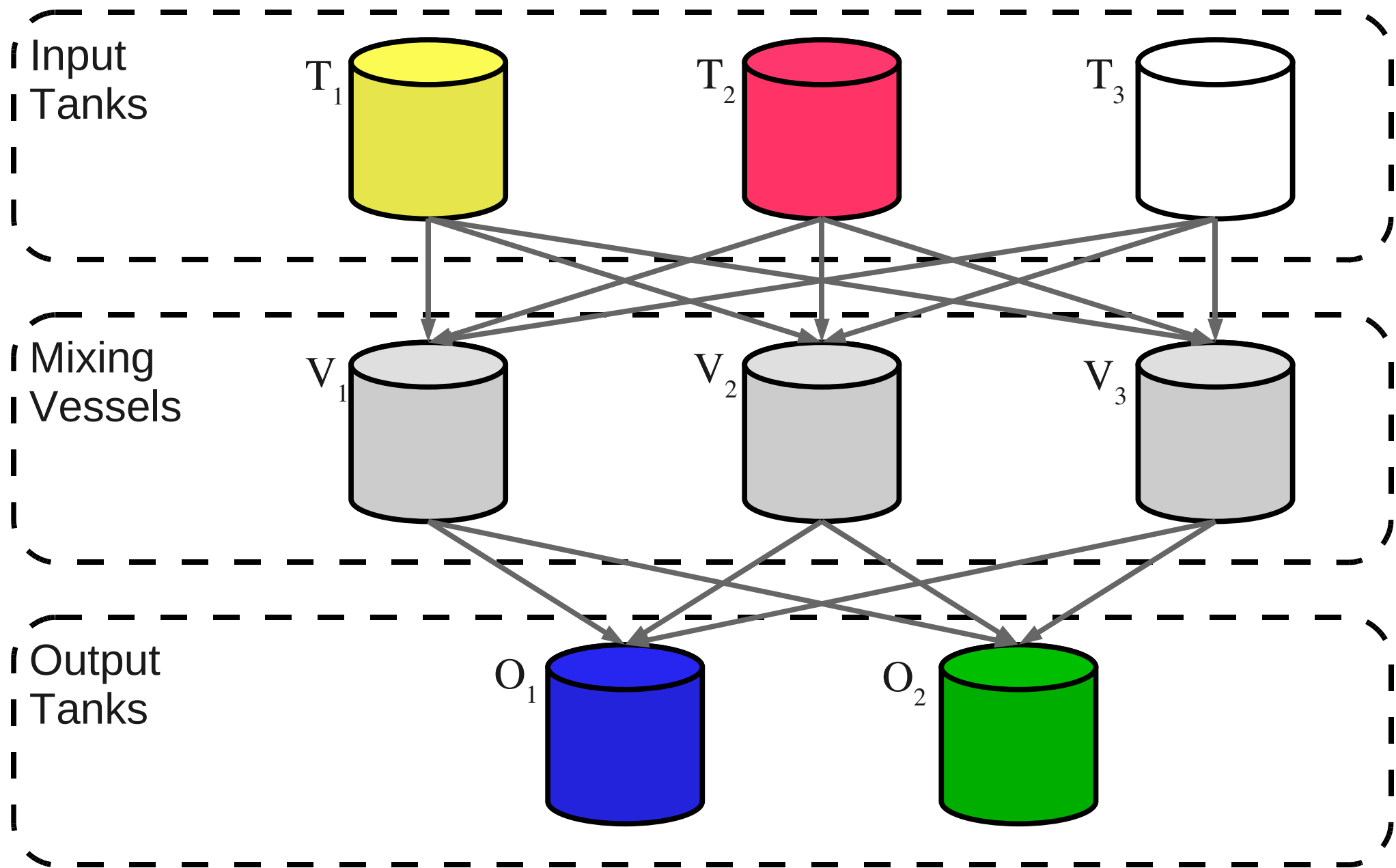
Purpose: Scheduling & Control

Jakob Illum Rasmussen  
Uli Fahrenberg



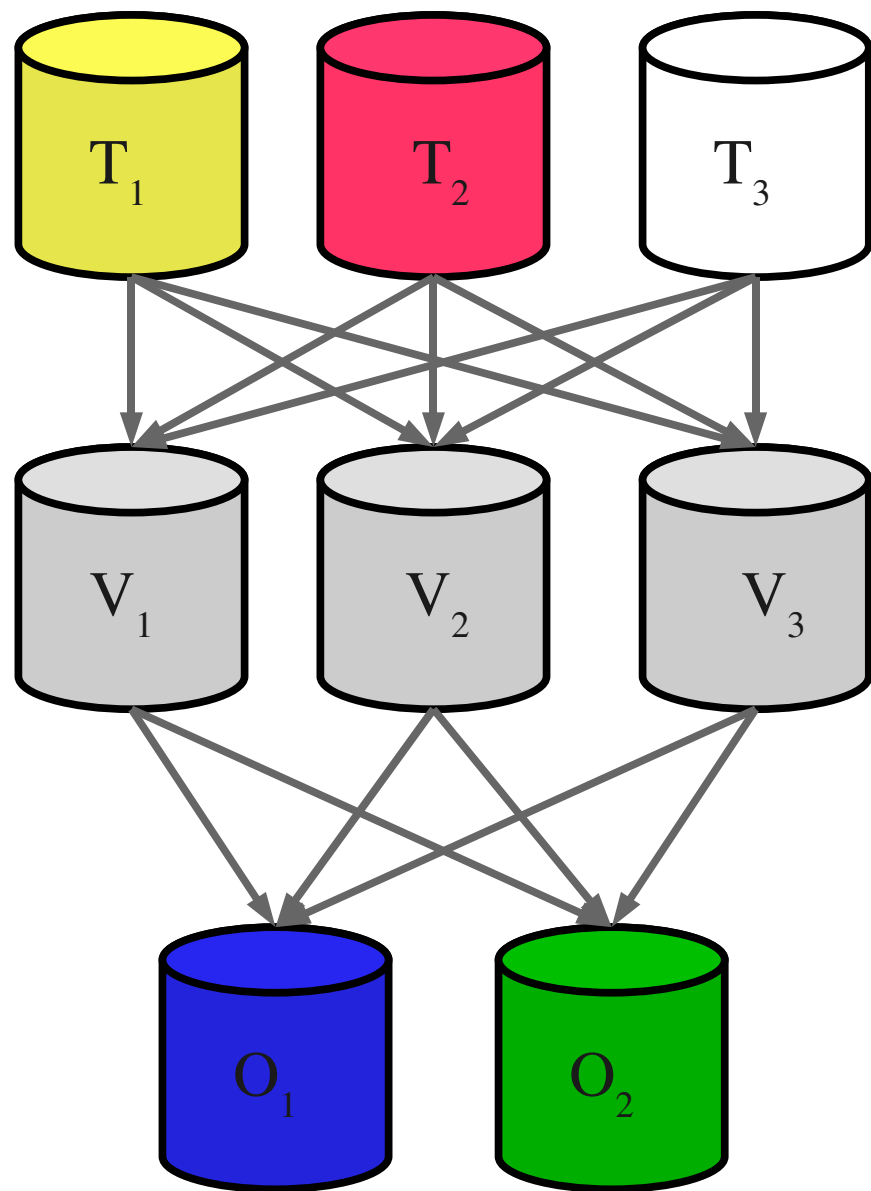
DaNES Mini-case workshop  
SDU, 12 March 2009

# Multi-product batch plant



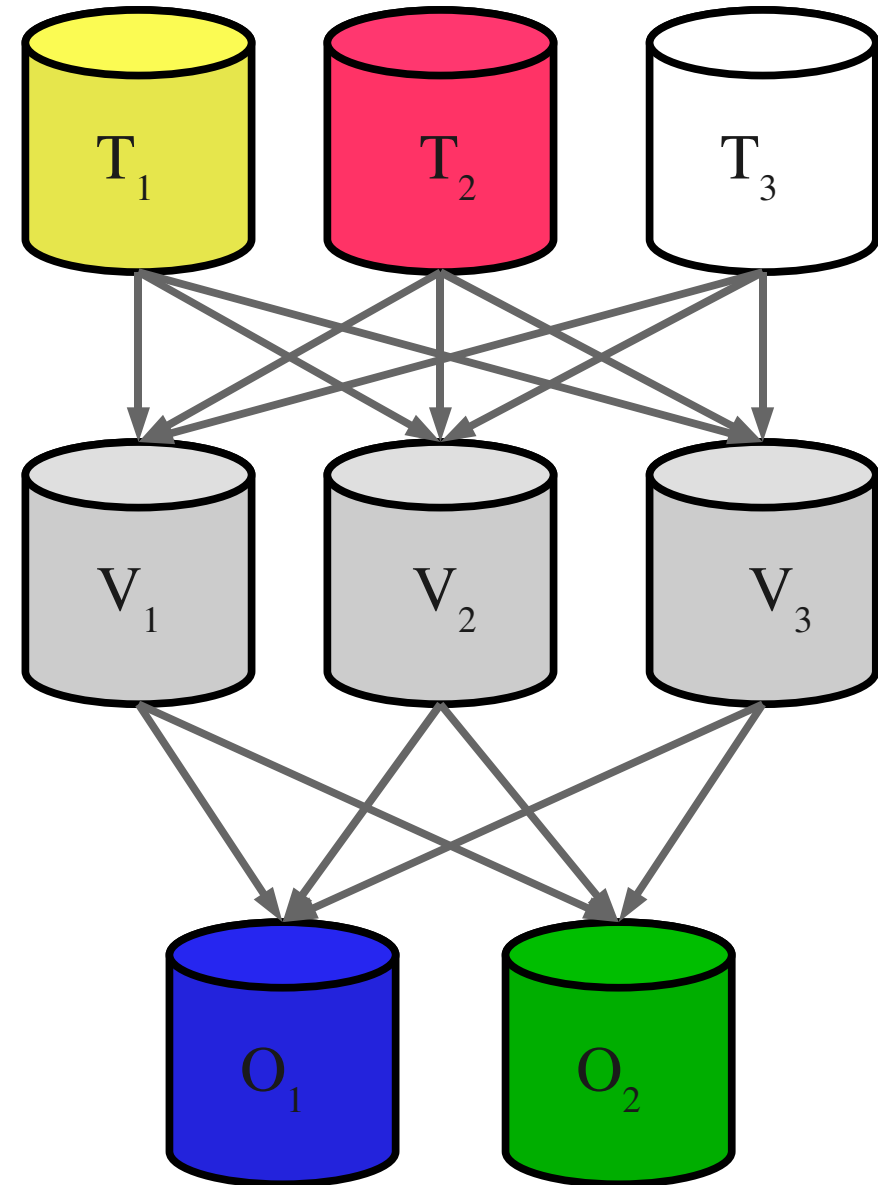
# Transfer time per batch

From	To	Time (s)
Out	T1	12
	T2	12
	T3	12
T1	V1	15
	V2	12
	V3	12
T2	V1	11
	V2	13
	V3	14
T3	V1	10
	V2	9
	V3	13
V1	O1	12
	O2	13
V2	O1	12
	O2	12
V3	O1	12
	O2	12
O1	Out	10
O2	Out	10



# Capacity constraints

	Batches
T1	2
T2	2
T3	2
V1	2
V2	2
V3	2
O1	6
O2	6



# Control problem

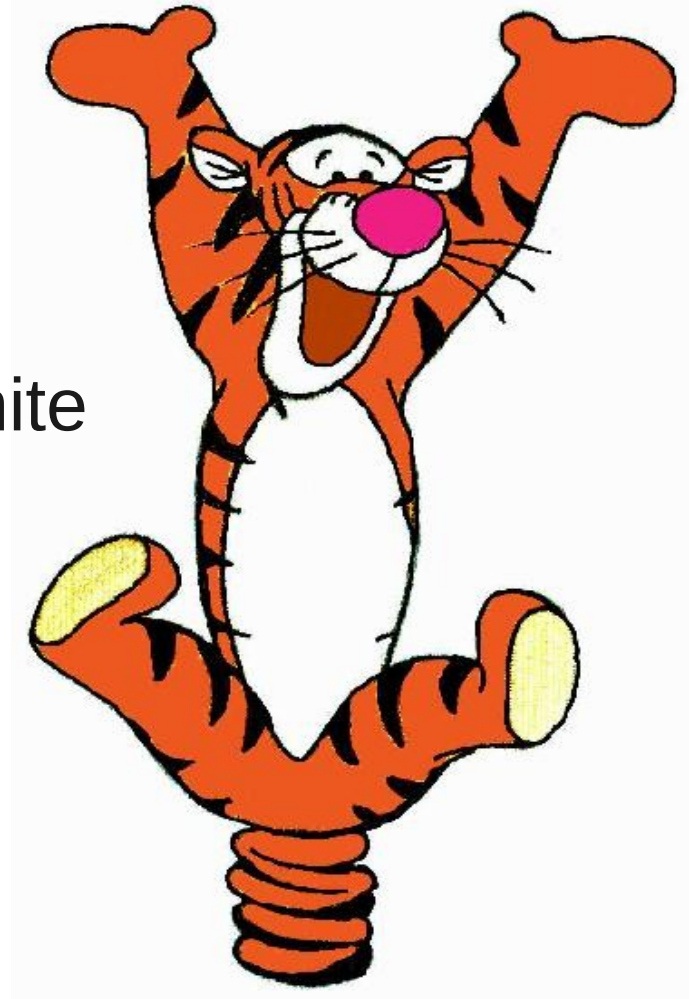
- **Problem:** Maintain neither underflow nor overflow of blue and green
- **Constraints:**
  - Pump flow or “open” flow
  - Release times for red, yellow, and white

# Scheduling problem

- **Problem:** Demands for blue and green are given for points in time
- **Constraints:** Release times for red, yellow, and white
- **Optimization:** Penalty for too late (or too early!) release of product

# Control problem: approach

- **Problem:** Maintain neither underflow nor overflow of blue and green
- **Constraints:**
  - Pump flow or “open” flow
  - Release times for red, yellow, white
- **Approach:**
  - Uppaal TIGA model
  - Use for controller generation



# Scheduling problem: possible approach

- **Problem:** Demands for blue and green are given for points in time
- **Constraints:** Release times for red, yellow, and white
- **Optimization:** Penalty for too late (or too early!) release of product
- **Approach:** **Priced timed games**
- **Theory & tool support:** Work in progress...
  - Undecidability; approximation