



Kiln Heat Balance · where every kilocalorie goes

The heat of the fuels, the gas and the cooler, set out in and out per kg of clinker, and what the loss above target costs.

Licensed to: Sample file · worked example on a demonstration plant

HEAT	ABOVE TARGET
729	19
kcal/kg clinker	kcal/kg

YOUR FIGURES

	Today	What if	
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The kiln

Clinker made	5,000		t/day
Hours the kiln ran	24.0		h
Kiln feed to clinker factor	1.600		t/t
Loss on ignition of the kiln feed	35.5		%
Water in the kiln feed	0.5		%

The fuels (the main burner first)

Main burner: fuel	Coal		
Main burner: rate	9.80		t/h
Main burner: calorific value (optional)			GJ/t
Calcliner, fuel 1: fuel	Petcoke		
Calcliner, fuel 1: rate	10.30		t/h
Calcliner, fuel 1: calorific value (optional)			GJ/t
Calcliner, fuel 2: fuel	RDF / SRF		
Calcliner, fuel 2: rate	3.84		t/h
Calcliner, fuel 2: calorific value (optional)			GJ/t

The preheater

Cyclone stages	5		
Preheater exit O2	2.48	2.00	%
Preheater exit gas	308		°C
Dust in the preheater exit gas	70		g/Nm³
Kiln feed temperature	60		°C

The cooler

Cooling air	1.97		Nm³/kg clinker
Primary air of the main burner	14,000		Nm³/h

COST OF IT	COOLER RECOVERS
1,607	72.1
\$ a day	% of the clinker heat

RESULTS

	Today		What if	Change	What it means
Heat consumption (kcal/kg)	729	ACT	729	0	All fuels, main burner and calciner, per kg of clinker.
Above the target (kcal/kg)	19		19	0	
Cost of the heat above target (\$/day)	1,607		1,607	0	At the price of the main fossil fuel.
Main burner share (%)	38.5		38.5	0	Kilns with a calciner usually burn 35 to 45 % of the heat at the main burner.
Alternative fuel share (%)	9.7		9.7	0	
Preheater exit gas (Nm³/kg)	1.316		1.284	-0.032	
Excess air factor λ	1.177	GOOD	1.139	-0.038	
Heat of one more point of O2 (kcal/kg)	6.9		6.6	-0.3	
Heat of 10 °C more at the exit (kcal/kg)	4.6		4.5	-0.1	
Heat leaving with the preheater gas (kcal/kg)	134	GOOD	131	-3	
Heat leaving with the cooler exhaust (kcal/kg)	93		80	-13	
Heat leaving with the clinker (kcal/kg)	15.0		15.0	0	
Radiation and not measured (kcal/kg)	76	GOOD	93	+16	Heat in minus the heat measured out. Above 150 kcal/kg a figure is off.
Cooler efficiency (%)	72.1	GOOD	75.5	+3.4	
Loss-free kiln feed factor (t/t)	1.534		1.534	0	

Cooler exhaust air	294	250	°C
Clinker leaving the cooler	100		°C
Clinker entering the cooler	1400		°C

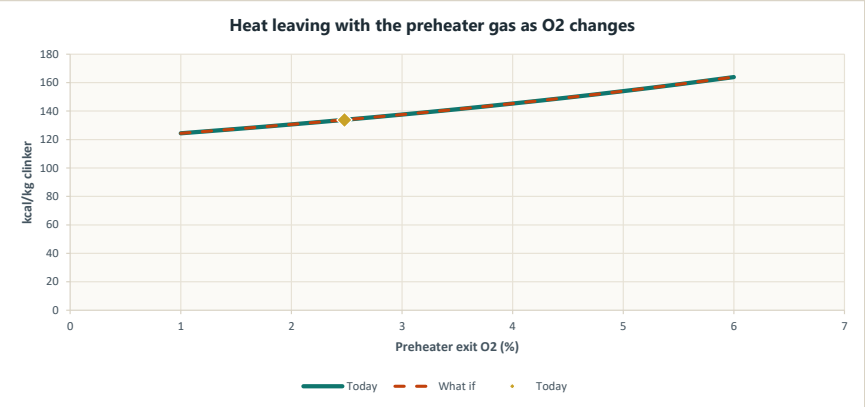
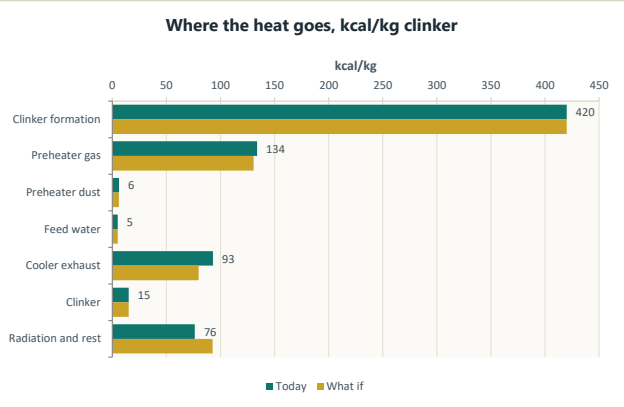
The air

Ambient air	30		°C
Ambient humidity	60		%
Barometric pressure	1013		mbar

The targets

Heat of clinker formation	420		kcal/kg
Heat target	710		kcal/kg
Price of the main fossil fuel	4.00		\$/GJ

Yellow cells are yours. Leave a What-if cell empty to keep today's figure; type a new one to see what changes, before anything is changed in the plant.



WHAT TO DO FIRST

ACT	HEAT 19 KCAL/KG ABOVE TARGET 729 kcal/kg against a target of 710: about \$1,607 a day, or 16.1 t of coal a day burnt for nothing. Do: Start with the largest item of the balance below that moved: the preheater gas, the cooler exhaust or the radiation. Why: The heat above target is paid every hour the kiln runs; the balance shows where it leaves.
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