

## LAMPIRAN

**Tabel Availability Ratio September 2017**

Minggu Ke	Jam Kerja Mesin ( menit )	Planned Downtime ( menit )	Loading Time ( menit )	Setup and Adjusment ( menit )	Failure and Repair ( menit )	Operation Time ( menit )	Availability Ratio ( % )
Minggu 1	10080	600	9480	880	1410	7190	75.84
Minggu 2	30240	1800	28440	2364	4465	21611	75.99
Minggu 3	30240	1800	28440	2380	3375	22685	79.76
Minggu 4	30240	1800	28440	2760	2535	23145	81.38
Minggu 5	30240	1800	28440	2420	4645	21375	75.16
Total	131040	7800	123240	10804	16430	96006	77.63

### 1. Jam Kerja Mesin

Jam Kerja Mesin Minggu 1 = 21 jam x 2 hari x 60 menit x 4 mesin *stretch blow moulding*  
 = 10080 menit

Jam Kerja Mesin Minggu 2 = 21 jam x 6 hari x 60 menit x 4 mesin *stretch blow moulding*  
 = 30240 menit

## 2. *Planned Downtime*

*Planned Downtime* Minggu 1 = 25 menit x 3 shift kerja x 4 mesin *stretch blow moulding*  
x 2 hari kerja

= 600 menit

*Planned Downtime* Minggu 2 = 25 menit x 3 shift kerja x 4 mesin *stretch blow moulding*  
x 6 hari kerja

= 1800 menit

## 3. *Loading Time*

*Loading Time* = Jam Kerja Mesin - *Planned Downtime*

**Tabel *Loading Time***

Minggu Ke -	Jam Kerja Mesin ( menit )	<i>Planned Downtime</i> ( menit )	<i>Loading Time</i> ( menit )
Minggu 1	10080	600	9480
Minggu 2	30240	1800	28440
Minggu 3	30240	1800	28440
Minggu 4	30240	1800	28440
Minggu 5	30240	1800	28440

### 3. Operation Time

$$\text{Operation Time} = \text{Loading Time} - \text{Failure \& Repair} - \text{Setup \& Adjustment}$$

**Tabel Operation Time**

Minggu Ke	Loading Time ( menit )	Failure & Repair ( menit )	Set Up & Adjustment ( menit )	Operation Time ( menit )
Minggu 1	9480	1410	880	7190
Minggu 2	28440	4465	2364	21611
Minggu 3	28440	3375	2380	22685
Minggu 4	28440	2535	2760	23145
Minggu 5	28440	4645	2420	21375

### 4. Availability Ratio

$$\text{Availability Ratio} = \frac{\text{Loading Time} - \text{Downtime}}{\text{Loading Time}} \times 100\%$$

$$\text{Availability Ratio} = \frac{\text{Loading time} - (\text{Failure \& Repair} + \text{Setup \& Adjustment})}{\text{Loading Time}} \times 100\%$$

**Tabel Availability Ratio**

Minggu Ke	Loading Time ( menit )	Failure & Repair ( menit )	Set Up & Adjustment ( menit )	Operation Time ( menit )	Availability Ratio ( % )
Minggu 1	9480	1410	880	7190	75.84 %
Minggu 2	28440	4465	2364	21611	75.99 %
Minggu 3	28440	3375	2380	22685	79.76 %
Minggu 4	28440	2535	2760	23145	81.38 %
Minggu 5	28440	4645	2420	21375	75.16 %

**Tabel Performance Efficiency September 2017**

Minggu Ke	Operation Time ( menit )	Target Produksi ( unit )	Jumlah Produksi ( unit )	Ideal Cycle Time ( menit / unit )	Actual Cycle Time ( menit / unit )	Performance Efficiency ( % )
Minggu 1	7190	20,000	20237	0.28	0.36	78.81
Minggu 2	21611	60000	49371	0.28	0.44	63.97
Minggu 3	22685	63000	66198	0.28	0.34	81.71
Minggu 4	23145	65000	69247	0.28	0.33	83.77
Minggu 5	21375	70000	57325	0.28	0.37	75.09
Total	96006	278,000	262,378	0.28	0.37	76.67

1. *Ideal Cycle Time*

1 botol = 17 detik

1 menit = 60 detik

Jumlah produk yang dihasilkan / menit =  $\frac{60 \text{ detik}}{17 \text{ detik per botol}} = 3,529 \text{ botol}$

*Ideal Cycle Time* =  $\frac{1 \text{ menit}}{3,529 \text{ botol}} = 0.28 \text{ menit / unit}$

2. *Actual Cycle Time*

*Actual Cycle Time* =  $\frac{\text{Operating time}}{\text{Output process}}$

**Tabel Actual Cycle Time**

Minggu Ke	Operation Time ( menit )	Jumlah Produksi ( unit )	Actual Cycle Time ( menit / unit )
Minggu 1	7190	20237	0.36
Minggu 2	21611	49371	0.44
Minggu 3	22685	66198	0.34
Minggu 4	23145	69247	0.33
Minggu 5	21375	57325	0.37
Total	96006	262,378	1.84

### 3. Performance Efficiency

$$\begin{aligned} \text{Performance Efficiency} &= \text{Net Operating Rate} \times \text{Operating Speed Rate} \\ &= \frac{\text{Jumlah produksi} \times \text{Ideal cycle time}}{\text{Operation time}} \times 100\% \end{aligned}$$

**Tabel Performance Efficiency**

Minggu Ke	Operation Time ( menit )	Jumlah Produksi ( unit )	Ideal Cycle Time ( menit / unit )	Performance Efficiency ( % )
Minggu 1	7190	20237	0.28	78.81
Minggu 2	21611	49371	0.28	63.97
Minggu 3	22685	66198	0.28	81.71
Minggu 4	23145	69247	0.28	83.77
Minggu 5	21375	57325	0.28	75.09
Total	96006	262,378	0.28	76.67

### Rate of Quality Product September 2017

$$\text{Rate of Quality Product} = \frac{\text{Jumlah Produksi} - \text{Reject} - \text{Recycle}}{\text{Jumlah produksi}} \times 100 \%$$

**Tabel Rate of Quality Product September 2017**

Minggu Ke	Jumlah Produksi ( unit )	Reject ( unit )	Recycle ( unit )	Rate of Quality Product ( % )
Minggu 1	20237	49	202	98.76
Minggu 2	49371	86	494	98.83
Minggu 3	66198	228	662	98.66
Minggu 4	69247	126	692	98.82
Minggu 5	57325	110	573	98.81
Total	262378	599	2624	98.77

Perhitungan Nilai *Overall Equipment Effectiveness* ( OEE )

$$\text{Overall Equipment Effectiveness} = \text{Availability Ratio} \times \text{Performance Efficiency} \times \text{Rate of Quality Product}$$

**Tabel Perhitungan Nilai *Overall Equipment Effectiveness* ( OEE )**

Minggu Ke	Avaliability Ratio ( % )	Performance Efficiency ( % )	Rate of Quality Product ( % )	Overall Equipment Effectiveness ( % )
Minggu 1	75.84%	78.81%	98.76%	59.03%
Minggu 2	75.99%	63.97%	98.83%	48.04%
Minggu 3	79.76%	81.71%	98.66%	64.30%
Minggu 4	81.38%	83.77%	98.82%	67.37%
Minggu 5	75.16%	75.09%	98.81%	55.77%
Rata - Rata	77.63%	76.67%	98.77%	58.90%

Perhitungan Nilai *Six Big Losses*

***Downtime Losses***

***1. Equipment Failure Losses***

$$\text{Equipment Failure Losses} = \frac{\text{Equipment Failure Time}}{\text{Loading Time}} \times 100\%$$

$$\text{Equipment Failure Losses} = \frac{16430}{123240} \times 100\%$$

$$\text{Equipment Failure Losses} = 13.33 \%$$

***2. Setup and Adjusment Losses***

$$\text{Setup and Adjusment Losses} = \frac{\text{Setup and Adjusment Losses}}{\text{Loading Time}} \times 100\%$$

$$\text{Setup and Adjusment Losses} = \frac{10804}{123240} \times 100\%$$

$$\text{Setup and Adjusment Losses} = 8.77 \%$$

## *Speed Losses*

### *1. Idle and Minor Stoppage Losses*

$$\begin{aligned} \text{Idle and Minor Stoppage Losses} &= \frac{(\text{Jumlah target} - \text{Jumlah produksi}) \times \text{Ideal Cycle Time}}{\text{Loading Time}} \\ &\times 100 \% \end{aligned}$$

$$\text{Idle and Minor Stoppage Losses} = \frac{(278000 - 262378) \times 0.33}{123240} \times 100 \%$$

$$\text{Idle and Minor Stoppage Losses} = \frac{15622 \times 0.33}{123240} \times 100 \%$$

$$\text{Idle and Minor Stoppage Losses} = \frac{5155.26}{123240} \times 100 \%$$

$$\text{Idle and Minor Stoppage Losses} = 4.23 \%$$

### *2. Reduce Speed Losses*

$$\begin{aligned} \text{Reduce Speed Losses} &= \frac{(\text{Actual Cycle Time} - \text{Ideal Cycle Time}) \times \text{Jumlah produk yang di proses}}{\text{Loading Time}} \\ &\times 100 \% \end{aligned}$$

$$\text{Reduce Speed Losses} = \frac{(0.37 - 0.33) \times 262378}{123240} \times 100 \%$$

$$\text{Reduce Speed Losses} = \frac{0.04 \times 262378}{123240} \times 100 \%$$

$$\text{Reduce Speed Losses} = \frac{10495.12}{123240} \times 100 \%$$

$$\text{Reduce Speed Losses} = 8.51 \%$$

## Quality Losses

### 1. Defect Losses

$$\text{Defect Losses} = \frac{(\text{Total recycle} \times \text{Ideal Cycle Time})}{\text{Loading Time}} \times 100\%$$

$$\text{Defect Losses} = \frac{(2624 \times 0.33)}{123240} \times 100\%$$

$$\text{Defect Losses} = \frac{866}{123240} \times 100\%$$

$$\text{Defect Losses} = 0.16 \%$$

### 2. Reduce Yield Losses

$$\text{Reduce Yield Losses} = \frac{(\text{Total reject} \times \text{Ideal Cycle Time})}{\text{Loading Time}} \times 100\%$$

$$\text{Reduce Yield Losses} = \frac{(599 \times 0.33)}{123240} \times 100\%$$

$$\text{Reduce Yield Losses} = \frac{197.67}{123240} \times 100\%$$

$$\text{Reduce Yield Losses} = 0.021 \%$$

## Efisiensi Mesin

$$\text{Efisiensi Mesin} = 1 - \frac{(\text{planned downtime} + \text{setup})}{\text{jam kerja mesin}} \times 100\%$$

$$\text{Efisiensi Mesin} = 1 - \frac{(7800 + 10804)}{131040} \times 100\%$$

$$\text{Efisiensi Mesin} = 1 - \frac{18604}{131040} \times 100\%$$

$$\text{Efisiensi Mesin} = 1 - 14.19 \%$$

$$\text{Efisiensi Mesin} = 85.80 \%$$