

ME349

Engineering Design Projects

Cost Estimation

Definitions

direct (prime) cost = direct materials + direct labor including direct engineering + direct expenses

production cost = direct cost + factory expenses

factory expenses = indirect labor + indirect expenses

total cost = production cost + commercial costs

commercial costs = general administration + sales expenses

selling price = total cost + mark-up

Cost Estimation at Embodiment Stage

In most customer driven design processes, cost is a huge issue. For a design to achieve commercial success, minimizing the final selling price is prime concern.

In estimating costs you must be aware of those items that contribute to the total cost of your system. You can estimate the cost as the sum of the individual contributions.

For example; direct cost of a machine frame =
material cost

- + preliminary fabrication cost (cutting, drilling , etc.)
- + assembly cost (welding, bolting)
- + finishing and installing cost
- + design work (your time at \$x /hr) *
- + direct expenses (tooling, jigs) *

* fixed costs, e.g. independent of quantity produced

Material cost = material cost per unit weight * (weight of finished part – weight of scrap)

Fabrication/Assembly/Finishing costs include machine operator pay, floor space (building depreciation), machine depreciation, and utility costs. These costs are often estimated as a total cost per time. For example, fabrication costs for milling may be \$150/hr.

Rough Cost Approximation: Some Rules of Thumb

All of these "rules" are for broad guidance only - USE with CAUTION. They give order of magnitude answers only.

1-3-9 "Rule" => Selling price = 3x manufacturing cost = 3 x 3 x material cost

Note: the numbers 1, 3, and 9 are indicative only and vary according to industry, product type and many other factors

For some products cost is proportional to mass (or volume)

Note: Most industries are moving away from a cost per mass type basis for estimating. Nevertheless this method can give some indicative numbers.

For fabricated products the number of joints or the length of welds may be a primary indicator of cost.

Likewise the cost of assembly is closely related to the number of parts.

Cost of purchased items will increase with "size" (e.g. dimension, power, mass), usually in a non-linear way.

Note: The price also depends on production volume and demand. Primary preferred sizes may be cheaper (on average) than secondary preferred sizes. Commonly used sizes will be cheaper than similar sized components that are seldom used and not kept in stock.