Bed Inventory and Height from Bed Pressure Drop

Mass of bed material from the measured bed pressure drop and cross-section (Δp = W g / A), with the expanded or settled bed height for a voidage.

Method: Basu; Circulating Fluidized Bed Boilers: Design; ...

Input parameters

Unit system: SI

Parameter	Value	Unit
Bed pressure drop (excluding the distributor)	8.0000	kPa
Bed cross-section	30.000	m²
Particle density	2,500.0	kg/m³
Bed voidage	50.000	%

Calculated results

Parameter	Value	Unit
Bed inventory	24.473	t
Bed height at this voidage	0.65262	m

Notes for this case

- Operators drain bed material to keep the pressure drop at its set point: it is the inventory measurement.

Formula and method

$$W = \frac{\Delta p_b A}{g}, \quad H_b = \frac{W}{A \rho_p (1 - \varepsilon)}$$

Variables

Δp_b	Bed pressure drop (excluding the distributor)	Pa
A	Bed cross-section	m²
ρ_p	Particle density	kg/m³
ε	Bed voidage	-
W	Bed inventory	kg
H_b	Bed height at this voidage	m
g	standard gravity, 9.80665	m/s²

Method and standards

Force balance on a fluidised bed.

Assumptions and limits

- Fully fluidised bed; the pressure drop is the weight of the solids between the taps.
- In a CFB the measured lower-furnace Δp also includes acceleration and wall friction, and part of the inventory sits in the dilute upper furnace and the loop; the result is the solids between the taps only, not the total loop inventory.

References

- Basu
- Circulating Fluidized Bed Boilers: Design
- Operation and Maintenance (Springer, 2015)
- ch. 2 and 11: a fluidised bed's pressure drop equals the weight of bed solids per unit area

Report details

Report reference	FCC-ZZZC-BXT0 (the same inputs always give the same reference)
Generated	17 November 2026, 19:36 UTC
Calculator	Bed Inventory and Height from Bed Pressure Drop
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/fluidised-bed/bed-inventory-from-pressure

Open this case on calc.firecad.com →

Reopens the calculator with the inputs of this report.