Emission Rate per GJ from Concentration, O_2 and F-Factor

Emission rate in g per GJ of fuel heat from a dry stack concentration at 0 °C, the dry O_2 and the fuel's dry F-factor (US EPA Method 19, Eq. 19-1).

Method: US EPA Method 19 Eq. 19-1; E = C_d F_d 20.9/(20.9 − %O_2d); 0 °C to 20 °C by ideal gas

Input parameters

Unit system: SI

Parameter	Value	Unit
Pollutant concentration (dry, 0 °C, 1 atm)	500.00	mg/Nm³
Oxygen in dry flue gas	6.0000	%
Dry F-factor (dscm per GJ at 20 °C)	264.00	

Calculated results

Parameter	Value	Unit
Concentration at 20 °C	465.89	mg/m³
Emission rate	172.52	g/GJ

Formula and method

$$C_{20} = C_d \frac{273.15}{293.15}, \quad E = C_{20} F_d \frac{20.9}{20.9 - \%O_{2,d}}$$

Variables

C_d	Pollutant concentration (dry, 0 °C, 1 atm)	kg/m³
$O_{2,d}$	Oxygen in dry flue gas	-
F_d	Dry F-factor (dscm per GJ at 20 °C)	-
C_{20}	Concentration at 20 °C	kg/m³
E	Emission rate	kg/J

Method and standards

US EPA Method 19.

Assumptions and limits

- Dry basis throughout.
- EPA F-factors are per unit of gross (higher) calorific value, so the emission rate is per GJ of HHV.
- The F-factor is entered in dscm per GJ at 20 °C in every unit system.

References

• US EPA Method 19 Eq. 19-1
• E = C_d F_d 20.9/(20.9 − %O_2d); 0 °C to 20 °C by ideal gas

Report details

Report reference	FCC-MHBM-6HSC (the same inputs always give the same reference)
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Calculator	Emission Rate per GJ from Concentration, O_2 and F-Factor
Method last reviewed	13 November 2026
Software release	FireCAD Calc, release of 17 November 2026
Release checks	2 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/boilers-power-plant/emissions-stacks/emission-rate-f-factor

Open this case on calc.firecad.com →

Reopens the calculator with the inputs of this report.