Bag Filter Sizing (Cloth Area and Number of Bags)

Cloth area and number of bags of a bag filter (fabric filter) from the gas flow, the air-to-cloth ratio and the bag size, with an allowance for compartments offline.

Method: Fabric filter design practice (air-to-cloth ratio method)

Input parameters

Unit system: SI

Parameter	Value	Unit
Gas flow (actual, at filter temperature)	72,000	m³/h
Air-to-cloth ratio (filtration velocity) m³ of gas per m² of cloth per minute. Depends on the dust, the bag fabric and the cleaning method; take it from the filter maker or your specification.	1.0000	m/min
Bag diameter	160.00	mm
Bag length	6.0000	m
Extra area for a compartment offline or cleaning	10.000	%

Calculated results

Parameter	Value	Unit
Number of bags	438.00	
Net cloth area at the air-to-cloth ratio	1,200.0	m²
Cloth area to install	1,320.0	m²
Cloth area of one bag	3.0159	m²

Formula and method

$$A_f = \frac{Q}{v_f} \qquad A_i = A_f\,(1 + x_s) \qquad A_b = \pi\, D_b\, L_b \qquad N = \left\lceil \frac{A_i}{A_b} \right\rceil$$

Variables

Q	gas flow at filter temperature	m³/s
v_f	air-to-cloth ratio (filtration velocity)	m/s
D_b	bag diameter	m
L_b	bag length	m
x_s	extra area for a compartment offline or cleaning	–
N	number of bags	–
A_f	net cloth area	m²
A_i	cloth area to install	m²
A_b	cloth area of one bag	m²

Method and standards

The air-to-cloth (filtration velocity) method used throughout fabric filter design: the cloth area carries the gas at the chosen superficial velocity through the fabric.

Assumptions and limits

- Cylindrical bags; pleated cartridges have more area per element.
- The bag count is rounded up; a ratio that is a whole number to within one part in 10^9 is not rounded up a further bag.
- A warning appears for an air-to-cloth ratio outside about 0.3–2.5 m/min.
- The air-to-cloth ratio sets the area; pressure drop, can velocity and bag life are the filter maker's checks.

References

- Fabric filter design practice (air-to-cloth ratio method)

Report details

Report reference	FCC-JSCK-XJQY (the same inputs always give the same reference)
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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/boilers-power-plant/emissions-stacks/bag-filter-sizing

Open this case on calc.firecad.com →

Reopens the calculator with the inputs of this report.