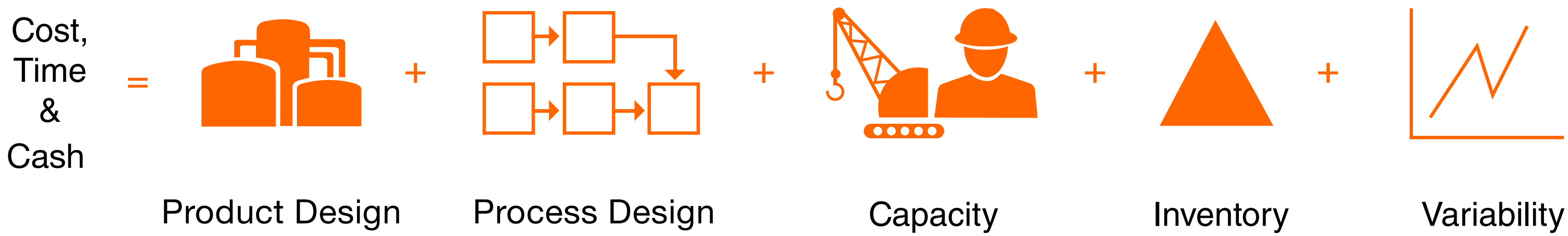
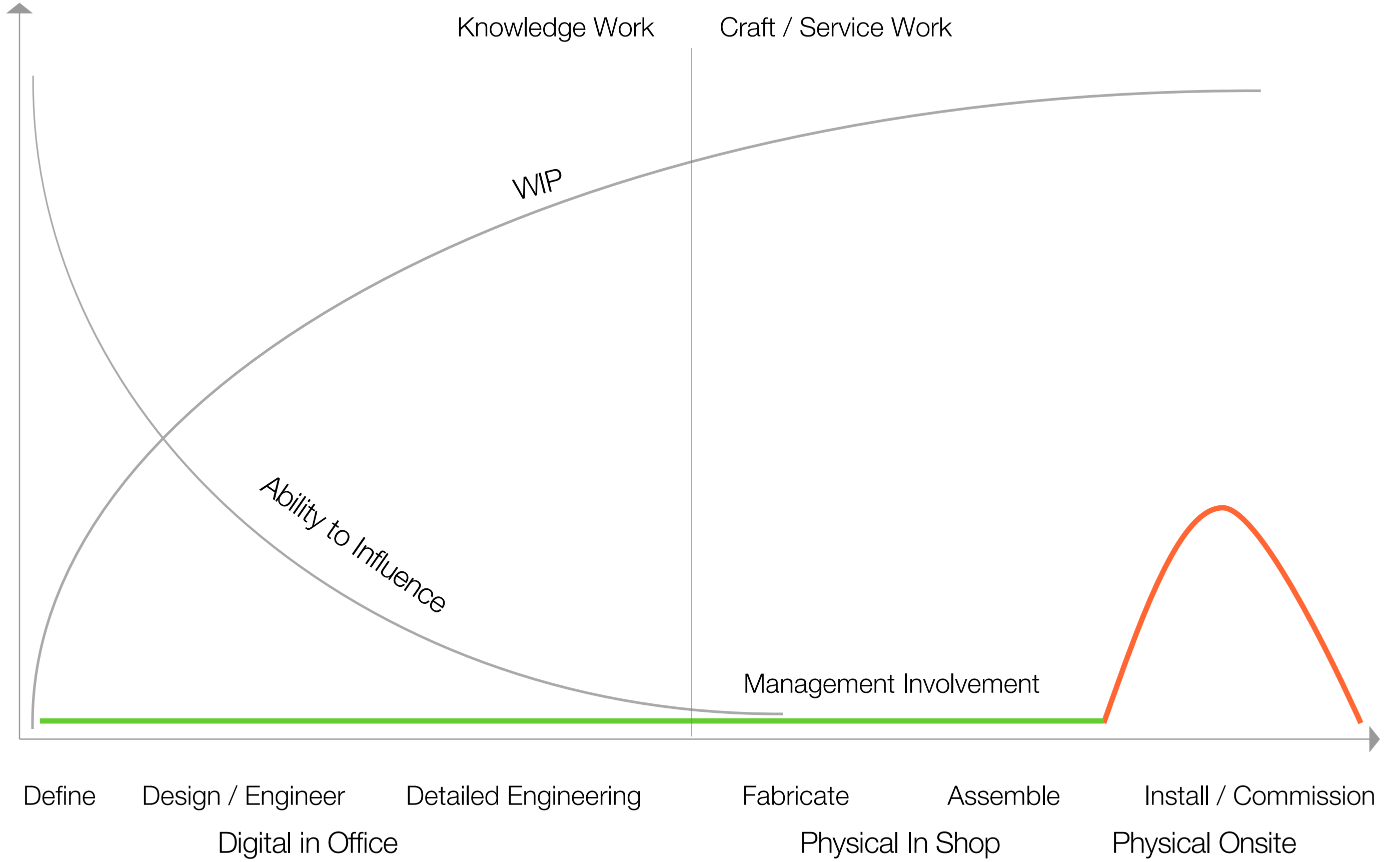
PROJECT PRODUCTION INSTITUTE

Production System Optimization

PPI Symposium
04 December 2019

PRODUCTION MANAGEMENT





Ability to Influence Curve adapted from Gluck & Foster HBR September 1975

Production System Optimization (PSO)

Reduce cost, time and risk through applying Project Production Management (PPM) to identify and remove:

- Less than optimal product and process design
- Unnecessary use of Inventory and Capacity
- Longer than desired cycle times
- Sources of Detrimental Variability

PSO can be used to Optimize

Core Production Systems & Distribution Networks

Engineering Processes & Offices

Fabrication / Manufacture Processes & Facilities

Logistics Routings & Flows

Site Construction

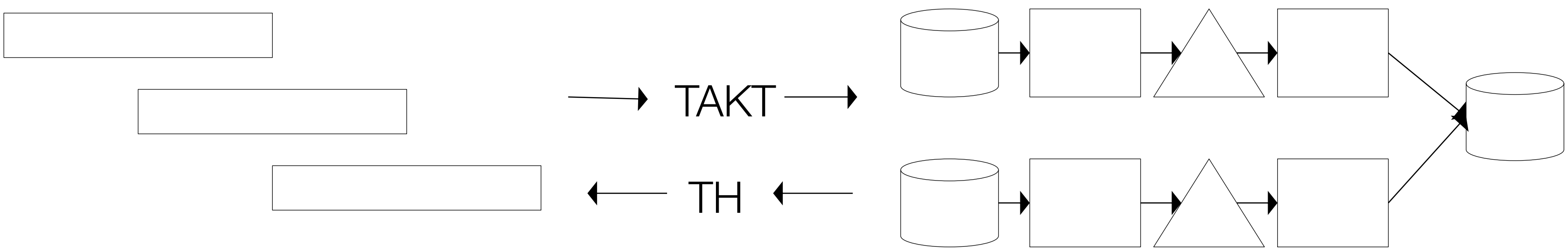
Project Value Stream

Some Combination of the Above

How is PSO Different?

Schedule = Demand / Should

Production System = Supply / Will

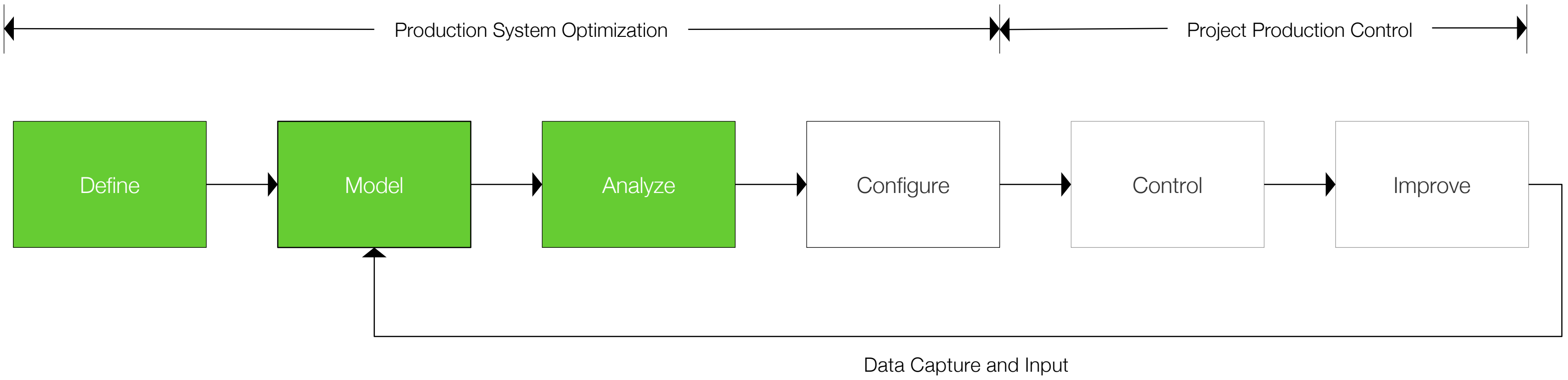


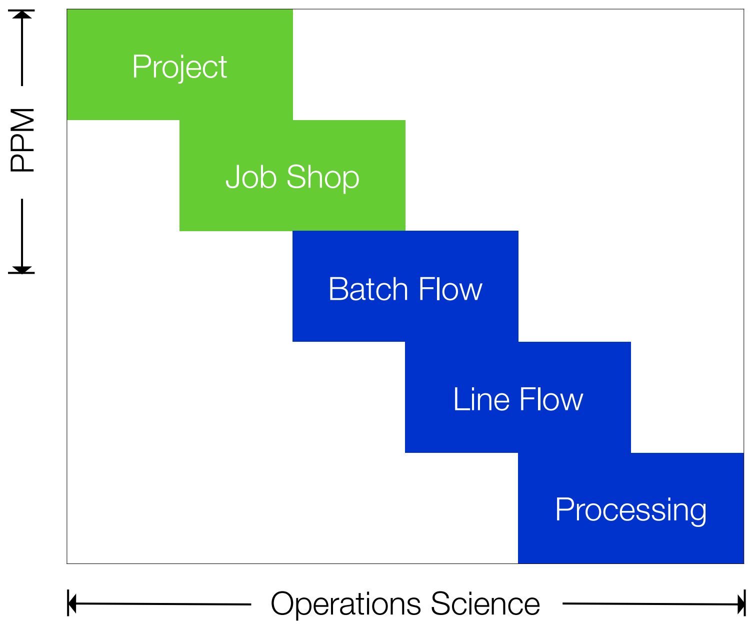
Dates & Progress

Rates / Throughput

PSO Focuses on Production Rates (not dates)

Methodology



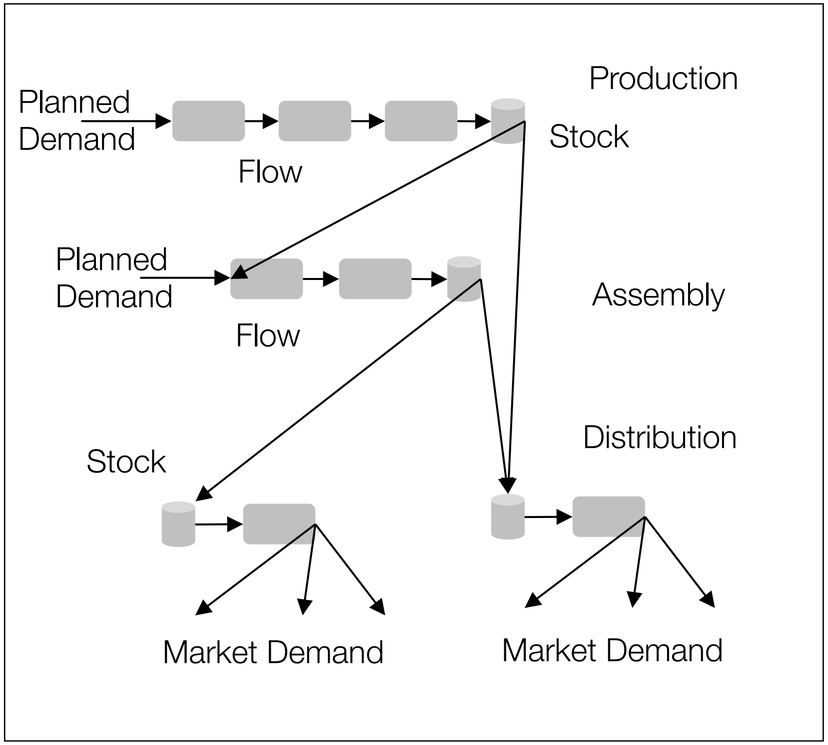


Operations Science is the basis for understanding and influencing all and any type of production system behavior

Project Production Management (PPM) focuses on project, job shop and batch flow production systems

Operations Science

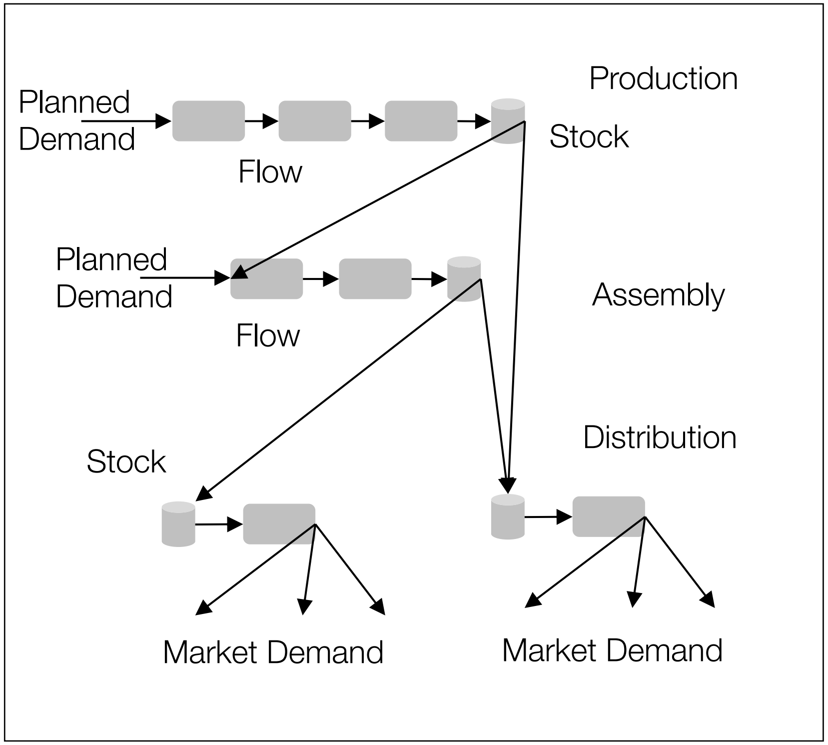
Components



Demand

Transformation

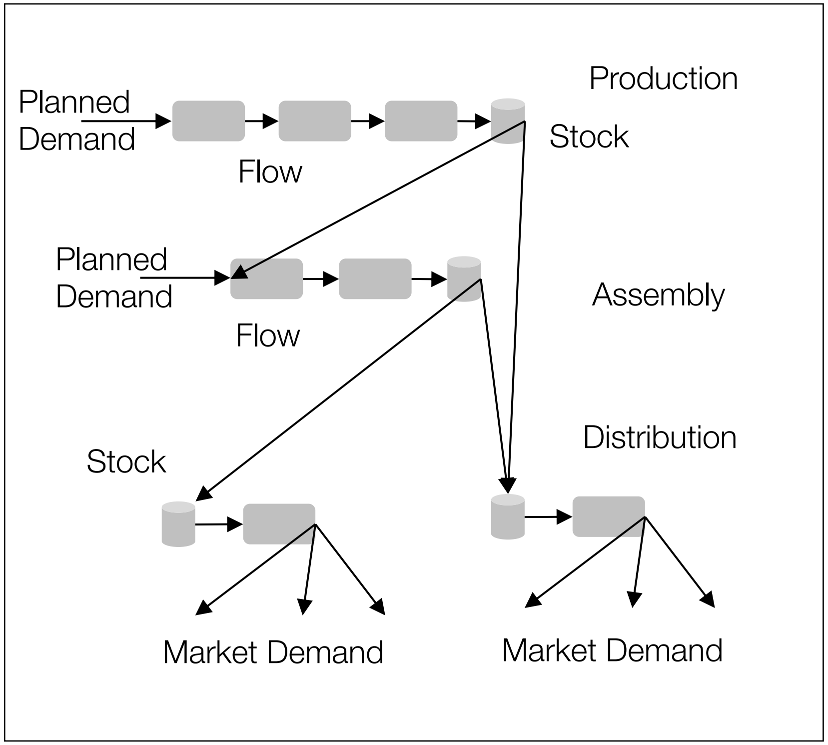
Elements



Flows

Stocks

Variability

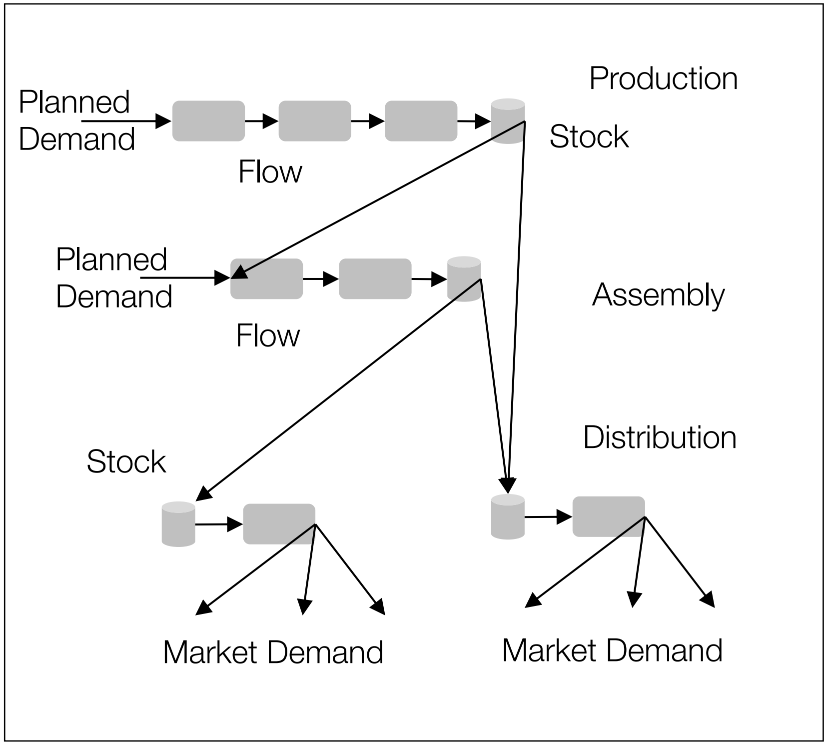


When variability is present

Demand is not synchronized with Transformation

Buffers develop

Buffers



Time/Inventory

Capacity

Some Basic Operations Science Principles

Little’s Law

Relates basic PS performance measures

WIP = (Cycle Time) (Throughput)

VUT Equation

Quantifies queueing effects
Relates variability, capacity, and time buffers

$$\mathrm{CT}_q \approx V \times U \times t$$
$$\approx \left(\frac{c_a^2 + c_e^2}{2}\right)\left(\frac{u}{1-u}\right)t_e$$

Some Basic Operations Science Principles

Variance of Lead Time Demand

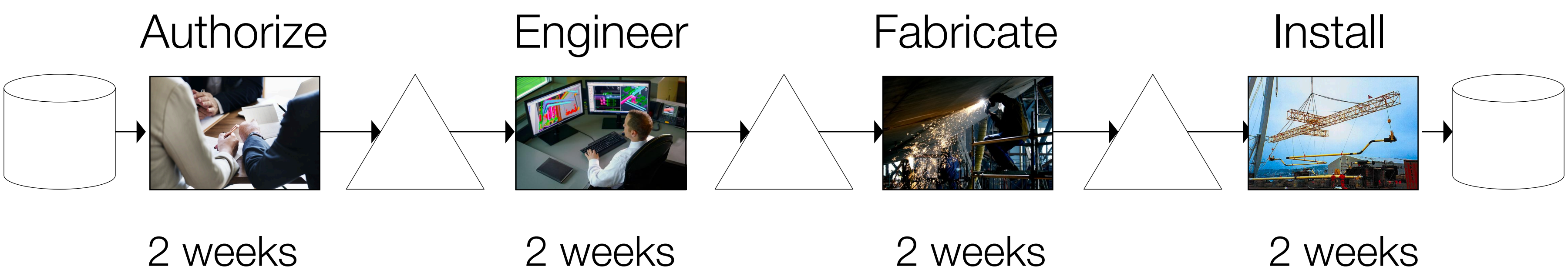
Drives inventory and service

$$\sigma^2 = \ell \sigma_D^2 + d^2 \sigma_L^2$$

Accounts for variability in demand AND supply

Appropriate use provides predictive control and optimal performance

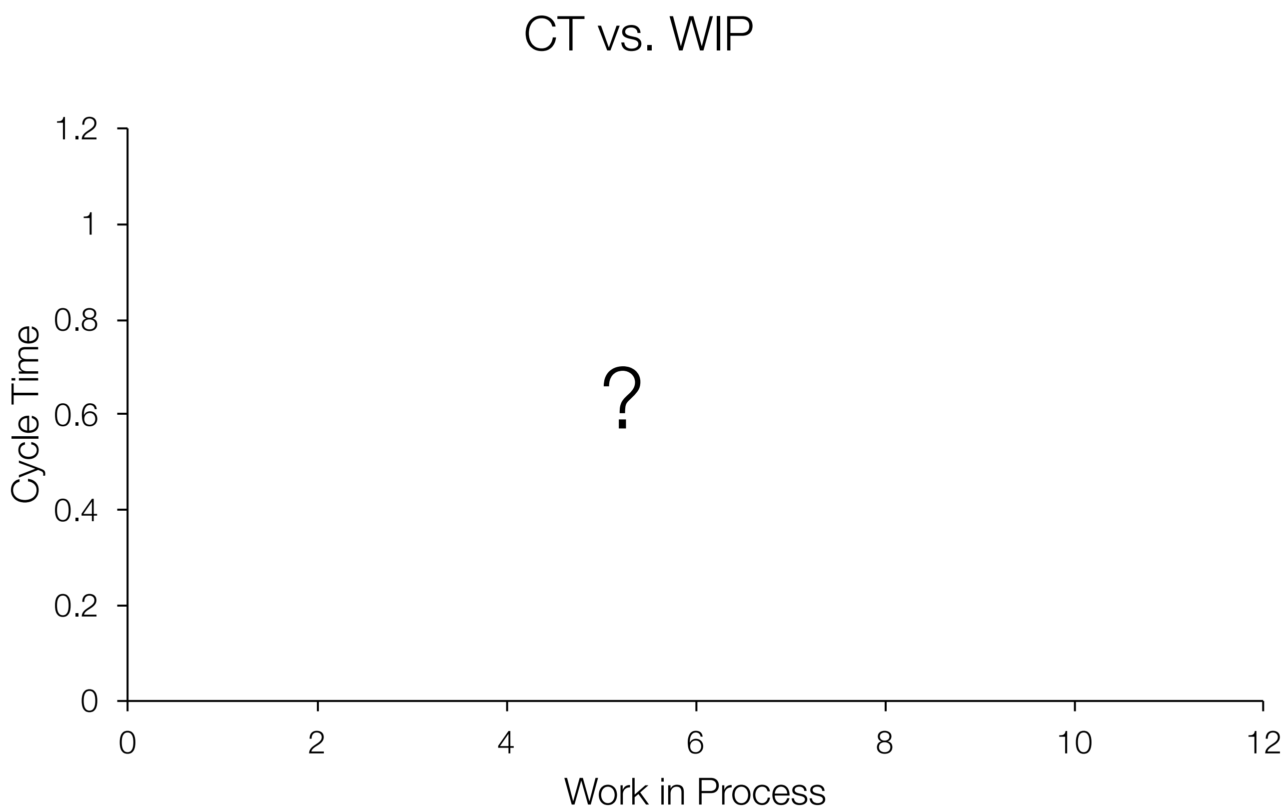
Project Production System



Four operations in sequence

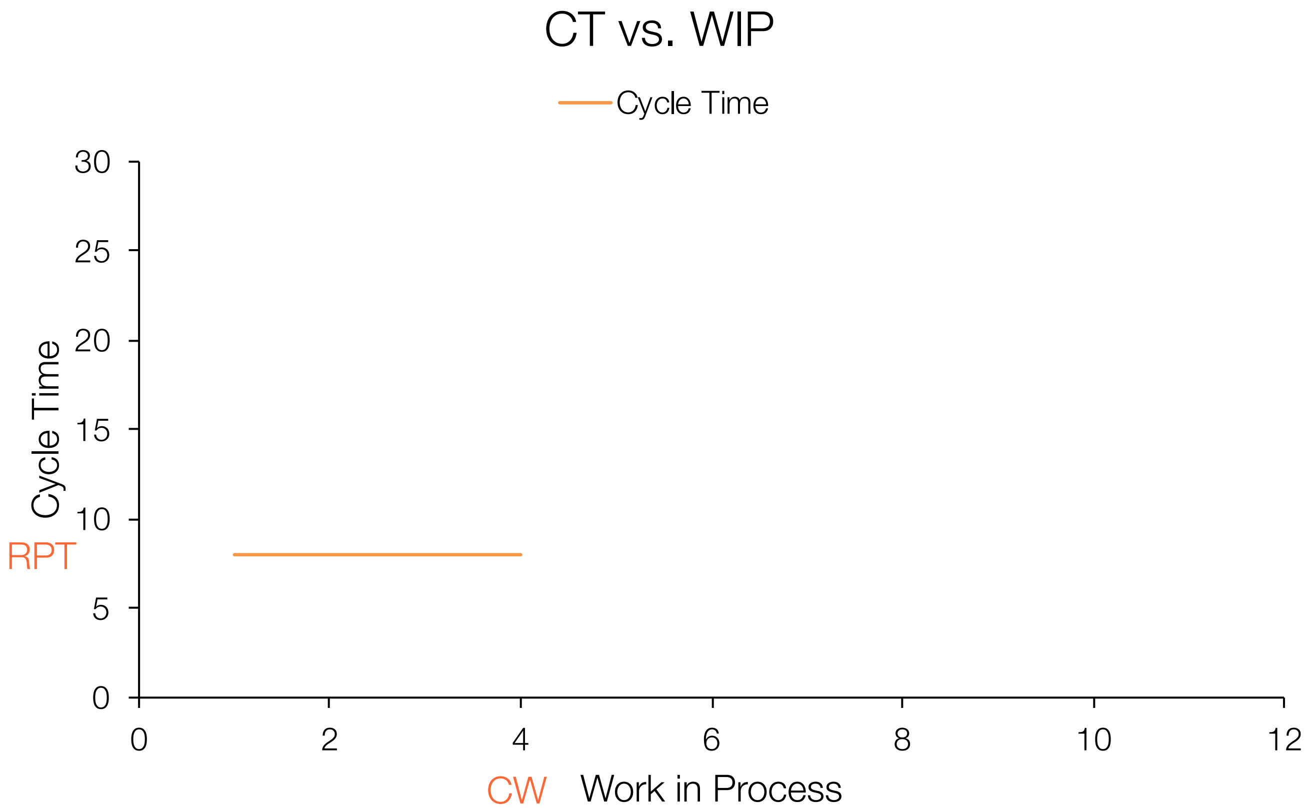
Different output each time

CT vs. WIP: Best Case



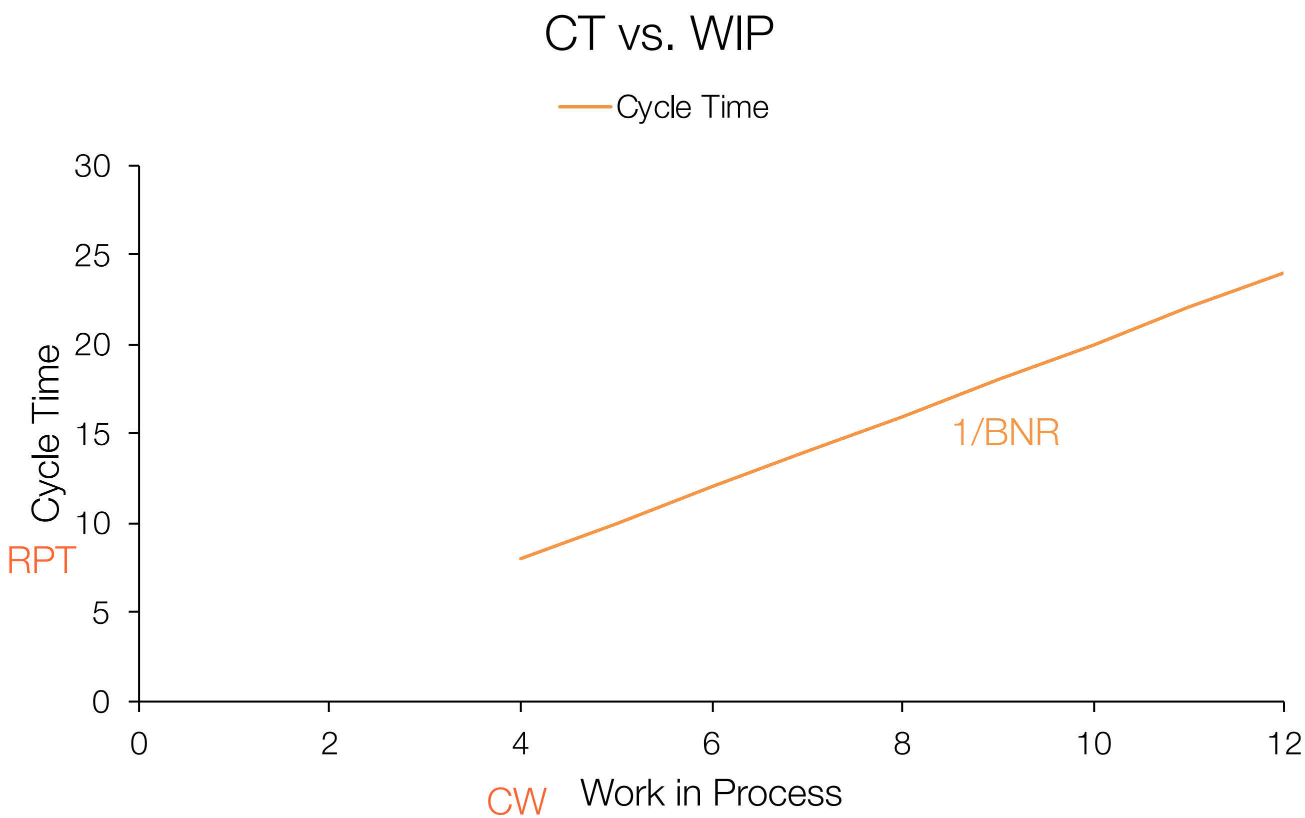
The answer to the question posed earlier

CT vs. WIP: Best Case



CT cannot be less than RPT

CT vs. WIP: Best Case



CT cannot be less than WIP/BNR

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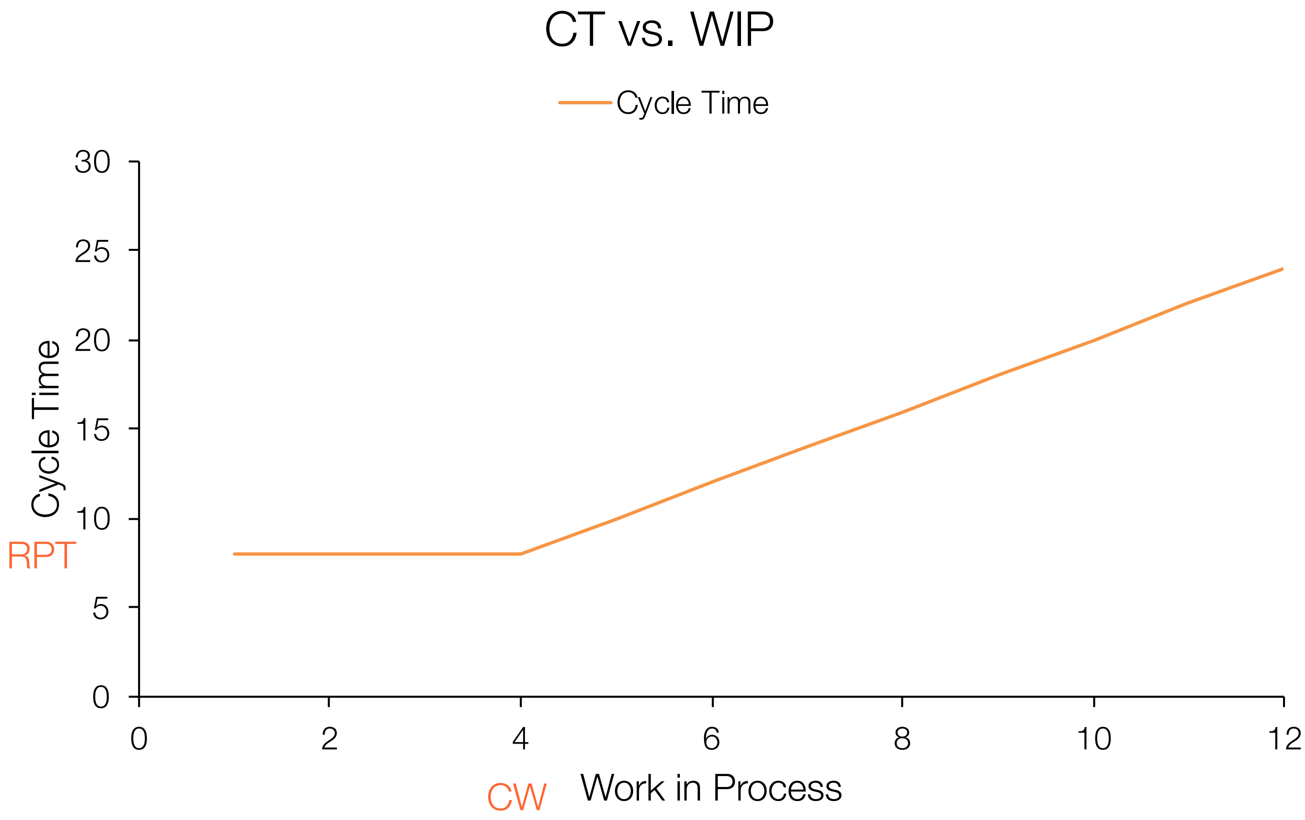
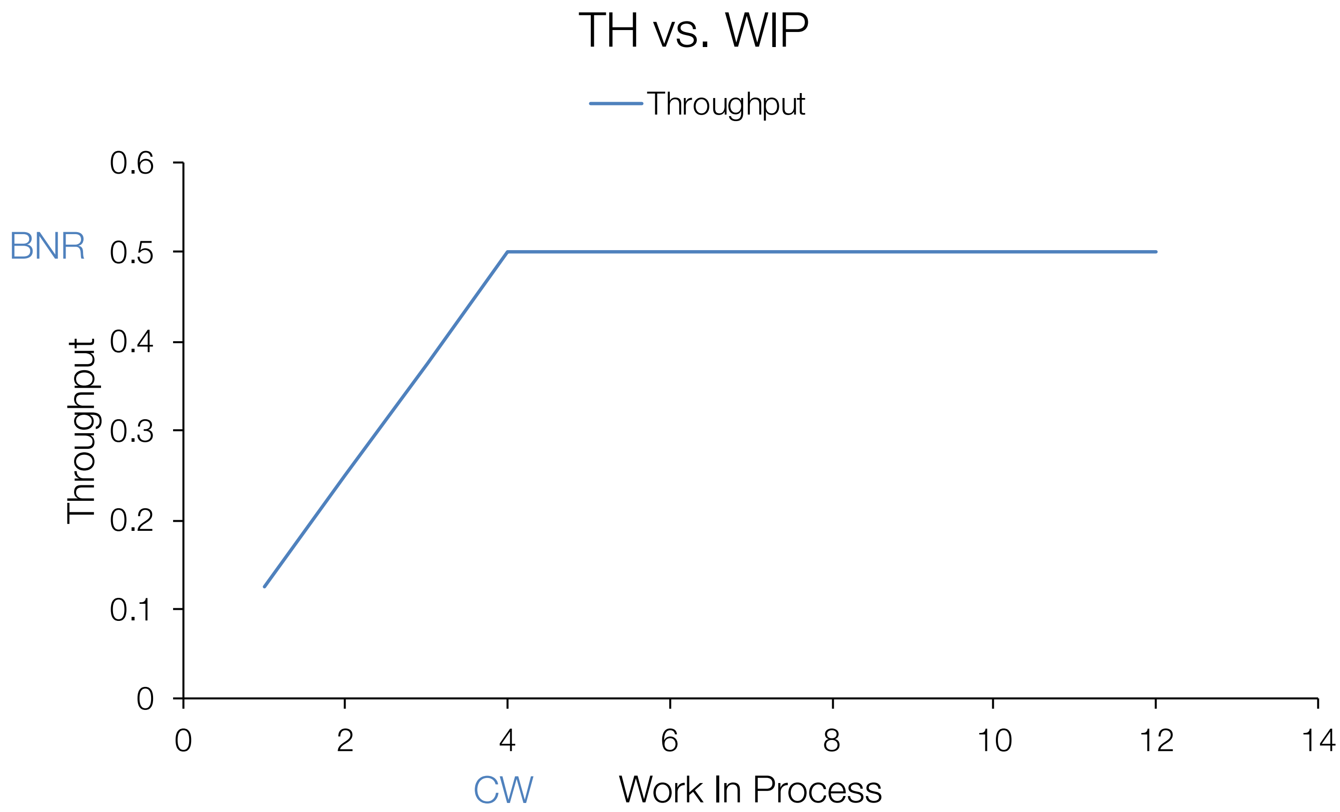
CT vs. WIP: Best Case

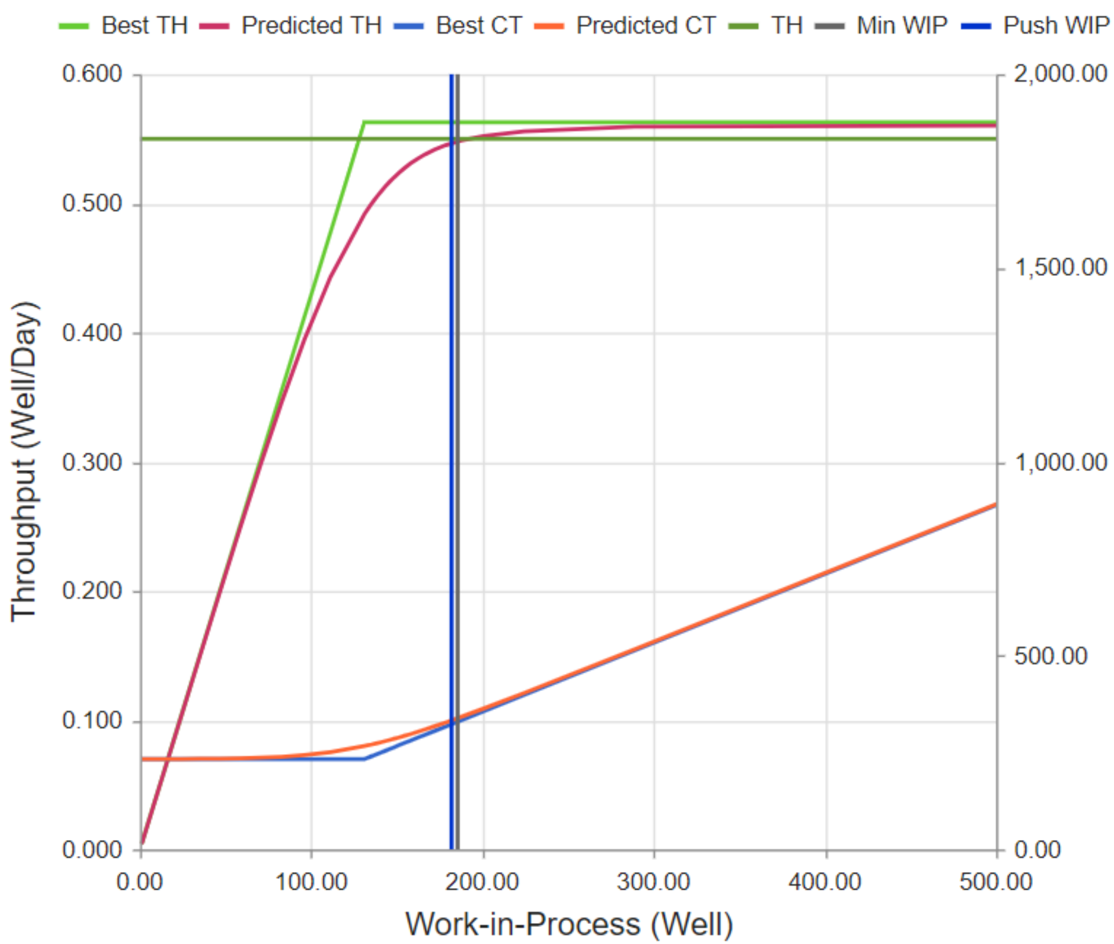


TH vs. WIP: Best Case

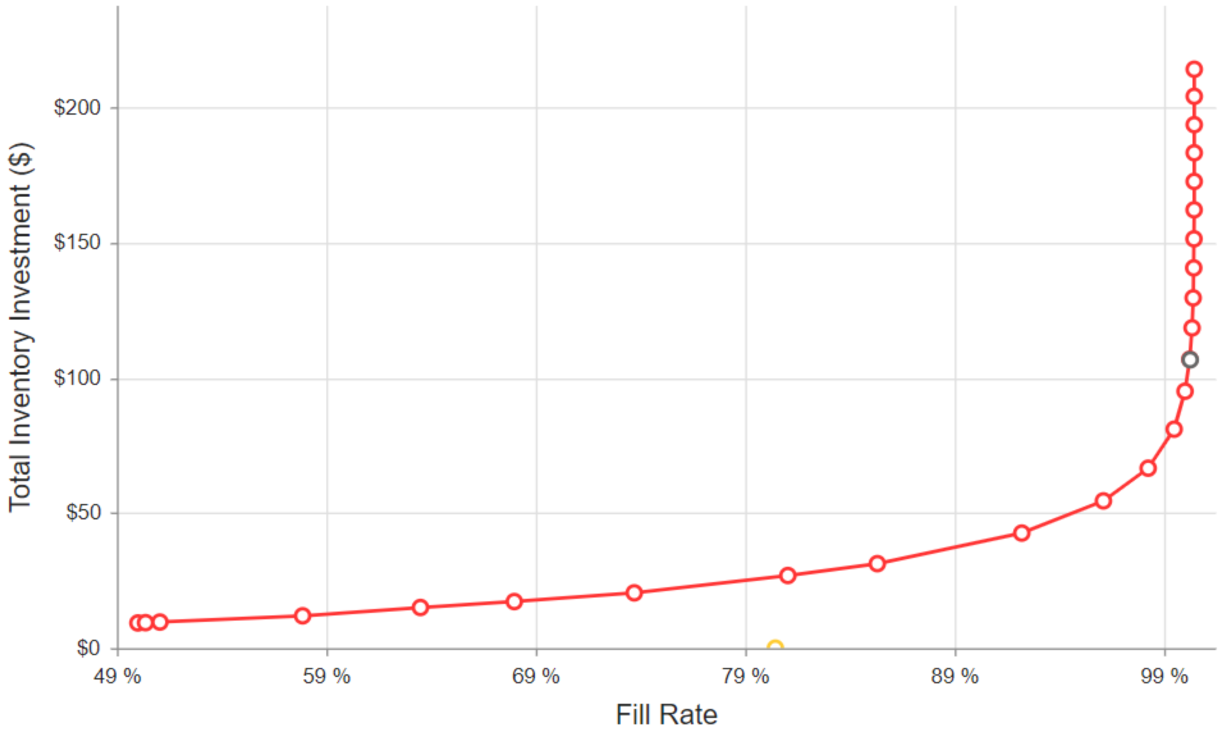


Little's Law

Optimize WIP for TH and CT



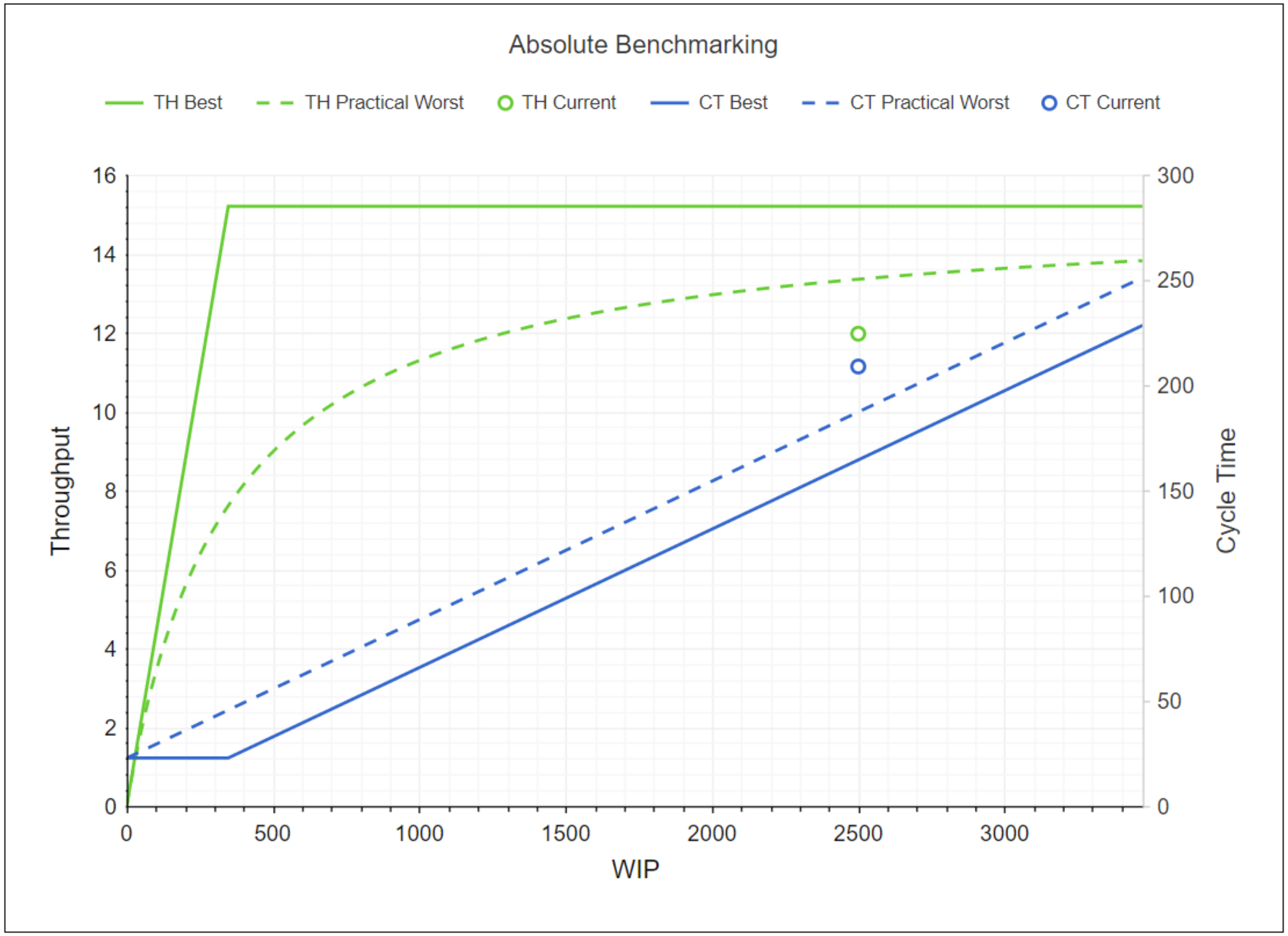
Efficient Frontier - Stock



Set optimal stock levels for outside suppliers and on site materials

Example

Pre-PSO



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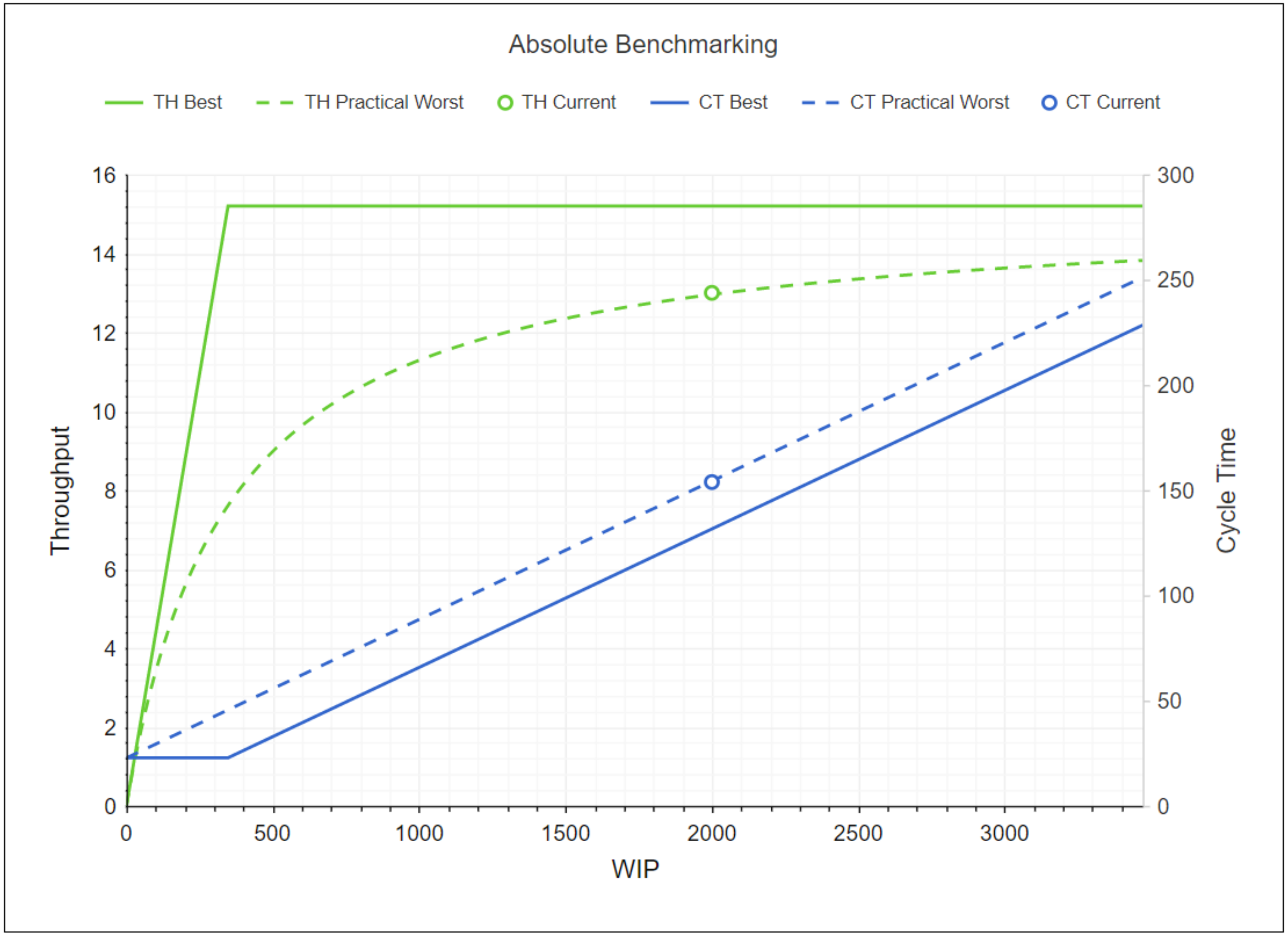
Post-PSO



Absolute Benchmarking
TH Best
TH Practical Worst
TH Current
CT Best
CT Practical Worst
CT Current
Throughput
Cycle Time
WIP
0
2
4
6
8
10
12
14
16
0
50
100
150
200
250
300
0
500
1000
1500
2000
2500
3000

Results

	PRE-PSO	POST-PSO
Throughput (TH)	12 Units per Day	13 Units per Day
Cycle Time (CT)	208 Days	154 Days

Same Capacity and Raw Process Time