OEE

Overall Equipment Effectiveness

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1. What is OEE ?

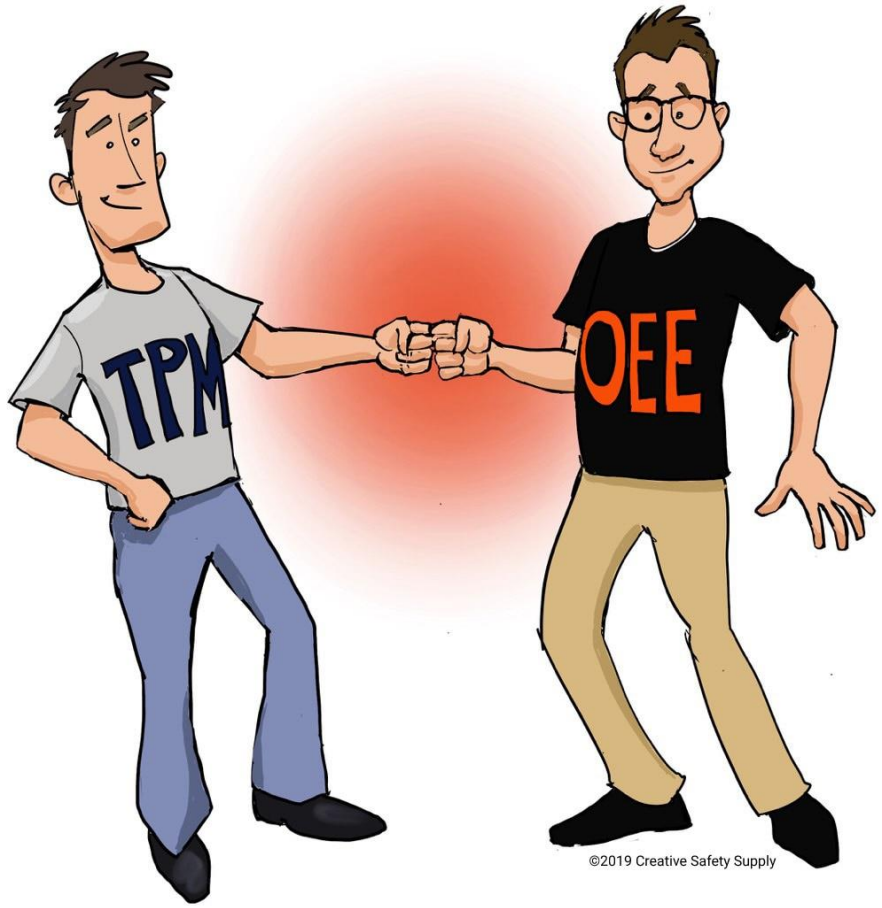
OEE :

- **O**verall Equipment Effectiveness is an index to judge production run in terms of **machine availability**, **production rate** & **quality rate** of the product .
- For TPM & Lean Manufacturing , **OEE is a key metric.**
- It is an important characteristic of **capacity planning, material planning, and other resource planning.**
- OEE is also known as **TEEP(Total effective equipment performance)**
- OEE is a Lean Manufacturing Tool.

2. What is mean by OEE ?

There are **three parameters** for Overall equipment effectiveness monitoring

- Availability
- Performance
- Quality



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What is Availability ?

- Availability shows the machine available duration for manufacturing
- In other words, for how much time our machine is available for manufacturing.
- Availability takes into account of Breakdown Losses.
- After removing, downtime we can get the operating duration of the machine.

Examples of Downtime :

- Equipment failure
- Material Shortage
- Excess changeover timing, etc…

What is Performance ?

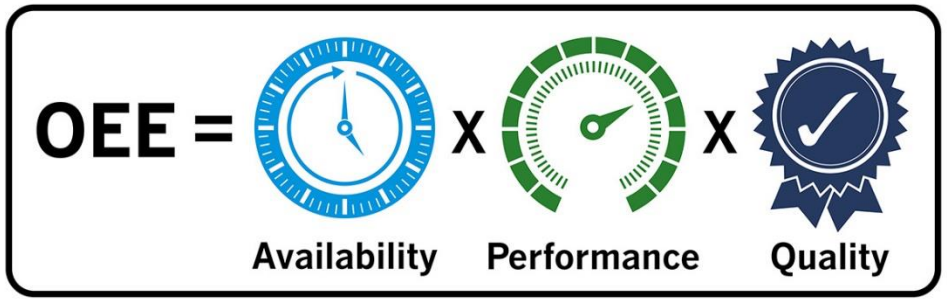
- Performance shows the excess time taken for manufacturing as compared to standard operating time.
- The performance takes into account of speed losses
- The Speed losses includes any factor that leads to operating production with more cycle time than maximum permissible.

Examples of Performance Losses :

- Low speed of job loading/unloading
- Fatigue of the operator,
- Excess cycle time in manual work, etc…

What is Quality Rate in OEE ?

- Quality shows the Good Quality of Product
- It takes into account the losses (Loss due to manufacturing of bad part.)
- Quality loss can only be present due to the manufacturing of a defective part or non-conforming part.



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How to Calculate OEE ?

Time Loss Calculation :

Planned Shutdown : Not part of OEE calculation

Break Down Loss :

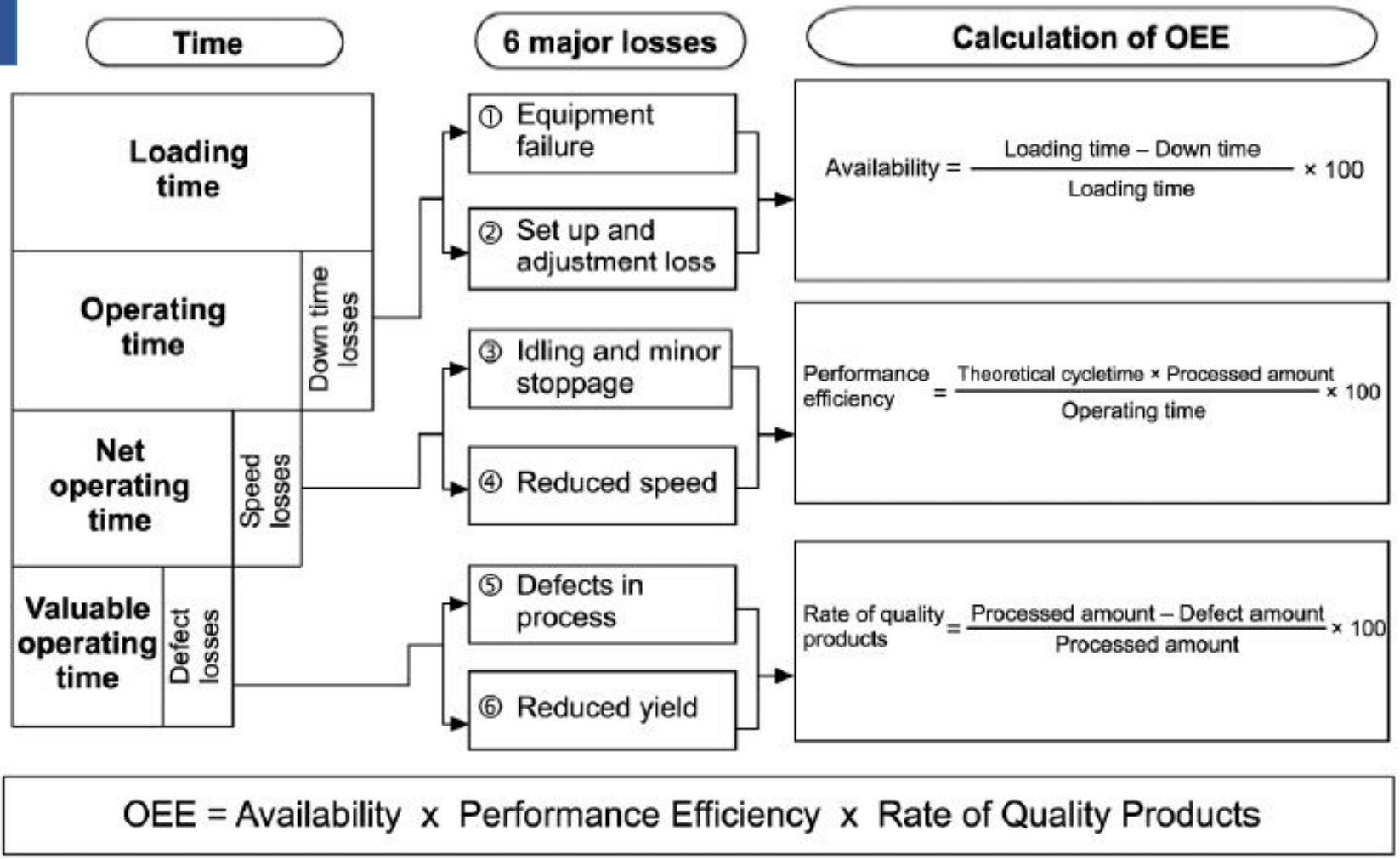
Operating time to planned manufacturing timing ration is called availability when a process runs without any stoppage there will be 100% availability.

Speed Loss

It is ration of net operating time to total operating timing or it can be calculated by actual cycle time / Ideal cycle time. When the process runs with maximum theoretical speed then performance will be 100%

Quality Loss

It is the ratio of total good parts to a total part produced. When all produced parts are good then will be 100% quality.



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OEE Calculation Examples :

Let's assume below data to understand OEE cal.

- Shift duration = 8hrs (480 Mins)
- Total Breaks = 55 Mins
- Breakdown = 40 Mins
- Ideal production rate =1 Part per minute
- Total part produced = 350
- Rejected parts = 4

$$\text{Availability} = \frac{\text{Loading time} - \text{Down time}}{\text{Loading time}} \times 100$$

$$\text{Performance efficiency} = \frac{\text{Theoretical Cycle time} * \text{Processed amount}}{\text{Operating time}} \times 100$$

$$\text{Quality Rate} = \frac{\text{Processed amount} - \text{Defect amount}}{\text{Processed amount}} \times 100$$

- **Planned production duration** = Total Available Time – Planned Breakdown

  480 Minutes – 55 Minutes = **425 Minutes**

- **Actual production duration** = Planned production duration – Breakdowns

  425 Minutes – 40 Minutes = **385 Minutes**

- **Availability (A)** = Actual Prod. Time / Planned Prod. Time

  385 Minutes / 425 Minutes = .905 Minutes

- **Actual Production rate** = Total Count / Total running time

  350 / 385 = 0.909

- **Performance (P)** = Actual Production rate / Ideal Production Rate

  0.909 / 1.0 = 0.909

- **Quality (Q)** = Good parts / Total parts produced

  (350-4) / 350 = 0.988

Overall Equipment Effectiveness = Availability (A) * Performance (P) * Quality (Q)

0.905 * 0.909 * 0.988 = .812 *100 % = 81.2%

OEE = 81.2%

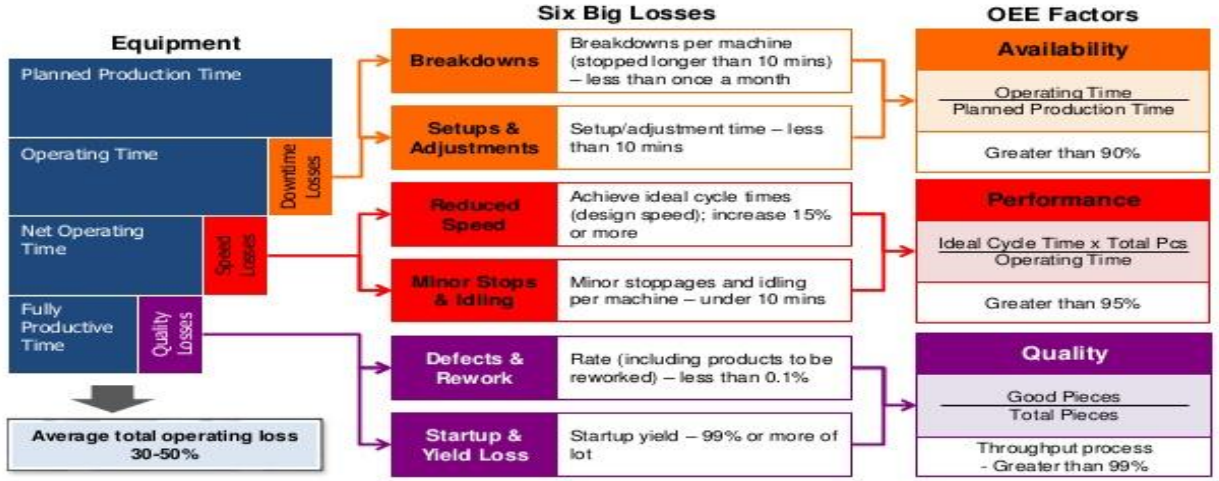
OEE Benefits:

- It helps us to set goals for improvement, and track the progress
- Overall Equipment Effectiveness helps us to find inefficiencies in the operation process
- It provides us a benchmark data for the new process setup.
- Overall equipment effectiveness helps to track progress in eliminating waste from an operation process.

Thank you.

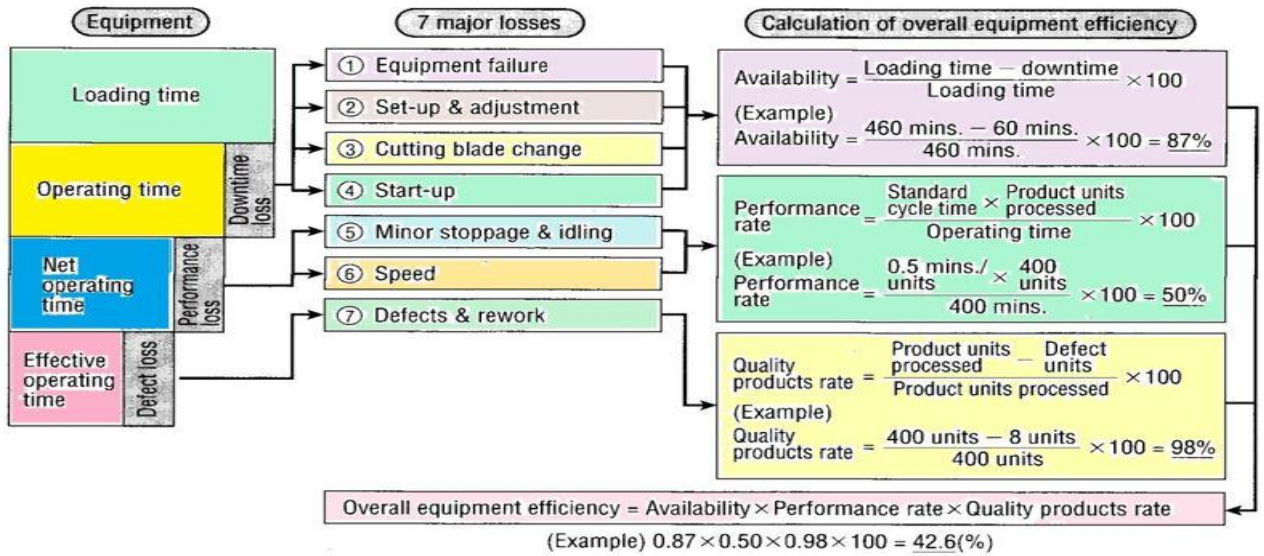
OEE = 81.2%

Equipment Losses & OEE



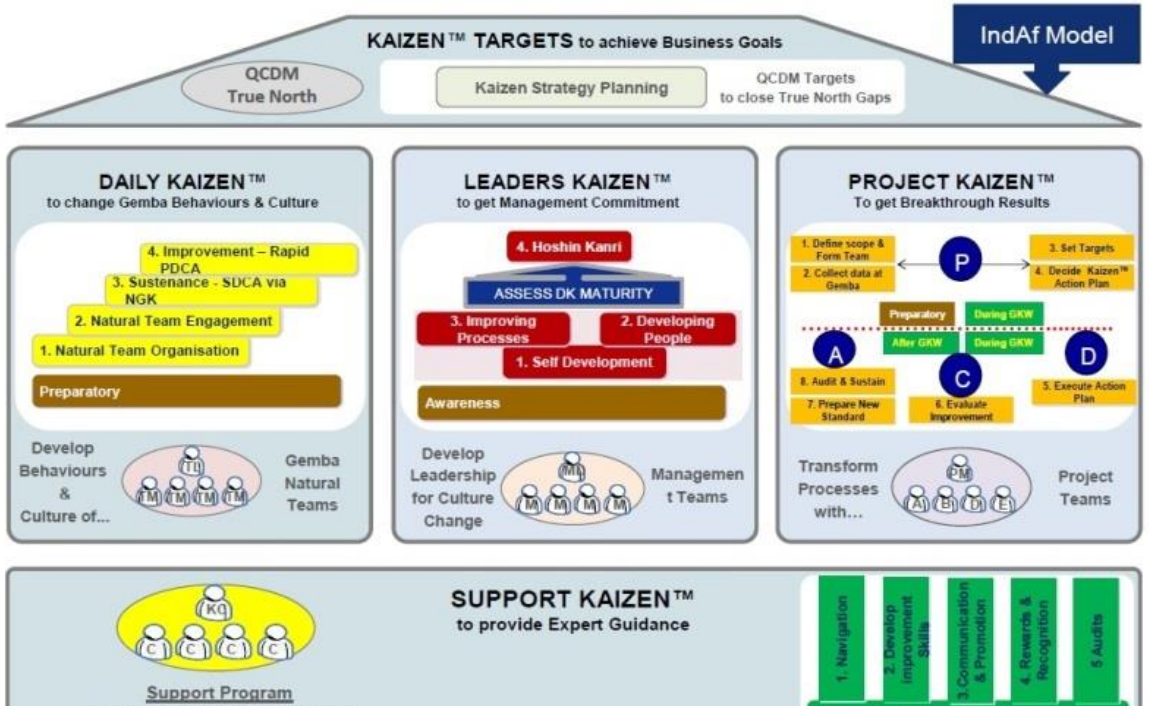
OEE = Availability x Performance x Quality

Source: Adapted from 'TPM for Supervisors', Productivity Press Development Team



Overall equipment efficiency

①Equipment failure②Set-up & adjustment③Cutting blade change④Start-up⑤Minor stoppage & idling⑥Speed⑦Deiects



Total operations time

Availability	A Potential production time		Unscheduled
	B Actual production time	Time loss: -Breakdowns, Waiting	
Performance	C Theoretical output		
	D Actual output	Speed loss: -Minor stoppages, -Reduced speed	
Quality	E Actual output	*Loss of Effectiveness*	
	F Good product output	Quality loss: -Scrap, -Rework	

OEE = availability rate x performance rate x quality rate

= B/A x D/C x F/E