Continuous Improvement Toolkit

Overall Equipment Effectiveness (OEE)


Managing Risk
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FMEA
RAID Logs
Fault Tree Analysis
Risk Assessment*
Traffic Light Assessment
Deciding & Selecting
Pros and Cons
Importance-Urgency Mapping
Break-even Analysis
Cost -Benefit Analysis
Force Field Analysis
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Pugh Matrix
Decision Tree
TPN Analysis
QFD
Matrix Diagram
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Prioritization Matrix
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Paired Comparison
Planning & Project Management*
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PEST
PERT/CPM
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Gap Analysis
Hoshin Kanri
Kaizen
How-How Diagram
Tree Diagram**
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Understanding Cause & Effect
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Design of Experiments
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Simulation
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Flow Process Chart
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Designing & Analyzing Processes
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Sampling
Data Collection
Focus groups
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Measles Charts
Surveys
Critical Incident Technique
Observations

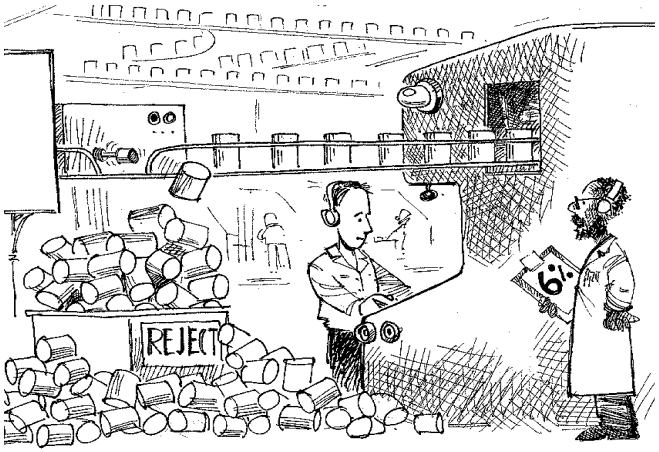
- Overall Equipment Effectiveness

- **Overall Equipment Effectiveness (OEE)** is a measure to evaluate the productiveness of a machine or a production line.
- The higher the OEE measure the more good products (per shift) a machine or line produces.
- This results in lower costs per unit produced and helps operations to be more competitive.
- **OEE Analysis** is a tool used to analyze equipment performance, accounting for losses due to availability, performance, and quality.

- Overall Equipment Effectiveness

Overall Equipment Effectiveness:

- A measure of the effectiveness of a process or a process step.
- Typically calculated on a weekly or monthly basis to account for C/O, etc.
- **OEE is derived from three factors:**
  - Availability.
  - Performance.
  - Quality.



- Overall Equipment Effectiveness

Benefits:

- Informs an operator of current machine (or process) conditions.
- Enables them to identify major losses, reduce lost time and maintain a more productive machine and line.
- Improving OEE will allow a more reliable delivery schedule to be maintained (satisfies the customer).
- Understanding OEE provides a true view of capacity availability.
- Improving OEE frees up capacity to be utilized more effectively.

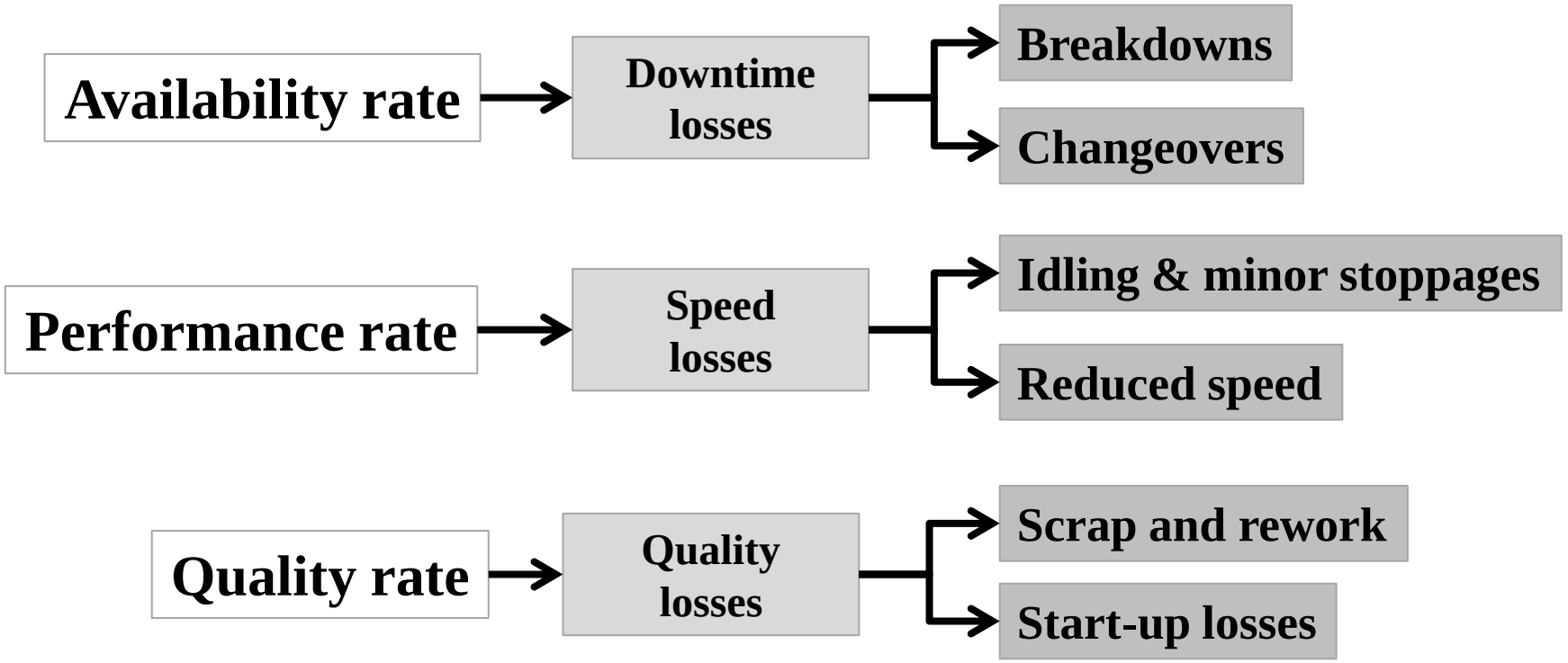
- Overall Equipment Effectiveness

Availability rate	Performance rate	Quality rate
How much time per shift was the machine actually running?	How well did the machine perform (compared to the rated speed) when it was actually running?	How many products were good the first time?

OEE = Availability % x Performance % x Quality %

- Overall Equipment Effectiveness

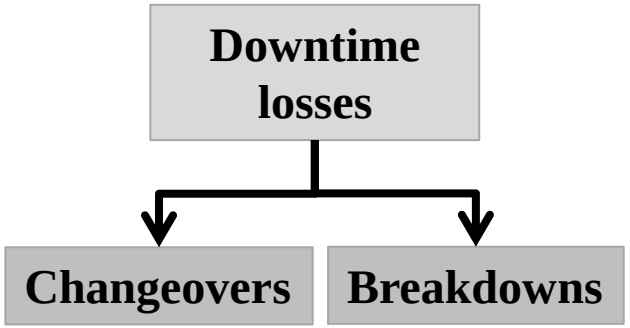
- The 3 primary factors are typically influenced by 6 key losses:



- Overall Equipment Effectiveness

Breakdowns:

- The line stops for more than a minutes because something is broken or needs to be fixed.
- **Examples:**
  - Machine is shut down because of failures.
  - Equipment stopped as operator is missing.



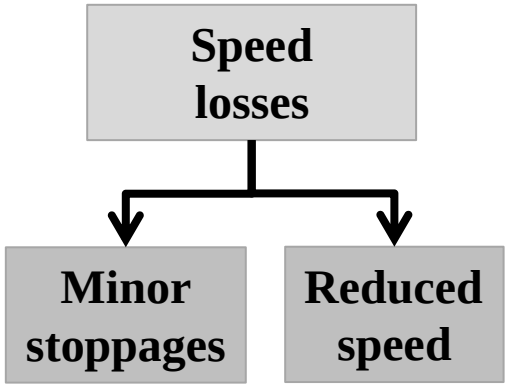
Changeover:

- The line stops because material or tooling need to be changed.
- **Example:**
  - Changeover because of the need to produce different product.

- Overall Equipment Effectiveness

Idling and Minor Stoppages:

- The line has either no products to process ,or it stops for short periods of time, often less than a minute.
- **Examples:**
  - Previous equipment is idle because product supply from previous process is insufficient.
  - Operators pause to ‘tweak’ the equipment.



Reduced Speed:

- The actual line speed is slower than the optimum speed.

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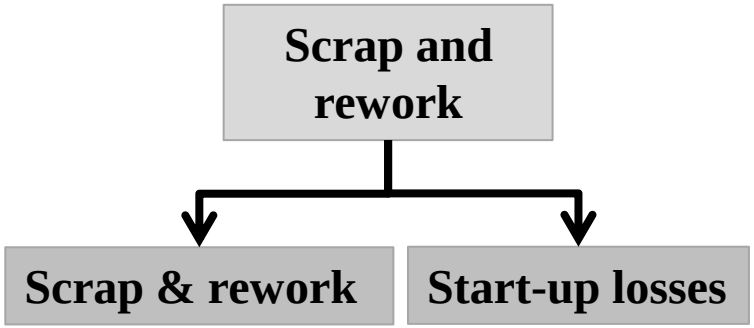
Scrap and Rework:

- Products are either failing totally or don't pass inspection the first time.
- **Examples:**
  - Products that are caught defective.
  - Products that leave the process and return later for additional rework.



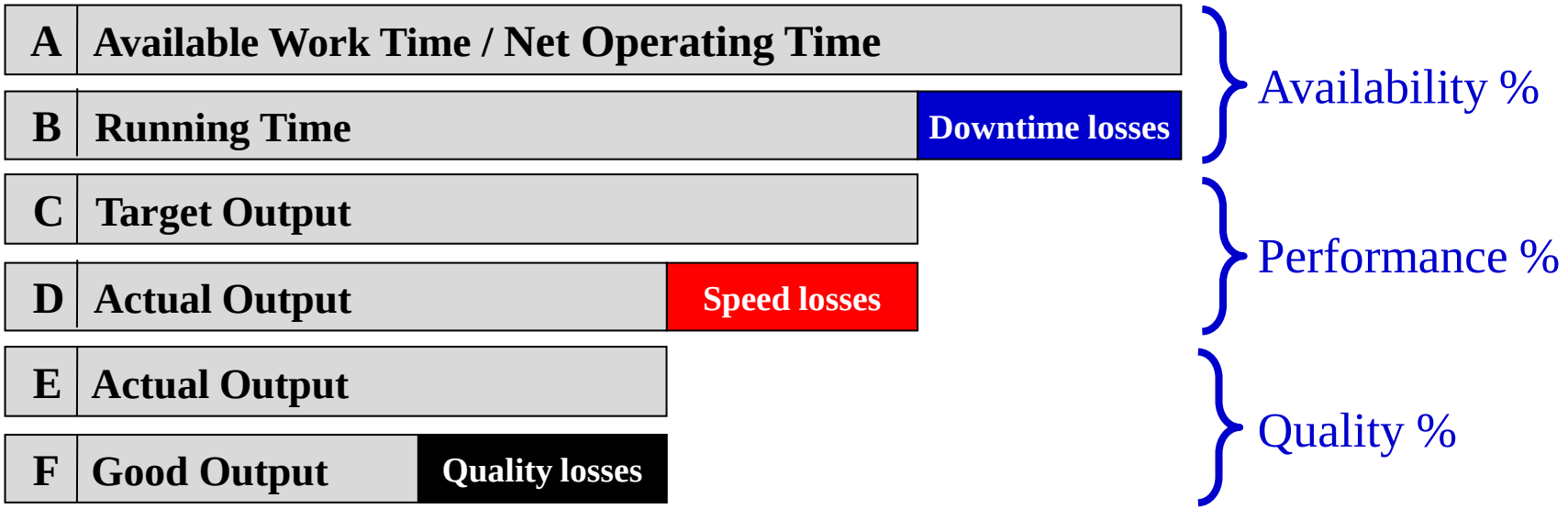
Startup Losses:

- All products that are rejected during start-up periods.

- Overall Equipment Effectiveness

Equipment-Related Losses:

- Downtime losses, speed losses and quality losses.



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

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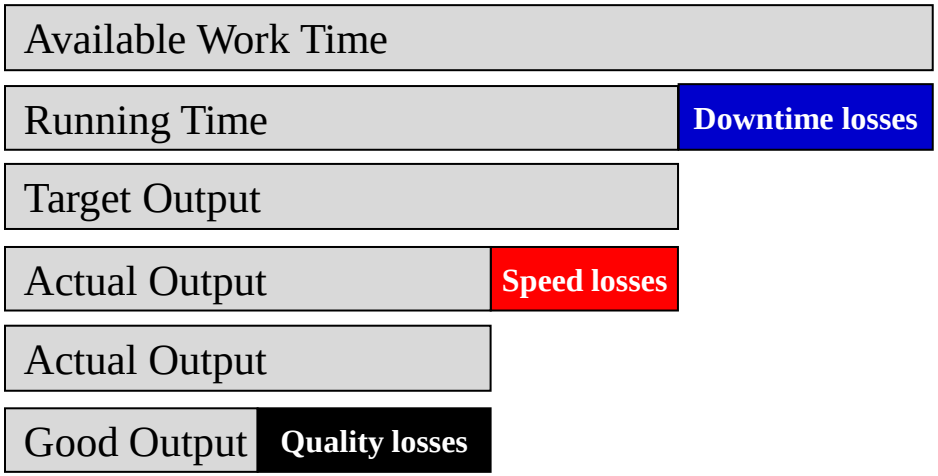
Downtime Losses Examples:

- Machine failure.
- Unplanned maintenance.
- Material shortage.
- Energy shortage.
- Operator shortage.
- Cleaning.
- Sampling and quality checks.
- Electricity cut off.
- Setup and startup time.
- Stoppages imposed by the process.



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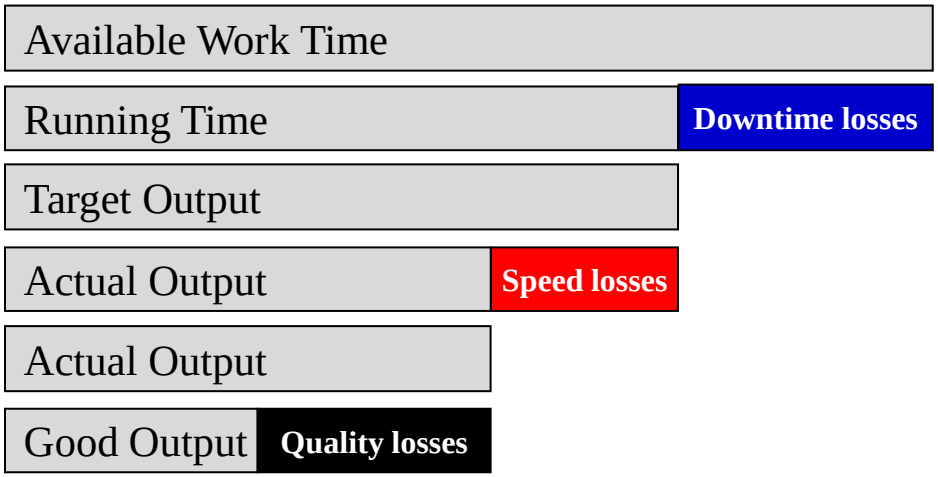
Speed Losses Examples:

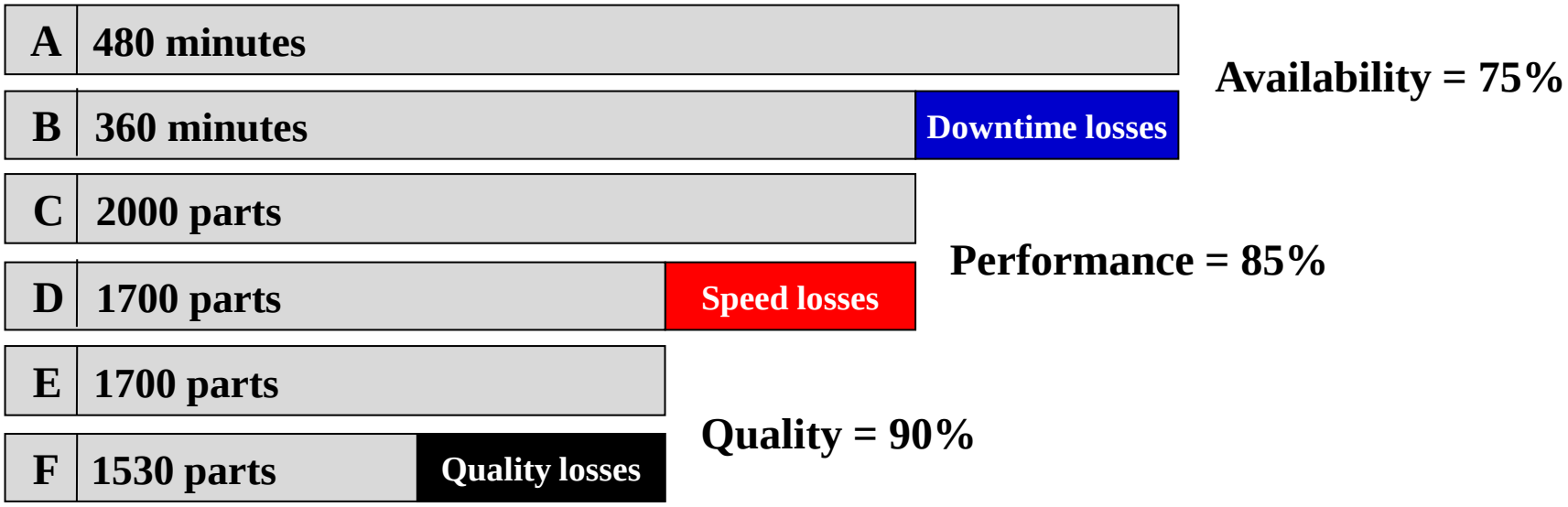
- Small stoppages (few minutes).
- Jams.
- Misfeeds.
- Obstructed product flow.
- Fast cleaning.
- Fast checking and sampling.
- Operator inefficiency.



- Overall Equipment Effectiveness

Example:

- Calculate OEE for the following:

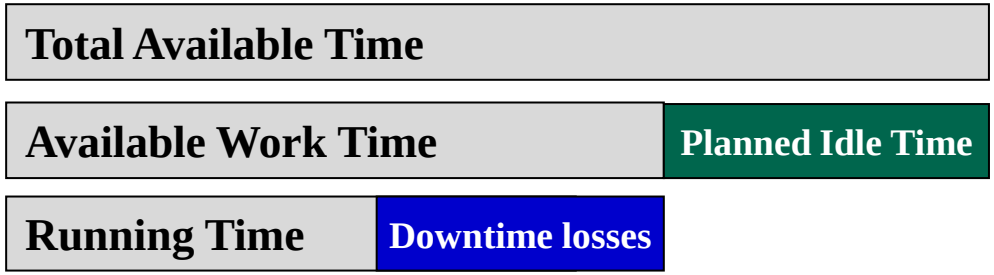


OEE = 75% x 85% x 90% = 57.4%

- Overall Equipment Effectiveness

Planned Idle Time:

- OEE focuses exclusively on planned production, so **planned idle time** is excluded from the measurement.
- Planned idle time may include:
  - No order.
  - Line shutdown.
  - Planned maintenance.
  - Planned trials.
  - Planned cleaning.
  - Holidays.
  - Unproductive breaks.



- Overall Equipment Effectiveness

Generating Improvement Ideas:

OEE Factor	Main losses	Improvement activities
Availability Rate	**Change over takes too long**	**SMED workshop**
Performance Rate		
Quality Rate	**Defect rates Above average**	**Kaizen**

- Overall Equipment Effectiveness

Further Information:

- Everybody can contribute to improving OEE.
- Technicians and Supervisors should support the team as they try to make improvements that will allow the line to run in the most efficient manner.
- **Allowance delay factors** are used to compensate as a result of changeover and maintenance activities.