Boiler Chemical Consumption and Cost per Tonne of Steam

Daily consumption and cost of a boiler water treatment chemical from its dose in feedwater, steam output, blowdown and product strength, per tonne of steam.

Method: Mass balance on feedwater (ppm = mg/kg)

Input parameters

Unit system: SI

Parameter	Value	Unit
Steam output	20.000	t/h
Blowdown, share of feedwater	4.0000	%
Dose of active chemical in feedwater	10.000	mg/L
Active content of the product as supplied	35.000	%
Price per kg of product (your currency)	120.00	
Operating hours per year	8,000.0	h

Calculated results

Parameter	Value	Unit
Product used per day (at full output)	14.286	kg
Cost per tonne of steam (your currency)	3.5714	
Cost per year (your currency)	571,429	
Feedwater flow	20.833	t/h

Formula and method

$$\dot{m}_{fw} = \frac{\dot{m}_s}{1-b} \qquad \dot{m}_p = \frac{\dot{m}_{fw}\, c}{\rho_w\, s} \qquad m_d = 86\,400\,\dot{m}_p \qquad c_t = \frac{\dot{m}_p\, c_p}{\dot{m}_s} \cdot 1000\ \text{kg/t} \qquad C_y = \dot{m}_p\, t_y\, c_p$$

Variables

$\dot{m}_s$	steam output	kg/s
b	blowdown share of feed	–
c	active dose	kg/m³
s	active content of product	–
c_p	price per kg	currency
t_y	hours per year	s
m_d	product per day	kg
c_t	cost per tonne of steam	currency
C_y	cost per year	currency
$\dot{m}_{fw}$	feedwater flow	kg/s
$\dot{m}_p$	product flow	kg/s
ρ_w	1000 kg/m³ (mg/L taken as mg/kg)	kg/m³

Method and standards

Mass balance: dose on feedwater flow, product flow from the active content.

Assumptions and limits

- Constant dose; full output.
- The dose is on the whole feedwater. Chemicals dosed to the drum (phosphate, for example) are often specified as a boiler-water residual instead: convert that to a feedwater dose (residual × blowdown share of feedwater) first.

References

- Mass balance on feedwater (ppm = mg/kg)

Report details

Report reference	FCC-DQFF-SR93 (the same inputs always give the same reference)
Generated	17 November 2026, 19:37 UTC
Calculator	Boiler Chemical Consumption and Cost per Tonne of Steam
Method last reviewed	12 November 2026
Software release	FireCAD Calc, release of 17 November 2026
Release checks	3 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/boilers-power-plant/water-treatment/chemical-cost-per-tonne-steam

Open this case on calc.firecad.com →

Reopens the calculator with the inputs of this report.