

Six loss category	OEE measure	Reason for Loss	Countermeasures
Planned downtime or external unplanned event	Availability	<ul style="list-style-type: none"> Changeovers Asset care Planned Maintenance Material shortages Labour shortages 	<ul style="list-style-type: none"> SMED – quick changeover techniques Benchmarking Planned downtime log and matrix
Breakdowns	Availability	<ul style="list-style-type: none"> Equipment failure >5mins Major component failure Unplanned maintenance 	<ul style="list-style-type: none"> Asset care or preventative maintenance Lubrication Root cause analysis Electrical thermographs or vibration analysis
Minor stops	Performance	<ul style="list-style-type: none"> Equipment failure <5mins Fallen product Obstruction blockages 	<ul style="list-style-type: none"> Targeted reduction of MTBF High speed cameras Tick sheets for further analysis OEM audit and servicing
Speed loss	Performance	<ul style="list-style-type: none"> Running lower than rated speed Untrained operator not able to run at nominal speed Machine idling 	<ul style="list-style-type: none"> Optimising line control Training and awareness of line balance theory
Production rejects	Quality	<ul style="list-style-type: none"> Product out of specification Damaged product scrap 	<ul style="list-style-type: none"> Error proofing Six Sigma Targeted analysis of reject area to analyse cause
Rejects on start up	Quality	<ul style="list-style-type: none"> Product out of specification at start of run Scrap created before nominal running after changeover Damaged product after planned maintenance activity 	<ul style="list-style-type: none"> Precision settings Ensure machine availability on start up Complete all checks before start up

Six loss Calculation

Six loss category	Calculation
Planned downtime or external unplanned event	Planned downtime / Total production time
Breakdowns (>5mins)	Major fault time / Total production time
Minor stops (<5mins)	Minor fault time / Total production time
Speed loss	$(\text{Output} / \text{Ave speed} \times \text{Total production time}) - (\text{Output} / \text{Rated speed} \times \text{Total production time})$
Production rejects	Rejects in prod / Actual speed \times Total production time
Rejects on start up	Rejects on start up / Actual speed \times Total production time

OEE and Six Loss Analysis Calculation Example

In a 480 minute shift :-

On a machine rated at 100 products output per minute

Maximum output = 480 mins x 100 units = 48000 units

Shift info:	Output (Good Production)	= 32000 units
	Speed	= 98 units per minute
	Planned downtime	= 82 mins
	Bottleneck loss due to B/down	= 30 mins
	Rejects (in process)	= 1255 in 8 hr shift

Output (OEE) = 32000 / 48000 = 66.66%

480mins x 66.67% = 320 mins

Total Loss = 160 mins

Six Loss Calculations:

Speed loss

Max theoretical units possible at actual speed = 98 x 480 = 47040

= (32000/47040) – (32000/48000) =

68.03% - 66.67% = 1.36%

480 x 1.36%

= 6.53 mins / 480 = (1.36%)

Planned downtime

= 82 mins / 480 = (17.08%)

Breakdown

= 30 mins / 480 = (6.25%)

Rejects = 1255 / 98 (actual running speed)

= 12.81 mins / 480 = (2.67%)

Minor stops = 480-320-6.53-82-30-12.81

= 28.66 mins / 480 = (5.97%)

Total loss = 160 mins = (33.33%)

OEE Calculations:

(Time in mins)

Production time = 480 Time less availability loss = 368 Time less performance loss = 333

Availability Loss

Planned downtime =82

Breakdowns =30

Total =112

Performance Loss

Speed loss =6.53

Minor stops (<5mins) =28.66

Total =35.19

Quality Loss

Rejects on start up =0

Rejects in process =12.81

Total =12.81

Availability (368/480) = 77%

Performance (333/368) = 90%

Quality (320/333)

= 96%

OEE = 0.77x0.9x0.96 = 66.7%