

# OEE-calculation Exercise 1

Calculate PfOEE and OEE for a production cell during the following conditions.

Working time: 3-shifts, Sunday 22:00 to Friday 20:00

Shift hours: Night shift, 22:00 – 06:12  
Morning shift, 06:00 – 14:12  
Afternoon shift, 14:00 – 22:12, Fridays, 14:00 - 20:00

Breaks: 30 minutes lunch each shift, with no production.

Meetings: Department meeting every Thursday 13:30 – 14:30, with no production (NOTE: no preventive maintenance is performed during this shift exchange).

Maintenance: Preventive maintenance is performed daily during shift exchange at 14:00 – 14:12 (except Thursdays), 22:00 – 22:12 and 06:00 – 06:12  
Also preventive maintenance is performed every Sunday night 22:00 – 23:30.

Production: The machine has a bought cycle time of 9 minutes per item

True outcome during one week:

Breakdowns: Mon. 04:30 – 10:00  
11:00 – 11:30  
Tue. 09:00 – 10:12  
Wed. 20:30 – 21:48  
Fri. 14:30 – 17:18

Production: 553 items produced of which 8 were scrap.

## Calculation

Scheduled working time	$2h + 4 \times 24h + 20h =$	118h	
Planning related stops	$3 \times 5 \times 0,5h + 1h + 1,5h + 12 \times 0,2h =$	12,4h	
Planning factor (Pf)	$(118 - 12,4) / 118 =$	0,895	Pf = 89,5%
Planned production time	$118h - 12,4h =$	105,6h	
Unplanned stop time	$5,5h + 0,5h + 1,2h + 1,3h + 2,8h =$	11,3h	
Availability (A)	$(105,6 - 11,3) / 105,6 =$	0,893	A = 89,3%
Available operative time	$105,6h - 11,3h =$	94,3h	
Bought cycle time	$9 \text{ min.} / 60 =$	0,15h	
Produced items	553		
Performance rate (P)	$(0,15 \times 553) / 94,3 =$	0,880	P = 88,0%
Defects/scrap	8		
Quality rate (Q)	$(553 - 8) / 553$	0,986	Q = 98,6%
PfOEE	$0,895 \times 0,893 \times 0,880 \times 0,986$	0,693	PfOEE = 69,3%
OEE	$0,893 \times 0,880 \times 0,986$	0,775	OEE = 77,5%

## OEE-calculation exercise 2

Calculate PfOEE and OEE for a production cell during the following conditions.

Working time: 3-shifts, Sunday 22:00 to Friday 20:00

Shift hours: Night shift, 22:00 – 06:12  
Morning shift, 06:00 – 14:12  
Afternoon shift, 14:00 – 22:12, Fridays, 14:00 - 20:00

Breaks: 30 minutes lunch each shift, with no production:  
Night shift, 02:00 – 02:30  
Morning shift, 10:30 – 11:00  
Afternoon shift, 18:00 – 18:30

Meetings: Department meeting every Thursday 13:30 – 14:30, with no production (NOTE: no preventive maintenance is performed during this shift exchange).

Maintenance: Preventive maintenance is performed daily during shift exchange at 14:00 – 14:12 (except Thursdays), 22:00 – 22:12 and 06:00 – 06:12  
Also preventive maintenance is performed every Sunday night 22:00 – 23:30.

Production: The machine has a bought cycle time of 36 seconds per item

True outcome during one week:

No production due to lack of material: Tuesday, 08:42 – 15:30

Breakdowns: Mon. 05:30 – 10:00  
Wed. 20:36 – 21:48  
Fri. 14:48 – 17:06

Production: 7893 items produced of which 39 were scrap.

## Calculation

Scheduled working time	$2h + 4 \times 24h + 20h =$	118h	
Planning related stops	$14 \times 0,5h + 1h + 1,5h + 11 \times 0,2h + 6,8 =$	18,5h	
Planning factor (Pf)	$(118 - 18,5) / 118 =$	0,843	Pf = 84,3%
Planned production time	$118h - 18,5h =$	99,5h	
Unplanned stop time	$4,5h + 1,2h + 2,3h =$	8h	
Availability (A)	$(99,5 - 8) / 99,5 =$	0,920	A = 92,0%
Available operative time	$99,5h - 8h =$	91,5h	
Bought cycle time	$36 \text{ sec.} / 3600 =$	0,01h	
Produced items	7893		
Performance rate (P)	$(0,01 \times 7893) / 91,5 =$	0,863	P = 86,3%
Defects/scrap	39		
Quality rate (Q)	$(7893 - 39) / 7893$	0,995	Q = 99,5%
PfOEE	$0,843 \times 0,920 \times 0,863 \times 0,995$	0,666	PfOEE = 66,6%
OEE	$0,920 \times 0,863 \times 0,995$	0,790	OEE = 79,0%

Note that lack of material is considered as a planned stop. This is because the stop is not caused by the machine itself, but rather by bad logistics.

### OEE-calculation exercise 3

Calculate PfOEE and OEE for a production cell during the following conditions.

Working time: 3-shifts, Sunday 23:30 to Friday 21:00

Shift hours: Night shift, 22:00 – 06:12, at Sundays the shift starts at 23:30  
Morning shift, 06:00 – 14:12  
Afternoon shift, 14:00 – 22:12, Fridays, 14:00 - 21:00

Breaks: 24 minutes lunch each shift, with no production.

Maintenance: Preventive maintenance is performed daily during shift exchange at 14:00 – 14:12, 22:00 – 22:12 and 06:00 – 06:12  
Also preventive maintenance is performed every Sunday night 23:30 – 00:18.

Production: The machine has a bought cycle time of 42 seconds per item type A and 54 seconds per item type B.

True outcome during one week:

Breakdowns: Mon. 10:48 – 11:36  
Wed. 20:24 – 21:48  
Fri. 14:30 – 17:18

Set-up changed from type A to type B on Tuesday at 09:06 – 10:12

Production: 2113 type A produced from Sunday 23:30 to Tuesday 09:06, of which 37 were defect.  
4367 type B produced from Tuesday 09:06 to Friday 21:00, of which 52 were defect.

## Calculation

Scheduled working time	$0.5h + 4 \times 24h + 21h =$	117.5h	
Planning related stops	$3 \times 5 \times 0.4h + 14 \times 0.2h + 0.8h =$	9.6h	
Planning factor (Pf)	$(117.5 - 9.6) / 117.5 =$	0.918	Pf = 91.8%
Planned production time	$117.5 - 9.6 =$	107.9h	
Unplanned stop time	6.1h	6.1h	
Availability (A)	$(107.9 - 6.1) / 107.9 =$	0.943	A = 94.3%
Available operative time	$107.9h - 6.1h =$	101.8h	
Bought cycletime A	42 sec. / 3600 =	0.0117h	
Produced items A	2113		
Bought cycletime B	54 sec. / 3600 =	0.015h	
Produced items B	4367		
Performance rate	$((0.0117 \times 2113) + (0.015 \times 4367)) / 101.8 =$	0.886	P = 88.6%
Defects/scrap	89		
Quality rate (Q)	$(2113 + 4367 - 89) / (2113 + 4367) =$	0.986	Q = 98.6%
PfOEE	$0.918 \times 0.943 \times 0.886 \times 0.986 =$	0.756	PfOEE = 75.6%
OEE	$0.943 \times 0.886 \times 0.986 =$	0.824	OEE = 82.4%