

Line Balance

How-to guide: what the workbook does, how to use it and what every number means.

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Assign work elements to stations, see each station's load against takt in a Yamazumi chart, and compare today's balance with a proposed one.

For: Industrial and manufacturing engineers, lean and continuous-improvement leads, and line supervisors balancing assembly lines and cells.

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Quick start

1. On Setup, type the net available time and demand per shift (takt time calculates), your efficiency target and labour rate, and list the stations in line order.
2. On Work Elements, add one row per element: number, task, seconds, type and the element that must come before it.
3. Give each element its current station, and its station in the balance you propose (leave Proposed blank for an element you remove).
4. Fix anything the Check column flags, especially an element placed before its predecessor.
5. Open the Dashboard: the two Yamazumi charts, the before-and-after table and the stations over takt.

What is in the workbook

Start Here	Read this first: what the workbook does and how to use it.
Setup	Takt time from the shift and demand, the targets, the labour rate and the stations in line order.
Work Elements	One row per work element: seconds, type, predecessor, and its station now and in the proposed balance.
Dashboard	Today's balance against the proposed one: Yamazumi charts, the bottleneck against takt and the balance figures.
Method	How every number is calculated, with assumptions, limits and sources.
Verify	Self-check: the workbook's formulas recomputed on fixed inputs against an independent reference.

What each number means

Quantity	How it is calculated	Units
Takt time	Net available time x 60 / customer demand per shift (Setup).	s per unit
Station position	The station's row in the Setup station list (MATCH): the line order.	-

Quantity	How it is calculated	Units
Station time	SUMIFS of element seconds assigned to the station (current or proposed). An element with no proposed station is removed in the proposal.	s
Time by type	Station time split by element type: value-adding, necessary non-value, waste (SUMIFS by station and type). The Yamazumi charts stack these.	s
Load	Station time / takt time.	% of takt
Idle vs takt	Takt time - station time (negative = the station is over takt).	s
Status	Under capacity below the Near-capacity threshold, Near capacity from it up to the Over-capacity threshold, Over capacity above it (Setup); Not used for a station with no elements.	-
Stations used	Stations with time above zero: one operator each.	stations
Work content	Sum of the station times.	s
Bottleneck	The station with the longest time, and its time.	s
Balance efficiency	Work content / (stations used x bottleneck time).	%
Balance delay	1 - balance efficiency.	%
Idle time per cycle	Stations used x bottleneck time - work content.	s
Takt gap	Takt time - bottleneck time (negative = the line cannot make demand).	s
Output per shift	Net available time x 60 / bottleneck time.	units
Labour cost per unit (est.)	Stations used x labour cost per hour x bottleneck time / 3600: every operator is paid for the bottleneck's cycle. An estimate in your currency; no exchange rate is applied.	currency
Theoretical minimum stations	CEILING(work content / takt time, 1).	stations
Chart scale (helper)	Hidden Dashboard columns AN:AO: 1.1 x the largest of every station time and takt, plotted as an invisible series so both Yamazumi charts share one scale.	s

Assumptions, limitations, sources and the self-check (the Verify sheet, which recomputes the workbook's formulas on fixed test inputs) are in the workbook. The last page shows the Dashboard with the example data for Crestline Seating, a fictional business.

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Engineering estimates for planning and improvement work. Verify the results against your own process, data and standards before you rely on them.

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Today's balance against the proposed one: Yamazumi charts, the bottleneck against takt and the balance figures.

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TAKT TIME (s)	CURRENT BOTTLENECK (s): ST3	PROPOSED BOTTLENECK (s): ST5	PROPOSED BALANCE EFFICIENCY
56.3	60.0	53.0	92.1%
Net available time x 60 / demand	Takt 56.3	Takt 56.3	Target 85.0%
	Over capacity	Near capacity	On target

