

Line Balancing

Pizzeria Fifi



Go Go Pizza vs Pizzeria Fifi

Which Pizza restaurant delivers pizzas more consistently?

In other words, which pizza may be delivered more efficiently at your door, thus gaining your business?



Go Go Pizza	6.5	6.6	6.7	6.8	7.1	7.3	7.4	7.7	7.7	7.7
Pizzeria Fifi	4.2	5.4	5.8	6.2	6.7	7.7	7.7	8.5	9.3	10.0

Average Delivery Time

Most frequent time to deliver

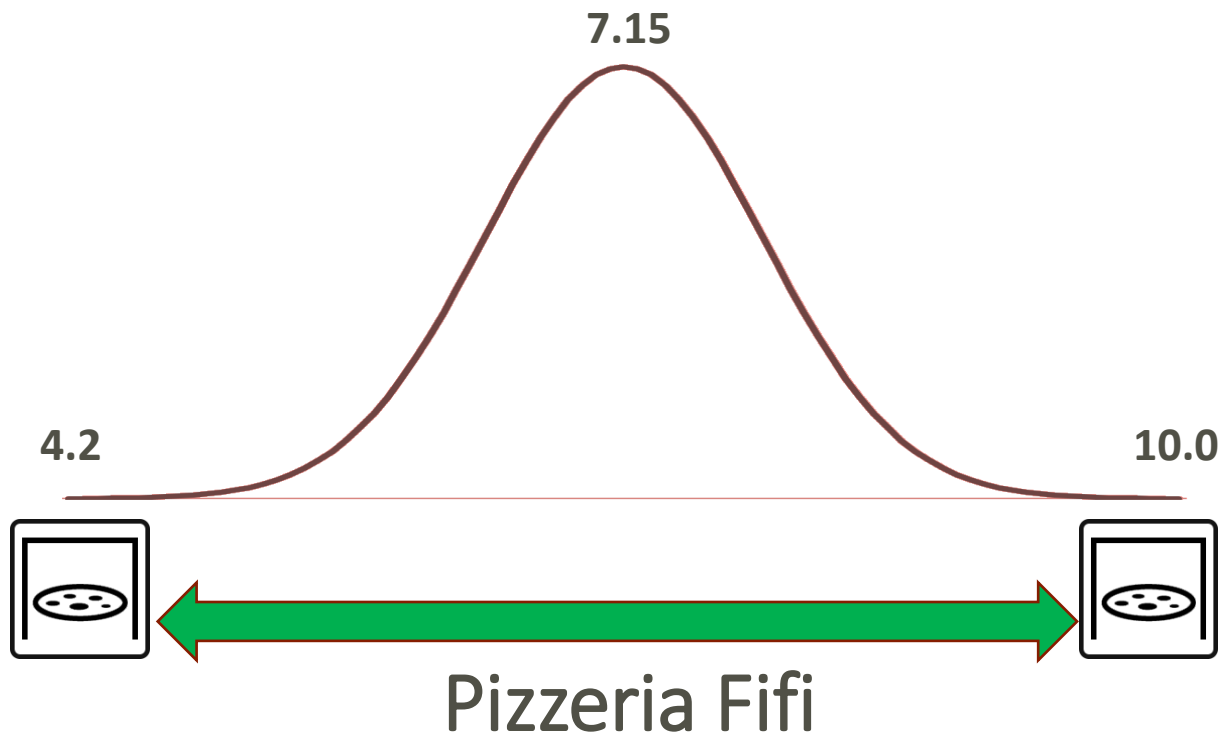
Go Go Pizza	7.15
Pizzeria Fifi	7.15

Go Go Pizza	7.7
Pizzeria Fifi	7.7

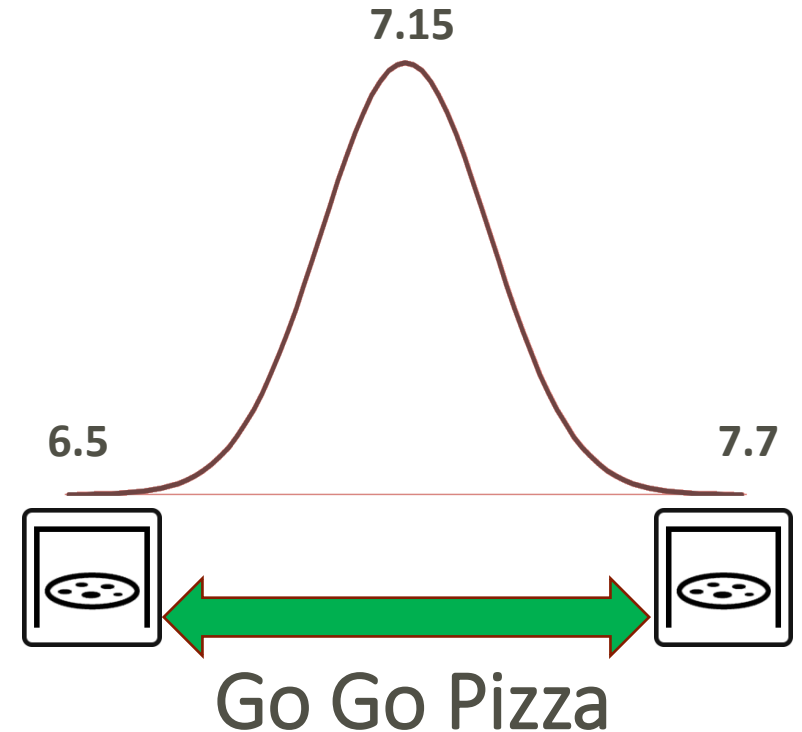


We need to measure and quantify the process variation.

Range and standard deviation.



Search for the 3D thieves:
Downtime, Defects, Deviations



Now we can look for improvement:
Line balancing

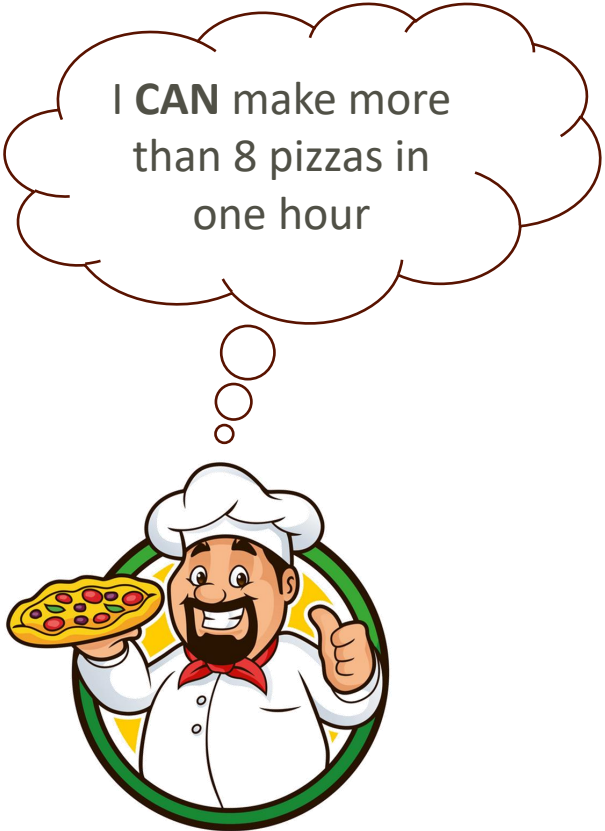
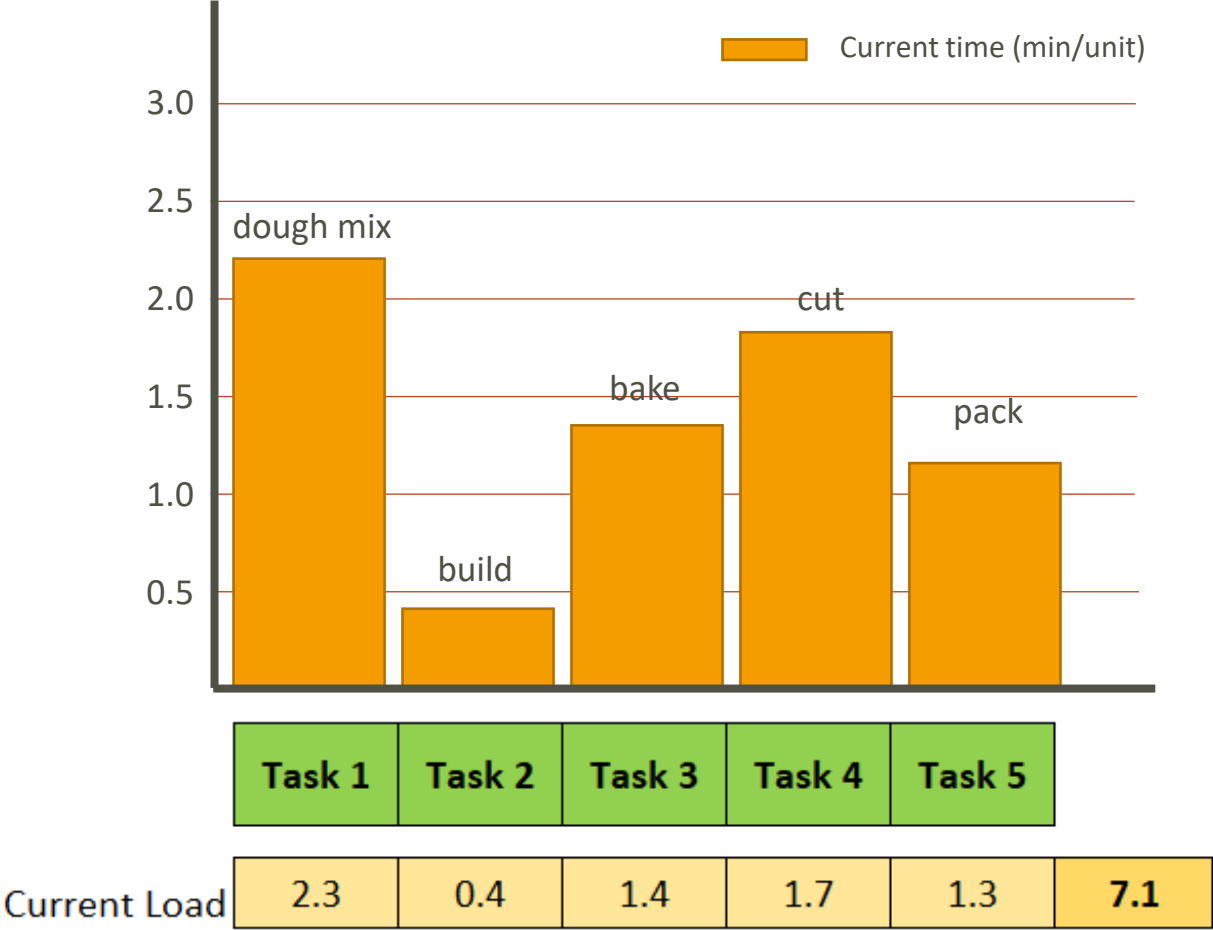
Line Balancing

The following are the major objectives of Line balancing methods:

- Manage the workloads among assemblers.
- Recognize the location of bottlenecks.
- Decide the optimal number of workstations.
- Decrease production costs.
- Assigning task to each workstation in such a way that there is little idle time.
- Achieve target outputs (ideal run rates).

Go Go Pizza

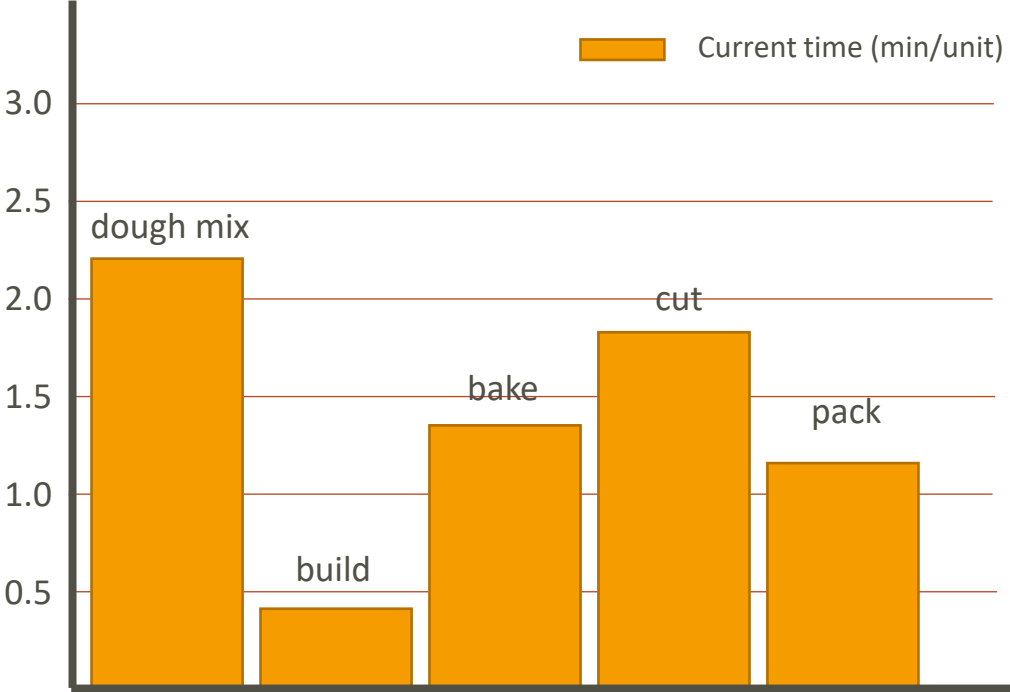
Current Process



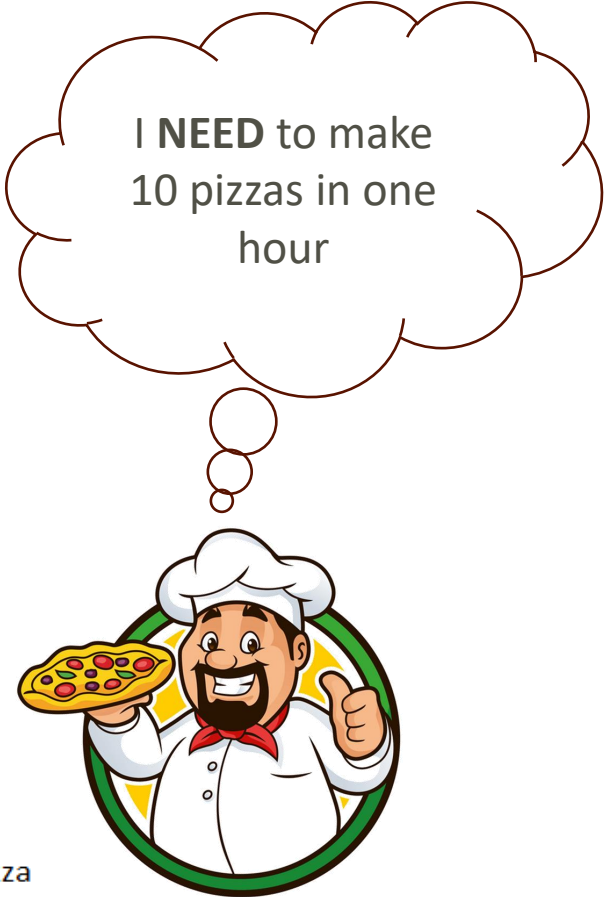
Minutes per pizza
8.5 pizzas per hour

Go Go Pizza

Process Needs



	Task 1	Task 2	Task 3	Task 4	Task 5	
Demand (pizza/hr)	10	10	10	10	10	
Takt time (min/pizza)	1.2	1.2	1.2	1.2	1.2	6 min per pizza
Takt time (min/kg)	2.3	0.4	1.4	1.7	1.3	7.1

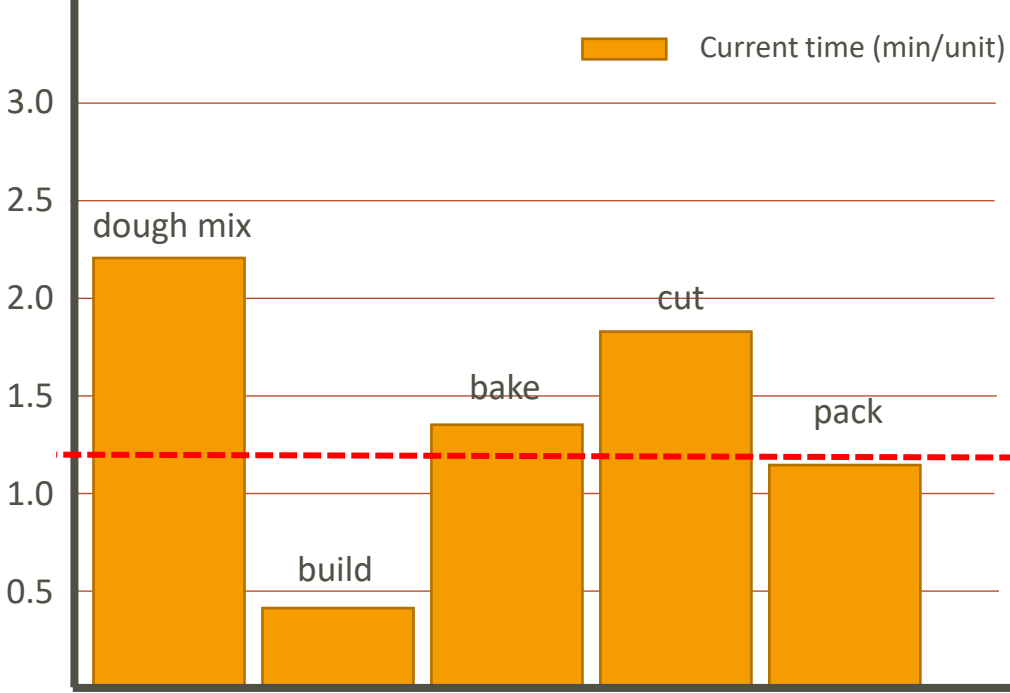


10 pizza/hr

18.3%

Go Go Pizza

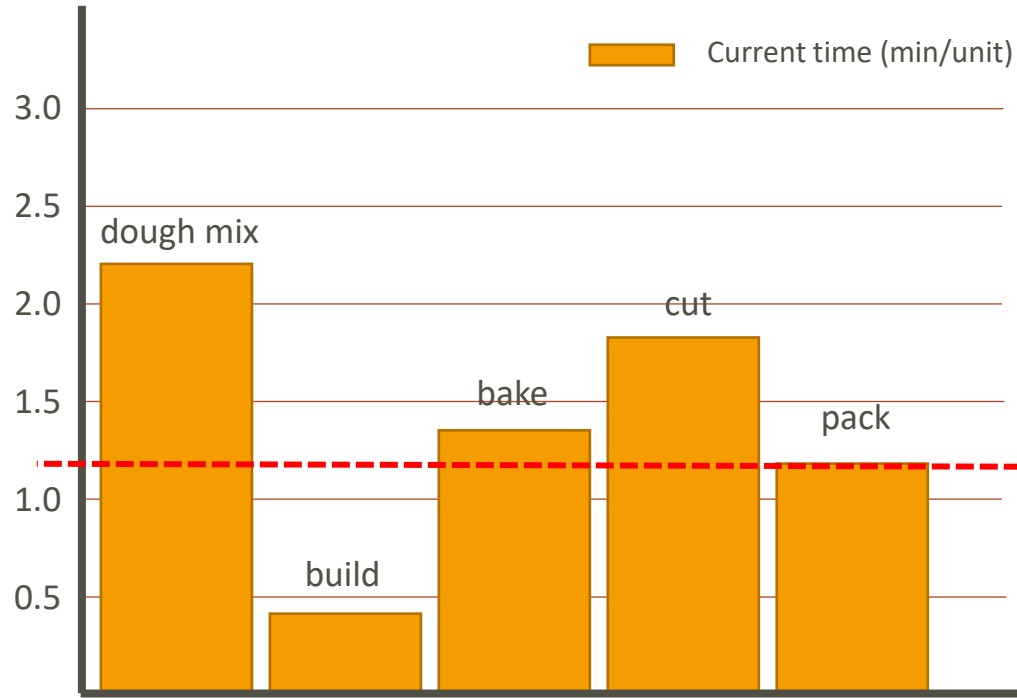
Process Improvement Identified



	Task 1	Task 2	Task 3	Task 4	Task 5	
Demand (pizza/hr)	10	10	10	10	10	
Takt time (min/pizza)	1.2	1.2	1.2	1.2	1.2	6 min per pizza
Takt time (min/kg)	2.3	0.4	1.4	1.7	1.3	7.1 10 pizza/hr
						18.3%

Go Go Pizza

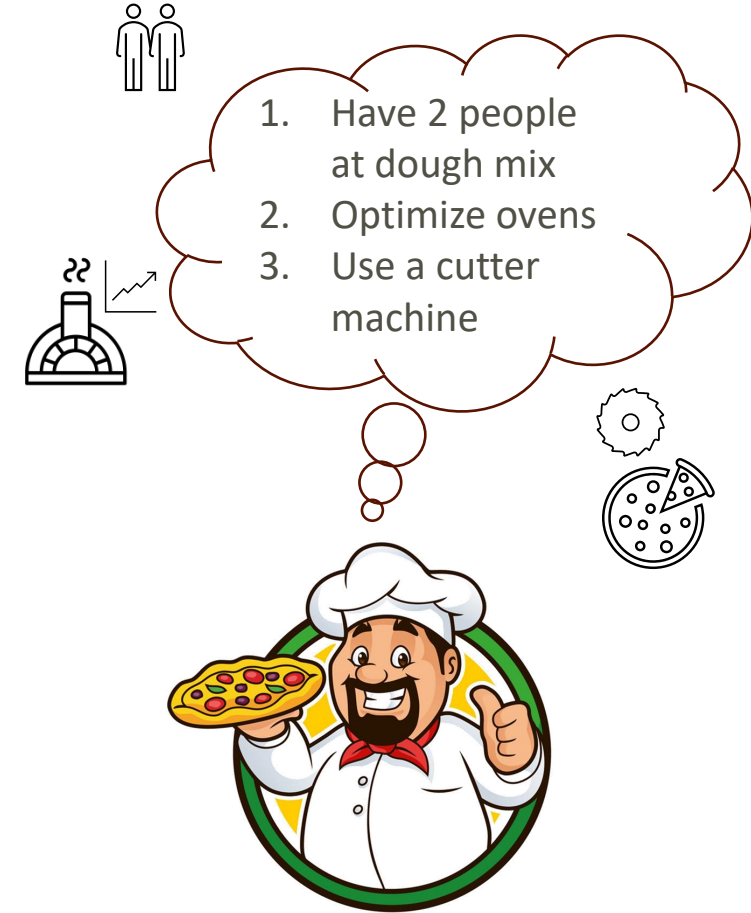
Process Improvement in Action



	Task 1	Task 2	Task 3	Task 4	Task 5	
Demand (pizza/hr)	10	10	10	10	10	
Takt time (min/pizza)	1.2	1.2	1.2	1.2	1.2	6 min per pizza

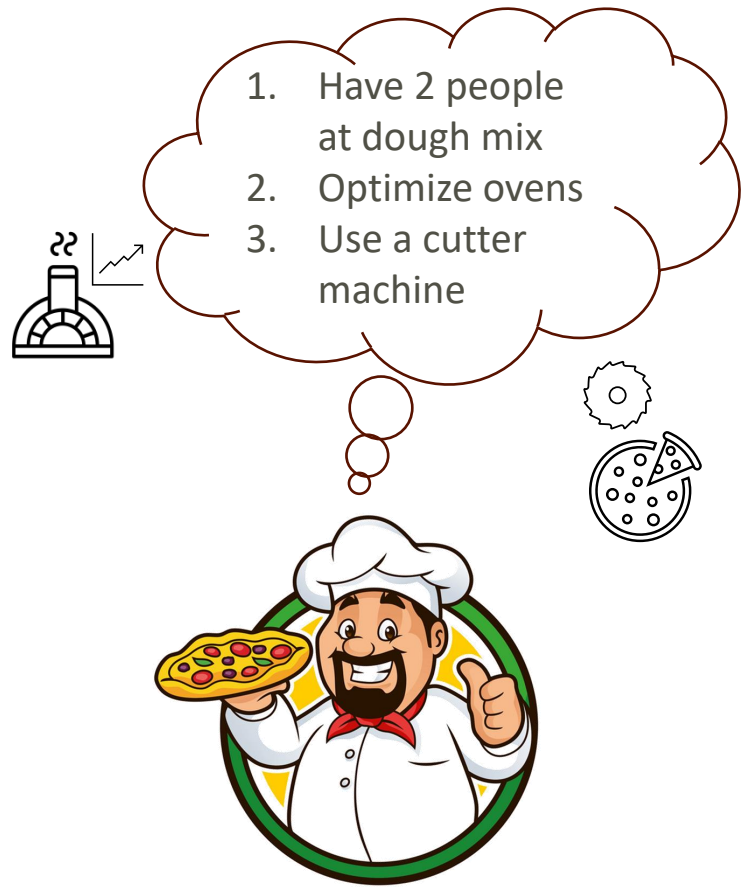
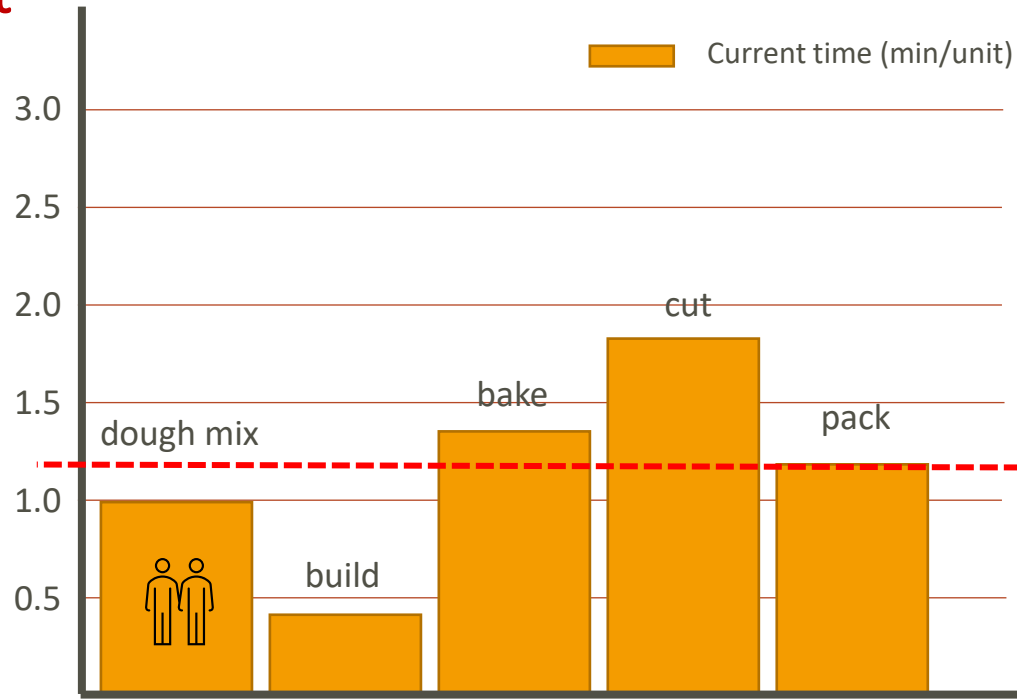
Before

Takt time (min/kg)	2.3	0.4	1.4	1.7	1.3	7.1	10 pizza/hr
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Go Go Pizza

Process Improvement in Action



	Task 1	Task 2	Task 3	Task 4	Task 5	
Demand (pizza/hr)	10	10	10	10	10	
Takt time (min/pizza)	1.2	1.2	1.2	1.2	1.2	6 min per pizza

Before

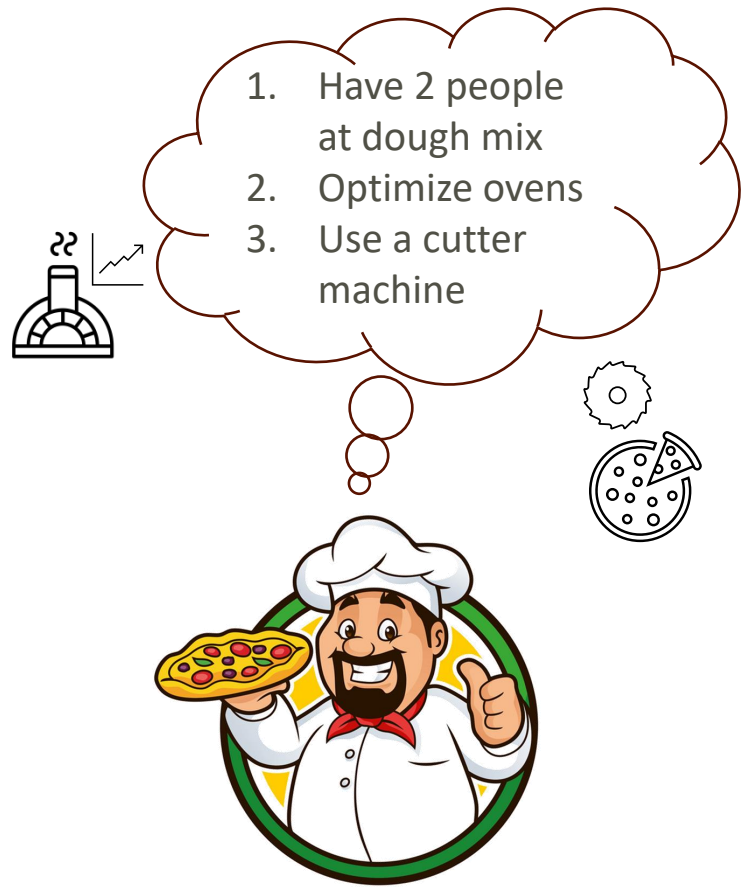
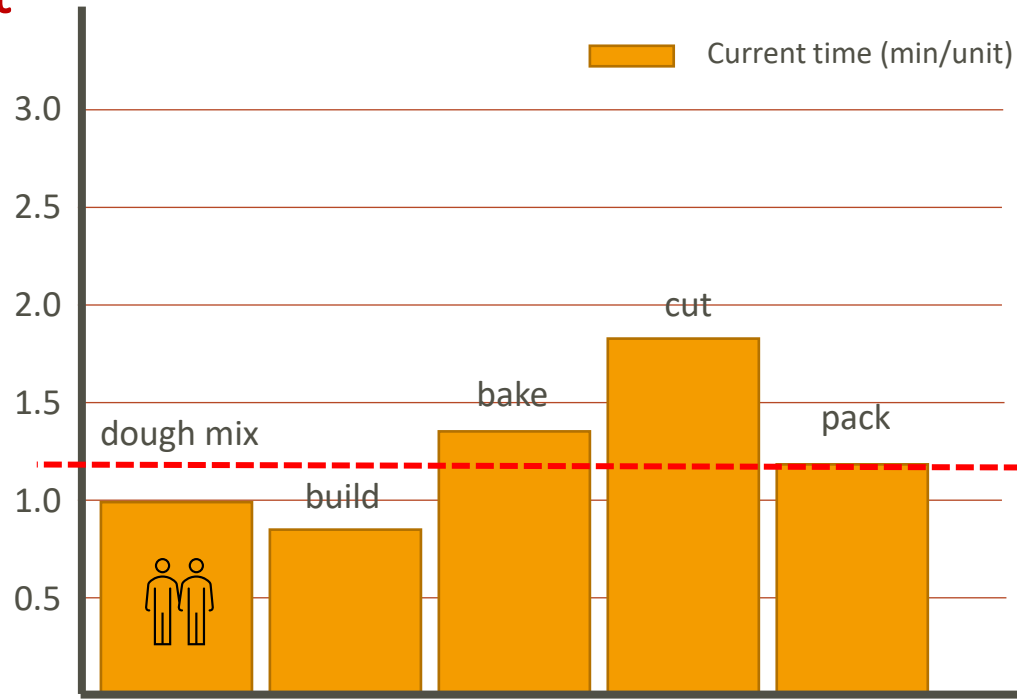
Takt time (min/kg)	2.3	0.4	1.4	1.7	1.3	7.1	10 pizza/hr
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After

Takt time (min/kg)	1	0.8	1	1.2	1.2	5.2	10 pizza/hr
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Go Go Pizza

Process Improvement in Action



	Task 1	Task 2	Task 3	Task 4	Task 5	
Demand (pizza/hr)	10	10	10	10	10	
Takt time (min/pizza)	1.2	1.2	1.2	1.2	1.2	6 min per pizza

Before

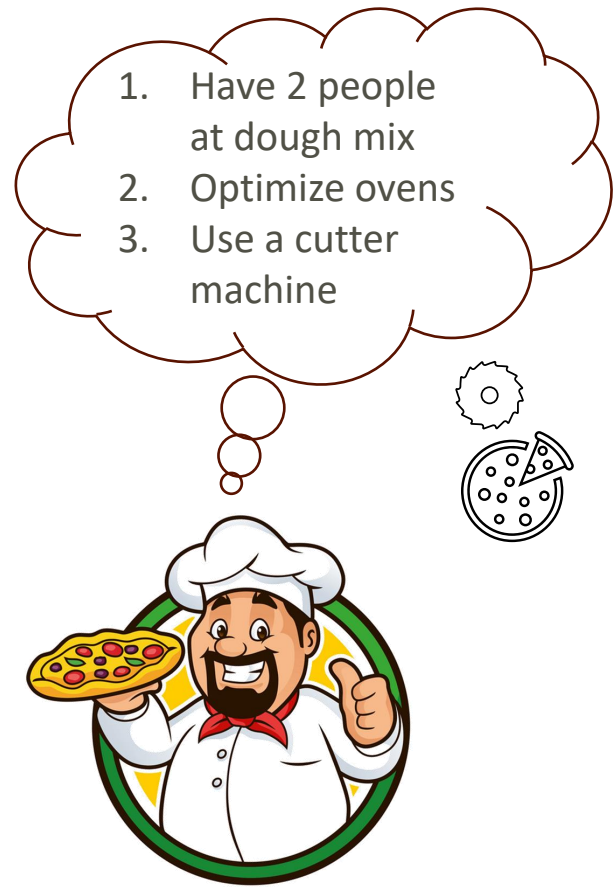
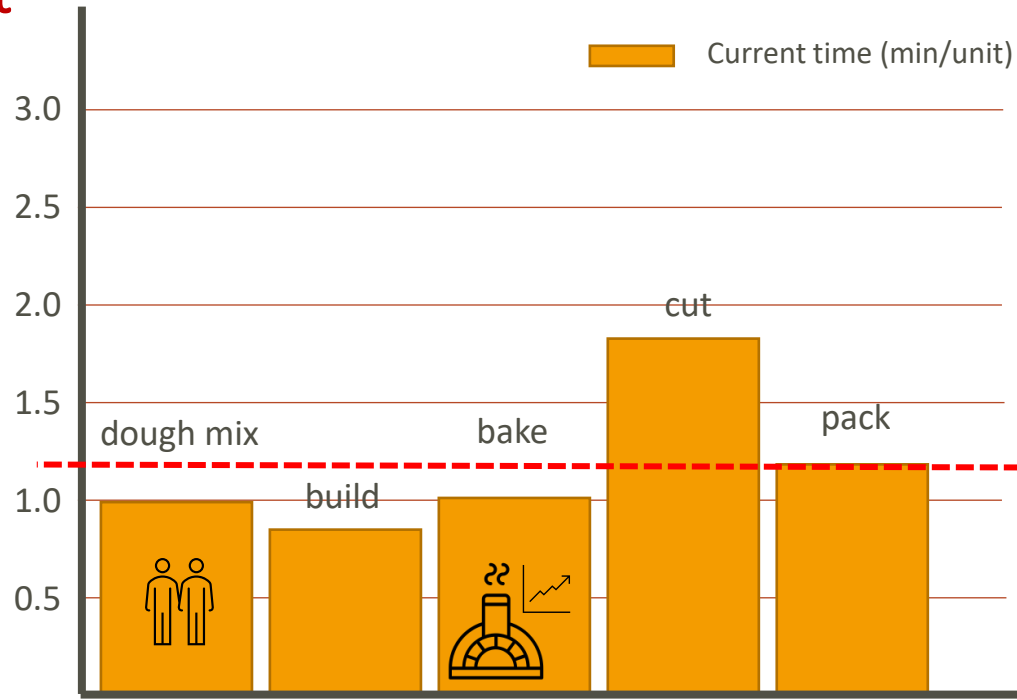
Takt time (min/kg)	2.3	0.4	1.4	1.7	1.3	7.1	10 pizza/hr
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After

Takt time (min/kg)	1	0.8	1	1.2	1.2	5.2	10 pizza/hr
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Go Go Pizza

Process Improvement in Action



	Task 1	Task 2	Task 3	Task 4	Task 5	
Demand (pizza/hr)	10	10	10	10	10	
Takt time (min/pizza)	1.2	1.2	1.2	1.2	1.2	6 min per pizza

Before

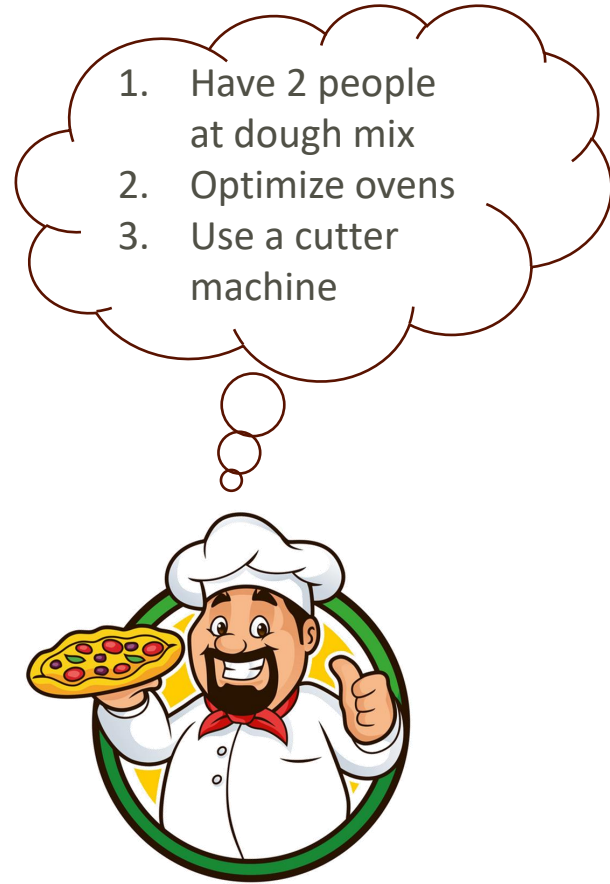
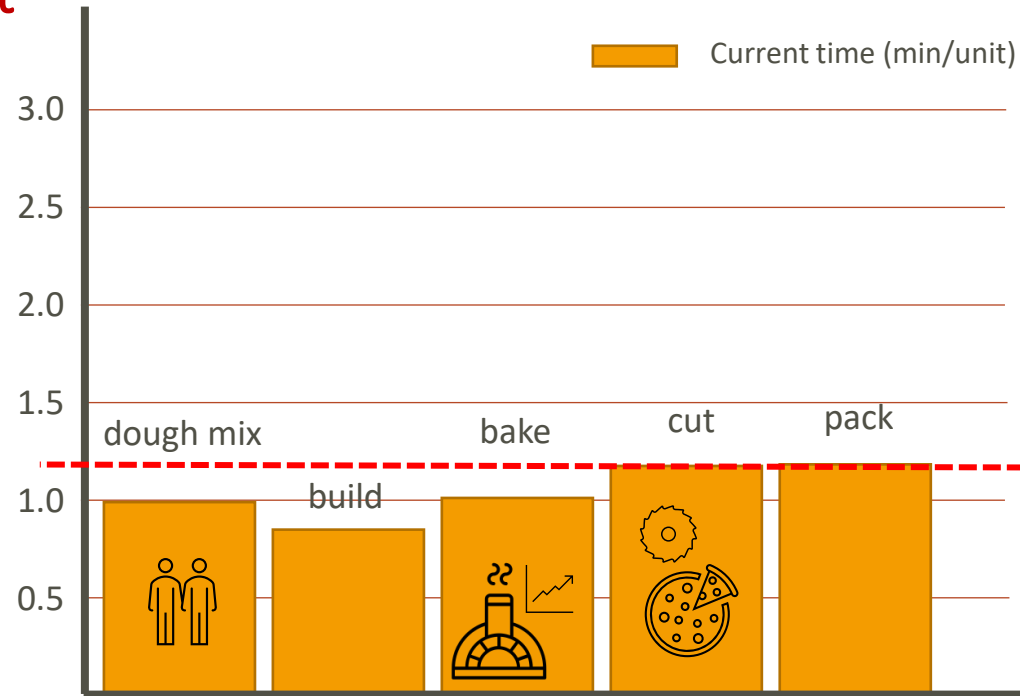
Takt time (min/kg)	2.3	0.4	1.4	1.7	1.3	7.1	10 pizza/hr
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After

Takt time (min/kg)	1	0.8	1	1.2	1.2	5.2	10 pizza/hr
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Go Go Pizza

Process Improvement in Action



	Task 1	Task 2	Task 3	Task 4	Task 5	
Demand (pizza/hr)	10	10	10	10	10	
Takt time (min/pizza)	1.2	1.2	1.2	1.2	1.2	6 min per pizza

Before

Takt time (min/kg)	2.3	0.4	1.4	1.7	1.3	7.1	10 pizza/hr
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After

Takt time (min/kg)	1	0.8	1	1.2	1.2	5.2	10 pizza/hr
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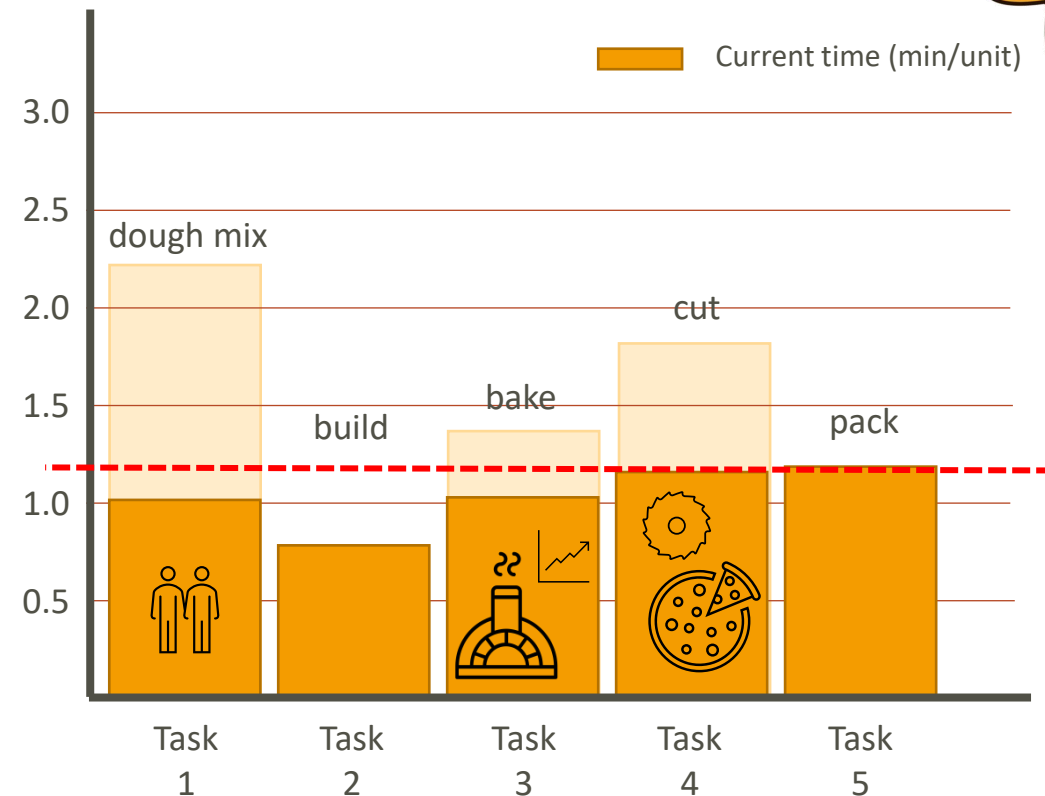
Go Go Pizza

Process Improved

Summarizing:

1. Reduce Variation (3D thieves)
2. Know the demand (Target)*
3. Breakdown the process in TASKS
4. Time each task
5. Reduce the slowest first
6. Time again, try again... don't give up
7. Document Improvement (Standard Work Instructions)

* Avoid going faster than the demand or you will create inventory, overproduction, and more mess that may need to be fixed eventually.



Standard Work Implementation

1. **Balance operations using standard work**
 - a. Define process characteristics and improvement target – takt time / run rate to be achieved
 - b. Observe process to **identify** basic process flow, work responsibilities, process wastes, etc.
 - c. Create standard work **diagram**
 - d. Define operator **cycle times**, summarize current work content and balance
 - e. Analyze and improve **work balance**
 - f. **Document** standard work
 - g. **Review** with operators and pilot new approach
2. **Cross train** operators to operate multiple processes
3. **Measure** performance and continuously improve operations