Electrostatic Precipitator Efficiency (Deutsch–Anderson)

Efficiency of an electrostatic precipitator from migration velocity, plate area and gas flow (Deutsch–Anderson), and the area for a target.

Method: Deutsch–Anderson η = 1 − exp(−wA/Q)

Input parameters

Unit system: SI

Parameter	Value	Unit
Effective migration velocity From the ESP maker or a test on your dust; typically 0.02–0.2 m/s.	0.060000	m/s
Collecting plate area	15,000	m²
Gas flow (actual)	540,000	m³/h
Target efficiency	99.800	%

Calculated results

Parameter	Value	Unit
Specific collecting area A/Q	100.00	m²/(m³/s)
Collection efficiency	99.752	%
Area for the target	15,537	m²

Notes for this case

- SCA in m² per m³/s. The effective migration velocity bundles dust resistivity, size and rapping losses.

Formula and method

$$\eta = 1 - \exp\left(-\frac{wA}{\dot{V}}\right), \quad A_t = -\frac{\dot{V}}{w}\ln(1-\eta_t)$$

Variables

w	Effective migration velocity	m/s
A	Collecting plate area	m²
$\dot{V}$	Gas flow (actual)	m³/s
η_t	Target efficiency	-
SCA	Specific collecting area A/Q, in m² per m³/s (× 5.08 = ft² per 1000 acfm)	s/m
η	Collection efficiency	-
A_t	Area for the target	m²

Method and standards

Deutsch–Anderson.

Assumptions and limits

- Uniform gas distribution.
- SCA is in m² per m³/s in every unit system; multiply by 5.08 for ft² per 1 000 acfm.

References

- Deutsch–Anderson η = 1 − exp(−wA/Q)

Report details

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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/esp-deutsch-anderson

Open this case on calc.firecad.com →

Reopens the calculator with the inputs of this report.