Plant Operating Cost per Tonne of Product

Cash operating cost per tonne from raw materials, utilities, labour, maintenance and overheads, with depreciation for the total production cost (Perry sec. 9).

Method: Perry's Chemical Engineers' Handbook; 9th ed. (McGraw-Hill, 2019); ...

Input parameters

Unit system: SI

Parameter	Value	Unit
Annual production (t)	100,000	
Raw materials per tonne	12,000	
Utilities per tonne	1,500.0	
Labour per year	2.0000e+07	
Maintenance as a share of fixed capital per year	4.0000	%
Fixed capital	5.0000e+08	
Overheads as a share of labour and maintenance	60.000	%
Depreciation life (years, straight line)	15.000	

Calculated results

Parameter	Value	Unit
Cash operating cost per tonne	14,140	
Depreciation per tonne	333.33	
Total production cost per tonne	14,473	
Raw materials share of cash cost	84.866	%

Notes for this case

- At low capacity use, fixed costs per tonne rise sharply: run the calculator at the expected, not the nameplate, output.

Formula and method

$$C_{cash} = C_{RM} + C_U + \frac{(C_L + mC_{FC})(1+o)}{P}, \quad C_D = \frac{C_{FC}}{nP}$$

Variables

P	Annual production (t)	-
C_{RM}	Raw materials per tonne	-
C_U	Utilities per tonne	-
C_L	Labour per year	-
m	Maintenance as a share of fixed capital per year	-
C_{FC}	Fixed capital	-
o	Overheads as a share of labour and maintenance	-
n	Depreciation life (years, straight line)	-
C_{cash}	Cash operating cost per tonne	-
C_D	Depreciation per tonne	-
C_{tot}	Total production cost per tonne	-
C_{RM}/C_{cash}	Raw materials share of cash cost	-

Method and standards

Perry's manufacturing cost structure.

Assumptions and limits

- Straight-line depreciation.

References

- Perry's Chemical Engineers' Handbook
- 9th ed. (McGraw-Hill, 2019)
- sec. 9 (manufacturing cost: direct, fixed and overhead charges)

Report details

Report reference	FCC-VA3T-JVBC (the same inputs always give the same reference)
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Calculator	Plant Operating Cost per Tonne of Product
Method last reviewed	13 November 2026
Software release	FireCAD Calc, release of 17 November 2026
Release checks	2 reference cases of this calculator, computed independently, are checked on every release

Results are for engineering estimation. Verify critical designs against the referenced standards and your own data.

This calculator online

https://calc.firecad.com/general/economics/plant-operating-cost-per-tonne

Open this case on calc.firecad.com →

Reopens the calculator with the inputs of this report.