Fly Ash Silo: Storage Volume, Size and Conditioning Water

Fly ash silo volume, diameter and height for a storage time from ash rate, bulk density and fill fraction, with conditioning water for truck loading.

Method: Volume and moisture balance definitions

Input parameters

Unit system: SI

Parameter	Value	Unit
Fly ash rate	15.000	t/h
Storage time	24.000	h
Bulk density in the silo	750.00	kg/m³
Usable fill fraction	85.000	%
Cylinder height-to-diameter ratio	1.5000	
Moisture added for conditioning	15.000	%
Unloading rate to trucks (dry ash)	100.00	t/h

Calculated results

Parameter	Value	Unit
Ash stored	360.00	t
Silo volume (gross)	564.71	m³
Silo diameter	7.8261	m
Cylinder height	11.739	m
Conditioning water while unloading	17.647	t/h

Notes for this case

- Cylinder volume only; the cone below and the dead space above the fill line are covered by the fill fraction. Moisture is added on a wet basis (w = water/(ash + water)).

Formula and method

$$M = \dot{m}_a t, \quad V = \frac{M}{\rho_b f}, \quad D = \sqrt[3]{\frac{4V}{\pi (H/D)}}, \quad H = (H/D)\, D, \quad \dot{m}_w = \dot{m}_{ul} \frac{w}{1 - w}$$

Variables

$\dot{m}_a$	Fly ash rate	kg/s
t	Storage time	s
ρ_b	Bulk density in the silo	kg/m³
f	Usable fill fraction	-
H/D	Cylinder height-to-diameter ratio	-
w	Moisture added for conditioning	-
$\dot{m}_{ul}$	Unloading rate to trucks	kg/s
M	Ash stored	kg
V	Silo volume (gross)	m³
D	Silo diameter	m
H	Cylinder height	m
$\dot{m}_w$	Conditioning water while unloading	kg/s

Method and standards

Storage and moisture balance.

Assumptions and limits

- Cylinder section only: the whole gross volume is put in the cylinder, so a real silo with a hopper cone is a little smaller in cylinder height.
- The unloading rate is dry ash; the conditioning water is added on a wet basis.

References

- Volume and moisture balance definitions

Report details

Report reference	FCC-XG10-R98W (the same inputs always give the same reference)
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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/boilers-power-plant/fuel-ash-handling/fly-ash-silo-sizing

Open this case on calc.firecad.com →

Reopens the calculator with the inputs of this report.