Raw Meal to Clinker Factor and Calcination CO2

Raw meal per tonne of clinker from loss on ignition and dust loss, and calcination CO2 per tonne of clinker from its CaO and MgO by stoichiometry.

Method: Duda; Cement Data Book; ...

Input parameters

Unit system: SI

Parameter	Value	Unit
Loss on ignition of the raw meal	34.670	%
Dust lost from the kiln system (fraction of raw meal fed)	0	%
CaO in clinker	66.920	%
MgO in clinker	2.0000	%
Share of clinker CaO from non-carbonate sources (slag, ash)	0	%
Clinker production	3,000.0	t/d

Calculated results

Parameter	Value	Unit
Raw meal (ignited basis) per unit clinker	1.5307	
Raw meal fed per unit clinker, with dust loss	1.5307	
Calcination CO_2 per tonne of clinker	547.02	kg/t
Calcination CO_2	1,641.1	t/d
Raw meal feed	4,592.1	t/d

Notes for this case

• All CaO and MgO are taken as from carbonates unless a non-carbonate share is entered; MgO may also come from silicates. Fuel CO_2 comes on top. Dust lost is assumed not returned and not calcined.

Formula and method

$$f_k = \frac{1}{1 - LOI}, \quad f_{rm} = \frac{f_k}{1 - d}, \quad CO_2 = CaO(1 - x_{nc})\frac{M_{CO_2}}{M_{CaO}} + MgO\frac{M_{CO_2}}{M_{MgO}}$$

Variables

LOI	Loss on ignition of the raw meal	-
d	Dust lost from the kiln system (fraction of raw meal fed)	-
CaO	CaO in clinker	-
MgO	MgO in clinker	-
x_{nc}	Share of clinker CaO from non-carbonate sources (slag, ash)	-
$\dot{m}_{cl}$	Clinker production	kg/s
f_k	Raw meal (ignited basis) per unit clinker	-
f_{rm}	Raw meal fed per unit clinker, with dust loss	-
CO_2	Calcination CO_2 per tonne of clinker	kg/kg
$\dot{m}_{CO_2}$	Calcination CO_2	kg/s
$\dot{m}_{rm}$	Raw meal feed	kg/s

Method and standards

Mass balance on ignition and stoichiometry.

Assumptions and limits

- All carbonate calcined.

References

- Duda
- Cement Data Book
- Vol. 1
- 3rd ed. (Bauverlag / Macdonald and Evans, 1985)
- ch. 2 (raw mix to clinker, Table 2.2)
- Stoichiometry of CaCO3 and MgCO3 calcination with IUPAC atomic masses

Report details

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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/raw-meal-clinker-factor-co2

Open this case on calc.firecad.com →

Reopens the calculator with the inputs of this report.