Vertical Tank with Cone Bottom: Volume at a Level

Liquid volume in a vertical cylindrical tank with a conical bottom at any level, the total volume and the level for a volume, as for hoppers and process tanks.

Method: Volume of a cone (similar cones scale with the cube of height) and a cylinder

Input parameters

Unit system: SI

Parameter	Value	Unit
Tank inside diameter	2.0000	m
Height of the cone	0.80000	m
Height of the cylindrical part	3.0000	m
Level above the cone apex	2.0000	m
Volume wanted (to find its level)	5.0000	m³

Calculated results

Parameter	Value	Unit
Volume at the level	4.6077	m³
Total volume	10.263	m³
Volume of the cone	0.83776	m³
Level for the volume wanted	2.1249	m
Share of the total volume	44.898	%

Formula and method

$$V(L) = V_c \left(\frac{L}{h_c}\right)^3 \quad (L \le h_c), \quad V(L) = V_c + \frac{\pi D^2}{4}(L - h_c), \quad V_c = \frac{\pi D^2 h_c}{12}$$

Variables

D	Tank inside diameter	m
h_c	Height of the cone	m
H_s	Height of the cylindrical part	m
L	Level above the cone apex	m
V_t	Volume wanted (to find its level)	m³
V	Volume at the level	m³
V_{tot}	Total volume	m³
V_c	Volume of the cone	m³
L_V	Level for the volume wanted	m
V/V_{tot}	Share of the total volume	-

Method and standards

Similar cones and a cylinder.

Assumptions and limits

- Sharp apex, vertical tank.
- A volume wanted above the total volume hides only its level; the other results are still shown.

References

• Volume of a cone (similar cones scale with the cube of height) and a cylinder

Report details

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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/instrumentation/pressure-level/cone-bottom-tank-level

Open this case on calc.firecad.com →

Reopens the calculator with the inputs of this report.