

Capsule Tank (Hemispherical Heads) volume formula tankvolumealc.com/formulas/capsule-tank/

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

TOTAL VOLUME

$$V = \pi r^2 L_{cyl} + (4/3)\pi r^3$$

PARTIAL FILL AT LIQUID DEPTH H

$$V(h) = \text{seg}(r, h) \cdot L_{cyl} + \pi h^2 (3r - h) / 3$$

Derivation

The shell contributes a circular segment per unit length; the two hemispherical heads together form a complete sphere, whose partial volume at depth h is the classic spherical-cap formula — so the head term needs no orientation bookkeeping at all.

Worked example

Take D = 37 in, L_{cyl} = 74 in. Total capacity: 459.3 gal. At a stick reading of 14.8 in (40% of the 37 in maximum depth), the filled volume is 169.1 gal — 36.8% of capacity. Check it live on the calculator.

Fill ratio: % of depth → % of volume (a capsule with shell length = 2×D)

Depth	Volume
5%	1.6%
10%	4.6%
15%	8.6%
20%	13.3%
25%	18.6%
30%	24.3%
35%	30.4%
40%	36.8%
45%	43.4%
50%	50%
55%	56.6%
60%	63.2%
65%	69.6%
70%	75.7%
75%	81.4%
80%	86.7%
85%	91.4%
90%	95.4%
95%	98.4%

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 capsule tank (hemispherical heads) volume?

Total: $V = \pi r^2 L_{cyl} + (4/3)\pi r^3$. Partial fill at depth h: $V(h) = \text{seg}(r, h) \cdot L_{cyl} + \pi h^2 (3r - h) / 3$. 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 (a capsule with shell length = $2 \times D$), 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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