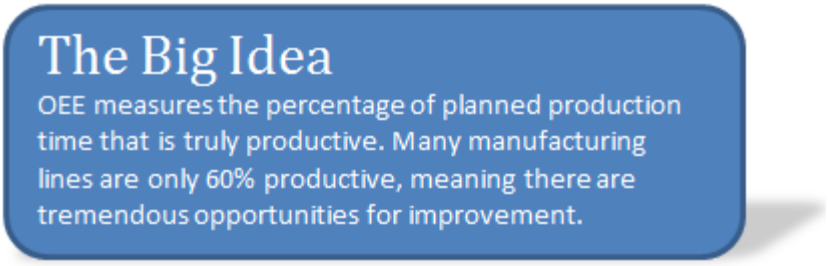
OEE (Overall Equipment Effectiveness)

What Is OEE?

OEE (Overall Equipment Effectiveness) is a "best practices" metric



that identifies the percentage of planned production time that is truly productive. An OEE score of 100% represents perfect production: manufacturing only good parts, as fast as possible, with no down time.

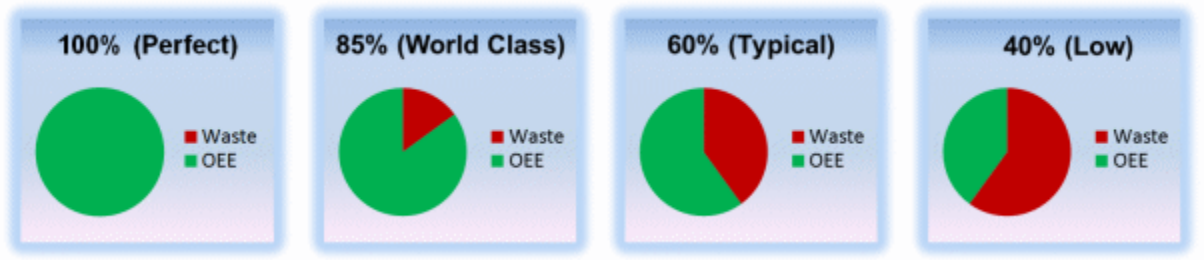
OEE is useful as both a benchmark and a baseline:

- As a benchmark it can be used to compare the performance of a given production asset to industry standards, to similar in-house assets, or to results for different shifts working on the same asset.
- As a baseline it can be used to track progress over time in eliminating waste from a given production asset.

OEE Benchmarks

So as a benchmark, what is considered a "good" OEE score?

- An OEE score of 100% is perfect production: manufacturing only good parts, as fast as possible, with no downtime.
- An OEE score of 85% is considered world class for discrete manufacturers. For many companies, it is a suitable long-term goal.
- An OEE score of 60% is fairly typical for discrete manufacturers, but indicates there is substantial room for improvement.
- An OEE score of 40% is not at all uncommon for manufacturing companies that are just starting to track and improve their manufacturing performance. It is a low score and in most cases can be easily improved through straightforward measures (e.g. by tracking down time reasons and addressing the largest sources of down time – one at a time).



Benchmark your OEE score against industry standards for discrete manufacturing and strive for world class results.

Calculating OEE – The Simple Way

So how is the OEE score calculated?

In simplest terms, OEE is the ratio of Fully Productive Time to Planned Production Time. In practice this is calculated as:

(Good Pieces x Ideal Cycle Time) / Planned Production Time

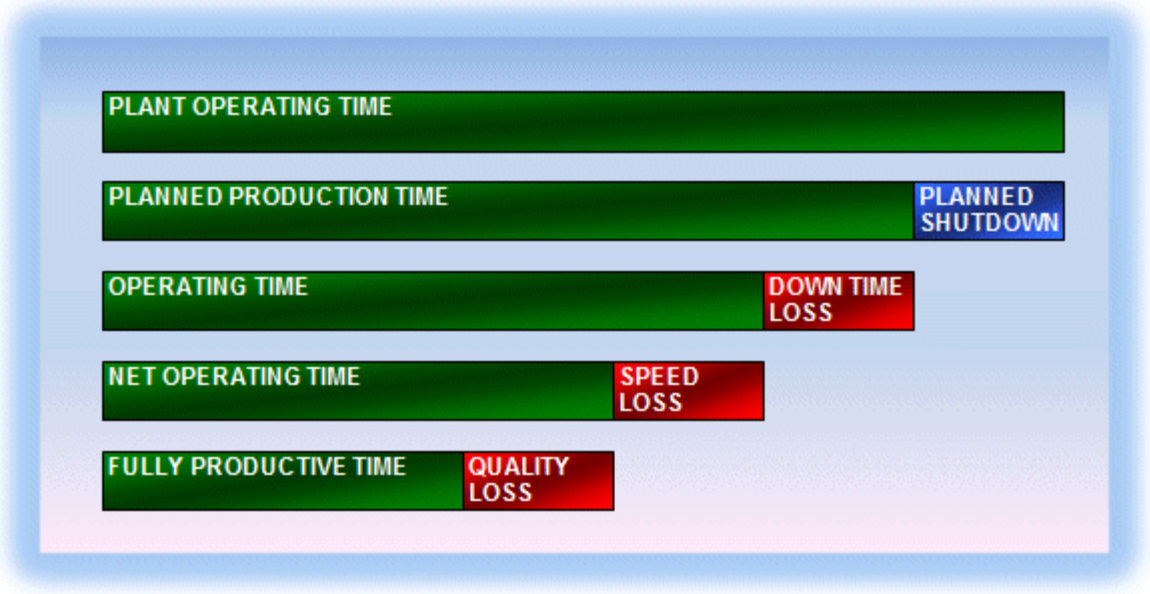
Let's define some terms:

- Good Pieces (pieces that are manufactured without any defects)
- Ideal Cycle Time (the theoretical fastest possible time to manufacture one piece)
- Planned Production Time (the total time that the production asset is scheduled for production)
- Fully Productive Time (producing only good pieces, as fast as possible, with no down time)

Calculating OEE – The Preferred Way

The preferred way to calculate OEE is mathematically equivalent to the simple formula described above, but provides a much richer understanding of waste in the manufacturing process by breaking it down into three measurable categories:

- Availability
- Performance
- Quality



OEE is the ratio of Fully Productive Time to Planned Production Time.
Planned Shutdown is not included in OEE calculations since there is no intention of running production.

Availability

Availability takes into account **Down Time Loss**, which includes all events that stop planned production for an appreciable length of time (typically several minutes or longer).

It is calculated as the ratio of Operating Time to Planned Production Time, where Operating Time is simply Planned Production Time less Down Time:

Operating Time / Planned Production Time

Performance

Performance takes into account **Speed Loss**, which includes all factors that cause the production asset to operate at less than the maximum possible speed when running.

It is calculated as the ratio of Net Operating Time to Operating Time. In practice, it is calculated as:

(Ideal Cycle Time x Total Pieces) / Operating Time

Ideal Cycle Time is the theoretical fastest possible time to manufacture one piece. Therefore, when it is multiplied by Total Pieces the result is Net Operating Time – the theoretical fastest possible time to manufacture the total quantity of pieces.

Here is a simple example of a Performance calculation:

Item	Value	Explanation
Ideal Cycle Time	1 minute	Theoretical fastest time to produce this part.
Total Pieces	300	Total quantity of pieces manufactured during this shift.
Operating Time	330 minutes	Run time of this shift (planned production time less down time).
Performance	90.9%	(Ideal Cycle Time x Total Pieces) / Operating Time = (1 x 300) / 330

Quality

Quality takes into account **Quality Loss**, which factors out manufactured pieces that do not meet quality standards, including pieces that require rework.

It is calculated as the ratio of Fully Productive Time (fastest possible time for Good Pieces) to Net Operating Time (fastest possible time for Total Pieces). In practice it is calculated as:

Good Pieces / Total Pieces

OEE

OEE takes into account all losses (Down Time Loss, Speed Loss, and Quality Loss), resulting in a measure of truly productive manufacturing time.

It is calculated as the ratio of Fully Productive Time to Planned Production Time. In practice, it is calculated as:

Availability x Performance x Quality

If the equations for Availability, Performance, and Quality are substituted in the above equation and then reduced to their simplest terms the result is:

(Good Pieces x Ideal Cycle Time) / Planned Production Time

This is the “simplest” OEE calculation described earlier. With a bit of reflection, it can be seen that multiplying Good Pieces by Ideal Cycle Time results in Fully Productive Time (manufacturing only good parts, as fast as possible, with no down time).

Perfect Production

Earlier, an OEE score of 100% was described as perfect production: manufacturing only good parts, as fast as possible, with no down time. Let's tie this notion of perfect production to the OEE calculation:

- Manufacturing only good parts…means a Quality score of 100%
- As fast as possible…means a Performance score of 100%
- With no down time…means an Availability score of 100%