

AM-01.02 — Percentages, efficiency, and losses: turn 98% into what it actually means

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Course compass

Guiding question: How do you read a percentage without losing the reference quantity and associated losses?

Markers: MEASURED · CONVENTION · CALCULATED · TEACHING ASSUMPTION · APPROXIMATION

- understand the concept
- do a simple calculation
- explain every symbol
- check a result

1 — Percent means “per hundred”

25% means $25/100 = 0.25$. To apply 25% to a quantity, multiply by 0.25.

Always name the reference quantity.

2 — Efficiency and loss are complementary only under a precise definition

If every non-useful output is classified as loss, 98% useful leaves 2%. But real systems can have several outputs, recycles, or intermediate storage.

Define the boundary before writing 10098.

3 — Relative change and percentage points

Moving from 90% to 95% is +5 percentage points, but a relative increase of $5/90 = 5.56\%$.

Those statements are not equivalent.

4 — Accumulating a small loss

A 2% daily loss on a renewed flow does not automatically mean “2% after one year.” Replacement, recycling, and accumulation matter.

Percentages always need a system model.

Three complete examples: change one assumption to understand

Before each calculation, identify where every number comes from and whether it is measured, conventional, assumed, or calculated.

Example A — 25% of 80

$$0.25 \times 80 = 20.$$

The word “of” corresponds to multiplication here.

Example B — 98% of 76

$$0.98 \times 76 = 74.48. \text{ Remainder } 1.52.$$

$$\text{Remainder} = 76 - 74.48.$$

Example C — percentage points

90% 95% = +5 points. Relative change = $(95-90)/90 = 0.0556 = 5.56\%$.

Two measures of change, two meanings.

Inverse calculation

If 74.48 represents 98% of the original flow, original = $74.48/0.98 = 76$.

Common trap and result check

Trap: saying “+5%” when you mean “+5 percentage points.”

Always check units, order of magnitude, and physical meaning before accepting a result.

Exercises and answers

Understand

Explain the relationship in your own words.

Change an assumption

Modify one input and predict the direction of change before calculating.

Verify

Name two checks after a calculation.

Primary and educational sources

- NIST - International System of Units (SI)
- NASA Glenn - Guide to Rockets