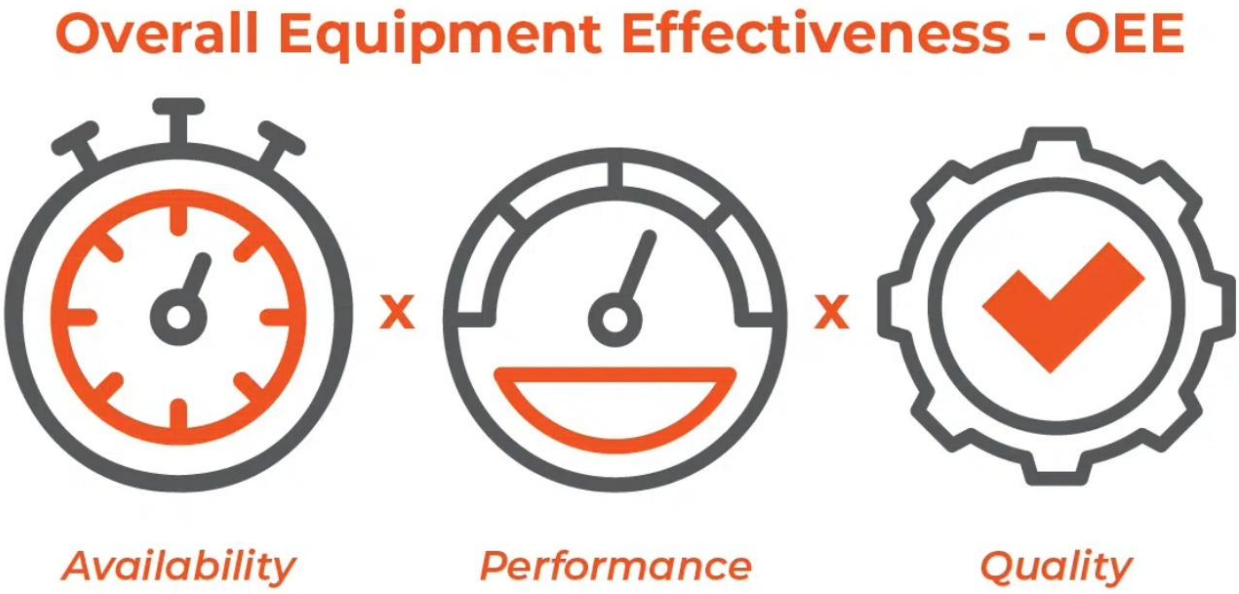
Study Guide: Overall Equipment Effectiveness (OEE)



What is Overall Equipment Effectiveness (OEE)?

Overall Equipment Effectiveness (OEE) is a key performance metric used in manufacturing and production industries to assess the efficiency and productivity of equipment and machinery. OEE provides a quantitative measure of how well a manufacturing process or machine is performing in terms of availability, performance, and quality. It is a valuable tool for identifying areas of improvement and optimizing the utilization of equipment.

This metric is applied to:

- Semi-Automated
- Fully Automated Equipment

- If your equipment is high quality, it will also be effective.
- When you improve OEE through Predictive and Autonomous maintenance you end up with a process that is more capable and stable over time.

OEE is typically calculated using the following formula:

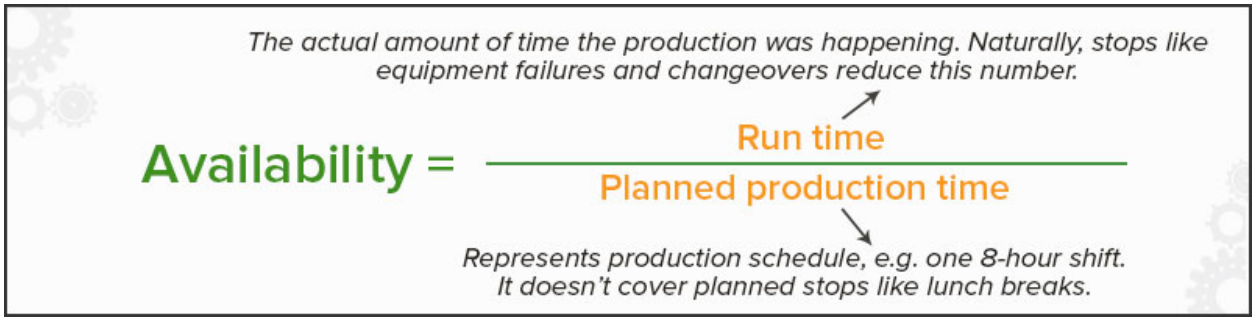
OEE = P x A x Y (remember the acronym PAY)
OEE= Performance x Availability x Yield

- Performance (is the machine performing a the right speed?)
- Availability (is the machine available to produce parts when you need it?)
- Yield (Is the machine producing good parts?)

How to Calculate OEE?

Let's talk about each of the OEE attributes: OEE= Performance x Availability x Yield

Availability



This component measures the percentage of time the equipment is available for production. It accounts for factors such as planned downtime, unplanned downtime, and changeovers. High availability indicates that the equipment is consistently available for production.

To Calculate Availability:

Availability = Actual Run Time / Planned Run Time

Potential available time: Theoretical total time possible for equipment, process, plant that could make a good product.

Let's say we are working with a 12-hour shift. so there are 12 hours of time available. Now, during the shift, you are going to have Planned Downtime.

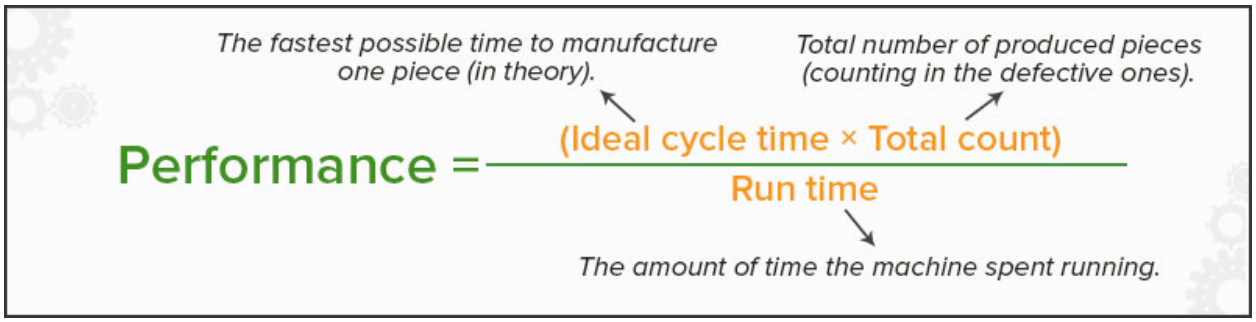
Planned Downtime: Includes all the time that should be removed from the OEE calculation for planned downtime activities. (In this part let's use 1 hour of planned lunch break, leaving us with 11 hours)

Planned Available Time: Is the time that the process, equipment, labor is planned to make a good product. Potential Available time - Planned Downtime (For our example, here we were left with 11 hours of Planned Available Time)

Unplanned Downtime: Is the sum of the losses of equipment availability due to unplanned stoppages (for the sake of our example, we can say that the equipment broke down or we had to do an unexpected changeover which took 1 hour, leaving us with 10 hours of actual Operating Time)
Actual Operating Time: Planned Available Time - Sum of all unplanned downtime losses (10 hours in this particular shift example)
So taking into consideration the numbers in our example, let's find out our OEE calculation.

Availability = Actual Run Time / Planned Run Time
Availability = 10hrs / 11hrs = 90.9%

Performance



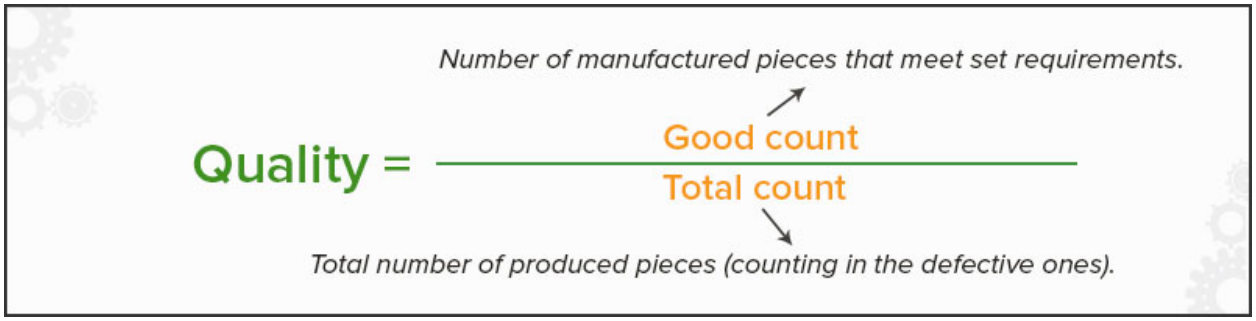
Performance evaluates the rate at which the equipment operates compared to its maximum designed or ideal speed. It considers factors like slow cycles, minor stoppages, and other factors that reduce the actual operating speed of the equipment.

Starting with the previous example; we ran the equipment for 10 hrs and the cycle time the equipment is designed for is 3 sec/part. We should be producing 20 parts/min or 1200 parts/hr. With this information, we know that our Theoretical Maximum Output for the 10 hrs of Actual Operating time is 12,000 parts per shift.

If at the end of the day, you produced 11,000 parts (Actual Total Output)

Performance = Actual Output / Theoretical Output
Performance = 11,000 / 12,000 = 91.7%

Yield or Quality



Yield measures the percentage of defect-free products or output generated by the equipment. It takes into account the number of defective or substandard products produced

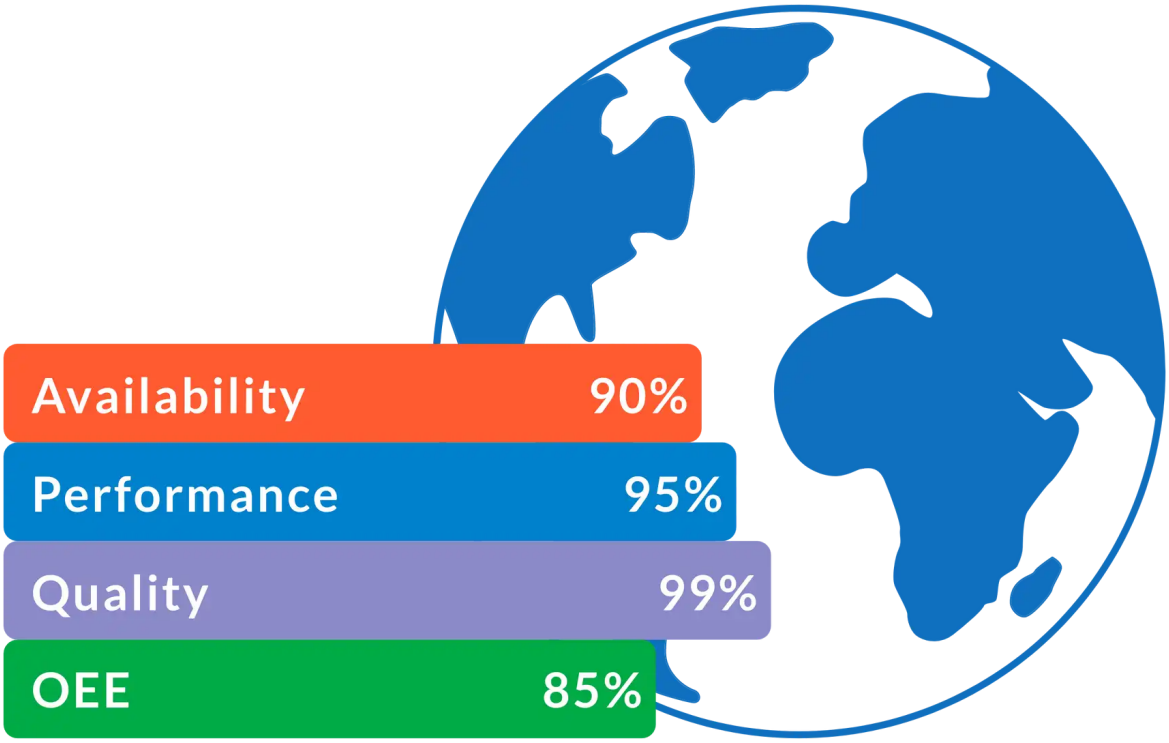
Coming back to the example:

Total Output = 11,000 (This includes good parts and bad parts)
In this example, we are going to say that from those 11,000 parts only 10,000 were actually good parts, the other 1,000 were scrap.

with this information
Yield = Good Parts Produced / Total Parts produced = 10,000 / 11,000 = 90.9%
Now that we have the information for the 3 main attributes of OEE, we can make our final calculation:

OEE = P x A x Y
OEE = 91% x 92% x 91% = 76%

- World Class OEE is 85%



Benefits of OEE

- The #1 benefit of improving your OEE is more capacity.
- Shorten Lead Time
- Reduce Overtime
- Increase time for Preventative Maintenance
- Creates a Stable/Capable Process
- Allows you to identify trends and act preventably
- Reduce Quality Loss