

Energy Cost per Part

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

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Energy Cost per Part

Turn measured machine power and cycle times into the electricity cost of each good part, by operation and by part, and see how much is idle energy.

For: Cost estimators, process and manufacturing engineers, energy managers and plant managers.

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Quick start

1. On Setup, type your blended electricity rate and idle-share limit, then replace the example machines and parts (annual volume and price).
2. On Operations, add one row per part per operation: machine, run power and in-cycle time, idle power and idle time per part, and scrap.
3. Read the Check column: anything other than OK names the problem in words.
4. Open the Dashboard to see the annual energy bill by machine, the idle share and the energy cost of each part.
5. Copy a row and change its cycle time or power to price an improvement before you make it.

What is in the workbook

Start Here	Read this first: what the workbook does and how to use it.
Setup	Your electricity rate, idle-share limit, machines and parts.
Operations	One row per part per operation: power, time per part and scrap give the energy and cost of each good part.
Dashboard	What electricity costs per year, per machine and per good part, and how much of it is idle energy.
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
Energy per part made	$(\text{Run power} \times \text{cycle time} + \text{idle power} \times \text{idle time}) / 3600$.	kWh/part
Energy per good part	Energy per part made / (1 - scrap): scrapped parts' energy is carried by the good ones.	kWh/part
Energy cost per good part	Energy per good part x electricity rate (Setup).	currency/part

Quantity	How it is calculated	Units
Idle share	Idle power x idle time / 3600 / energy per part made. Status: On target at or below the limit, Near target up to 5% above it, Above target beyond.	%
Average demand	Energy per part made x 3600 / (cycle time + idle time): the time-weighted average power of the operation.	kW
Runtime	Annual volume / (1 - scrap) x (cycle time + idle time) / 3600: machine hours to make the volume and its scrap.	h/yr
Annual energy, idle energy	Energy per good part x annual volume (looked up from Parts on Setup); idle energy = annual energy x idle share.	kWh/yr
Annual energy cost	Annual energy x electricity rate.	currency/yr
By machine	SUMIFS over the operations of each machine. In-cycle cost = (energy - idle energy) x rate; idle cost = idle energy x rate; idle share = idle energy / energy.	currency/yr
By part	Energy and cost per good part summed over the part's operations; share of price = energy cost per good part / price.	currency/part, %
Energy share of sales	Total annual energy cost / sum over parts of annual volume x price (SUMPRODUCT over the Parts list).	%

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 Harlow Precision, 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.

Energy Cost per Part

What electricity costs per year, per machine and per good part, and how much of it is idle energy.

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Money in USD at the electricity rate and annual volumes on Setup. 14 operations on 6 machines.

ANNUAL ENERGY COST (USD/YR)	ANNUAL ENERGY (MWH/YR)	IDLE SHARE OF ENERGY	IDLE ENERGY COST (USD/YR)
17,258	143.8	17.7%	3,049
All operations at Setup volumes	Including the energy of scrapped parts	Limit 25.0% On target	Drawn between cycles

