Cement Kiln Specific Heat Consumption and Thermal Efficiency

Specific heat consumption of a clinker kiln from fuel rate, calorific value and clinker output, with thermal efficiency against the heat of formation.

Method: Kiln heat consumption balance

Input parameters

Unit system: SI

Parameter	Value	Unit
Fuel feed rate	14.000	t/h
Fuel net calorific value	25.000	MJ/kg
Clinker production	3,000.0	t/d
Theoretical heat of clinker formation	1,750.0	kJ/kg

Calculated results

Parameter	Value	Unit
Fuel heat input	97.222	MW
Specific heat consumption	2,800.0	kJ/kg
Specific heat consumption (kcal/kg)	668.77	kcal/kg
Kiln thermal efficiency	62.500	%

Notes for this case

• q_sp = ṁ_f·NCV/ṁ_cl. Modern dry-process kilns with five- or six-stage preheaters and calciners use about 2,900–3,300 kJ/kg clinker; wet kilns 5,000–6,000. The theoretical heat of formation (about 1,700–1,800 kJ/kg, from raw-mix chemistry) is the minimum; the rest goes to exit gases, clinker, shell and cooler air losses.

Formula and method

$$q_{sp} = \frac{\dot{m}_f NCV}{\dot{m}_{cl}}, \quad \eta_{th} = \frac{\Delta H_f}{q_{sp}}$$

Variables

$\dot{m}_f$	Fuel feed rate	kg/s
NCV	Fuel net calorific value	J/kg
$\dot{m}_{cl}$	Clinker production	kg/s
ΔH_f	Theoretical heat of clinker formation	J/kg
$\dot{Q}_f$	Fuel heat input	W
q_{sp}	Specific heat consumption	J/kg
η_{th}	Kiln thermal efficiency	-

Method and standards

Heat consumption.

Assumptions and limits

- Steady operation; all fuel to the kiln system.

References

Kiln heat consumption balance

Report details

Report reference	FCC-1D51-2811 (the same inputs always give the same reference)
Generated	23 November 2026, 17:51 UTC
Calculator	Cement Kiln Specific Heat Consumption and Thermal Efficiency
Method last reviewed	17 November 2026
Software release	FireCAD Calc, release of 22 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/chemical/cement/kiln-specific-heat-consumption

Open this case on calc.firecad.com →

Reopens the calculator with the inputs of this report.