Cyclone Cut Diameter (Lapple)

Cut diameter (50 % efficiency particle size) of a cyclone by Lapple's method from gas viscosity, inlet width, inlet velocity, effective turns and particle density.

Method: Lapple (1951) cut diameter d_{50} = [9μW/(2πN_eV_i(ρ_p − ρ_g))]^½

Input parameters

Unit system: SI

Parameter	Value	Unit
Gas viscosity	2.5000e-05	Pa·s
Inlet width	250.00	mm
Effective number of turns About 5–6 for conventional cyclones; from the design.	6.0000	
Inlet velocity	18.000	m/s
Particle density	2,200.0	kg/m³
Gas density	0.80000	kg/m³

Calculated results

Parameter	Value	Unit
Cut diameter	6.1394	µm

Notes for this case

- Particles larger than d_{50} are mostly caught, smaller ones mostly escape; the full grade-efficiency curve needs the cyclone maker's data.

Formula and method

$$d_{50} = \sqrt{\frac{9\mu W}{2\pi N_e V_i(\rho_p - \rho_g)}}$$

Variables

μ	Gas viscosity	Pa·s
W	Inlet width	m
N_e	Effective number of turns	-
V_i	Inlet velocity	m/s
ρ_p	Particle density	kg/m³
ρ_g	Gas density	kg/m³
d_{50}	Cut diameter	m

Method and standards

Lapple.

Assumptions and limits

- Conventional reverse-flow cyclone.

References

- Lapple (1951) cut diameter d_{50} = [9μW/(2πN_eV_i(ρ_p − ρ_g))]^½

Report details

Report reference	FCC-4FAD-FMMQ (the same inputs always give the same reference)
Generated	17 November 2026, 19:35 UTC
Calculator	Cyclone Cut Diameter (Lapple)
Method last reviewed	12 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/environmental/air-pollution/cyclone-cut-diameter

Open this case on calc.firecad.com →

Reopens the calculator with the inputs of this report.