Pressure Vessel and Tank Estimator

How-to guide: what the workbook does, how to use it and what every number means. mfgcalcs.com

Pressure Vessel and Tank Estimator

Estimate a pressure vessel or tank's cost from its shell and heads, bought-out items, shop hours, testing, coating and one-off charges, and price five order quantities.

For: Estimators, sales engineers and managers at pressure vessel and tank fabricators, and buyers of fabricated vessels.

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Quick start

1. On Setup, choose US or metric units and type your company, currency, shop rate, markup, margin and price step, then your plate materials and head types.
2. On Vessel Estimate, choose the plate material and head type and enter the inside diameter, shell length, thicknesses, plate yield and price per head.
3. List the nozzles, supports and other bought-out items, and the shop hours for each operation.
4. Enter consumables, radiographs, coating, inspection and one-off charges, then five order quantities.
5. On the Dashboard, pick a quantity to see the tiles, the two charts and where the cost goes.

What is in the workbook

Start Here	Read this first: what the workbook does and how to use it.
Setup	Your company, units, currency, costing defaults, plate materials and head types.
Vessel Estimate	The vessel and quote, shell and heads, bought-out items, shop hours, testing and coating, and cost and price for five order quantities.
Dashboard	Price, cost and margin per vessel at the order quantity you pick, and where the cost of a vessel goes.
Method	How every number is calculated, with assumptions, limits and sources.
Verify	Self-check: the workbook's formulas recomputed on fixed inputs against an independent reference.
About MFG Calcs	Everything MFG Calcs offers, free: calculators, templates, tariff tools, data and the Calkee AI helper.

What each number means

Quantity	How it is calculated	Units
Shell weight	pi x mean diameter x shell length x wall x density; mean diameter = inside diameter + wall. Exact for a cylinder: the same as pi/4 x (outside diameter^2 - inside diameter^2) x length.	lb or kg

Quantity	How it is calculated	Units
Weight of one head	(area factor x head mean diameter^2 + pi x head mean diameter x straight flange) x head thickness x density; head mean diameter = inside diameter + head thickness.	lb or kg
Weight in your units	Volume in cubic length units x (cm per length unit)^3 = cm3; x density (g/cm3) / 1,000 = kg; / kg per weight unit = lb (1 lb = 0.45359237 kg) or kg.	lb or kg
Head shape factors	2:1 semi-ellipsoidal: area (pi/4)(1 + ln(2 + sqrt 3) / (2 sqrt 3)) = 1.0840 D^2, capacity pi D^3/24 = 0.1309 D^3. Hemispherical: pi D^2/2 and pi D^3/12. Torispherical with crown radius D and knuckle radius 0.06 D: 0.9306 D^2 and 0.0810 D^3, from its spherical crown and toroidal knuckle.	x D^2, x D^3
Capacity, inside	(pi/4 x inside diameter^2 x (shell length + heads x straight flange) + heads x capacity factor x inside diameter^3) / cubic length units per gallon or litre (231 in3 = 1 US gallon).	gal or L
Outside surface	pi x (inside diameter + 2 x wall) x shell length + heads x (area factor x head outside diameter^2 + pi x head outside diameter x straight flange); / (12 in or 1,000 mm)^2.	ft2 or m2
Shell plate to buy and its cost	Shell weight / plate yield; cost = plate to buy x plate price. Heads = heads x price per formed head.	lb or kg, currency
Bought-out items and empty weight	Sum of quantity x cost each. Empty weight = shell + heads x weight of one head + sum of quantity x weight each.	currency, lb or kg
Shop labour and consumables	Sum of shop hours x loaded shop rate; filler metal x filler price + gas and flux.	h, currency
Testing, coating and inspection	Radiographs x cost per radiograph; coating to buy = outside surface x coating per area / transfer efficiency, x coating price; inspection and paperwork per vessel.	currency
Cost per vessel	Plate + heads + bought-out items + markup on those three + consumables + shop labour + radiography + coating + inspection + one-off charges, spread: (engineering and setup + RT mobilisation) / quantity.	currency/vessel
Price per vessel	CEILING(total cost / (1 - target margin), price step); margin achieved = (price - cost) / price; price per empty weight = price / empty weight.	currency
Labour and engineering for the order	Shop hours per vessel x quantity x shop rate + engineering and setup.	currency

Assumptions, limitations, sources and the self-check (the Verify sheet, which recomputes the workbook's formulas on fixed test inputs) are in the workbook. The last page shows the Dashboard with the example data for Wrenmoor Vessel Works, a fictional business.

Free from MFG Calcs - keep this credit when you share it.

Engineering estimates for planning and improvement work. Verify the results against your own process, data and standards before you rely on them.

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Price, cost and margin per vessel at the order quantity you pick, and where the cost of a vessel goes.

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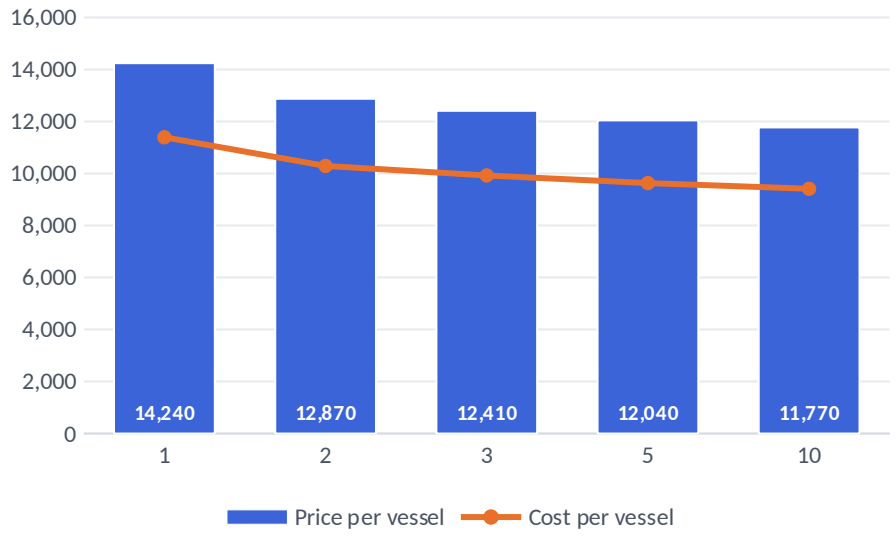
Order quantity shown 3

Showing 3 x AR-48-120: 48.0 in inside diameter, 2,491 lb empty each. Pick another quantity in the yellow cell.

PRICE PER VESSEL (USD)	COST PER VESSEL (USD)	MARGIN ACHIEVED	EMPTY WEIGHT (lb)
12,410	**9,924**	**20.0%**	**2,491**
Order value 37,230 USD	All lines, before margin	Target 20.0%	Price 4.98 USD per lb
		On target	

Price and cost per vessel by quantity



Where the cost per vessel goes

