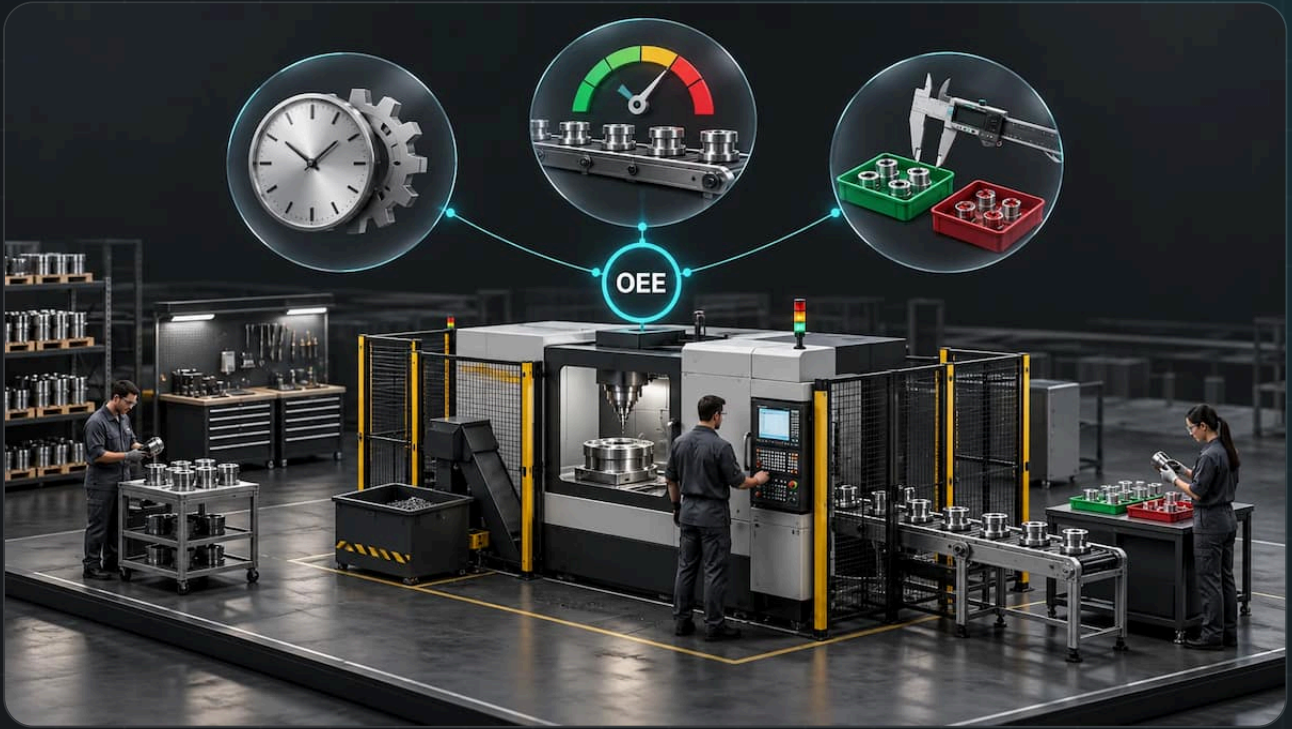


KNOWLEDGE LIBRARY

What Is OEE?

How to Calculate It and Turn It into Real Gains in Production



Author

Ender Öztürk

OETECH Solutions, Bursa, Türkiye

Published

18 October 2026

Version · Language

1.0 · English

ABSTRACT

OEE is an equipment effectiveness measure that shows how much of the time planned for production is converted into good-first-time output at the ideal speed. OEE stands for **Overall Equipment Effectiveness**; in Turkish it is commonly referred to as **Toplam Ekipman Etkinliği**.

OEE asks three questions together: Were we able to run during the time we set aside for production? While running, did we produce at the speed we should have? Were the parts we produced good the first time? The answers to these questions are the **availability, performance and quality** components.¹

A machine running all day does not, on its own, show that the day was productive. Slow cycles, short stops and rework can hide behind the total count seen at the end of a shift. The value of OEE emerges when it makes losses visible and can be turned into improvement decisions.

Keywords: OEE · MES · Production Efficiency · Downtime Analysis · Quality · TPM · Capacity

Suggested citation: Öztürk, E. (2026). What Is OEE? How to Calculate It and Turn It into Real Gains in Production (Report No. 2026-02). OETECH Solutions. <https://oetechsolutions.com/nedir/oe-nedir>

Report No.	OETECH-TR-2026-02
Author	Ender Öztürk — Enterprise Solutions Account Manager, OETECH Solutions, Bursa, Türkiye
Published	18 October 2026
Version / Language	1.0 / English
Scope	22 sections, 4 figures, 16 Q&As
Online version	https://oetechsolutions.com/nedir/oe-nedir

This report is the print edition of the online guide in the OETECH Knowledge Library. Example calculations, budgets and timelines are explicitly hypothetical; they are not customer results, price quotes or performance commitments. Images are conceptual illustrations.

CONTENTS

—	What does this guide cover?
1	What is OEE used for?
2	How is OEE calculated?
3	How is planned production time determined?
4	Step-by-step sample OEE calculation
5	The lost minutes behind the OEE percentage
6	What are the Six Big Losses?
7	How does a company gain an advantage by drilling into the details?
8	Why does the bottleneck matter?
9	How many parts, and how much benefit, does an improvement translate into?
10	How is OEE calculated for multi-cavity molds?
11	How are different products and machines reported together?
12	The difference between ideal cycle time, takt and target quantity
13	What is a good OEE value? Is 85% a must?
14	What is the difference between OEE and TEEP?
15	What data is needed for reliable OEE?
16	How do MES and AI support OEE work?
17	A practical plan for getting started with OEE
18	Common calculation and interpretation mistakes
19	OETECH's approach
—	First step: define the loss before the score
—	Sources and calculation scope
A	Frequently asked questions

What does this guide cover?

- The meaning, purpose and brief history of OEE
- Availability, performance and quality formulas
- A sample shift calculated from start to finish, with a lost-minutes analysis
- The Six Big Losses, root causes and the right actions
- Calculation details for multi-cavity molds, different products and lines
- Its contribution to capacity, cost, delivery and investment decisions
- MES, data quality, AI and a practical starting plan
- A checklist and frequently asked questions

1. What is OEE used for?

OEE is used to understand equipment-related production losses and to track improvement over time. Its main uses are:

- Identifying where planned production time is lost.
- Separating breakdowns, setups, micro stops, speed and quality problems.
- Enabling maintenance, quality, production and planning teams to discuss the same events.
- Evaluating before and after an improvement under comparable conditions.
- Examining whether gains are available in existing capacity before buying a new machine.

OEE is not a single score that measures all of profitability, customer satisfaction or employee performance. Producing products that do not sell can raise OEE, but it can also increase inventory and cash requirements. Results should therefore be evaluated together with delivery, demand, work-in-process inventory, energy and cost of quality.

Brief history: its relationship with TPM

OEE developed with the **TPM — Total Productive Maintenance** approach. JIPM states that the indicator was created during the development and spread of TPM. Today the approach is used not only by maintenance teams but also in production improvement work. ²

MES and automated data collection systems make it easier to perform this calculation more frequently. However, a digital screen does not make an incorrectly defined calculation correct. Measurement rules must be clarified first.

2. How is OEE calculated?

OEE = Availability × Performance × Quality

The ratios are used as decimals in the formula, and the result is converted to a percentage. For example, $95\% \times 80\% \times 100\%$ means $0.95 \times 0.80 \times 1.00 = 0.76$ in the calculation, i.e. **76% OEE**.

Table 1

Component	Key question	Formula
Availability — A	How much did we run during planned production time?	Run time / planned production time
Performance — P	While running, how close did we come to the ideal production speed?	Ideal cycle time × total count / run time
Quality — Q	How many of the parts produced were good first time?	Good first time count / total count

For a single product with consistent units, the same result can also be reached with this shortcut:

$$\text{OEE} = \text{Ideal cycle time} \times \text{good first time count} / \text{planned production time}$$

The short formula gives the result; the three-component calculation separates which area the loss occurs in. ³ When products with different ideal cycle times are calculated together, the aggregation method must be defined separately; we cover this topic later.

Availability: it is not just breakdowns

Events that stop production during planned production time, such as waiting for material, mold changes, staff shortages or adjustments, can also create availability losses. Saying "there were no breakdowns" does not mean availability is 100%.

Performance: it is not just the average cycle

Slow cycles during run time and short stops classified within this scope show up as performance loss. The ideal cycle time should not be a time that makes the budget comfortable; it should represent the safe and sustainable technical best speed for the relevant machine-product-process. Check your units: seconds per piece and minutes of time cannot be multiplied directly. ⁴

Quality: fixing it later is not producing it right the first time

A part sent to rework is not counted as good on the first pass. Its later acceptance should not retroactively erase the quality loss from the first production pass. Rework quantity and recovered product should be tracked separately. The "total count" must include both good parts and parts that were non-conforming on the first pass.

3. How is planned production time determined?

The starting point of the OEE calculation is not total calendar time but **the time during which production is intended**. Time when no production is planned must be separated from the losses within that time. ⁵

For example, in a 480-minute shift, if the production plan does not foresee running for 60 minutes due to meals and breaks, planned production time may be 420 minutes. However, if teams take staggered breaks and the line is planned to keep running, the same 60 minutes is not automatically deducted.

"Planned downtime" and "time when no production is planned" are not the same thing. Removing a planned mold change within the production window from the denominator just because it was known in advance can hide the loss. The time window in which cleaning and maintenance will be performed, the effect of these times on the calculation, and who is authorized to change them should be in writing.

Table 2

Event	Evaluation approach
Time when the plant is closed and no production is planned	Outside OEE scope; shown separately in calendar utilization.
A break during which the line does not run per the production plan	Can be deducted from planned production time according to the policy defined at the outset.
Mold/product changeover within the production window	Kept visible as an availability loss.
No material or staff available while production is expected	Recorded as a production loss with the appropriate reason code.
No plan opened because there are genuinely no orders	Planning/calendar utilization is tracked separately; low demand is not hidden within OEE.

Do not remove time from scope after the shift ends because the result looks bad. Plan changes must be traceable; the denominator definition must be applied independently of the result.

4. Step-by-step sample OEE calculation

The shift below is **an illustrative, hypothetical example**. It is not a real customer result. A single product, a constant ideal cycle time, single-pass counting and a known quality result are assumed.

Table 3

Input	Value
Shift length	480 minutes
Break with no production planned	60 minutes
Planned production time	420 minutes
Downtime within planned production time	60 minutes
Run time	360 minutes
Ideal cycle time	30 seconds/piece = 0.5 minutes/piece
Total production	600 pieces
Good first time production	570 pieces
Nonconforming production on first pass	30 pieces

Step 1 — Availability

$$360 / 420 = 85.71\%$$

Approximately 14.29% of the time allocated to production was lost to downtime.

Step 2 — Performance

The ideal production equivalent of 600 parts is **$600 \times 0.5 = 300$ minutes**.

$$300 / 360 = 83.33\%$$

Although the machine appears to have been running for 360 minutes, the ideal time equivalent of the total quantity produced is 300 minutes. The 60-minute difference is the equivalent of the performance loss.

Step 3 — Quality

$$570 / 600 = 95.00\%$$

30 parts are nonconforming on the first pass. Their time equivalent is **$30 \times 0.5 = 15$ minutes**.

Step 4 — OEE

Using unrounded values:

$$(360 / 420) \times (300 / 360) \times (570 / 600) = 285 / 420 = 67.86\%$$

The cross-check gives the same result:

$$570 \text{ good pieces} \times 0.5 \text{ minutes} / 420 \text{ minutes} = 67.86\%$$

This result does not mean "the machine ran for 67.86% of the shift." Of the 420 minutes allocated to production, **285 minutes** are equivalent to good-first-time production at the ideal speed. Run time, meanwhile, is 360 minutes.

5. The lost minutes behind the OEE percentage

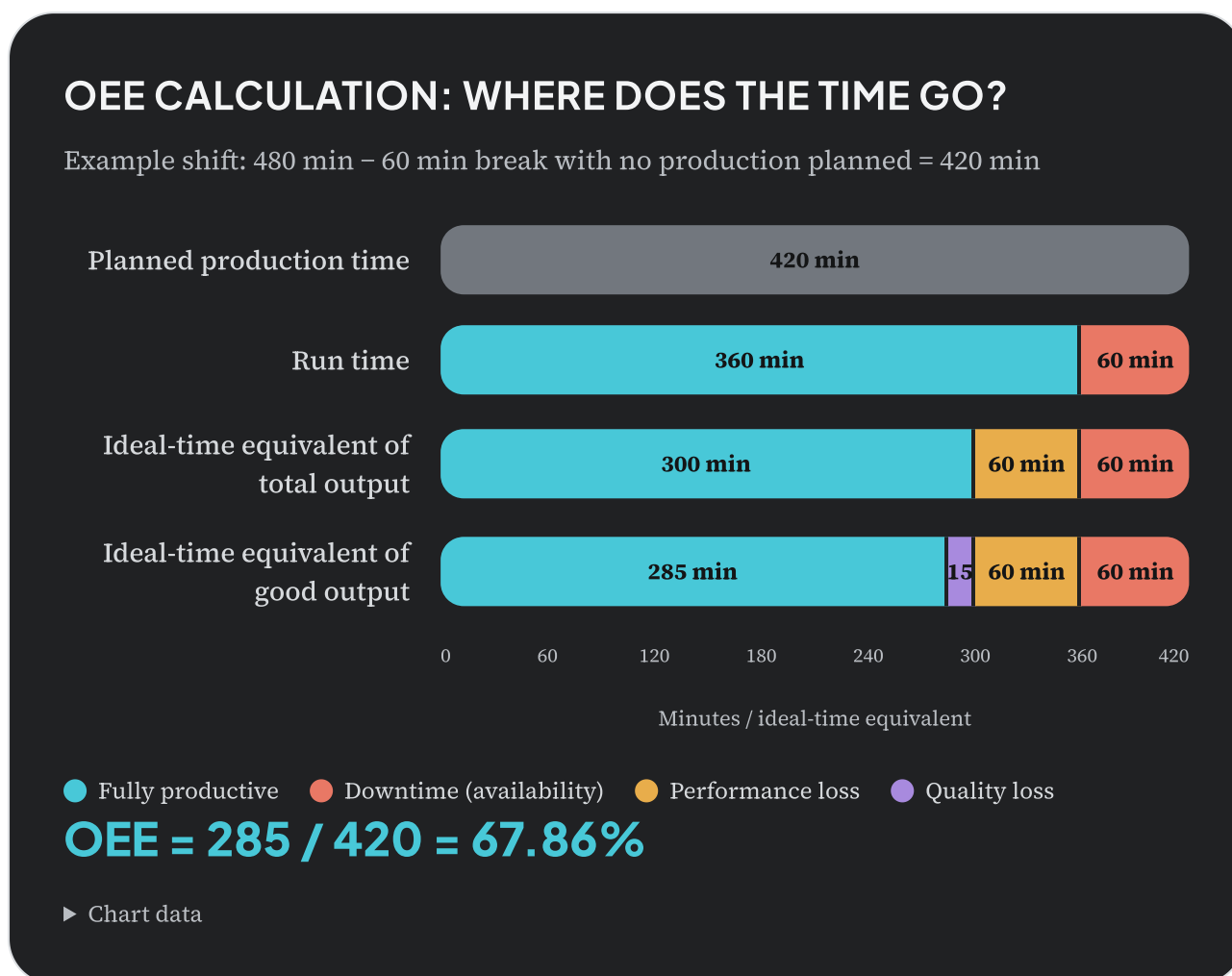


Figure 1. The chart is calculated from the sample inputs above. Performance and quality losses are ideal-time equivalents; they are not stacked on top of each other like separately measured stops on an event timeline.

Table 4

Breakdown of planned production time	Time equivalent	Share of 420 minutes
Availability loss	60 minutes	14.29%
Performance loss	60 minutes	14.29%
Quality loss	15 minutes	3.57%
Fully productive time	285 minutes	67.86%
Total	420 minutes	100.00%

This breakdown changes the question asked in the meeting: instead of "Why is OEE low?", the question becomes "Which 60-minute stop or which speed loss will we reduce, and with what action?"

Do not count downtime and performance loss twice. For example, you can keep micro stops within run time and show them under performance, or you can separate them as downtime using a defined threshold. The same loss must not be recorded again in two components. If the threshold changes, A and P may change; if the same underlying data is preserved, total OEE is not expected to change artificially as a result.

6. What are the Six Big Losses?

The Six Big Losses break the OEE components down into more concrete problem groups. This way, a single score turns into topics that different teams can work on. ⁶



Figure 2. The left column represents availability losses, the middle column performance losses and the right column quality losses. The upper and lower scenes are explained in the table below.

Table 5

Component	Loss group	Example	Action to examine
Availability	Breakdown / unplanned stop	Hydraulic failure, waiting for material	Event history, maintenance plan, supply and preparation checks
Availability	Setup and adjustment	Mold change, product adjustment	Preparation standard, tool access, SMED work
Performance	Short stops	Sensor contamination, part jam	Cycle-level event analysis and elimination of the recurring cause
Performance	Reduced speed	Cycle longer than ideal, slow feeding	Checking process parameters, equipment condition and material effects
Quality	Defects in stable production	Out-of-tolerance part, surface problem	Control plan, process variability and error-proofing
Quality	Startup / commissioning loss	Nonconforming product during initial setup	Recipe verification, first-article approval and standard startup procedure

These groups are classifications, not the root cause itself. Under a "mold change" record there may be clamping, waiting for material, recipe adjustment or waiting for quality approval. Drill down as deep as improvement requires; do not present operators with hundreds of similar codes.

7. How does a company gain an advantage by drilling into the details?

Turning downtime into a maintenance and preparation decision

Discovering that a recurring 12-minute wait comes from searching for the same tool can change the preparation process without requiring a major technology investment. Conversely, if different causes are lumped under the same code, the wrong team gets assigned.

Establish the **event → cause → owner → action → result check** chain. Whether an issue recurs in the following period matters just as much as a closed breakdown record.

Making speed loss visible

Small cycle extensions that last for hours can add up to a serious capacity loss. Cycle data examined in the context of product, mold, recipe, raw material lot and shift shows whether the problem concentrates under specific conditions. Instead of simply saying "run faster," the cause is investigated within safe process limits.

Not measuring quality only from the scrap bin

Rework, startup trials and defects that surface later should also be taken into account. Matching defect records to the lot and production time makes it easier to investigate the affected scope. Material, additional labor, testing and shipping impacts on the cost of quality are examined separately; the

quality component of OEE does not provide these amounts on its own.

Feeding planning with real capacity

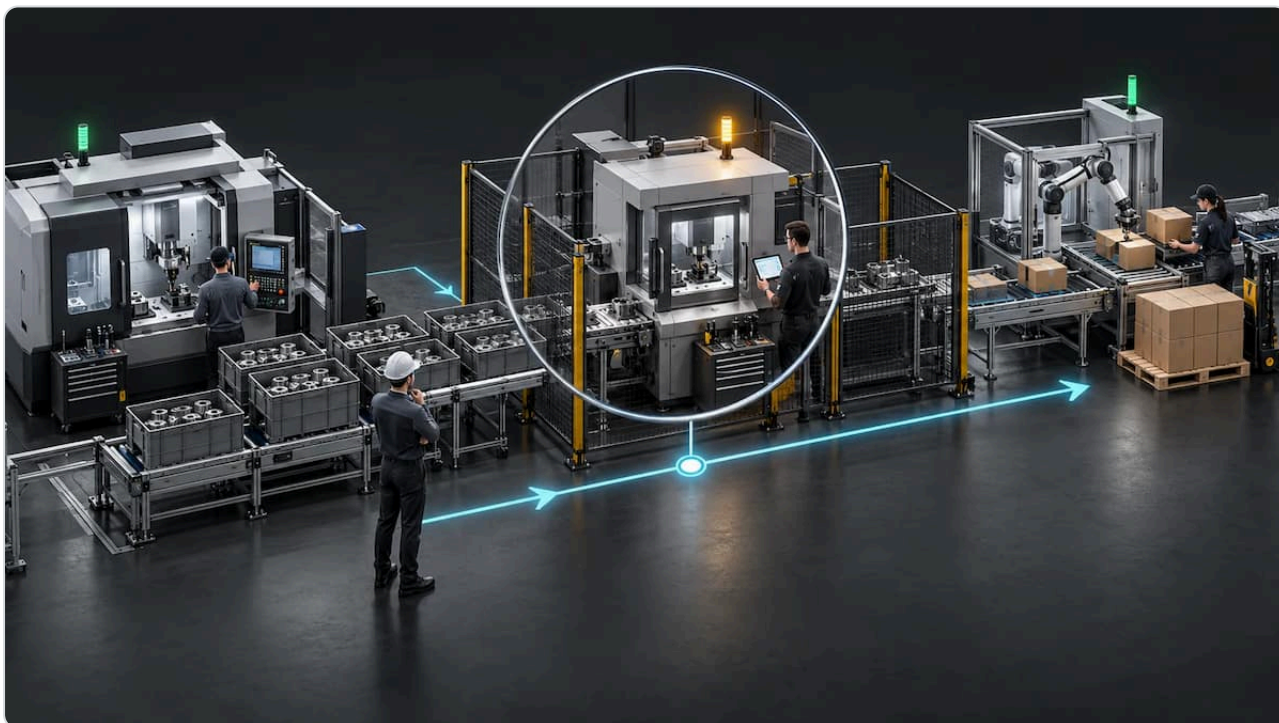
Once cycle, changeover and loss times are verified, the speed and setup assumptions used by planning can be reviewed. However, do not lengthen the ideal cycle time to hide low OEE. **The technical ideal time and the planning time based on actuals should be separate fields.**

Building a stronger case for new machine decisions

If existing equipment has reducible losses, additional capacity can be created. However, if loss reduction is not enough to meet demand, or if the bottleneck is elsewhere, the need for new equipment may remain. OEE provides input to the investment decision; on its own, it does not replace the purchasing decision.

8. Why does the bottleneck matter?

Running all the machines on a line more may not increase finished output at the same rate. While work-in-process inventory builds up in front of the operation that limits production flow, downstream operations may sit waiting. So do not choose improvement priorities based only on the lowest OEE; evaluate the effect on the point that limits flow.⁷



For example, producing an extra 500 parts at a first operation that is not the bottleneck may create work-in-process inventory instead of shipments. Reducing waiting at the bottleneck, on the other hand, can increase output with the same resources. Because the bottleneck can shift with product routing and product mix, this assessment should be refreshed regularly.

At line level, the input-output boundary and the ideal line speed must be defined. Multiplying the OEEs of machines connected in series, or taking their simple average, does not by itself yield a "line OEE." Starvation from the upstream operation and blocking by the downstream operation should also be coded separately from internal breakdowns.

9. How many parts, and how much benefit, does an improvement translate into?

Assume that the 60-minute downtime in the sample shift is **reduced by 24 minutes**. Product, ideal cycle time, planned time, performance and quality rate stay the same. This is a controlled scenario, not a guarantee of results.

Table 6

Indicator	Before	After scenario
Planned production time	420 min	420 min
Downtime	60 min	36 min
Run time	360 min	384 min
Availability	85.71%	91.43%
Performance	83.33%	83.33%
Quality	95.00%	95.00%
Total production	600	640
Good first time production	570	608
OEE	67.86%	72.38%

The calculation uses unrounded ratios. The result is **38 additional good parts per shift**. The OEE increase is **4.52 percentage points**, while the relative increase is approximately **6.67%**. These are not the same statement.

The 24 recovered minutes theoretically correspond to 48 parts at a 30-second ideal cycle time. However, because performance remains at 83.33% and quality at 95% in the example, $48 \times (5/6) \times 0.95 = 38$ **good parts** are obtained. Multiplying every recovered minute directly by ideal capacity can overstate the benefit.

How should we assess the monetary value?

For 22 similar shifts per month, there is a potential of $38 \times 22 = 836$ **additional good parts**. Assuming all of them can be sold and the hypothetical contribution per part after deducting additional variable costs is TRY 40, the hypothetical additional monthly contribution is **TRY 33,440**. The additional operating and investment costs of the improvement must then be deducted from this amount.

This is not a market price or an OETECH customer result. It assumes that the bottleneck is at this equipment, that downstream operations have sufficient capacity, and that demand exists. Without demand, a capacity gain does not automatically turn into sales or cash savings. The benefit may also take the form of less overtime, shorter lead times or deferred investment; only the realized value should be recorded.

Do not count the same gain over and over as additional sales contribution, value of recovered hours and overtime savings. Finance and production teams should verify the calculation together.

10. How is OEE calculated for multi-cavity molds?

In injection molding and similar applications, a single machine cycle can produce more than one part. For this reason, **cycles/shots**, **total parts** and **good parts** must be kept separate.

For example, with a 30-second cycle and a four-cavity mold, if all four cavities are expected to produce, the ideal time is $30 / 4 = 7.5$ seconds/part. Using the cycle count as the part count, or multiplying 30 seconds directly by the number of parts, breaks the calculation.

If a cavity is closed, do not make the capacity loss invisible. Distinguish between these two situations:

- **Closing a cavity due to a fault or temporary problem:** The loss against designed capacity should be kept visible separately. Correcting the score by changing the number of active cavities can hide the problem.
- **An approved different production configuration:** A separate, versioned capacity definition can be created for the relevant product-mold-machine. Old and new configurations should not be compared without explanation.

State clearly whether you treat missing cavity output as a performance loss or, in a particular counting system, as a quality loss. Do not deduct the same shortfall from both performance and quality. Recording both the actual number of parts produced and the active/nominal cavity count is useful for interpretation and capacity analysis.

11. How are different products and machines reported together?

A simple average of shift percentages is not enough

Using the same calculation definition, suppose a 60-minute production run has an OEE of 90% and another 360-minute run has an OEE of 60%. The simple average is 75%. The result weighted by planned time, however, is:

$$(60 \times 0.90 + 360 \times 0.60) / 420 = 64.29\%$$

Giving short trial runs and long series production the same weight in particular can mislead management. A combined plant-wide indicator can be used to track trends, but it should not eliminate detail at the level of individual machines, products and lines. ⁸

Watch the quality weighting with different ideal cycle times

If the lost-minutes approach in this guide is to be extended to different products, an **equivalent-time-based method** can be explicitly chosen:

$$\text{Combined OEE} = \Sigma(\text{product ideal time} \times \text{good first time count}) / \Sigma(\text{planned production time})$$

To reach this result by multiplying the components with the same method, quality is also weighted by ideal time:

- $A = \text{total run time} / \text{total planned production time}.$
- $P = \Sigma(\text{ideal time} \times \text{total count}) / \text{total run time}.$
- $Q_{\text{time}} = \Sigma(\text{ideal time} \times \text{good count}) / \Sigma(\text{ideal time} \times \text{total count}).$

Q_time differs from the usual count-based quality rate. This method should not be presented as the single standard that all solutions are required to apply. Name the method in the report, and also show count-based quality separately.

Why does it matter? Suppose product A has an ideal time of 10 seconds, a total of 100 and 90 good pieces; product B has an ideal time of 1 second, with a total and good count of 100 pieces. Count-based quality is $190/200 = 95\%$, while quality weighted by ideal time is $1,000/1,100 = 90.91\%$. Because defective parts are concentrated in the product with the longer cycle, the time effect is different.

To avoid getting lost in technical detail, the first step is to set up a correct calculation at the product/work order level. Do not mix the definitions of different reports and assume that $A \times P \times Q$ and the short formula will always produce the same result.

12. The difference between ideal cycle time, takt and target quantity

Table 7

Concept	Meaning	Point to watch
Ideal cycle time	The technically best sustainable part time for the relevant production	The reference for OEE performance.
Actual cycle time	Measured production speed or cycle time	State and counting boundaries must be defined.
Takt	The rhythm required to meet customer demand	Not the same concept as the technical ideal speed.
Planning time	The operating assumption used for due dates and capacity	May differ from ideal due to setup and expected losses.
Target quantity attainment	How much of the planned quantity was completed	Exceeding a low target does not mean high OEE.

For example, your target may be 500 and your good output 570 pieces. Achieving 114% of target does not make the OEE in the example above 114%. OEE is still 67.86%, because the denominator and the technical reference are different.

13. What is a good OEE value? Is 85% a must?

There is no single mandatory OEE target valid for every company, product and process. 85% is a frequently cited historical reference, not a universal threshold for success. A line that changes products frequently and a line that produces a single product for long periods operate under different conditions.⁹

At the start, do the following:

1. Make sure the data is correct and the calculation rules remain fixed.
2. Establish a comparable baseline period.
3. Select a loss cause and an achievable action.
4. Define the target not only as a score but in terms of the loss to be reduced and the delivery impact.

For example, instead of "let's get OEE to 85%," a more actionable target is "let's reduce material waiting time during mold changes, and track good output and on-time delivery together on comparable production runs."

14. What is the difference between OEE and TEEP?

OEE examines effectiveness within the planned production window. **TEEP — Total Effective Equipment Performance** takes the same analysis together with total calendar time and utilization.¹⁰

TEEP = OEE × (planned production time / total calendar time)

For example, if only 420 of the 1,440 minutes in a day are planned for production and OEE in this window is 67.857...%:

TEEP = 285 / 1,440 = 19.79%

This low value does not automatically indicate a problem; the plant may be running a single shift. TEEP helps discuss the potential of additional shifts or calendar utilization. A high OEE score does not mean the facility is busy every hour of the week.

15. What data is needed for reliable OEE?

At a minimum, planned time, run/downtime, ideal time per product, total production and good-first-time production are required. For real improvement, context must also be added.

Table 8

Data	Why is it needed?
Machine, work order, product and routing	Determines which production the calculation belongs to.
Mold, recipe, nominal/active cavities	Establishes the correct speed and capacity reference.
Shift and timestamp	Preserves the order and boundaries of events.
Downtime start/end and reason	Links availability loss to action.
Cycle / counter records	Helps break down performance loss.
Quality result and quantity	Determines good production on the first pass.
Revision information if the result arrived later	Allows provisional and final OEE to be separated.
Data validity / connection status	Prevents missing measurements from being interpreted as real downtime.

A communication outage does not automatically mean the machine stopped. Missing data should be flagged as "unknown" and, where available, completed later from local buffer records. Updated quality results and manual corrections should be kept with an audit trail.

If the denominator is zero or there is no production, the relevant component can be shown as **not calculable**. "0" and "no data" should not be used to mean the same thing. Showing data coverage alongside OEE at the start reduces a false sense of precision.

16. How do MES and AI support OEE work?

MES can make OEE easier to explain by linking cycle, work order, downtime, quality and material records. **MES is a broader manufacturing execution system; OEE is one of the indicators this structure can use.** Connecting a machine counter does not mean all of these relationships have been established.

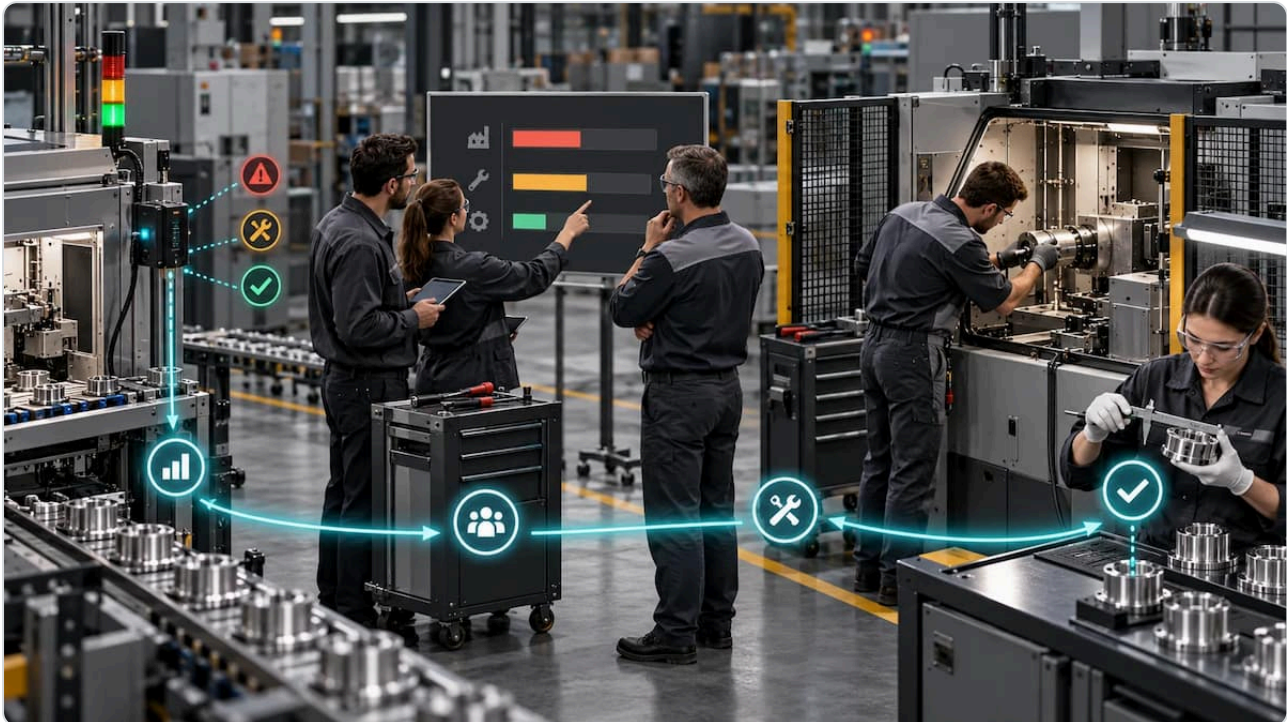


Figure 3. Measurement, team review and verified action are needed together. The cause records behind a result matter as much as the result itself.

AI can help investigate recurring losses in specific products or lots, prepare shift summaries and suggest possible causes associated with past events. However, the fact that things "happened at the same time" is not on its own proof of cause and effect. Suggestions should be presented together with source records and time ranges, and verified by a shop-floor expert.

Do not allow AI to automatically change the ideal cycle time to raise the score, or to fill in missing production data with estimates as if it were real. Machine parameter or recipe changes must be managed separately under authorization, approval and process safety rules.

17. A practical plan for getting started with OEE

The four-week flow below is an example of a narrowly scoped start; it is not a plant-wide MES rollout schedule or a delivery commitment.

Table 9

Period	Work	Expected output
Week 1	Pilot equipment, time policy, count and ideal time definitions	Shared data dictionary and a sample manual calculation
Week 2	Validating counter and time records against shop-floor references	Data coverage/discrepancy list
Week 3	Examining the most significant losses by product and cause	Limited action list with clear owners
Week 4	Implementing and comparing the first action	Before/after evaluation under similar conditions

Who should be involved?

The production manager, operator/key user, maintenance–automation, quality and, if needed, planning/IT representatives should work together. Management should own the scope and the time commitment. Finance should also take part when the monetary benefit is assessed.

Five questions for the daily short meeting

1. Is the data reliable and sufficiently complete?
2. Where was the biggest loss, and in which production run did it occur?
3. What is its impact on the bottleneck and on delivery?
4. Who will take which action, and when?
5. How will we check that the action worked?

Do not turn OEE into a pressure tool that ranks employees by score alone. There are raw material, maintenance and planning problems that the operator cannot control. Punishing accurate reporting of causes weakens data quality and improvement.

18. Common calculation and interpretation mistakes

Table 10

Mistake	Consequence	Correct approach
Loosening the ideal time	Performance rises artificially.	Technically verify the reference and manage it with version history.
Hiding performance above 100%	Counting or reference errors become permanent.	Investigate units, cavity count, time and ideal time.
Always removing mold changes from the denominator	Availability loss becomes invisible.	Apply the production window policy consistently.
Deducting micro stops twice	Effectiveness appears lower than it is.	Count a loss in only one time category.
Counting reworked product as good on the first pass	Quality loss is erased.	Separate first-pass quality from re-work recovery.
Assigning a work order or quality result to the wrong shift	Results shift.	Manage time boundaries and late results.
Simply averaging the percentages of different production runs	Short jobs affect the report disproportionately.	Choose a weighting suited to the purpose and units.
Looking only at total OEE	A rising score may be mistaken for success while quality deteriorates.	Track A, P, Q and business results together.
Increasing production when there are no orders	Work-in-process inventory and cost may rise.	Produce in line with demand and the bottleneck.

Go-live or pilot acceptance checklist

- ☐ Planned production time and out-of-scope times are documented.
- ☐ The relationship between product, machine, mold and ideal time is verified.
- ☐ Counter resets, overflow, work order and shift changes are tested.
- ☐ Second/minute and shot/part units are consistent.
- ☐ Good, scrap, rework and pending-quality output are separated.
- ☐ Missing data is distinguished from real downtime.
- ☐ Micro stops are not counted twice.
- ☐ The combined reporting method and its weights are explained.
- ☐ OEE can be recalculated from raw inputs.
- ☐ The action's owner, target and result evaluation are defined.

19. OETECH's approach

At OETECH, we do not reduce OEE to a single dashboard in our MES and automation work. We focus on validating shop-floor data in the context of work order, product, mold, cycle and quality; on explaining downtime with appropriate reasons; and on tracking results through actions.

Establishing a shared calculation definition is especially important in production environments with multi-cavity molds, manual operations and different machine connections. In suitable projects, data collection, operator reporting, reporting and integration capabilities that can be addressed within the scope of IoE+ MES and ERP Core are designed according to the facility's needs.

The aim here is not to make a score look good, but to enable the company to understand which loss to reduce, and in what order. The figures in this guide are not customer performance or a commitment to gains.

First step: define the loss before the score

Select a pilot piece of equipment. Verify planned time, ideal cycle time, and total and good quantities. Then choose a single significant loss and improve it with a clear owner and a result check.

With OETECH, you can jointly assess your OEE calculation definitions, existing data sources and initial pilot scope. For the broader scope of MES, see [our What Is MES? guide](#).

Sources and calculation scope

Prepared on: **October 18, 2026**. The definitions and technical framework are supported by the primary sources below. OEE.com and LeanProduction.com are practitioner resources published by Vorne; they are not presented as an independent certification standard. The sample shift, benefit scenario and implementation plan were created for this guide. The 3D scenes in the visuals are AI-generated conceptual illustrations; the numerical loss chart is a visual calculated from the sample inputs.

1. [Vorne — What Is OEE?](#): the meaning of OEE and its three components.
2. [JIPM — About TPM](#): the relationship between OEE and TPM.
3. [Vorne — Calculating OEE](#): basic formulas and calculation approach.
4. [Vorne — Cycle Time Metrics](#): ideal cycle time, takt and other time concepts.
5. [Vorne — OEE Factors](#): planned production time and time losses.
6. [Vorne — Six Big Losses](#): the Six Big Losses and first-pass quality.
7. [Vorne — Theory of Constraints](#): bottleneck-focused improvement.
8. [Vorne — OEE FAQ](#): topics on different production runs and plant-level aggregation. The time-weighted quality method in this guide is a separately explained calculation choice.
9. [Vorne — World-Class OEE](#): the 85% reference and the context for setting targets.
10. [Vorne — TEEP](#): the relationship between total calendar time and utilization.

Appendix A — Frequently asked questions

A.1 What is OEE called in Turkish?

The common Turkish term is "Toplam Ekipman Etkinliği". It stands for Overall Equipment Effectiveness. It considers availability, performance and quality together.

A.2 The machine is running, so why is OEE low?

Cycles may be slow, short stops may accumulate, or the first-pass good rate may be low. A running signal does not explain all of these losses. Examine the three components and the records they are based on.

A.3 Should we average the three components of OEE?

No. They are multiplied together. If all three are 90%, OEE is 72.9%, not 90%.

A.4 Can OEE be 100%?

It refers to the situation where there is no downtime in the defined production window, the ideal speed is achieved and all products are good the first time. If 100% is seen continuously for long periods, also check the measurement scope and references.

A.5 Why does performance exceed 100%?

Possible reasons include an ideal time entered too long, cavity/count conversion, unit errors, double counting or missing run time. Track the raw value and investigate the problem; simply capping it at 100% on screen does not solve the definition problem.

A.6 What should we do if the quality result is not finalized by the end of the shift?

Provisional OEE and final OEE should be separated. Do not silently accept pending parts as good. When the quality result arrives, the relevant production record should be updated and the change should be traceable.

A.7 Isn't a part recovered through rework counted as good?

It may eventually become usable, but because it was not good on the first pass, the quality loss of the original production is retained. The rework operation, its quantity, duration and recovery should be tracked separately.

A.8 Should we deduct break and maintenance times?

Define the window in which production is intended at the outset. Separate time when no production is planned from downtime within this window. Automatically excluding every maintenance or adjustment period from scope is not a sound general rule.

A.9 Can OEE be used in manual production?

If there is a defined operation boundary and time and output measurement, adapted effectiveness tracking can be performed. However, do not use an equipment-focused indicator as if it explained the full performance of employees. Support it with standard work, first-pass quality and delivery indicators.

A.10 How is it applied on lines that produce kg, meters or tons?

An appropriate production unit can be used instead of parts. Ideal speed and output must be in the same unit; if product thickness, width, density or recipe changes, references should be defined accordingly. In batch processes, the equipment boundary and waiting/processing times should be modeled separately.

A.11 Should we add up the OEE of all the machines in the plant?

Percentages are not added directly. A weighted indicator can be produced once the purpose is defined, but this is not the same concept as the effectiveness of a physical production line. The bottleneck and line output should be examined separately.

A.12 Does cost always fall when OEE rises?

No. Demand, the bottleneck, overtime, variable costs and inventory effects matter. Creating additional capacity and achieving cash savings are different outcomes. Calculate the realized benefit separately.

A.13 Is a very low value in the first measurement bad?

Data and definitions should be checked first. If the result is correct, previously invisible losses may have come to light. The goal is not to hide the starting score but to choose an appropriate, measurable improvement.

A.14 Can we start with Excel?

Yes. It can be used in a narrow pilot to validate the calculation logic and the data dictionary. As cycle-level data, multiple shifts, different products and real-time alerts increase, the sustainability of manual records should be evaluated separately.

A.15 Can OEE be calculated without MES?

Yes. The calculation can be performed if the required inputs are collected reliably. MES supports linking this data to production context and maintaining record continuity. An OEE calculation and full MES scope are not the same thing.

A.16 Can artificial intelligence raise OEE on its own?

Generating a suggestion and eliminating a physical loss are different things. Data, correct cause analysis, technical action and verification of the result are required. AI can support this process; it does not replace missing measurements or process expertise.



ABOUT THE AUTHOR

Ender Öztürk works on enterprise solutions at OETECH Solutions, focusing on bringing manufacturing execution systems, industrial data and AI applications to the shop floor.

ABOUT OETECH

Founded in 2013 and based in Bursa, OETECH Solutions develops software and hardware for production management, industrial data collection and automation. With IoE+ MES Cloud, HR+ Cloud PDKS and SoSo Inventory, it carries production data from the shop floor to decisions.

© 2026 OETECH Solutions. All rights reserved. Quotation permitted with attribution. ·
oetechsolutions.com