Business Growth Hub

21 Factsheet

Line Balancing

You would use this approach to improve production flow and reduce manufacturing lead times.

Projected performance gains

Improved

- Production flow

Reduced

- Bottleneck processes
- The 8 lean wastes

What investment is needed to understand the concept?

DIFFICULTY

Medium

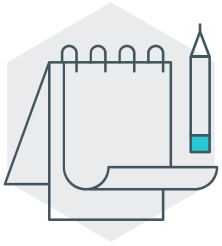
Requires some reading around the subject and a structured approach.

ACTIVITY

Team

Best results come from a team of Engineers and Assembly Operators.

EQUIPMENT



Possibly

Additional benches, racking, tools or even machines.

For more advice, case studies and additional factsheets visit: www.businessgrowthhub.com/manufacturing

Explanation of the concept

Line Balancing is targeted at improving the flow of a production line. Improving the flow has a number of key benefits:

- Reduction in manufacturing lead time as products move through the process faster
- Reduction in Work In Process (WIP) as there are fewer build-ups of WIP in the process due to unbalanced Cycle Times
- Identification and reduction of bottleneck processes
- A more predictable and easier process to manage.

The Objective:

The objective of line balancing is to match the production rate to the Takt time, at each stage of the process. Line balancing levels the workload across all processes and cells so that bottlenecks, constraints and extra capacity are removed. Both a constraint and over-capacity in a process will result in waiting time being produced.

Takt time: Is the rate at which products must be produced in order to meet customer demand.

Takt time = Available production time / Required units of production

Available time is calculated after all of the wastes in the process have been removed and is measured in minutes / shift, seconds per day, minutes per day etc

Required units of production (or customer demand rate) is measured in pieces per day, parts per minute, etc

Cycle time: Is the amount of time it takes to carry out a set of actions to complete a task from start to finish. It is the measured time that explains how often a part is completed by a particular process.

Calculating Takt Time -
Available time / Customer requirement

For example if you have three hours to produce 180 units the Takt Time will be one minute per unit (180/180). Essentially Takt Time sets your benchmark, and Cycle Time tells you how you are performing against this.

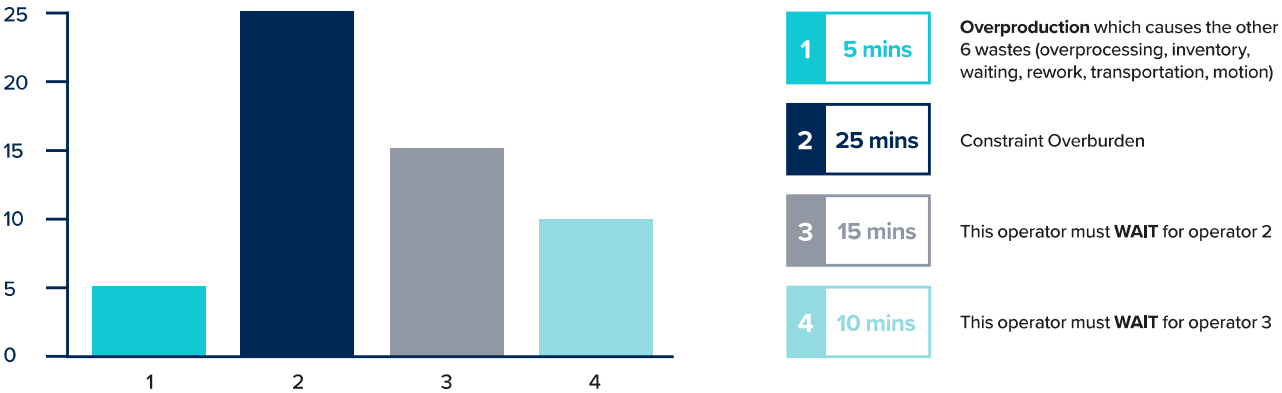
Line Balance: Simple Example

In order to achieve this it is important for you to measure your Cycle time - the time it takes for a part to be completed by a process, and your Takt time - a calculation of the optimum time each process should take to meet customer demand.

In the diagram, the columns represent the different Cycle Times of the process stages. Clearly they are not the same as each other. Stage 1 is a fast process and this causes a build-up of WIP in front of Stage 2 which has a much longer cycle time. Stage 3 spends much of the time waiting for Stage 2 and Stage 4, because it is faster than Stage 3, also waits.

The solution is to balance all four production stages. This can happen in a number of ways:

- Add machines/tools/people to Stage 2 to break the bottleneck
- Take some of the work from Stage 2 and redistribute it to Stage 1
- Share work content across all four production stages to equalise the Cycle Times as much as possible.



What action should I take?

1.

Gather together a group of Engineers and Assembly Operators.

2.

Explain the concepts behind Line Balancing.

3.

Time all of the process stages to work out the Cycle Times and calculate the Takt Time.

4.

Look for opportunities to redistribute work content to equalise Cycle Times and to achieve Takt Time.

5.

Invest in additional tools/ machines/people to break bottlenecks.

Recommended resources

Bicheno, J. (2004). The New Lean Toolbox. Picsie Books.
ISBN: 0-9541-2441-3

Suzaki, K. (1987). The New Manufacturing Challenge. The Free Press.
ISBN: 0-02-932040-2

Rother, M. & Harris, R. (2001). Creating Continuous Flow. The Lean Enterprise Institute.
ISBN: 0-9667843-3-2

GC Business Growth Hub Factsheet 07: Value Add and the 8 Wastes

Glossary

Cycle Time: The time from a part entering a process stage to it leaving the process stage

Bottleneck: A process stage that is slower than all of the other stages and causes a build-up of WIP in front of it

WIP: Work In Process, parts that have been launched into the process

Takt Time: A calculation of the available time over the customer demand.

Waste: Activities that do not add value to the final product

Business Growth Hub
European Union
European Regional Development Fund
In partnership with NORTHERN POWERHOUSE
GMCA GREATER MANCHESTER COMBINED AUTHORITY
Greater Manchester Local Enterprise Partnership