

Selecting a Material

Mechanical Engineering

Turning a function into a material index you can rank candidates by.

Function, constraint, free variable, objective: then the index falls out.

1

State function and constraint

What must the part do, and what must it not exceed?

2

Name the free variable

Usually a dimension you are allowed to change.

3

Write the objective

Minimise mass, or cost, or deflection at a stated load.

4

Derive the index

Stiff light tie: $E \div \text{density}$. Strong light tie: $\text{yield} \div \text{density}$.

5

Screen, rank, then check

Rank on the index, then test process, supply and price.

An index ranks materials; it does not choose one. Corrosion, joining and availability decide in the end.