Dust Concentration: % by Weight ↔ g/m³ and Grains/ft³

Converts the ash or dust in flue gas from % by weight to g per actual or normal cubic metre and grains per standard cubic foot (Ganapathy Q2.16b).

Method: Ganapathy; Steam Plant Calculations Manual; ...

Input parameters

Unit system: SI

Parameter	Value	Unit
Ash in the flue gas (by weight, wet gas)	1.5000	%
Gas temperature	204.44	°C
Gas pressure (absolute)	101.33	kPa
Gas molar mass (wet gas)	28.800	kg/kmol

Calculated results

Parameter	Value	Unit
Gas density at t	0.73489	kg/m³
Concentration, actual	11.023	g/m³
Concentration per US standard ft³ (60 °F, 14.696 psia)	7.9687	gr/scf
Concentration at 0 °C, 101.325 kPa	19,274	mg/Nm³

Formula and method

$$C_a = A\,\rho_g, \quad \rho_g = \frac{p\,MW}{RT}$$

$$C_s = A\,\frac{p_0\,MW}{RT_s}, \quad C_N = A\,\frac{p_0\,MW}{RT_N}$$

Variables

A	Ash in the flue gas (by weight)	-
t	Gas temperature	K
p	Gas pressure (absolute)	Pa
MW	Gas molar mass	kg/kmol
ρ_g	Gas density at t	kg/m³
T	gas temperature t in kelvin	K
R	universal gas constant, 8314.46	J/(kmol·K)
p_0	reference pressure, 101 325	Pa
T_s	standard temperature, 60 °F = 288.71	K
T_N	normal temperature, 0 °C = 273.15	K
C_a	Concentration, actual	kg/m³
C_s	Concentration at 60 °F (standard ft³)	kg/m³
C_N	Concentration at 0 °C, 101.325 kPa	kg/m³

Method and standards

Definition with ideal-gas density (Ganapathy uses 39.5/(460 + t) lb/ft³ for MW 28.8).

Assumptions and limits

- Ideal gas; dust volume negligible.
- The ash share and molar mass are for the wet gas as it flows. Emission limits are usually quoted on dry gas at a reference O_2;

convert with the emission O_2 correction calculator.

- C_a is per actual volume at the gas temperature. C_s and C_N are the same concentration per standard volume: gr/scf is per US standard cubic foot (60 °F, 14.696 psia), mg/Nm³ per normal cubic metre (0 °C, 101.325 kPa), and the units convert between the two reference states.

References

- Ganapathy
- Steam Plant Calculations Manual
- 2nd ed. (Marcel Dekker, 1993)
- Q2.16b
- Eq. (12b)
- Ideal-gas density; standard 60 °F (288.71 K) and normal 0 °C at 101.325 kPa

Report details

Report reference	FCC-1DQF-KVAJ (the same inputs always give the same reference)
Generated	17 November 2026, 19:46 UTC
Calculator	Dust Concentration: % by Weight ↔ g/m³ and Grains/ft³
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/ash-concentration-grains

Open this case on calc.firecad.com →

Reopens the calculator with the inputs of this report.