Hydrocyclone Cut Size by Plitt's Model

Corrected cut size d50c of a hydrocyclone by Plitt's model from cyclone, inlet, vortex finder and apex diameters, vortex height, flow and slurry properties.

Method: Wills and Finch; Wills' Mineral Processing Technology; ...

Input parameters

Unit system: SI

Parameter	Value	Unit
Cyclone inside diameter	25.400	cm
Inlet diameter (or sqrt(4A/π))	6.5000	cm
Vortex finder diameter	9.0000	cm
Apex (spigot) diameter	5.0000	cm
Free vortex height (vortex finder to apex)	90.000	cm
Feed slurry flow	1,500.0	L/min
Feed solids by volume	15.000	%
Liquid viscosity	1.0000	cP
Solids density	2.7000	g/cm³
Hydrodynamic exponent (0.5 laminar)	0.50000	
Calibration factor for the material (1 if untested)	1.0000	

Calculated results

Parameter	Value	Unit
Corrected cut size	39.534	µm

Notes for this case

- Plitt's model is empirical, fitted to a large database; calibrate F1 from a survey of the actual cyclone for design work. The corrected cut size excludes the fines that short-circuit with the underflow water.

Formula and method

$$d_{50c} = \frac{F_1\, 39.7 D_c^{0.46} D_i^{0.6} D_o^{1.21} \eta^{0.5} e^{0.06 C_v}}{D_u^{0.71} h^{0.38} Q_f^{0.45} \left(\frac{\rho_s - 1}{1.6}\right)^k}$$

Variables

D_c	Cyclone inside diameter	m
D_i	Inlet diameter (or sqrt(4A/π))	m
D_o	Vortex finder diameter	m
D_u	Apex (spigot) diameter	m
h	Free vortex height (vortex finder to apex)	m
Q_f	Feed slurry flow	m³/s
C_v	Feed solids by volume	-
η	Liquid viscosity	Pa·s
ρ_s	Solids density	kg/m³
k	Hydrodynamic exponent (0.5 laminar)	-
F_1	Calibration factor for the material (1 if untested)	-
d_{50c}	Corrected cut size	m

Method and standards

Plitt's modified cut-size model.

Assumptions and limits

- Plitt's database range.

References

- Wills and Finch
- Wills' Mineral Processing Technology
- 8th ed. (Butterworth-Heinemann, 2016)
- ch. 9
- eq. 9.22 (Plitt, 1976; Flintoff et al., 1987)

Report details

Report reference	FCC-PMWA-GW3A (the same inputs always give the same reference)
Generated	17 November 2026, 19:46 UTC
Calculator	Hydrocyclone Cut Size by Plitt's Model
Method last reviewed	17 November 2026
Software release	FireCAD Calc, release of 17 November 2026
Release checks	3 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/civil/mining-minerals/hydrocyclone-plitt-cut-size

Open this case on calc.firecad.com →

Reopens the calculator with the inputs of this report.