How to calculate OEE in manufacturing

A quick guide (with examples)

What is OEE?

Overall Equipment Effectiveness (OEE) tells you how productive your equipment really is.

What is OEE?

It takes three factors into account:

1. Availability

Time lost to stops

2. Performance

Time lost to slow running

3. Quality

Time lost to defects

It’s a simple formula:

$$OEE = Availability \times Performance \times Quality$$

1. Availability

Availability = Operating time / Planned production time

- Planned production time:
  Total time scheduled
- Operating time:
  Time actually producing

Lost time includes:

- Changeovers
- Equipment breakdowns
- Cleaning
- Maintenance

2. Performance

Performance efficiency = Net operation rate - Operating speed rate

Also:

Performance efficiency = ((Processed amount x Ideal cycle time) / Operation time)

Captures speed loss due to:

- Micro stops
- Slow cycles
- Idle times

3. Quality

Quality rate =
(Right first time production
/ Total production)

Right first time =
Total production - Scrap and rework.

Calculating availability

Production data:

One line over one week

- Total time = 168 hrs

Non-production time (94 hrs)

- Unscheduled: 56
- Maintenance: 8
- Validation/testing: 6
- Changeover/cleaning: 24

Calculating availability

Calculation:

Availability = Operating time / Planned production time

Operating time =
168 – 94 = 74 hrs

Planned production time =
168 – 56 = 112 hrs

Availability = 74 / 112 = 66%

We use 66% of our scheduled production time for actual production.

Calculating performance

Production data:

Max speed = 240 pcs/min

Processed amount = 710,000

Operation time =
74 hours x 60 = 4,400 minutes

Calculation:

Performance =
(Total processed amount /
Validated maximum speed) /
Operation time

Performance =
(710,000 / 240) / 4,400 = 0.67

We ran at 67% of the maximum validated speed.

Calculating quality

Production data:

Total pieces over the week = 710,000

Defects over the week = 35,500

Calculation:

Quality rate = (Right First Time / Total Production)

Quality = (710,000 – 35,500) / 710,000 = 95%

95% of our parts had no defects.

Final OEE score

OEE =
66% × 67% × 95% = 42%

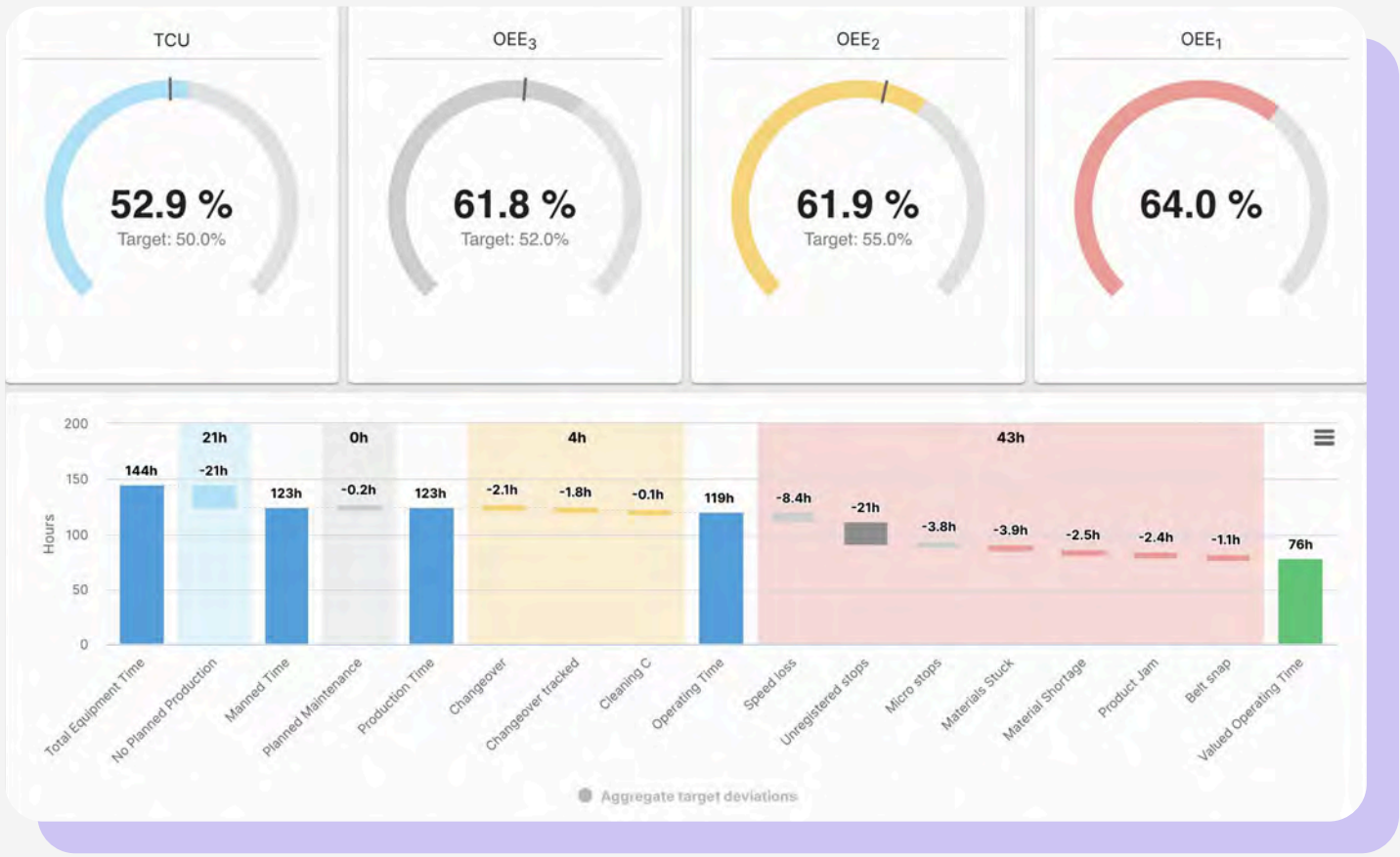
Only 42% of planned time produced good-quality output.

This OEE calculation ignores unscheduled time. Total Capacity Utilization (TCU) includes it as an availability loss revealing more hidden capacity. Here's the TCU score:

TCU =
44% × 67% × 95% = 28%

OEE waterfall charts

An OEE waterfall chart shows how an ideal production score (100%) is reduced by availability, performance, and quality losses, making it easy to see how each factor affects OEE.



See an example

Check out our comprehensive guide on OEE calculation for a detailed walkthrough, including how to calculate OEE1, OEE2, OEE3 and TCU using a waterfall chart:

factbird.com/academy-lessons/factbirds-practical-guide-to-calculating-oee

(includes a free OEE calculation Excel template)

Other resources

A guide to OEE essentials:

factbird.com/blog/quick-guide-to-oee-calculation

Our free course on mastering OEE:

factbird.com/free-oee-course

See how Factbird helps track and improve OEE:

factbird.com/solutions/oee-software

Learn how Europe's largest meat processor uses OEE:

factbird.com/case-studies/danish-crown