

Friday May 3, 2013

Lean Manufacturing's Unexpected Windfall: A Lower Carbon Footprint

LEAP

Global Leaders in Environmental Assessment and Performance

A collaboration between MIT's Center for Transportation & Logistics and Materials Systems Laboratory.



**Massachusetts
Institute of
Technology**

Charles M. Cohon www.cohon.com

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Lean usually is a way to:

- Make my company more profitable.
- Help my company meet competitive threats.
- Achieve sustainable competitive advantage

But not for today!

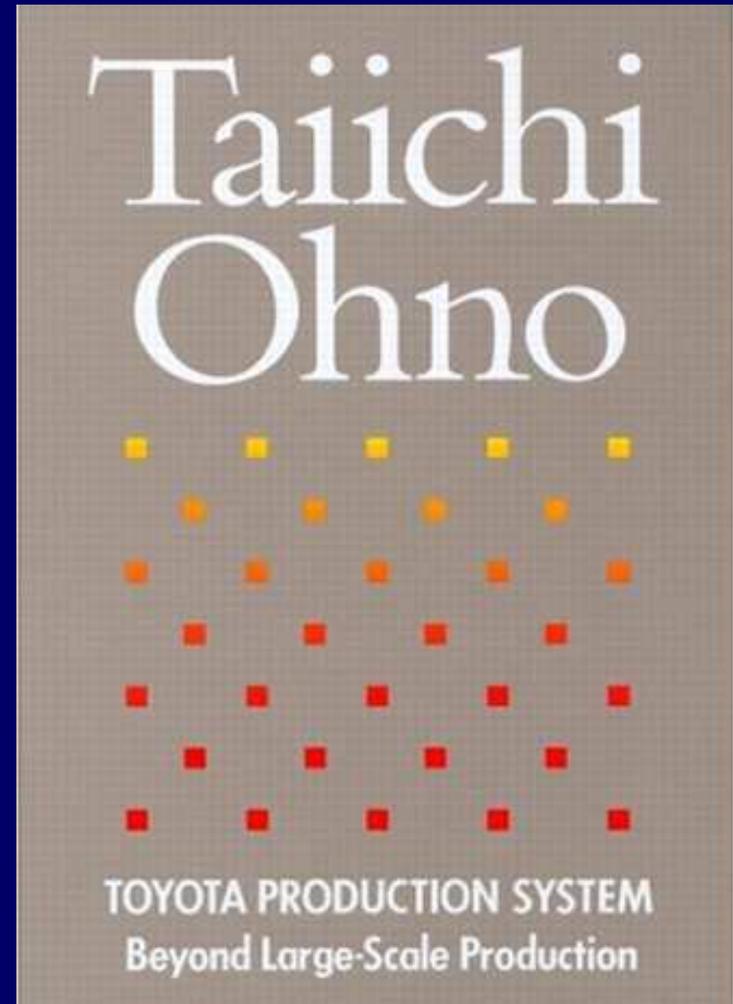
- ~~Make my company more profitable.~~
- ~~Help my company meet competitive threats.~~
- ~~Achieve sustainable competitive advantage~~

Today Lean is a way to:

- Reduce **my company's** carbon footprint.
- Reduce **my industry's** carbon footprint.



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“Consider the waste of overproduction, for example. It is not an exaggeration to say that in a low-growth period such waste is

“Consider the waste of overproduction, for example. It is not an exaggeration to say that in a low-growth period such waste is a crime against society more than a business loss.”

Agenda

- FNGP Seal & Gasket
recast from
Lean Manufacturing to
Green Manufacturing

Agenda

- Transition from Batch & Queue to Single Piece Flow

What are the traditional ways to:

- Reduce **my company's** carbon footprint?
- Reduce **my industry's** carbon footprint?

Atmospheric emissions

- Commuting
- HVAC systems
- Industrial processes
(ovens to fork lift trucks)

Atmospheric emissions

- Duplicated services

Two airlines that fly half full planes from O'Hare to Wichita may decide to code-share.

Wastewater emissions

- Sewage
- Industrial processes
- Underutilized
plating operations
may be consolidated.

Power Gen. Emissions

- From lights and HVAC
- From industrial processes
- A lean manufacturer can speed the exit of high-consuming operations.

FNGP (seal & gasket mfr.) Ligonier, Indiana

Source: <i>Lean Thinking,</i> Womack and Jones	Mo. 1 1,155	Mo. 40 1,800
Workers	21	3
Units/worker/mo.	55	600
Feet ² utilized	2300	1200

	Green Company		Not Green Company	
	Mo. 1 1,155	Mo.40 1,800	Mo. 1 1,155	Mo. 40 1,155
Workers	21	3	21	21
Units/ wkr./mo.	55	600	55	55
Feet ²	2300	1200	2300	2300

	Green Company		Not Green Company	
		Mo.40		Mo. 40
Workers		3		21
Units/ wkr./mo.				
Feet ²				

How does this reduce
the **Lean Company's**
carbon footprint?

Atmospheric emissions

- Commuting

Wastewater emissions

■ Sewage

	Green Company		Not Green Company	
	Mo. 1 1,155	Mo.40 1,800	Mo. 1 1,155	Mo. 40 1,155
Workers	21	3	21	21
Units/ wkr./mo.	55	600	55	55
Feet ²	2300	1200	2300	2300

	Green Company		Not Green Company	
Workers				
Units/ wkr./mo.				
Feet ²		1200		2300

How does this reduce
the **Lean Company's**
carbon footprint?

Atmospheric emissions

- HVAC systems

Power Gen. Emissions

- From lights and HVAC

	Green Company		Not Green Company	
	Mo. 1 1,155	Mo.40 1,800	Mo. 1 1,155	Mo. 40 1,155
Workers	21	3	21	21
Units/ wkr./mo.	55	600	55	55
Feet ²	2300	1200	2300	2300

	Green Company		Not Green Company	
				Mo. 40 1,200
Workers		+2		
Units/ wkr./mo.		600		
Feet ²				

	Green Company		Not Green Company	
	Mo. 1 1,155	Mo.40 1,800	Mo. 1 1,155	Mo. 40 1,155
Workers	21	3	21	21
Units/ wkr./mo.	55	600	55	55
Feet ²	2300	1200	2300	2300

	Green Company	Not Green Company
Workers	3+2	
Units/ wkr./mo.		
Feet ²	2300	2000

	Green Company		Not Green Company	
		Mo. 40 1,800		Mo. 40 1,155
Workers		3+2		21
Units/ wkr./mo.		600		55
Feet ²		2000		2300

How does this reduce
the this industry's
carbon footprint?

Atmospheric emissions

- Commuting
- HVAC systems
- Industrial processes
(ovens to fork lift trucks)

Wastewater emissions

- Sewage
- Industrial processes

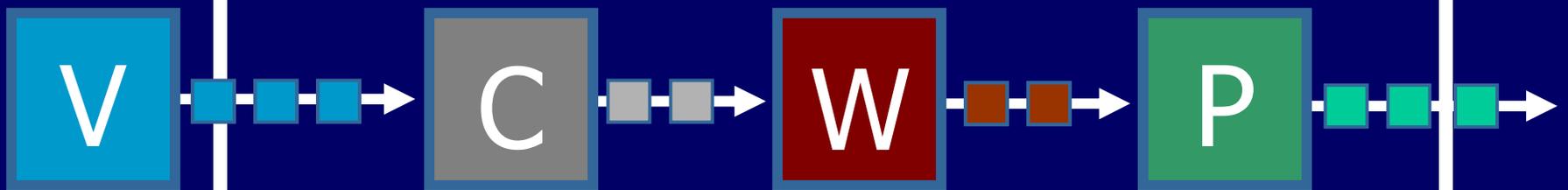
Power Gen. Emissions

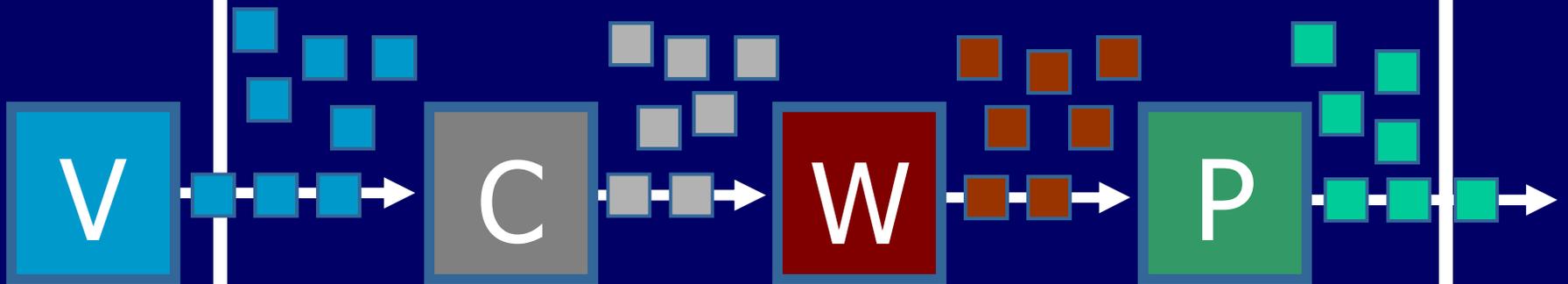
- From lights and HVAC
- From industrial processes

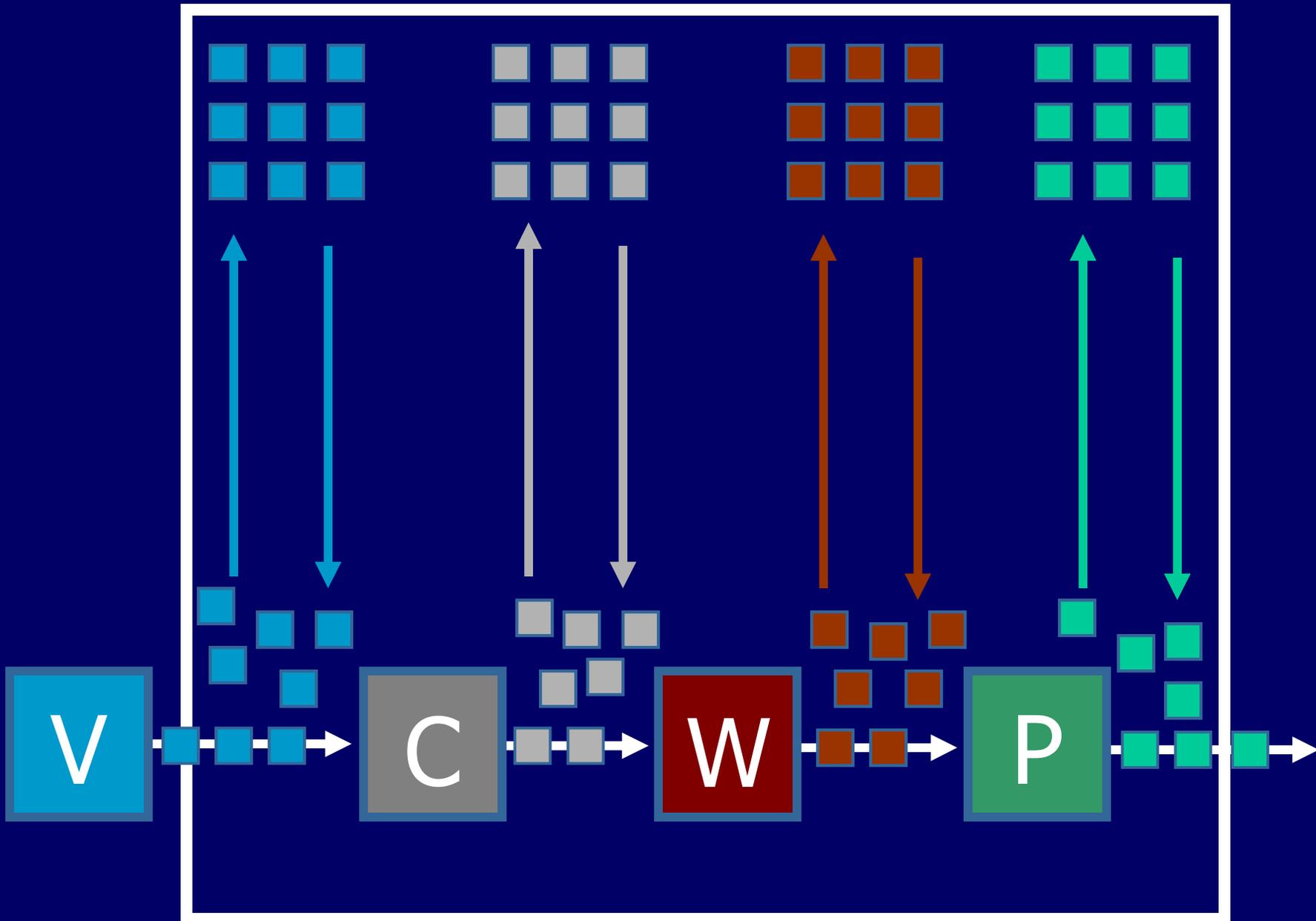
The Lean Manufacturer
accelerated the exit of a
high-consuming operation

Batch & Queue

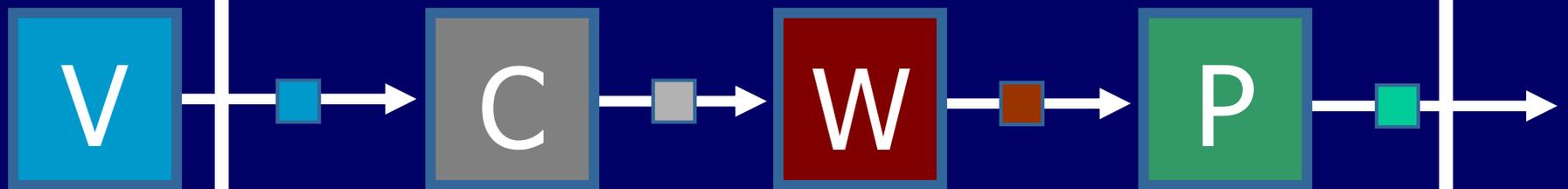


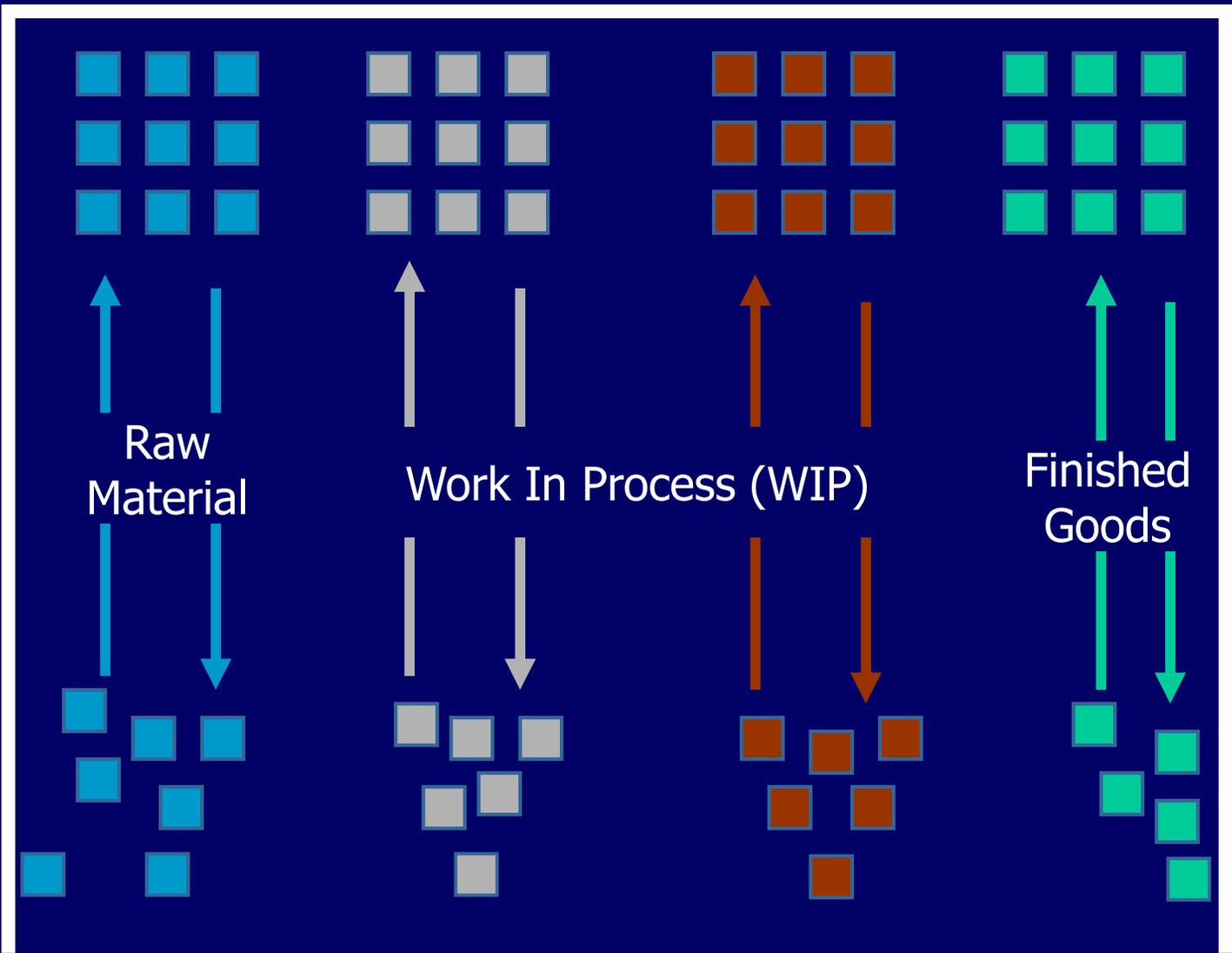






Productive Work





Excess Carbon Footprint

Excess Carbon Footprint

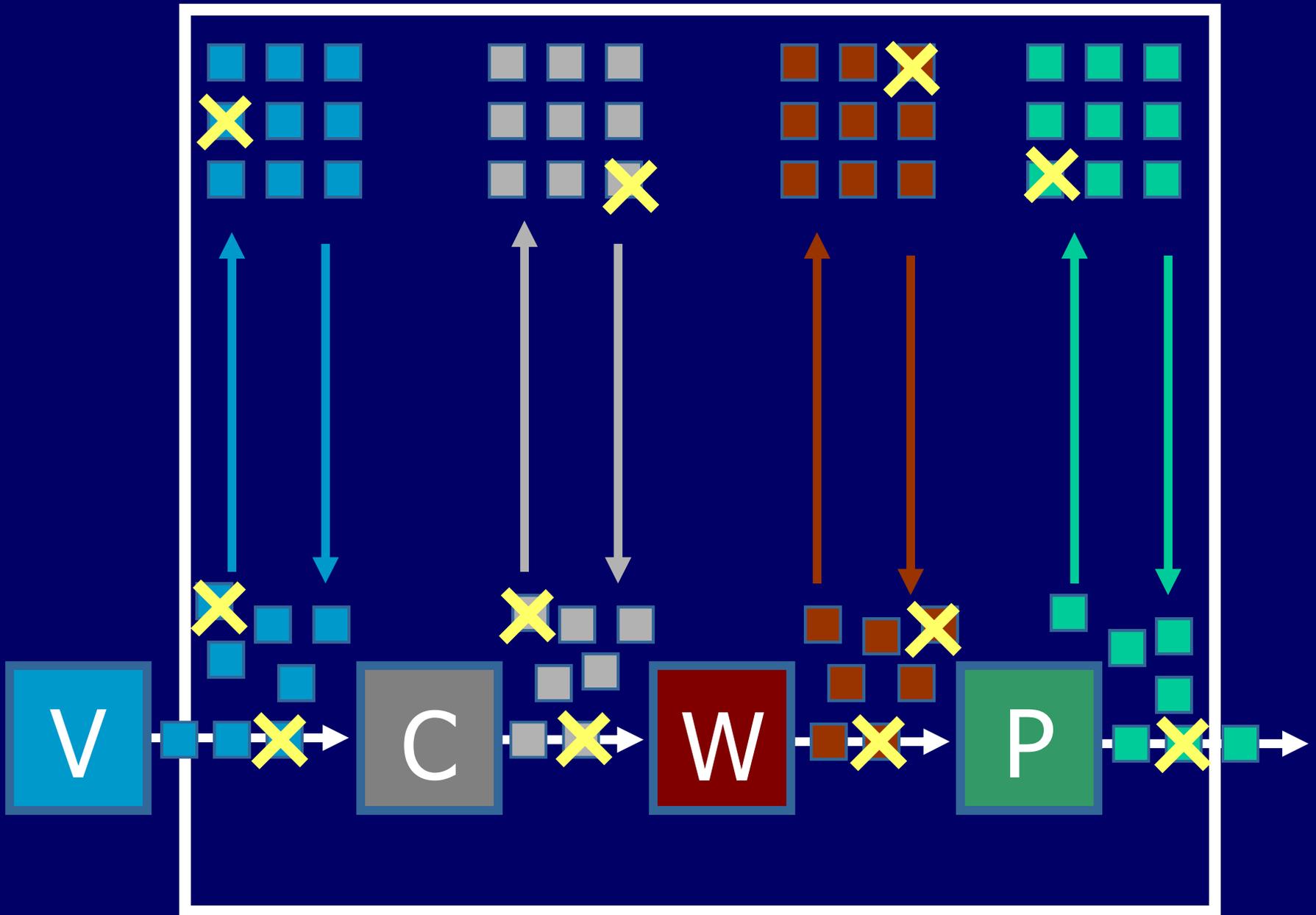
- Early/unneeded emissions
- Damage to inventory
 - Repair & scrap costs
- Complex mfg. requires MRP and/or ERP
 - Bar codes and/or RFID
 - Data center costs

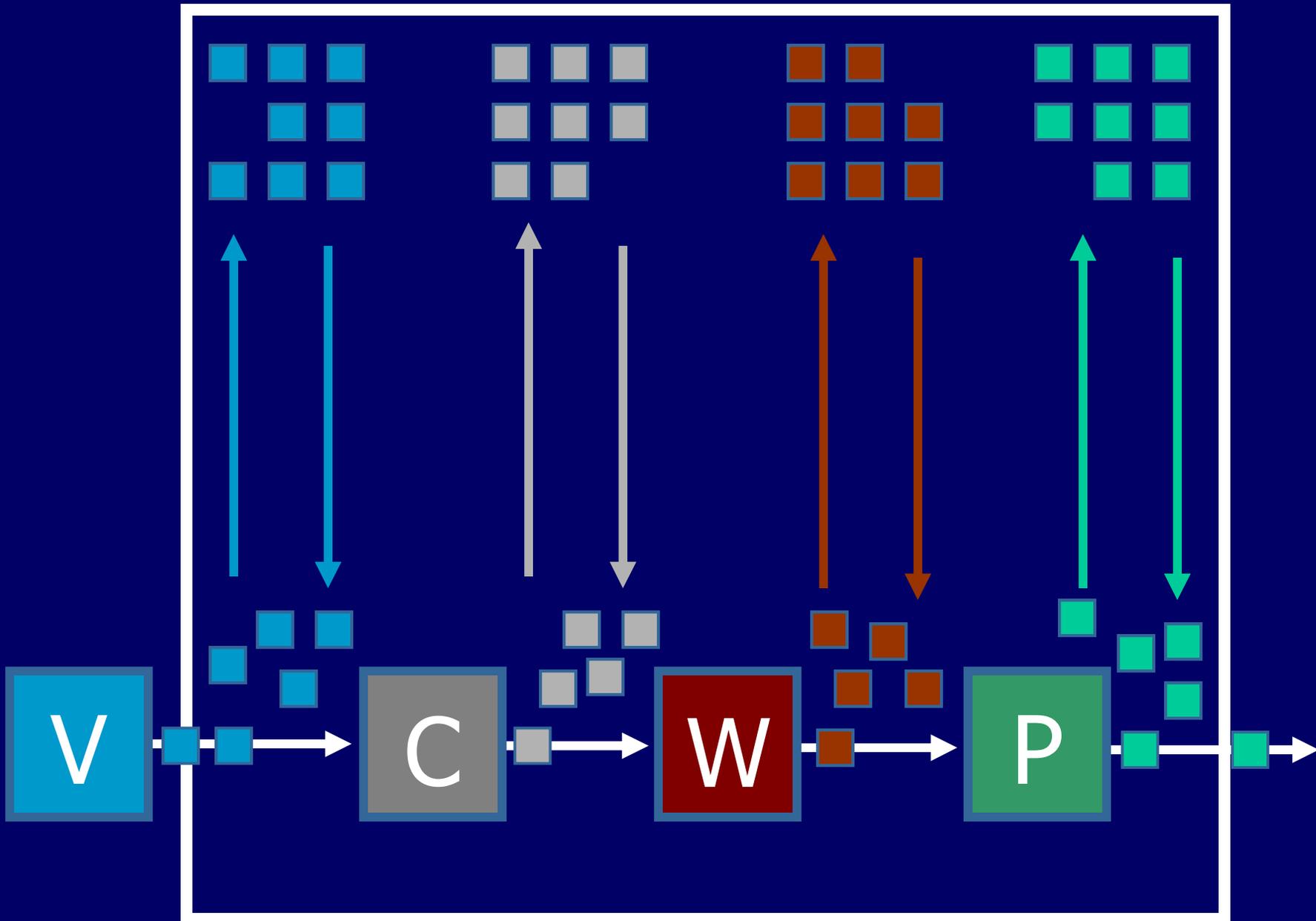
Excess Carbon Footprint

- Obsolescence
- Rust and dust
- Warehouse, racks, warehouse personnel, fork lift trucks, etc.

Excess Carbon Footprint

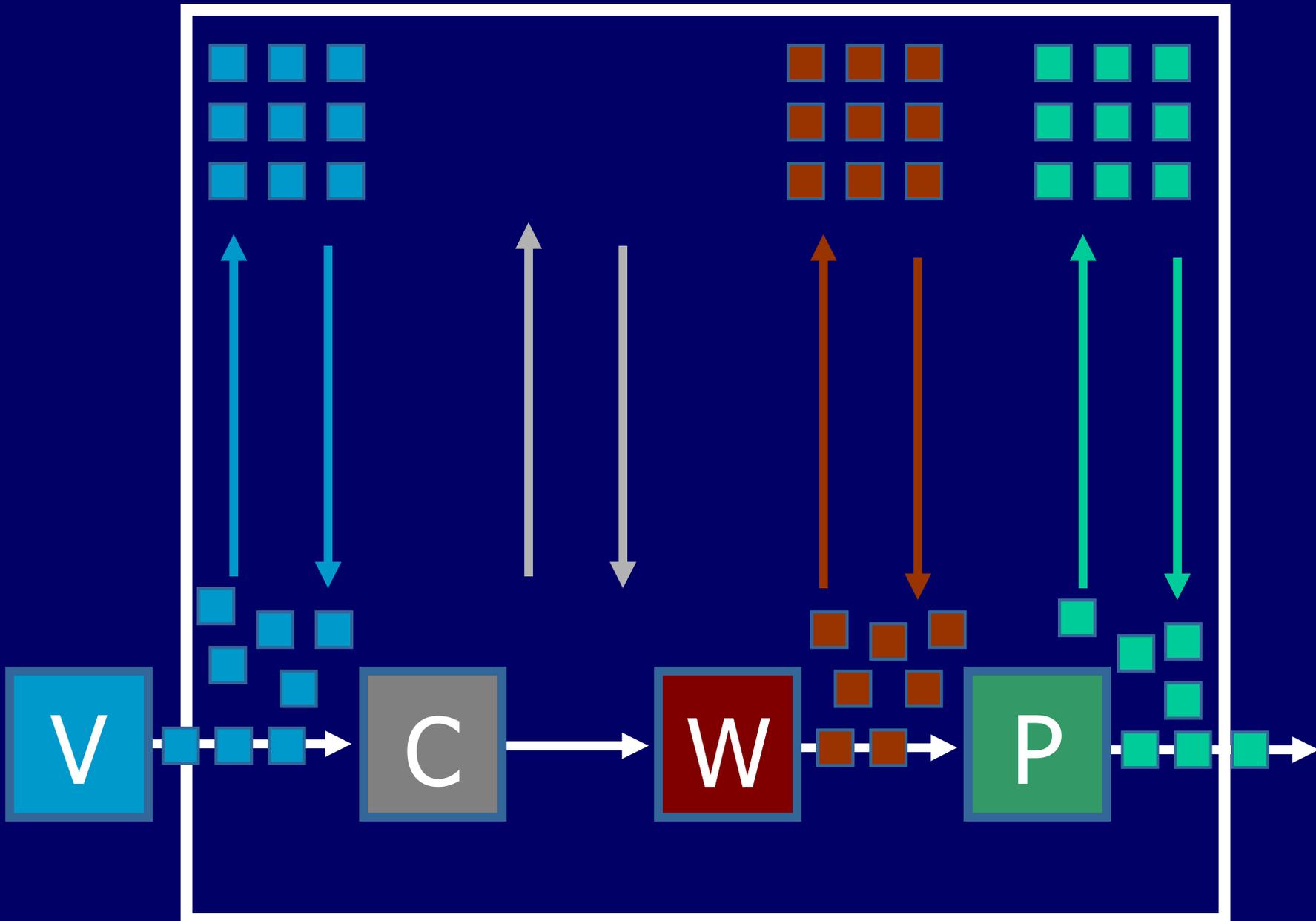
- Intermittently defective work can be hidden by excess inventory.





Excess Carbon Footprint

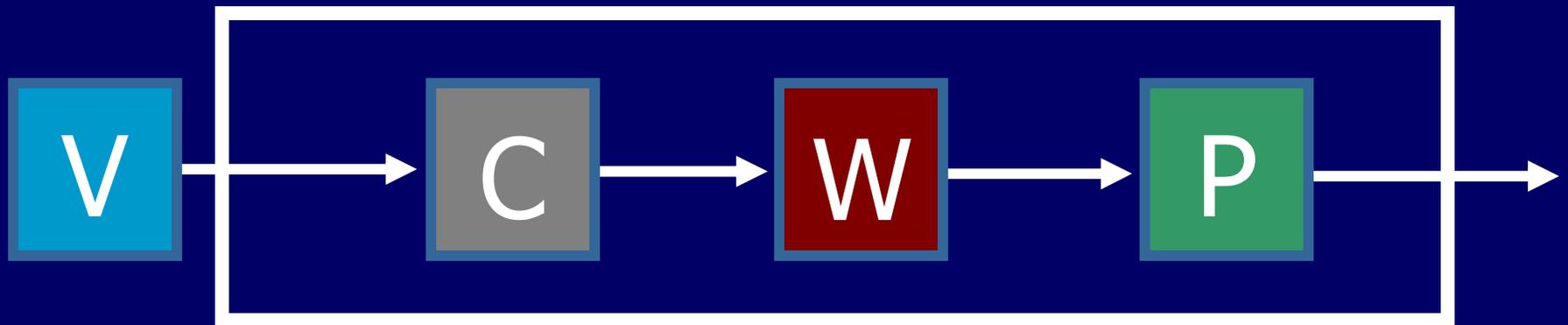
- Defects repeated across an entire batch.



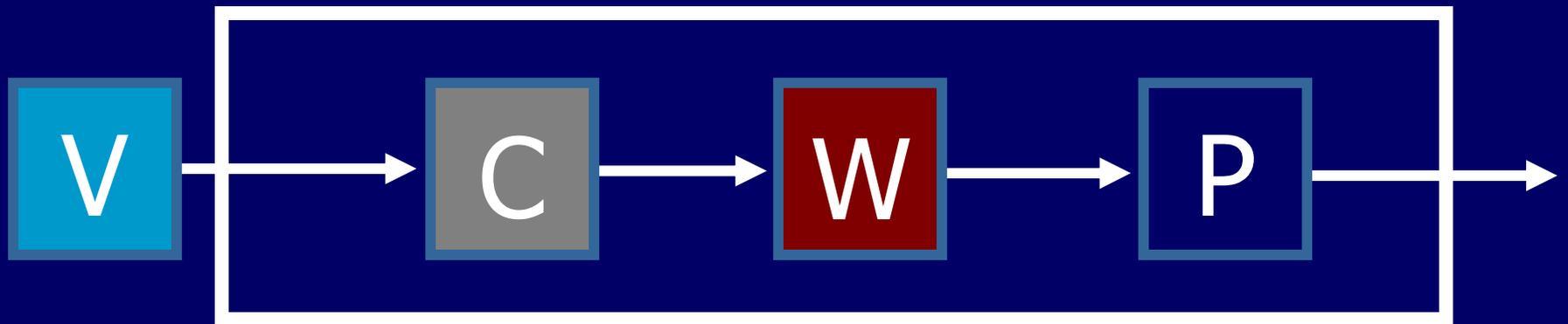
Single Piece Flow



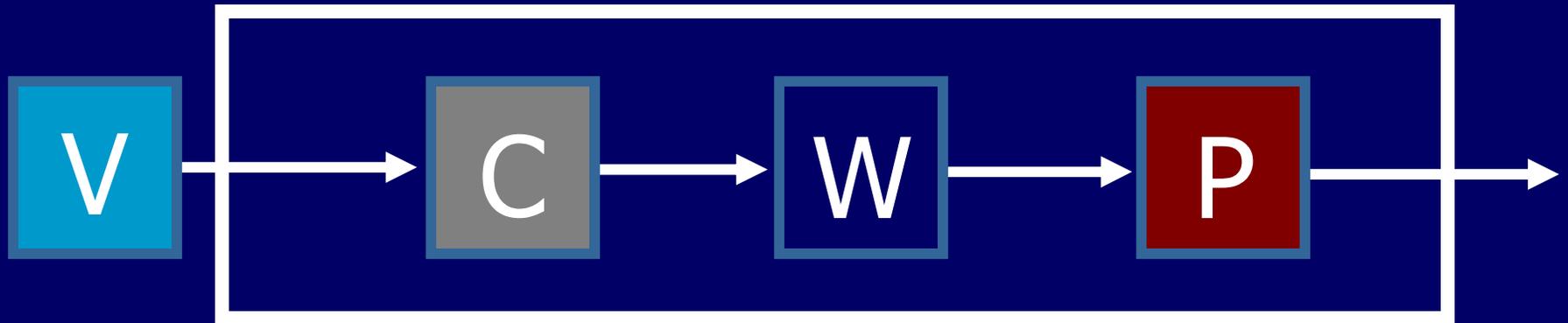
Single Piece Flow



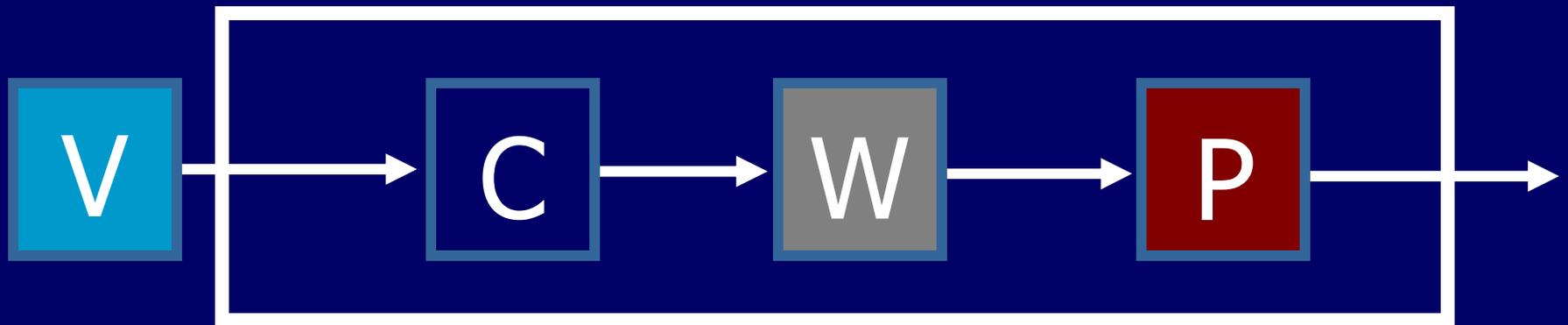
Single Piece Flow



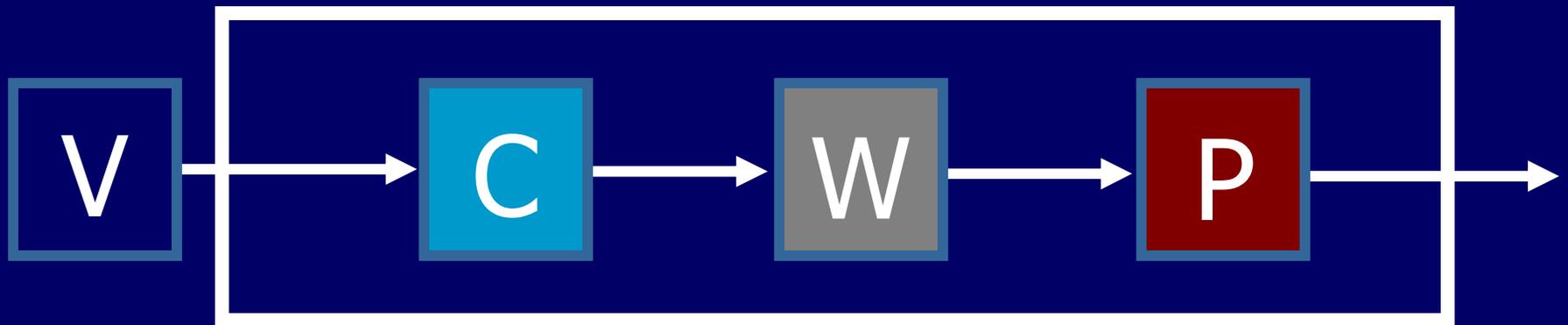
Single Piece Flow



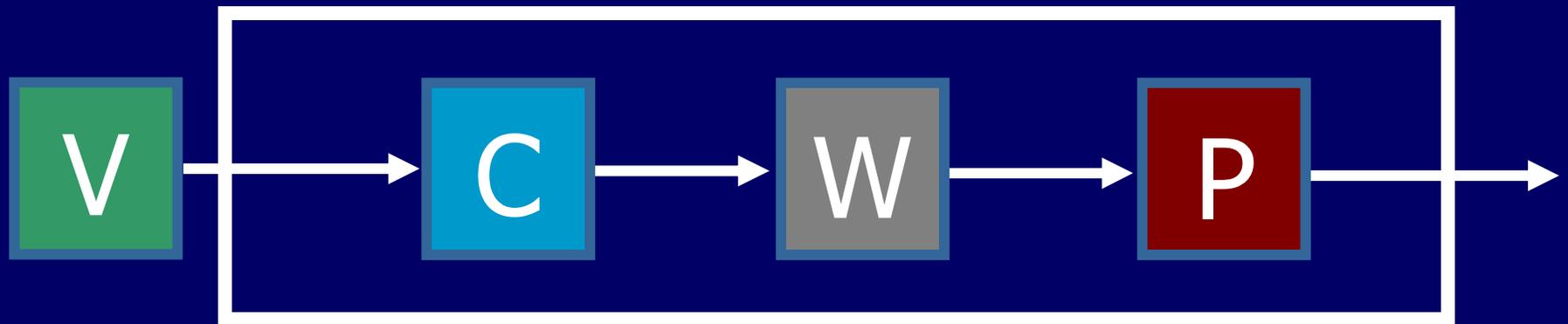
Single Piece Flow



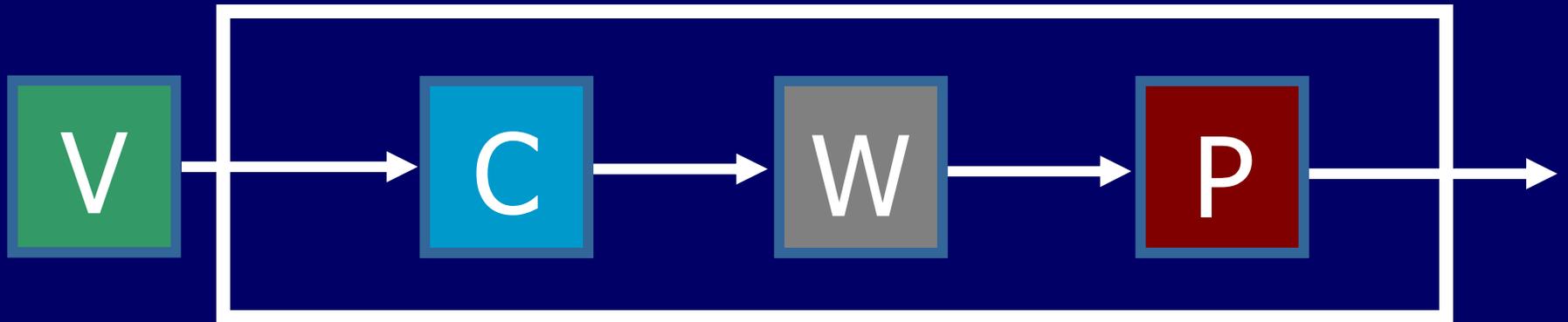
Single Piece Flow



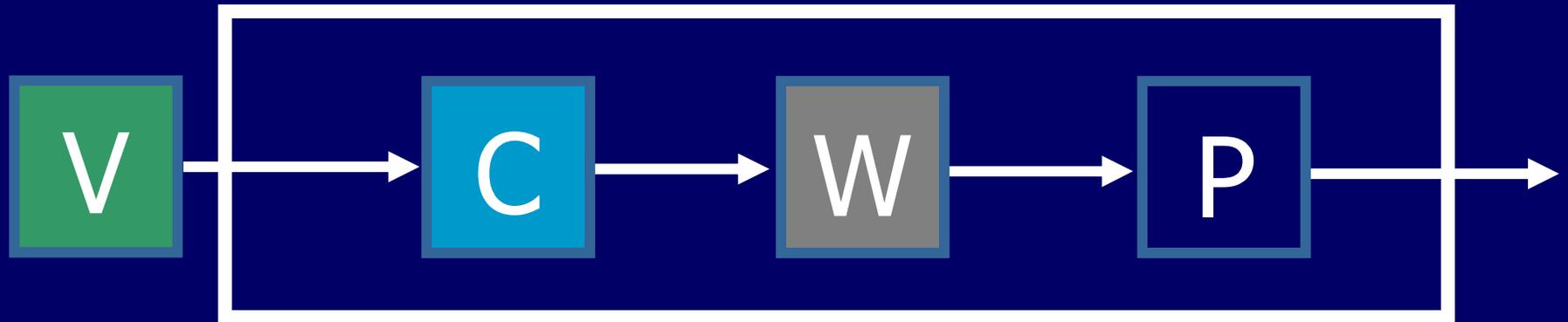
Single Piece Flow



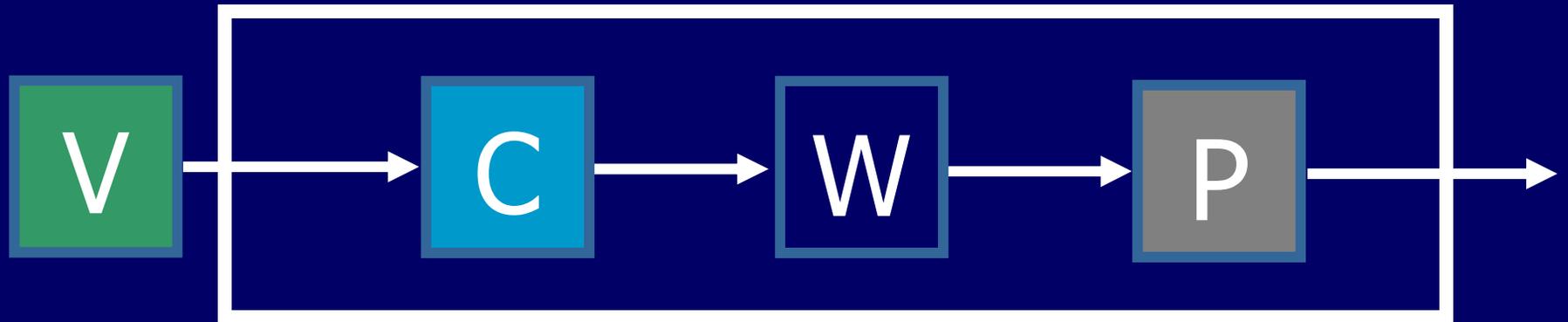
Preventing Defective Batches



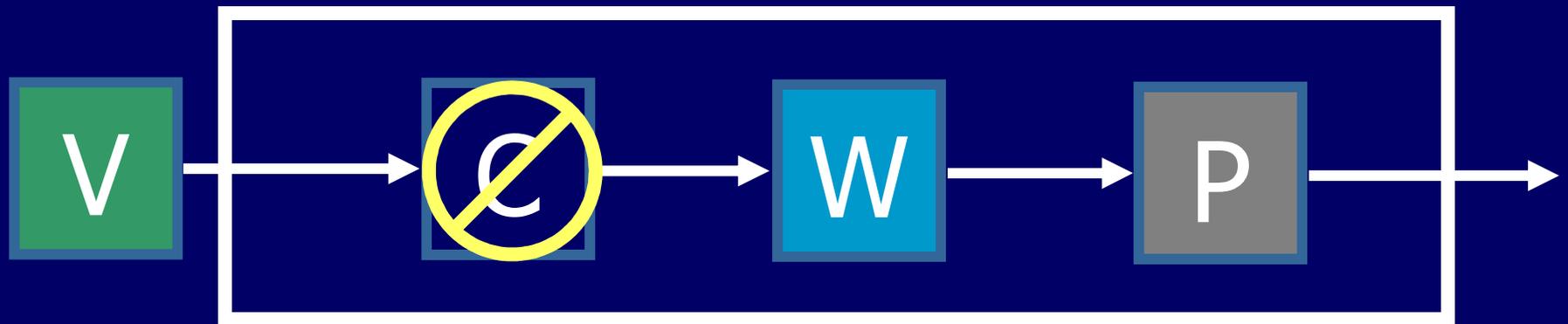
Preventing Defective Batches



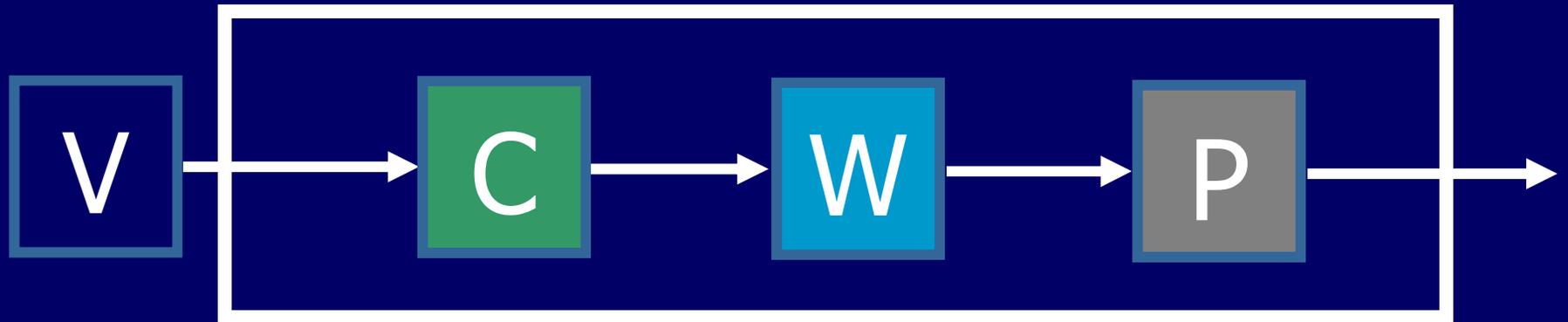
Preventing Defective Batches



Preventing Defective Batches



Preventing Defective Batches



We never have the
time to do it _____
but we always find
time to do it _____

We never have the
time to do it right
but we always find
time to do it _____

We never have the
time to do it right
but we always find
time to do it over.

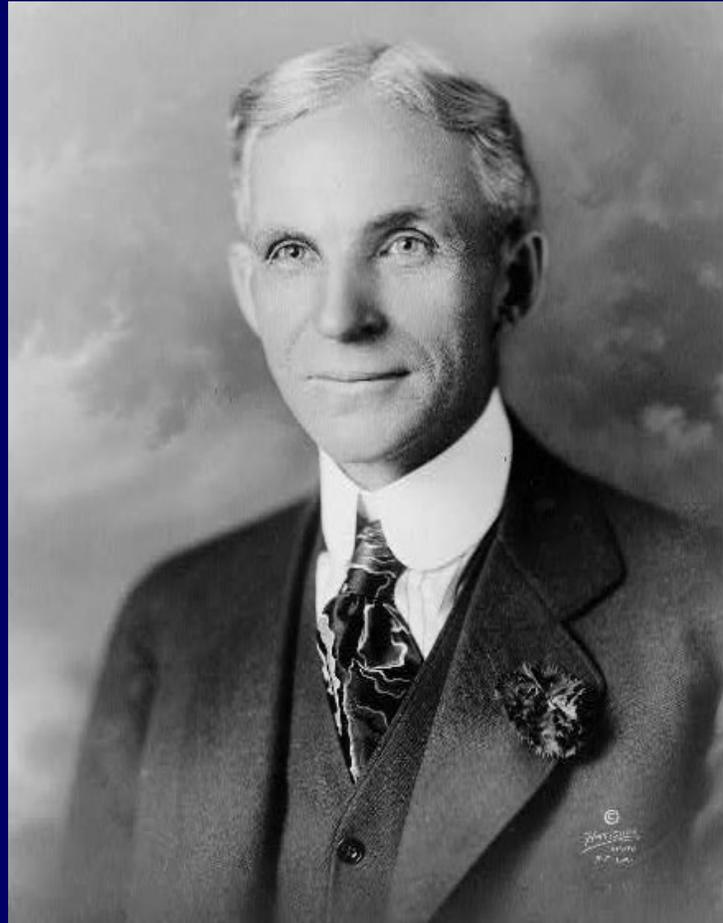
“We have a large salvage department, which apparently earns us twenty or more million dollars a year...”

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“We have a large salvage department, which apparently earns us twenty or more million dollars a year...But as that department grew and became more important and more strikingly valuable, we began to ask ourselves: ‘Why should we have so much to salvage? Are we not giving more attention to reclaiming than not wasting?...’ ”

“...Our studies and investigations to date have resulted in the savings of 80,000,000 pounds of steel a year that formerly went into scrap and had to be reworked with the expenditure of labor...of upward of two thousand men.”

1926



Henry Ford
Today and Tomorrow, 1926
page 98

The Drill vs. The Hole

The Drill: Lean Thinking

The Hole:

Lower Carbon Footprint

	Green Company	Not Green Company
	Mo. 40 1,800	Mo. 40 1,155
Workers	3	21
Units/ wkr./mo.	600	55
Feet²	1200	2300

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