Rotary Kiln Thermal Loading and Volumetric Loading

Inside diameter and cross-section of a rotary kiln, the burning-zone thermal loading per area, and the volumetric and specific clinker loadings.

Method: Rotary kiln loading measures

Input parameters

Unit system: SI

Parameter	Value	Unit
Shell diameter	4.8000	m
Refractory thickness	220.00	mm
Kiln length	74.000	m
Clinker production	3,000.0	t/d
Heat input at the kiln burner	40.000	MW

Calculated results

Parameter	Value	Unit
Effective inside diameter	4.3600	m
Inside cross-section	14.930	m²
Burning-zone thermal loading	2.6792	MW/m²
Volumetric loading	2.7154	
Specific loading per cross-section	200.94	

Notes for this case

• Thermal loading q_A = heat input at the main burner/inside cross-section: about 4–6 MW/m² is common, higher values shorten refractory life. Volumetric loading in t/d per m³ of inside volume (preheater-calciner kilns 4–6, wet kilns below 1) and specific loading in t/d per m² of cross-section compare kiln utilisation.

Formula and method

$$D_i = D_s - 2t_r, \quad q_A = \frac{\dot{Q}_k}{\pi D_i^2/4}, \quad \frac{\dot{m}_{cl}}{V} = \frac{\dot{m}_{cl}}{A_i L}$$

Variables

D_s	Shell diameter	m
t_r	Refractory thickness	m
L	Kiln length	m
$\dot{m}_{cl}$	Clinker production	kg/s
$\dot{Q}_k$	Heat input at the kiln burner	W
D_i	Effective inside diameter	m
A_i	Inside cross-section	m²
q_A	Burning-zone thermal loading	W/m²
$\dot{m}_{cl}/V$	Volumetric loading	-
$\dot{m}_{cl}/A_i$	Specific loading per cross-section	-

Method and standards

Kiln loading.

Assumptions and limits

- Uniform refractory thickness; outputs in t/d.

References

Rotary kiln loading measures

Report details

Report reference	FCC-PP0Z-E2J1 (the same inputs always give the same reference)
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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-thermal-volumetric-loading

Open this case on calc.firecad.com →

Reopens the calculator with the inputs of this report.