



Kiln Gas, False Air, Fans and Stack · what the ID fan really moves

Excess air at the kiln inlet, the calciner and the preheater exit, the false air between them, the fans and the stack.

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

GAS AT THE PREHEATER EXIT	FALSE AIR, CALCINER TO EXIT
171 actual m³/s	3.0 % of the gas

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
Calciner, fuel 1: fuel	Petcoke		
Calciner, fuel 1: rate	10.30		t/h
Calciner, fuel 1: calorific value (optional)			GJ/t
Calciner, fuel 2: fuel	RDF / SRF		
Calciner, fuel 2: rate	3.84		t/h
Calciner, fuel 2: calorific value (optional)			GJ/t

Along the gas path

Kiln inlet O2	2.65		%
Kiln inlet CO (optional)	600		ppm
Share of the feed CO2 still released in the kiln	12.5		%
Calciner outlet O2 (optional)	1.90		%
Preheater exit O2	2.48	2.00	%
Preheater exit CO (optional)	140		ppm
Preheater exit gas	308		°C
Preheater exit static pressure	-5523		Pa

ID FAN EFFICIENCY	ONE POINT OF O2 COSTS
62.7 % · motor included	579 \$ a day

RESULTS

	Today		What if	Change	What it means
Actual gas flow at the preheater exit (m³/s)	171.4		167.3	-4.1	
Gas flow (Nm³/h)	274,071		267,451	-6,620	
Gas per kg of clinker (Nm³/kg)	1.316		1.284	-0.032	
Excess air factor λ, preheater exit	1.177	GOOD	1.139	-0.038	
Excess air factor λ, kiln inlet	1.158	GOOD	1.158	0	The main burner's gas and the CO2 still released in the kiln.
Excess air factor λ, calciner outlet	1.132		1.132	0	
False air, calciner outlet to exit (%)	3.0	GOOD	0.5	-2.5	Above 10 % the tower is drawing air through doors, flaps and joints.
Heat of one point of O2 at the exit (kcal/kg)	6.9		6.6	-0.3	
Cost of one point of O2 (\$/day)	579		550	-29	
ID fan efficiency (motor included) (%)	62.7	GOOD	61.2	-1.5	
ID fan energy (kWh/t clinker)	7.05		7.05	0	
Fan law flow against the gas balance (%)	2.0	GOOD	-0.2	-2.2	The design flow × speed ratio against the flow the gas balance gives.
Stack dust at 10 % O2 (mg/Nm³)	7.0	GOOD	7.0	0	
Stack NOx at 10 % O2 (mg/Nm³)	364	GOOD	364	0	
Stack SO2 at 10 % O2 (mg/Nm³)	34	GOOD	34	0	

The ID fan

ID fan power	1,469		kW
Fan inlet static pressure	-5523		Pa
Fan outlet static pressure	-150		Pa
Fan design flow (optional)	700,000		m³/h
Fan design speed (optional)	990		rpm
Fan speed now (optional)	890	850	rpm

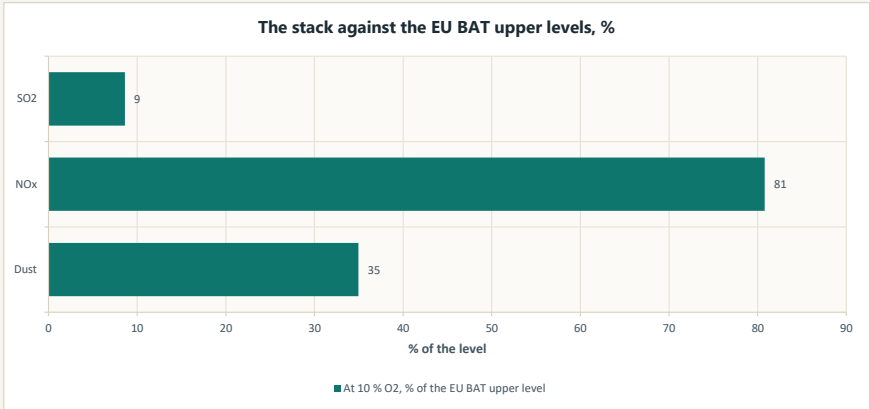
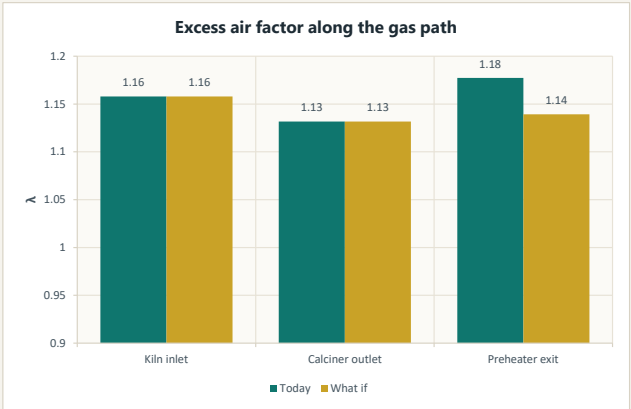
The stack

Stack O2 (dry)	9.2		%
Stack dust (optional)	7.5		mg/Nm³
Stack NOx (optional)	390		mg/Nm³
Stack SO2 (optional)	37		mg/Nm³
Price of the main fossil fuel	4.00		\$/GJ

The air

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

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

READ

WHAT THE ID FAN MOVES

The kiln makes 1.316 Nm³ of gas per kg of clinker: 171.4 actual m³/s at 308 °C and -5,523 Pa at the preheater exit.

Do: Keep this figure beside the fan curve.

Why: The fan is sized for a flow; every m³/s of leaked air takes the place of kiln gas, and of feed.
