Cone-Bottom Tank volume formula

tankvolumecalc.com/formulas/cone-bottom-tank/

Total volume, exact partial fill, derivation, worked example and a copy-ready fill table.

TOTAL VOLUME

$$V = \pi r^2 H_{cone}/3 + \pi r^2 H_{cyl}$$

PARTIAL FILL AT LIQUID DEPTH H

$$h \le H_{cone}: V = \pi(r \cdot h/H_{cone})^2 \cdot h/3 \quad | \quad h > H_{cone}: V = V_{cone} + \pi r^2 (h - H_{cone})$$

Derivation

Inside the cone the wetted radius grows linearly with depth, so volume grows with the cube of depth — which is why the bottom of a cone tank holds almost nothing. Above the knuckle it switches to plain cylinder math. At 40% depth this representative tank holds only 25.9% of its volume.

Worked example

Take D = 48 in, Hcyl = 60 in, Hcone = 24 in. Total capacity: 532.7 gal. At a stick reading of 33.6 in (40% of the 84 in maximum depth), the filled volume is 137.9 gal — 25.9% of capacity. Check it live on the calculator.

Fill ratio: % of depth → % of volume (cone height = D/2, shell = 1.25×D)

Depth	Volume
5%	0.1%
10%	0.5%
15%	1.7%
20%	4%
25%	7.9%
30%	13.5%
35%	19.7%
40%	25.9%
45%	32.1%
50%	38.2%
55%	44.4%
60%	50.6%
65%	56.8%
70%	62.9%
75%	69.1%
80%	75.3%
85%	81.5%
90%	87.6%
95%	93.8%

Need the full inch-by-inch table for specific dimensions? The dip chart generator prints it as a laminate-ready PDF.

FAQ

Q. What is the formula for a cone-bottom tank volume?

Total: $V = \pi r^2 H_{cone}/3 + \pi r^2 H_{cyl}$. Partial fill at depth h: $h \le H_{cone}: V = \pi(r \cdot h/H_{cone})^2 \cdot h/3$ | $h > H_{cone}: V = V_{cone} + \pi r^2 (h - H_{cone})$.

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Derivation and a worked example are above.

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Q. Is the fill-ratio table exact?

Yes — computed by the same engine as our calculators (cone height = D/2, shell = 1.25×D), verified by the automated test suite described on the methodology page.

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Q. Can I use this in a spreadsheet?

Yes — the formulas are closed-form (acos and sqrt only). Copy the 5%-step table for quick interpolation, or implement the formula directly for exact values.

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