OEE/TCU-definition

The OEE waterfall- Theory and practice

Principles of measuring efficiency

$$\text{Efficiency} = \text{Availability} * \text{Speed} * \text{Quality}$$

Definitions

Availability:
The ratio between the time when the equipment is available for production and the total period of the measurement.

Speed:
The ratio between actual production speed and the inherent maximum speed of the equipment.

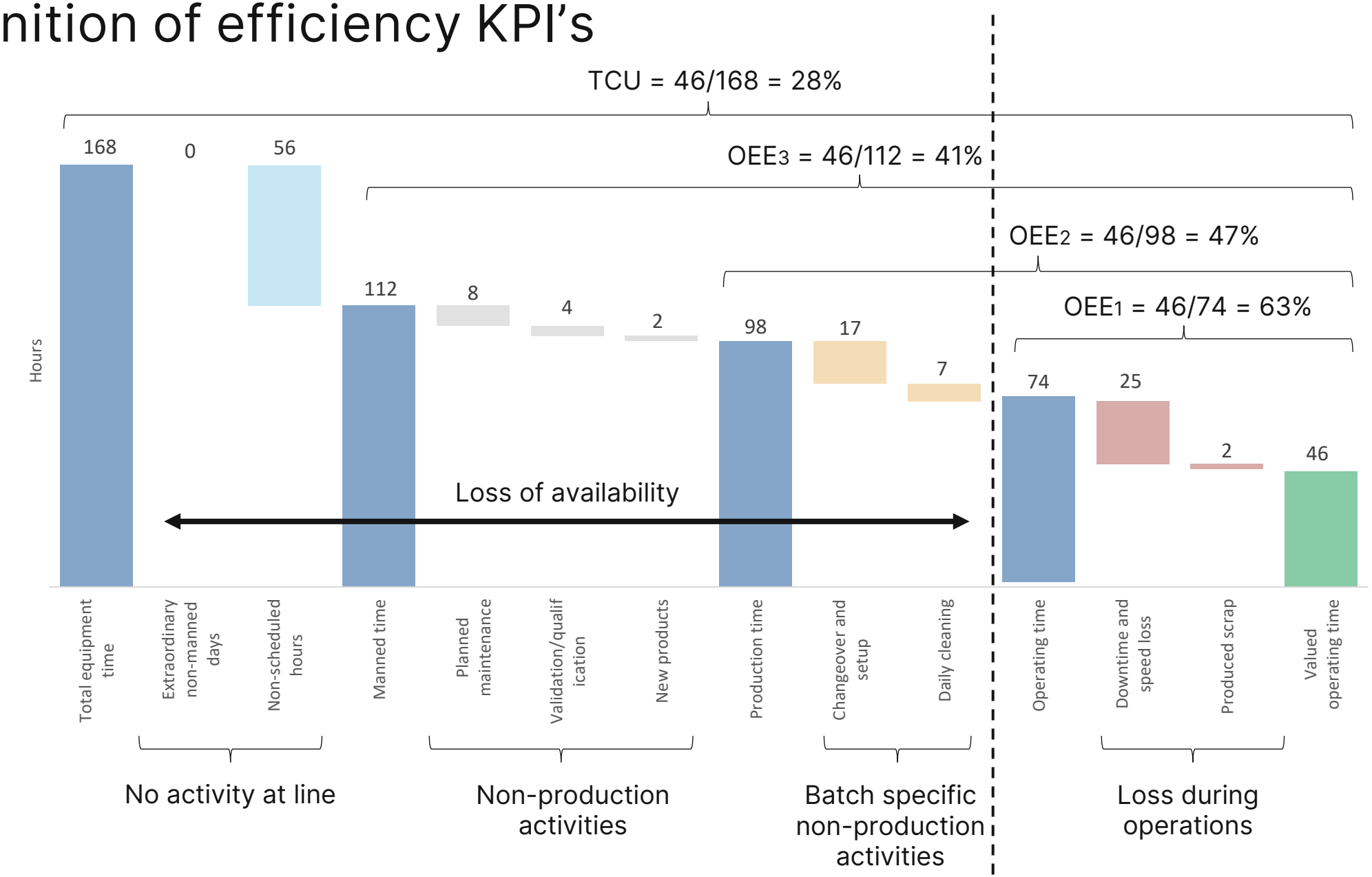
Quality:
The ratio between the quantity of good items and the quantity of items produced.

Principles of measuring efficiency

1 week			Performance
A	A week: 7 days of 24 hours	168 hours	Availability losses
B	Unmanned line: 7 shifts of 8 hours per week (Manning: 7 days, 2 shifts per day, 8 hours per shift)	56 hours	
C	Extraordinary not manned: 0 hours this week	0 hours	
D	Maintenance: 1 shift of 8 hours per week	8 hours	
E	Validation of equipment: 4 hours this week	4 hours	
F	Testing new products: 2 hours this week	2 hours	
G	Change over - 2½ hours per batch - 7 batches this week	17.5 hours	
H	Daily cleaning - 1 hour	7 hours	
I	Availability = A - (B+C+D+E+F+G+H)	73.5 hours	73.5/168 = 0.44
J	Validated maximum speed	240 pcs./min	Speed losses
K	Actual speed (tact)	200 pcs./min	
L	Downtime: 2 hours per batch => Total production time = 620 min => realized speed 161 pcs./min =>	39 pcs./min	
M	Speed = J - (K+L)	161 pcs./min	161/240 =0.67
N	Batch size (produced volume)	100,000 pcs.	Quality losses
O	Scrap per batch	5,000 pcs.	
P	Quality (Good items) = N - O	95,000 pcs.	95,000/100,000 = 0.95

Efficiency:
0,44 X 0,67 X 0,95 = 0,28 = 28%

Definition of efficiency KPI's



Calculating the efficiency KPI’s

	In theory	In practice
TCU	Valued Operating Time Total Equipment Time	Number of produced items / Validated speed Total period of measuring
OEE_3	Valued Operating Time Manned Time	Number of produced items / Validated speed Hours of manning (activities on or at the line)
OEE_2	Valued Operating Time Production Time	Number of produced items / Validated speed Hours of batch related work
OEE_1	Valued Operating Time Operating Time	Number of produced items / Validated speed Hours of producing