PENINGKATAN EFISIENSI POMPA SENTRIFUGAL DENGAN MENGGUNAKAN METODE *OVERALL EQUIPMENT EFFECTIVENES* DI PT. PERMATA HIJAU GROUP

SKRIPSI

Diajukan untuk Memenuhi dan Melengkapi Salah Satu Syarat dalam Menempuh Ujian Sarjana Program Studi Teknik Industri pada Fakultas Teknik Universitas Islam Sumatera Utara

OLEH:

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(71230914045)

PROGRAM STUDI TEKNIK INDUSTRI
FAKULTAS TEKNIK
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MEDAN
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Dosen Pembimbing I	**Dosen Pembimbing II**
(Ir. Suliawati, MT)	**(Wirda Novarika AK, ST, MM)**

Disetujui Oleh,
Ketua Prodi Teknik Industri
FT UISU

(Wirda Novarika AK, ST, MM)

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CATATAN ASISTENSI BIMBINGAN PROPOSAL

Nama : Wery Prahendi Gultom

NPM : 71230914045

Pembimbing I : Ir. Suliawati, MT

Judul Skripsi : PENINGKATAN EFISIENSI POMPA SENTRIFUGAL DENGAN MENGGUNAKAN METODE *OVERALL EQUIPMENT EFFECTIVENES* DI PT. PERMATA HIJAU GROUP

No	Hari/ Tanggal	Uraian	Paraf

Diketahui Medan, April 2025

Ketua Prodi Teknik Industri Pembimbing I

(Wirda Novarika AK, ST, MM) (Ir. Suliawati, MT)

PROGRAM STUDI TEKNIK INDUSTRI
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Ketua Prodi Teknik Industri Pembimbing II

(Wirda Novarika AK, ST, MM) (Wirda Novarika AK, ST, MM)

ABSTRACT

Centrifugal pumps often experience downtime due to damage so that the production process stops. By approaching the Overall Equipment Effectiveness (OEE) method, it is expected to identify the factors that cause decreased pump efficiency and formulate strategies and corrective actions that increase the operational efficiency of centrifugal pumps at PT. Permata Hijau Group in May 2024 - April 2025. From the results of the study, the OEE value was obtained above the JIPM standard of 85% with the highest value in February 2025 of 88.15% and the lowest value in July 2024, September 2024, January 2025 and March 2025 of 85.34%. The biggest influence occurred in reduce speed losses of 8.32%, idling and minor stoppages losses of 6.96%. Based on the fishbone analysis, the cause of the high breakdown time in the Hydrogenation division at PT. Permata Hijau Group is due to the lack of scheduled preventive maintenance, so the Company needs to rearrange the schedule.

Kata Kunci: *Overall Equipment Effectiveness* (OEE), Pompa Sentrifugal, *Six Big Losses, reduce speed*, efisiensi.

ABSTRAK

Pompa sentrifugal seringkali mengalami *downtime* yang disebabkan karena adanya kerusakan sehingga proses produksi menjadi terhenti. Dengan melakukan pendekatan dengan metode *Overall Equipment Effectiveness* (OEE) diharapkan dapat mengidentifikasi faktor- faktor penyebab penurunan efisiensi pompa serta merumuskan strategi dan tindakan perbaikan yang meningkatkan efisiensi operasional pompa sentrifugal di PT. Permata Hijau Group pada bulan Mei 2024 – April 2025. Dari hasil penelitian diperoleh nilai OEE setiap diatas standar JIPM 85% dengan nilai tertinggi pada bulan Februari 2025 sebesar 88,15% dan nilai terendah pada bulan Juli 2024, September 2024, Januari 2025 dan Maret 2025 sebesar 85,34%. Pengaruh terbesar terjadi pada *reduce speed losses* sebesar 8,32%, *idling and minor stoppages losses* sebesar 6,96%. Berdasarkan analisa *fishbone,* penyebab tingginya *breakdown time* pada divisi Hydrogenation di PT. Permata Hijau Group dikarenakan kurang terjadwalnya *preventive maintenance*, sehingga Perusahaan perlu mengatur ulang jadwal.

Kata Kunci: *Overall Equipment Effectiveness* (OEE), Pompa Sentrifugal, *Six Big Losses, reduce speed*, efisiensi.

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KATA PENGANTAR

Puji syukur kehadirat Allah, karena dengan rahmat dan hidayah-Nya, penulis masih diberi kesempatan dan kemampuan untuk menyelesaikan penulisan skripsi dengan judul Peningkatan Efisiensi Pompa Sentrifugal Dengan Menggunakan Metode *Overall Equipment Effectivenes* Di PT. Permata Hijau Group. Penulisan skripsi ini tidak lepas dari dukungan dan bantuan dari berbagai pihak. Oleh karena itu, pada kesempatan ini penulis menyampaikan penghargaan dan ucapan terimakasih kepada:

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Medan, Mei 2025

Penulis

Wery Prahendi Gultom

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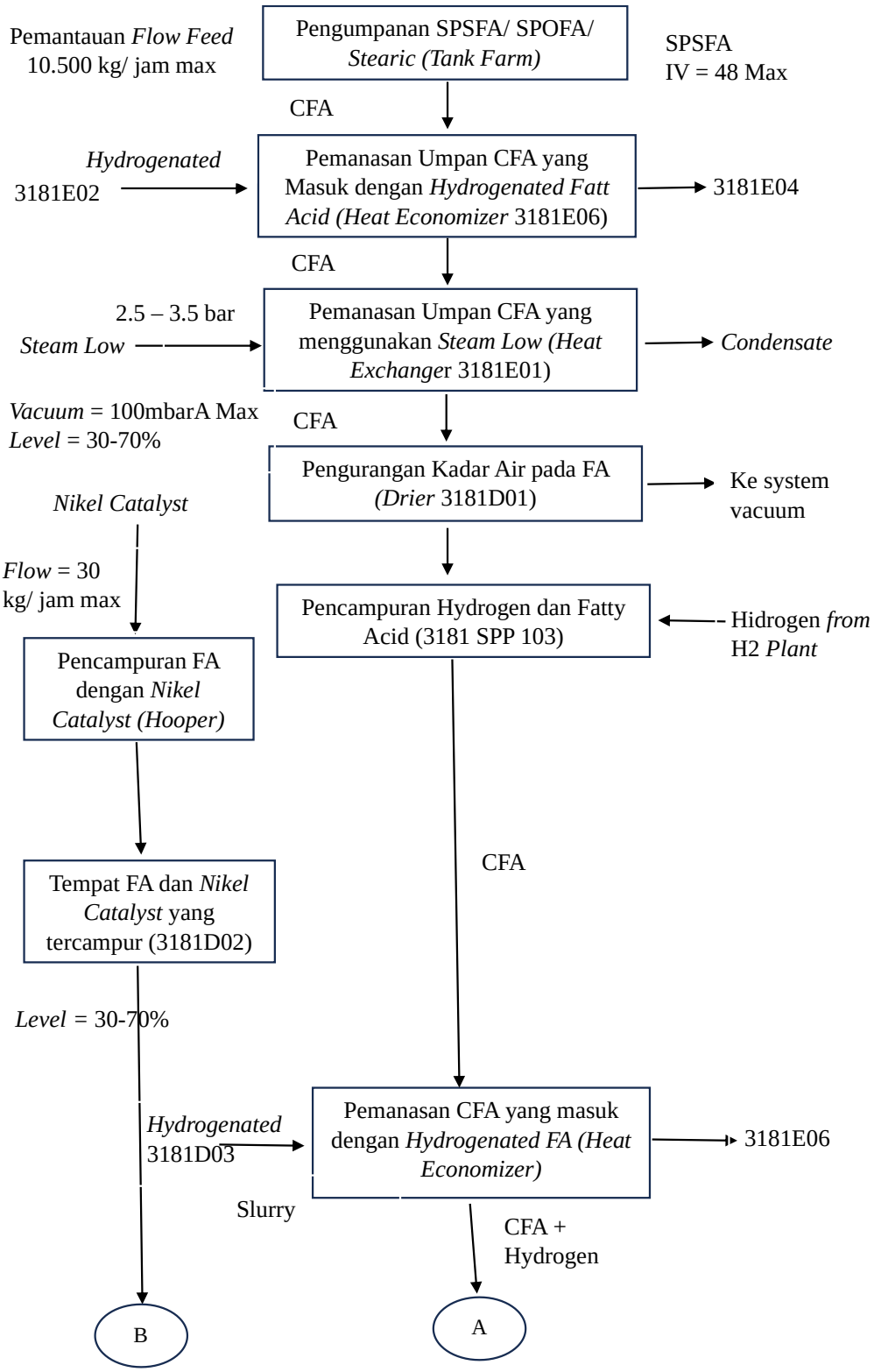
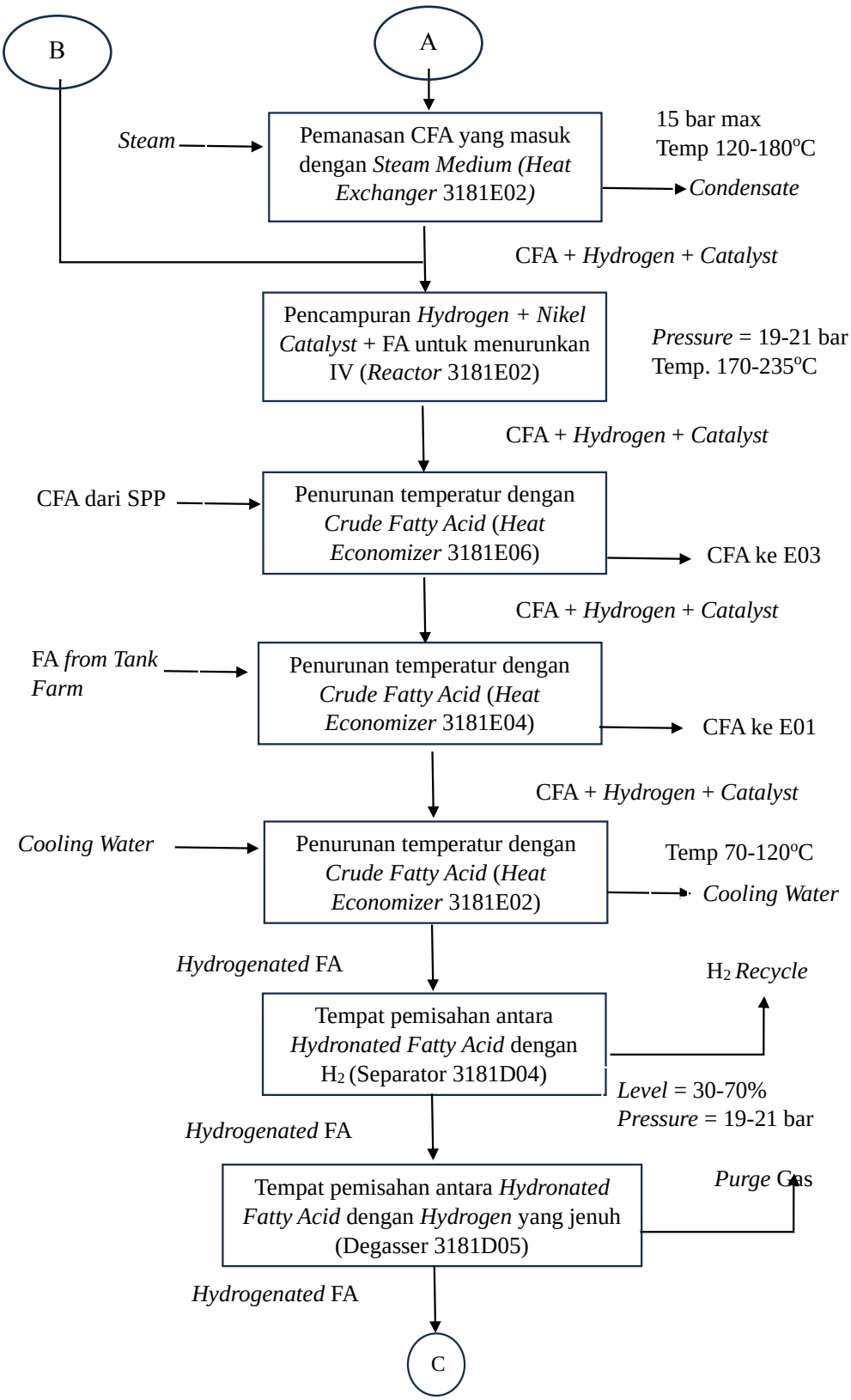
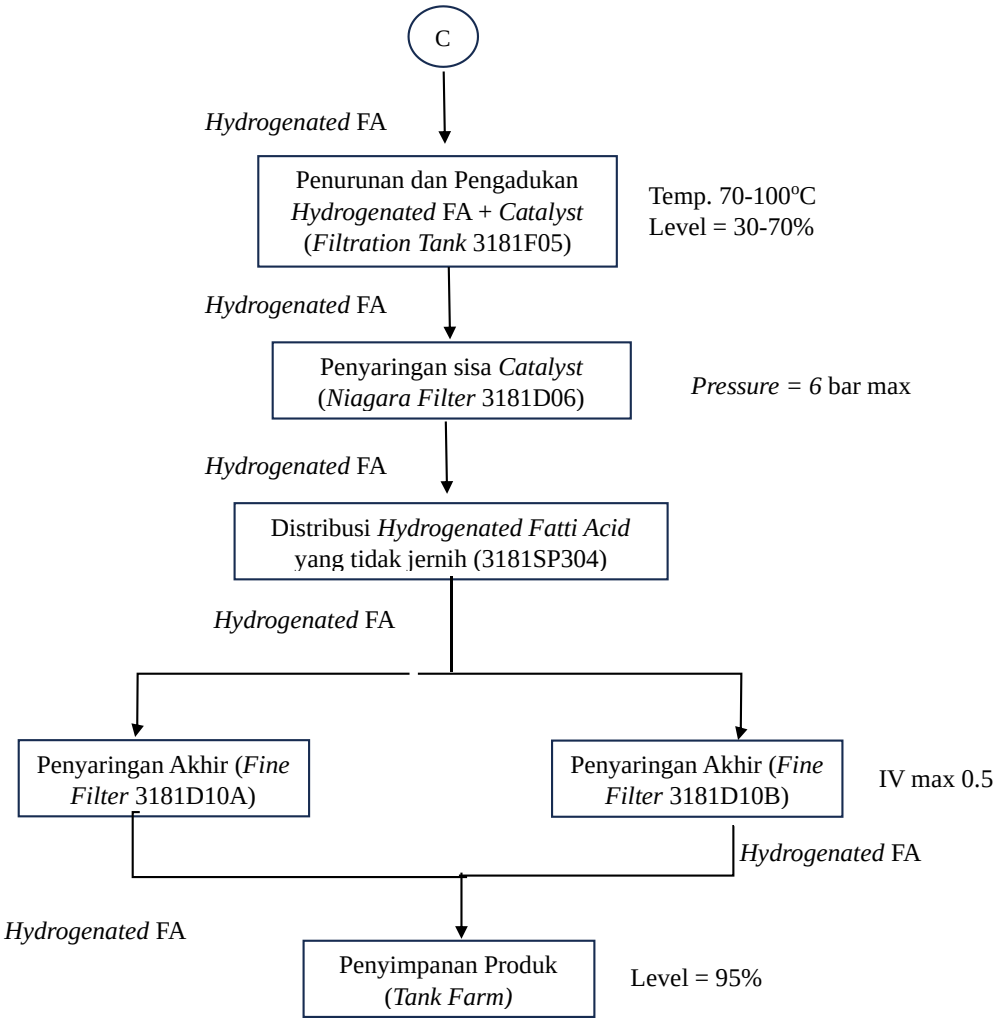
Lampiran 1. Flow Proses




B
A
Steam
Pemanasan CFA yang masuk dengan *Steam Medium (Heat Exchanger* 3181E02*)*
15 bar max
Temp 120-180ºC
Condensate
CFA + *Hydrogen* + *Catalyst*
Pencampuran *Hydrogen* + *Nikel Catalyst* + FA untuk menurunkan IV (*Reactor* 3181E02)
Pressure = 19-21 bar
Temp. 170-235ºC
CFA + *Hydrogen* + *Catalyst*
CFA dari SPP
Penurunan temperatur dengan *Crude Fatty Acid* (*Heat Economizer* 3181E06)
CFA ke E03
CFA + *Hydrogen* + *Catalyst*
FA *from Tank Farm*
Penurunan temperatur dengan *Crude Fatty Acid* (*Heat Economizer* 3181E04)
CFA ke E01
CFA + *Hydrogen* + *Catalyst*
Cooling Water
Penurunan temperatur dengan *Crude Fatty Acid* (*Heat Economizer* 3181E02)
Temp 70-120ºC
Cooling Water
Hydrogenated FA
H_2 *Recycle*
Tempat pemisahan antara *Hydronated Fatty Acid* dengan H_2 (Separator 3181D04)
Level = 30-70%
Pressure = 19-21 bar
Hydrogenated FA
Tempat pemisahan antara *Hydronated Fatty Acid* dengan *Hydrogen* yang jenuh (Degasser 3181D05)
Purge Gas
Hydrogenated FA
C


C
Hydrogenated FA
Penurunan dan Pengadukan *Hydrogenated* FA + *Catalyst* (*Filtration Tank* 3181F05)
Temp. 70-100°C
Level = 30-70%
Hydrogenated FA
Penyaringan sisa *Catalyst* (*Niagara Filter* 3181D06)
Pressure = *6* bar max
Hydrogenated FA
Distribusi *Hydrogenated Fatti Acid* yang tidak jernih (3181SP304)
Hydrogenated FA
Penyaringan Akhir (*Fine Filter* 3181D10A)
Penyaringan Akhir (*Fine Filter* 3181D10B)
IV max 0.5
Hydrogenated FA
Hydrogenated FA
Penyimpanan Produk (*Tank Farm)*
Level = 95%

Lampiran 2. Jadwal Penelitian di PT. Permata Hijau Group

Tahapan Penelitian	Status	Februari 2025				Maret 2025				April 2025				Mei 2025			
		Wk1	Wk2	Wk3	Wk4	Wk5	Wk6	Wk7	Wk8	Wk9	Wk10	Wk11	Wk12	Wk13	Wk14	Wk15	Wk16
Observasi	Plan																
	Aktual																
Identifikasi dan Perumusan Masalah	Plan																
	Aktual																
Studi Literatur	Plan																
	Aktual																
Pengumpulan Data	Plan																
	Aktual																
Pengolahan Data	Plan																
	Aktual																
Analisis Pemecahan Masalah	Plan																
	Aktual																
Kesimpulan dan Saran	Plan																
	Aktual																

Lampiran 3. Perhitungan OEE dan *Six Big Losses*

1. Nilai *Availability* Pompa Sentrifugal dengan menggunakan rumus:

   Loading Time = Total Available— Planned Downtime

   Operation Time = Loading Time – Downtime

   $$Avaiblity = \frac{Operation\ Time}{Loading\ Time}\ x\ 100\%$$

   Bulan Mei 2024 (*Availability* $_1$):

   $Loading\ Time_1$ = $Total\ Available_1$— $Planned\ Downtime_1$

   = 744- 24 = 720 Jam

   $Operation\ Time_1$ = $Loading\ Time_1$ – $Downtime_1$

   = 720- 37 = 683 Jam

   $$Avaiblity1 = \frac{Operation\ Time1}{Loading\ Time1}\ x\ 100\%$$

   $$= \frac{683\ Jam}{720\ Jam}\ x\ 100\% = 94{,}86\ \%$$

   Bulan Juni 2024 (*Availability* $_2$):

   $Loading\ Time_2$ = $Total\ Available_2$— $Planned\ Downtime_2$

   = 720- 3 = 717 Jam

   $Operation\ Time_2$ = $Loading\ Time_2$ – $Downtime_2$

   = 717- 40 = 677 Jam

   $$Avaiblity2 = \frac{Operation\ Time2}{Loading\ Time2}\ x\ 100\%$$

   $$= \frac{677\ Jam}{717\ Jam}\ x\ 100\% = 94{,}42\ \%$$

   Bulan Juli 2024 (*Availability* $_3$):

   $Loading\ Time_3$ = $Total\ Available_3$— $Planned\ Downtime_3$

   = 744- 3 = 741 Jam

$Operation\ Time_3 = Loading\ Time_3 – Downtime_3$

$= 741 - 38 = 703$ Jam

$$Avaiblity3 = \frac{Operation\ Time3}{Loading\ Time3}\ x\ 100\%$$

$$= \frac{703\ Jam}{741\ Jam}\ x\ 100\% = 94{,}87\ \%$$

Bulan Agustus 2024 (*Availability* $_4$):

$Loading\ Time_4 = Total\ Available_4 — Planned\ Downtime_4$

$= 720 - 24 = 696$ Jam

$Operation\ Time_4 = Loading\ Time_4 – Downtime_4$

$= 696 - 3841 = 655$ Jam

$$Avaiblity4 = \frac{Operation\ Time4}{Loading\ Time4}\ x\ 100\%$$

$$= \frac{655\ Jam}{696\ Jam}\ x\ 100\% = 94{,}11\ \%$$

Bulan September 2024 (*Availability* $_5$):

$Loading\ Time_5 = Total\ Available_5 — Planned\ Downtime_5$

$= 744 - 3 = 741$ Jam

$Operation\ Time_5 = Loading\ Time_5 – Downtime_5$

$= 741 - 35 = 706$ Jam

$$Avaiblity5 = \frac{Operation\ Time5}{Loading\ Time5}\ x\ 100\%$$

$$= \frac{706\ Jam}{741\ Jam}\ x\ 100\% = 95{,}28\ \%$$

Bulan Oktober 2024 (*Availability* $_6$):

$Loading\ Time_6 = Total\ Available_6 — Planned\ Downtime_6$

$= 720 - 3 = 717$ Jam

$Operation\ Time_6 = Loading\ Time_6 – Downtime_6$

$= 717 - 51 = 666$ Jam

$$Avaiblity6 = \frac{Operation\ Time6}{Loading\ Time6}\ x\ 100\%$$

$$= \frac{666\ Jam}{717\ Jam}\ x\ 100\% = 92{,}89\ \%$$

Bulan November 2024 (*Availability* $_7$):

$Loading\ Time_7 = Total\ Available_7 — Planned\ Downtime_7$

$= 744 - 24 = 720$ Jam

$Operation\ Time_7 = Loading\ Time_7 – Downtime_7$

$= 720 - 41 = 679$ Jam

$$Avaiblity7 = \frac{Operation\ Time7}{Loading\ Time7}\ x\ 100\%$$

$$= \frac{679\ Jam}{720\ Jam}\ x\ 100\% = 94{,}31\ \%$$

Bulan Desember 2024 (*Availability* $_8$):

$Loading\ Time_8 = Total\ Available_8 — Planned\ Downtime_8$

$= 720 - 3 = 717$ Jam

$Operation\ Time_3 = Loading\ Time_3 – Downtime_3$

$= 717 - 39 = 678$ Jam

$$Avaiblity8 = \frac{Operation\ Time8}{Loading\ Time8}\ x\ 100\%$$

$$= \frac{678\ Jam}{717\ Jam}\ x\ 100\% = 94{,}56\ \%$$

Bulan Januari 2025 (*Availability* $_9$):

$Loading\ Time_9 = Total\ Available_9 — Planned\ Downtime_9$

$= 744 - 3 = 741$ Jam

Operation Time$_9$ = *Loading Time*$_9$ – *Downtime*$_9$

= 741- 43 = 698 Jam

$$Avaiblity9 = \frac{Operation\ Time9}{Loading\ Time9}\ x\ 100\%$$

$$= \frac{698\ Jam}{741\ Jam}\ x\ 100\% = 94{,}20\ \%$$

Bulan Maret 2025 (*Availability* $_{11}$):

Loading Time$_{11}$ = *Total Available*$_{11}$— *Planned Downtime*$_{11}$

= 744- 3 = 741 Jam

Operation Time$_{11}$ = *Loading Time*$_{11}$ – *Downtime*$_{11}$

= 641- 38 = 703 Jam

$$Avaiblity11 = \frac{Operation\ Time11}{Loading\ Time11}\ x\ 100\%$$

$$= \frac{703\ Jam}{741\ Jam}\ x\ 100\% = 94{,}87\ \%$$

Bulan April 2025 (*Availability* $_{12}$):

Loading Time$_{12}$ = *Total Available*$_{12}$— *Planned Downtime*$_{12}$

= 720- 3 = 717 Jam

Operation Time$_{12}$ = *Loading Time*$_{12}$ – *Downtime*$_{12}$

= 717- 30 = 687 Jam

$$Avaiblity12 = \frac{Operation\ Time12}{Loading\ Time12}\ x\ 100\%$$

$$= \frac{687\ Jam}{717\ Jam}\ x\ 100\% = 95{,}82\ \%$$

2. Nilai *Performance Efficiency* Pompa Sentrifugal dengan menggunakan rumus:

$$Performance\ E = \frac{Processed\ amount\ x\ Idle\ cycle\ time}{Operation\ Time}\ x\ 100\%$$

Bulan Mei 2024 (*Performance E* $_1$):

$$Performance\ E1 = \frac{Processed\ amount1\ x\ Idle\ cycle\ time1}{Operation\ Time1}\ x\ 100\%$$

$$= \frac{15815\ ton\ x\ \ 0.04\frac{jam}{ton}}{683\ jam}\ x\ 100\% = 92{,}62\%$$

Bulan Juni 2024 (*Performance E* $_2$):

$$Performance\ E1 = \frac{Processed\ amount2\ x\ Idle\ cycle\ time2}{Operation\ Time2}\ x\ 100\%$$

$$= \frac{15308\ ton\ x\ \ 0.04\frac{jam}{ton}}{677\ jam}\ x\ 100\% = 90{,}45\%$$

Bulan Juli 2024 (*Performance E* $_3$):

$$Performance\ E3 = \frac{Processed\ amount3\ x\ Idle\ cycle\ time3}{Operation\ Time3}\ x\ 100\%$$

$$= \frac{15820\ ton\ x\ \ 0.04\frac{jam}{ton}}{703\ jam}\ x\ 100\% = 90{,}01\%$$

Bulan Agustus2024 (*Performance E* $_4$):

$$Performance\ E4 = \frac{Processed\ amount4\ x\ Idle\ cycle\ time4}{Operation\ Time4}\ x\ 100\%$$

$$= \frac{15312 ton\ x\ \ 0.04\frac{jam}{ton}}{655\ jam}\ x\ 100\% = 93{,}51\%$$

Bulan September 2024 (*Performance E* $_5$):

$$Performance\ E5 = \frac{Processed\ amount5\ x\ Idle\ cycle\ time5}{Operation\ Time5}\ x\ 100\%$$

$$= \frac{15818\ ton\ x\ \ 0.04\frac{jam}{ton}}{706 jam}\ x\ 100\% = 89{,}62\%$$

Bulan Oktober 2024 (*Performance E* $_6$):

$$Performance\ E6 = \frac{Processed\ amount6\ x\ Idle\ cycle\ time6}{Operation\ Time6}\ x\ 100\%$$

$$= \frac{15309\ ton\ x\ \ 0.04\frac{jam}{ton}}{666\ jam}\ x\ 100\% = 91{,}95\%$$

Bulan November 2024 (*Performance E* $_7$):

$$Performance\ E7 = \frac{Processed\ amount7\ x\ Idle\ cycle\ time7}{Operation\ Time7}\ x\ 100\%$$

$$= \frac{15815\ ton\ x\ \ 0.04\frac{jam}{ton}}{679\ jam}\ x\ 100\% = 93{,}71\%$$

Bulan Desember 2024 (*Performance E* $_8$):

$$Performance\ E8 = \frac{Processed\ amount8\ x\ Idle\ cycle\ time8}{Operation\ Time8}\ x\ 100\%$$

$$= \frac{15308\ ton\ x\ \ 0.04\frac{jam}{ton}}{678\ jam}\ x\ 100\% = 90{,}31\%$$

Bulan Januari 2025 (*Performance E* $_9$):

$$Performance\ E9 = \frac{Processed\ amount9\ x\ Idle\ cycle\ time9}{Operation\ Time9}\ x\ 100\%$$

$$= \frac{15820\ ton\ x\ \ 0.04\frac{jam}{ton}}{698\ jam}\ x\ 100\% = 90{,}66\%$$

Bulan Februari 2025 (*Performance E* $_{10}$):

$$Performance\ E10 = \frac{Processed\ amount10\ x\ Idle\ cycle\ time10}{Operation\ Time10}\ x\ 100\%$$

$$= \frac{14289 ton\ x\ \ 0.04\frac{jam}{ton}}{614\ jam}\ x\ 100\% = 93{,}09\%$$

Bulan Maret 2025 (*Performance E* $_{11}$):

$$Performance\ E11 = \frac{Processed\ amount11\ x\ Idle\ cycle\ time11}{Operation\ Time11}\ x\ 100\%$$

$$= \frac{15817\ ton\ x\ \ 0.04\frac{jam}{ton}}{703\ jam}\ x\ 100\% = 90{,}00\%$$

Bulan April 2025 (*Performance E* $_{12}$):

$$Performance\ E12 = \frac{Processed\ amount12\ x\ Idle\ cycle\ time12}{Operation\ Time12}\ x\ 100\%$$

$$= \frac{15310\ ton\ x\ \ 0.04\frac{jam}{ton}}{687 jam}\ x\ 100\% = 89{,}14\%$$

3. Nilai *Rate of quality product* Pompa Sentrifugal dengan menggunakan rumus:

$$Rate\ of\ Quality\ Product = \frac{Processed\ amount - Defect\ Amount}{Processed\ amount}\ x\ 100\%$$

Bulan Mei 2024 (*Rate of quality product1*):

$$Rate\ of\ Quality\ Product1 = \frac{Processed\ amount1 - Defect\ Amount1}{Processed\ amount1}\ x\ 100\%$$

$$= \frac{15815\ ton - 5\ ton}{15815\ ton}\ x\ 100\% = 99{,}97\ \%$$

Bulan Juni 2024 (*Rate of quality product2*):

$$Rate\ of\ Quality\ Product2 = \frac{Processed\ amount2 - Defect\ Amount2}{Processed\ amount2}\ x\ 100\%$$

$$= \frac{15308\ ton - 8\ ton}{15308\ ton}\ x\ 100\% = 99{,}95\%$$

Bulan Juli 2024 (*Rate of quality product3*):

$$Rate\ of\ Quality\ Product3 = \frac{Processed\ amount3 - Defect\ Amount3}{Processed\ amount3}\ x\ 100\%$$

$$= \frac{15820\ ton - 10\ ton}{15820\ ton}\ x\ 100\% = 99{,}94\%$$

Bulan Agustus 2024 (*Rate of quality product4*):

$$Rate\ of\ Quality\ Product4 = \frac{Processed\ amount3 - Defect\ Amount4}{Processed\ amount4}\ x\ 100\%$$

$$= \frac{15312\ ton - 12\ ton}{15312\ ton}\ x\ 100\% = 99{,}92\%$$

Bulan September 2024 (*Rate of quality product5*):

$$Rate\ of\ Quality\ Product5 = \frac{Processed\ amount5 - Defect\ Amount5}{Processed\ amount5}\ x\ 100\%$$

$$= \frac{15818\ ton - 8\ ton}{15818\ ton}\ x\ 100\% = 99{,}95\%$$

Bulan Oktober 2024 (*Rate of quality product6*):

$$Rate\ of\ Quality\ Product6 = \frac{Processed\ amount6 - Defect\ Amount6}{Processed\ amount6}\ x\ 100\%$$

$$= \frac{15309\ ton - 9\ ton}{15309\ ton}\ x\ 100\% = 99{,}94\%$$

Bulan November 2024 (*Rate of quality product7*):

$$Rate\ of\ Quality\ Product7 = \frac{Processed\ amount7 - Defect\ Amount7}{Processed\ amount7}\ x\ 100\%$$

$$= \frac{15815\ ton - 5\ ton}{15815\ ton}\ x\ 100\% = 99{,}97\%$$

Bulan Desember 2024 (*Rate of quality product8*):

$$Rate\ of\ Quality\ Product8 = \frac{Processed\ amount8 - Defect\ Amount8}{Processed\ amount8}\ x\ 100\%$$

$$= \frac{15308\ ton - 8\ ton}{15308\ ton}\ x\ 100\% = 99{,}95\%$$

Bulan Januari 2025 (*Rate of quality product9*):

$$Rate\ of\ Quality\ Product9 = \frac{Processed\ amount9 - Defect\ Amount9}{Processed\ amount9}\ x\ 100\%$$

$$= \frac{15820\ ton - 10\ ton}{15820\ ton}\ x\ 100\% = 99{,}94\%$$

Bulan Februari 2025 (*Rate of quality product10*):

$$Rate\ of\ Quality\ Product10 = \frac{Processed\ amount10 - Defect\ Amount10}{Processed\ amount10}\ x\ 100\%$$

$$= \frac{14289\ ton - 9\ ton}{14289\ ton}\ x\ 100\% = 99{,}94\%$$

Bulan Maret 2025(*Rate of quality product11*):

$$Rate\ of\ Quality\ Product11 = \frac{Processed\ amount11 - Defect\ Amount11}{Processed\ amount11}\ x\ 100\%$$

$$= \frac{15817\ ton - 7\ ton}{15817\ ton}\ x\ 100\% = 99{,}96\%$$

Bulan April 2025 (*Rate of quality product12*):

$$Rate\ of\ Quality\ Product12 = \frac{Processed\ amount12 - Defect\ Amount12}{Processed\ amount12}\ x\ 100\%$$

$$= \frac{15310\ ton - 10\ ton}{15310\ ton}\ x\ 100\% = 99{,}93\%$$

4. Nilai *Rate Overall Equipment Effectiveness (OEE)* Pompa Sentrifugal dengan menggunakan rumus:

   OEE (%) = *Availability (%) x Performance Rate (%) x Quality Rate (%)*

   Bulan Mei 2024 (OEE_1):

   OEE_1 (%) = *$Availability_1$ (%) x $Performance\ Rate_1$ (%) x $Quality\ Rate_1$ (%)*

   = 94,86% x 92,62% x 99,97%

   = 87,83%

   Bulan Juni 2024 (OEE_2):

   OEE_2 (%) = *$Availability_2$ (%) x $Performance\ Rate_2$ (%) x $Quality\ Rate_2$ (%)*

   = 94,42% x 90,45% x 99,95%

= 85,36%

Bulan Juli 2024 (OEE_3):

OEE_3 (%) = *Availability$_3$ (%) x Performance Rate$_3$ (%) x Quality Rate$_3$ (%)*

= 94,87% x 90,01% x 99,94%

= 85,34%

Bulan Agustus 2024 (OEE_4):

OEE_4 (%) = *Availability$_4$ (%) x Performance Rate$_4$ (%) x Quality Rate$_4$ (%)*

= 94,11% x 93,51% x 99,92%

= 87,93%

Bulan September 2024 (OEE_5):

OEE_5 (%) = *Availability$_5$ (%) x Performance Rate$_5$ (%) x Quality Rate$_5$ (%)*

= 95,28% x 89,62% x 99,95%

= 85,34%

Bulan Oktober 2024 (OEE_6):

OEE_6 (%) = *Availability$_6$ (%) x Performance Rate$_6$ (%) x Quality Rate$_6$ (%)*

= 92,89% x 91,95% x 99,94%

= 85,36%

Bulan November Juni 2024 (OEE_7):

OEE_7 (%) = *Availability$_7$ (%) x Performance Rate$_7$ (%) x Quality Rate$_7$ (%)*

= 94,31% x 93,17% x 99,97%

= 87,83%

Bulan Desember 2024 (OEE_8):

OEE_8 (%) = *Availability$_8$ (%) x Performance Rate$_8$ (%) x Quality Rate$_8$ (%)*

= 94,56% x 90,31% x 99,95%

= 85,36%

Bulan Januari 2025 (OEE_9):

OEE_9 (%) = *Availability$_9$ (%) x Performance Rate$_9$ (%) x Quality Rate$_9$ (%)*

= 94,20% x 90,66% x 99,94%

= 85,34%

Bulan Februari 2025 (OEE_{10}):

OEE_{10} (%) = *Availability$_{10}$ (%) x Performance Rate$_{10}$ (%) x Quality Rate$_{10}$ (%)*

= 94,75% x 93,09% x 99,94%

= 88,15%

Bulan Maret 2025 (OEE_{11}):

OEE_{11} (%) = *Availability$_{11}$ (%) x Performance Rate$_{11}$ (%) x Quality Rate$_{11}$ (%)*

= 94,87% x 90,00% x 99,96%

= 85,34%

Bulan April 2025 (OEE_{12}):

OEE_{12} (%) = *Availability$_{12}$ (%) x Performance Rate$_{12}$ (%) x Quality Rate$_{12}$ (%)*

= 95,85% x 89,14% x 99,93%

= 85,36%

5. Nilai *Breakdown Losses* Pompa Sentrifugal dengan menggunakan rumus:

$$Breakdown\ Losess = \frac{Breakdown\ time}{Loading\ time}\ x\ 100\%$$

Bulan Mei 2024 (*Breakdown Losses1*):

$$Breakdown\ Losess1 = \frac{Breakdown\ time1}{Loading\ time1}\ x\ 100\%$$

$$= \frac{37\ Jam}{720\ Jam}\ x\ 100\% = 5{,}14\%$$

Bulan Juni 2024 (*Breakdown Losses2*):

$$Breakdown\ Losess2 = \frac{Breakdown\ time2}{Loading\ time2}\ x\ 100\%$$

$$= \frac{40\ Jam}{717\ Jam}\ x\ 100\% = 5{,}58\%$$

Bulan Juli 2024 (*Breakdown Losses3*):

$$Breakdown\ Losess3 = \frac{Breakdown\ time3}{Loading\ time3}\ x\ 100\%$$

$$= \frac{38\ Jam}{741\ Jam}\ x\ 100\% = 5{,}13\%$$

Bulan Agustus 2024 (*Breakdown Losses4*):

$$Breakdown\ Losess4 = \frac{Breakdown\ time4}{Loading\ time4}\ x\ 100\%$$

$$= \frac{41\ Jam}{696\ Jam}\ x\ 100\% = 5{,}89\%$$

Bulan September 2024 (*Breakdown Losses5*):

$$Breakdown\ Losess5 = \frac{Breakdown\ time5}{Loading\ time5}\ x\ 100\%$$

$$= \frac{35\ Jam}{741\ Jam}\ x\ 100\% = 4{,}72\%$$

Bulan Oktober 2024 (*Breakdown Losses6*):

$$Breakdown\ Losess6 = \frac{Breakdown\ time6}{Loading\ time6}\ x\ 100\%$$

$$= \frac{51\ Jam}{717\ Jam}\ x\ 100\% = 7{,}11\%$$

Bulan November 2024 (*Breakdown Losses7*):

$$Breakdown\ Losess7 = \frac{Breakdown\ time7}{Loading\ time7}\ x\ 100\%$$

$$= \frac{41\ Jam}{720\ Jam}\ x\ 100\% = 5{,}69\%$$

Bulan Desember 2024 (*Breakdown Losses8*):

$$Breakdown\ Losess8 = \frac{Breakdown\ time8}{Loading\ time8}\ x\ 100\%$$

$$= \frac{39\ Jam}{717\ Jam}\ x\ 100\% = 5{,}44\%$$

Bulan Januari 2025 (*Breakdown Losses9*):

$$Breakdown\ Losess9 = \frac{Breakdown\ time9}{Loading\ time9}\ x\ 100\%$$

$$= \frac{43\ Jam}{741\ Jam}\ x\ 100\% = 5{,}80\%$$

Bulan Februari 2025 (*Breakdown Losses10*):

$$Breakdown\ Losess10 = \frac{Breakdown\ time10}{Loading\ time10}\ x\ 100\%$$

$$= \frac{34\ Jam}{648\ Jam}\ x\ 100\% = 5{,}25\%$$

Bulan Maret 2025 (*Breakdown Losses11*):

$$Breakdown\ Losess11 = \frac{Breakdown\ time11}{Loading\ time11}\ x\ 100\%$$

$$= \frac{38\ Jam}{741\ Jam}\ x\ 100\% = 5{,}13\%$$

Bulan April 2025 (*Breakdown Losses12*):

$$Breakdown\ Losess12 = \frac{Breakdown\ time12}{Loading\ time12}\ x\ 100\%$$

$$= \frac{30\ Jam}{717\ Jam}\ x\ 100\% = 4{,}18\%$$

6. Nilai *Set up & Adjusment time* Pompa Sentrifugal dengan menggunakan rumus:

$$Setup\ \&\ Adjustment\ Losess = \frac{Setup\ \&\ Adjustment\ time}{Loading\ time}\ x\ 100\%$$

Bulan Mei 2024 (*Set up & Adjusment time1*):

$$Setup\ \&\ Adjustment\ Losess1 = \frac{Setup\ \&\ Adjustment\ time1}{Loading\ time1}\ x\ 100\%$$

$$= \frac{15\ Jam}{720\ Jam}\ x\ 100\% = 2{,}08\%$$

Bulan Juni 2024 (*Set up & Adjusment time2*):

$$Setup\ \&\ Adjustment\ Losess2 = \frac{Setup\ \&\ Adjustment\ time2}{Loading\ time2}\ x\ 100\%$$

$$= \frac{10\ Jam}{717\ Jam}\ x\ 100\% = 1{,}39\%$$

Bulan Juli 2024 (*Set up & Adjusment time3*):

$$Setup\ \&\ Adjustment\ Losess3 = \frac{Setup\ \&\ Adjustment\ time3}{Loading\ time3}\ x\ 100\%$$

$$= \frac{16\ Jam}{741\ Jam}\ x\ 100\% = 2{,}16\%$$

Bulan Agustus 2024 (*Set up & Adjusment time4*):

$$Setup\ \&\ Adjustment\ Losess4 = \frac{Setup\ \&\ Adjustment\ time4}{Loading\ time4}\ x\ 100\%$$

$$= \frac{18\ Jam}{696\ Jam}\ x\ 100\% = 2{,}59\%$$

Bulan September 2024 (*Set up & Adjusment time5*):

$$Setup\ \&\ Adjustment\ Losess5 = \frac{Setup\ \&\ Adjustment\ time5}{Loading\ time5}\ x\ 100\%$$

$$= \frac{10\ Jam}{741\ Jam}\ x\ 100\% = 1{,}35\%$$

Bulan Oktober 2024 (*Set up & Adjusment time6*):

$$Setup\ \&\ Adjustment\ Losess6 = \frac{Setup\ \&\ Adjustment\ time6}{Loading\ time6}\ x\ 100\%$$

$$= \frac{11\ Jam}{717\ Jam}\ x\ 100\% = 1{,}53\%$$

Bulan November 2024 (*Set up & Adjusment time7*):

$$Setup\ \&\ Adjustment\ Losess7 = \frac{Setup\ \&\ Adjustment\ time7}{Loading\ time7}\ x\ 100\%$$

$$= \frac{16\ Jam}{720\ Jam}\ x\ 100\% = 2{,}22\%$$

Bulan Desember 2024 (*Set up & Adjusment time8*):

$$Setup\ \&\ Adjustment\ Losess8 = \frac{Setup\ \&\ Adjustment\ time8}{Loading\ time8}\ x\ 100\%$$

$$= \frac{15\ Jam}{717\ Jam}\ x\ 100\% = 2{,}09\%$$

Bulan Januari 2025 (*Set up & Adjusment time9*):

$$Setup\ \&\ Adjustment\ Losess9 = \frac{Setup\ \&\ Adjustment\ time9}{Loading\ time9}\ x\ 100\%$$

$$= \frac{17\ Jam}{741\ Jam}\ x\ 100\% = 2{,}29\%$$

Bulan Februari 2025 (*Set up & Adjusment time10*):

$$Setup\ \&\ Adjustment\ Losess10 = \frac{Setup\ \&\ Adjustment\ time10}{Loading\ time10}\ x\ 100\%$$

$$= \frac{15\ Jam}{648\ Jam}\ x\ 100\% = 2{,}31\%$$

Bulan Maret 2025 (*Set up & Adjusment time11*):

$$Setup\ \&\ Adjustment\ Losess11 = \frac{Setup\ \&\ Adjustment\ time11}{Loading\ time11}\ x\ 100\%$$

$$= \frac{12\ Jam}{741\ Jam}\ x\ 100\% = 1{,}62\%$$

Bulan April 2025 (*Set up & Adjusment time2*):

$$Setup\ \&\ Adjustment\ Losess12 = \frac{Setup\ \&\ Adjustment\ time12}{Loading\ time12}\ x\ 100\%$$

$$= \frac{15\ Jam}{717\ Jam}\ x\ 100\% = 2{,}09\%$$

7. Nilai *Idling & minor stoppages* Pompa Sentrifugal dengan menggunakan rumus:

Nonproductive time = Breakdown + Set Up + Planned Downtime

$$Idling\ \&\ Minor\ Stoppages\ Losess = \frac{Nonproductive\ time}{Loading\ time}\ x\ 100\%$$

Bulan Mei 2024 (*Idling & minor stoppages1*):

Nonproductive time1 = Breakdown1 + Set Up1 + Planned Downtime1

= 22 Jam + 15 Jam + 24 Jam = 61 Jam

$$Idling\ \&\ Minor\ Stoppages\ Losess1 = \frac{Nonproductive\ time1}{Loading\ time1}\ x\ 100\%$$

$$= \frac{61\ Jam}{720\ Jam}\ x\ 100\% = 8{,}47\%$$

Bulan Mei 2024 (*Idling & minor stoppages2*):

Nonproductive time2 = Breakdown2 + Set Up2 + Planned Downtime2

= 30 Jam + 10 Jam + 3 Jam = 43 Jam

$$Idling\ \&\ Minor\ Stoppages\ Losess2 = \frac{Nonproductive\ time2}{Loading\ time2}\ x\ 100\%$$

$$= \frac{43\ Jam}{717\ Jam}\ x\ 100\% = 6{,}00\%$$

Bulan Juni 2024 (*Idling & minor stoppages3*):

Nonproductive time3 = Breakdown3 + Set Up3 + Planned Downtime3

= 22 Jam + 16 Jam + 3 Jam = 41 Jam

$$Idling\ \&\ Minor\ Stoppages\ Losess3 = \frac{Nonproductive\ time3}{Loading\ time3}\ x\ 100\%$$

$$= \frac{41\ Jam}{741\ Jam}\ x\ 100\% = 5{,}53\%$$

Bulan Agustus 2024 (*Idling & minor stoppages4*):

Nonproductive time4 = Breakdown4 + Set Up4 + Planned Downtime4

= 23 Jam + 18 Jam + 24 Jam = 65 Jam

$$Idling\ \&\ Minor\ Stoppages\ Losess4 = \frac{Nonproductive\ time4}{Loading\ time4}\ x\ 100\%$$

$$= \frac{65\ Jam}{696\ Jam}\ x\ 100\% = 9{,}34\%$$

Bulan September 2024 (*Idling & minor stoppages5*):

Nonproductive time5 = Breakdown5 + Set Up5 + Planned Downtime5

= 25 Jam + 10 Jam + 3 Jam =38 Jam

$$Idling\ \&\ Minor\ Stoppages\ Losess5 = \frac{Nonproductive\ time5}{Loading\ time5}\ x\ 100\%$$

$$= \frac{38\ Jam}{741\ Jam}\ x\ 100\% = 5{,}13\%$$

Bulan Oktober 2024 (*Idling & minor stoppages6*):

Nonproductive time6 = Breakdown6 + Set Up6 + Planned Downtime6

= 40 Jam + 11 Jam + 3 Jam = 54 Jam

$$Idling\ \&\ Minor\ Stoppages\ Losess6 = \frac{Nonproductive\ time6}{Loading\ time6}\ x\ 100\%$$

$$= \frac{54\ Jam}{717\ Jam}\ x\ 100\% = 7{,}53\%$$

Bulan November 2024 (*Idling & minor stoppage76*):

Nonproductive time7 = Breakdown7 + Set Up7 + Planned Downtime7

= 25 Jam + 16 Jam + 24 Jam = 65 Jam

$$Idling\ \&\ Minor\ Stoppages\ Losess7 = \frac{Nonproductive\ time7}{Loading\ time7}\ x\ 100\%$$

$$= \frac{65\ Jam}{720\ Jam}\ x\ 100\% = 9{,}03\%$$

Bulan Desember 2024 (*Idling & minor stoppages8*):

Nonproductive time8 = Breakdown8 + Set Up8+ Planned Downtime8

= 24 Jam + 15 Jam + 3 Jam = 42 Jam

$$Idling\ \&\ Minor\ Stoppages\ Losess8 = \frac{Nonproductive\ time8}{Loading\ time8}\ x\ 100\%$$

$$= \frac{42\ Jam}{717\ Jam}\ x\ 100\% = 5{,}86\%$$

Bulan Januari 2025 (*Idling & minor stoppages9*):

Nonproductive time9 = Breakdown9 + Set Up9 + Planned Downtime9

= 26 Jam + 17 Jam + 3 Jam = 46 Jam

$$Idling\ \&\ Minor\ Stoppages\ Losess1 = \frac{Nonproductive\ time1}{Loading\ time1}\ x\ 100\%$$

$$= \frac{46\ Jam}{741\ Jam}\ x\ 100\% = 6{,}21\%$$

Bulan Februari 2025 (*Idling & minor stoppages10*):

Nonproductive time10 = Breakdown10+ Set Up10 + Planned Downtime10

= 19 Jam + 15 Jam + 24 Jam = 58 Jam

$$Idling\ \&\ Minor\ Stoppages\ Losess1 = \frac{Nonproductive\ time1}{Loading\ time1}\ x\ 100\%$$

$$= \frac{58\ Jam}{648\ Jam}\ x\ 100\% = 8{,}95\%$$

Bulan Maret 2025 (*Idling & minor stoppages11*):

Nonproductive time11 = Breakdown11 + Set Up11 + Planned Downtime11

= 26 Jam + 12 Jam + 3 Jam = 41 Jam

$$Idling\ \&\ Minor\ Stoppages\ Losess11 = \frac{Nonproductive\ time11}{Loading\ time11}\ x\ 100\%$$

$$= \frac{41\ Jam}{741\ Jam}\ x\ 100\% = 5{,}53\%$$

Bulan April 2025 (*Idling & minor stoppages12*):

Nonproductive time12 = Breakdown12 +Set Up12 + Planned Downtime12

= 25 Jam + 15 Jam + 3 Jam = 43 Jam

$$Idling\ \&\ Minor\ Stoppages\ Losess12 = \frac{Nonproductive\ time12}{Loading\ time12}\ x\ 100\%$$

$$= \frac{43\ Jam}{717\ Jam}\ x\ 100\% = 6{,}00\%$$

8. Nilai *Reduced Speed Losses* Pompa Sentrifugal dengan menggunakan rumus:

$$Reduced\ Speed = \frac{Operation\ time - (Ideal\ cycle\ x\ Processed\ amount)}{Loading\ time}\ x\ 100\%$$

Bulan Mei 2024 (*Reduced Speed Losses1*):

$$Reduced\ Speed\ 1 = \frac{Operation\ time1 - (Ideal\ cycle\ x\ Processed\ amount1)}{Loading\ time1}\ x\ 100\%$$

$$= \frac{683\ Jam - (0{,}04\frac{Jam}{Ton}x\ 15815\ Ton)}{720\ Jam}\ x\ 100\% = 7{,}00\ \%$$

Bulan Juni 2024 (*Reduced Speed Losses2*):

$$Reduced\ Speed\ 2 = \frac{Operation\ time2 - (Ideal\ cycle\ x\ Processed\ amount2)}{Loading\ time2}\ x\ 100\%$$

$$= \frac{677\ Jam - (0{,}04\frac{Jam}{Ton}x\ 15308\ Ton)}{717\ Jam}\ x\ 100\% = 9{,}02\ \%$$

Bulan Juli 2024 (*Reduced Speed Losses3*):

$$Reduced\ Speed\ 3 = \frac{Operation\ time3 - (Ideal\ cycle\ x\ Processed\ amount3)}{Loading\ time3}\ x\ 100\%$$

$$= \frac{703\ Jam - (0{,}04 \frac{Jam}{Ton} x\ 15820\ Ton)}{741\ Jam}\ x\ 100\% = 9{,}47\ \%$$

Bulan Agustus 2024 (*Reduced Speed Losses4*):

$$Reduced\ Speed\ 4 = \frac{Operation\ time4 - (Ideal\ cycle\ x\ Processed\ amount4)}{Loading\ time4}\ x\ 100\%$$

$$= \frac{655\ Jam - (0{,}04 \frac{Jam}{Ton} x\ 15812\ Ton)}{696\ Jam}\ x\ 100\% = 6{,}11\ \%$$

Bulan September 2024 (*Reduced Speed Losses5*):

$$Reduced\ Speed\ 5 = \frac{Operation\ time5 - (Ideal\ cycle\ x\ Processed\ amount5)}{Loading\ time5}\ x\ 100\%$$

$$= \frac{706\ Jam - (0{,}04 \frac{Jam}{Ton} x\ 15818\ Ton)}{741\ Jam}\ x\ 100\% = 9{,}89\ \%$$

Bulan Oktober 2024 (*Reduced Speed Losses6*):

$$Reduced\ Speed\ 6 = \frac{Operation\ time6 - (Ideal\ cycle\ x\ Processed\ amount6)}{Loading\ time6}\ x\ 100\%$$

$$= \frac{666\ Jam - (0{,}04 \frac{Jam}{Ton} x\ 15309\ Ton)}{741\ Jam}\ x\ 100\% = 7{,}48\ \%$$

Bulan November 2024 (*Reduced Speed Losses7*):

$$Reduced\ Speed\ 7 = \frac{Operation\ time7 - (Ideal\ cycle\ x\ Processed\ amount7)}{Loading\ time7}\ x\ 100\%$$

$$= \frac{679\ Jam - (0{,}04 \frac{Jam}{Ton} x\ 15815\ Ton)}{717\ Jam}\ x\ 100\% = 6{,}44\ \%$$

Bulan Desember 2024 (*Reduced Speed Losses8*):

$$Reduced\ Speed\ 8 = \frac{Operation\ time8 - (Ideal\ cycle\ x\ Processed\ amount8)}{Loading\ time8}\ x\ 100\%$$

$$= \frac{678\ Jam - (0{,}04 \frac{Jam}{Ton} x\ 15308\ Ton)}{720\ Jam}\ x\ 100\% = 9{,}16\ \%$$

Bulan Januari 2025 (*Reduced Speed Losses9*):

$$Reduced\ Speed\ 9 = \frac{Operation\ time9 - (Ideal\ cycle\ x\ Processed\ amount9)}{Loading\ time9}\ x\ 100\%$$

$$= \frac{698\ Jam - (0{,}04 \frac{Jam}{Ton} x\ 15820\ Ton)}{741\ Jam}\ x\ 100\% = 8{,}80\ \%$$

Bulan Februari 2025 (*Reduced Speed Losses10*):

$$Reduced\ Speed\ 10 = \frac{Operation\ time10 - (Ideal\ cycle\ x\ Processed\ amount10)}{Loading\ time10}\ x\ 100\%$$

$$= \frac{614\ Jam - (0{,}04\frac{Jam}{Ton} x\ 14289\ Ton)}{648\ Jam}\ x\ 100\% = 6{,}55\ \%$$

Bulan Maret 2025 (*Reduced Speed Losses11*):

$$Reduced\ Speed\ 11 = \frac{Operation\ time11 - (Ideal\ cycle\ x\ Processed\ amount11)}{Loading\ time11}\ x\ 100\%$$

$$= \frac{703\ Jam - (0{,}04\frac{Jam}{Ton} x\ 15817\ Ton)}{741\ Jam}\ x\ 100\% = 9{,}49\ \%$$

Bulan April 2025 (*Reduced Speed Losses12*):

$$Reduced\ Speed\ 12 = \frac{Operation\ time12 - (Ideal\ cycle\ x\ Processed\ amount12)}{Loading\ time12}\ x\ 100\%$$

$$= \frac{687\ Jam - (0{,}04\frac{Jam}{Ton} x\ 15310\ Ton)}{7\ J17am}\ x\ 100\% = 10{,}40\ \%$$

9. Nilai *Rework Losses* Pompa Sentrifugal dengan menggunakan rumus:

$$Rework\ Losess = \frac{Ideal\ cycle\ x\ Rework}{Loading\ time}\ x\ 100\%$$

Bulan Mei 2024 (*Rework Losses1*):

$$Rework\ Losess1 = \frac{Ideal\ cycle\ x\ Rework1}{Loading\ time1}\ x\ 100\%$$

$$= \frac{0{,}04\frac{Jam}{ton} x\ 5\ Ton}{720\ Jam}\ x\ 100\% = 0{,}03\%$$

Bulan Juni 2024 (*Rework Losses2*):

$$Rework\ Losess2 = \frac{Ideal\ cycle\ x\ Rework2}{Loading\ time2}\ x\ 100\%$$

$$= \frac{0{,}04\frac{Jam}{ton} x\ 8\ Ton}{717\ Jam}\ x\ 100\% = 0{,}04\%$$

Bulan Juli 2024 (*Rework Losses3*):

$$Rework\ Losess3 = \frac{Ideal\ cycle\ x\ Rework3}{Loading\ time3}\ x\ 100\%$$

$$= \frac{0{,}04\frac{Jam}{ton} x\ 10\ Ton}{741\ Jam}\ x\ 100\% = 0{,}05\%$$

Bulan Agustus 2024 (*Rework Losses4*):

$$Rework\ Losess4 = \frac{Ideal\ cycle\ x\ Rework4}{Loading\ time4}\ x\ 100\%$$

$$= \frac{0{,}04\frac{Jam}{ton} x\ 12\ Ton}{696\ Jam}\ x\ 100\% = 0{,}07\%$$

Bulan September 2024 (*Rework Losses5*):

$$Rework\ Losess5 = \frac{Ideal\ cycle\ x\ Rework5}{Loading\ time5}\ x\ 100\%$$

$$= \frac{0{,}04\frac{Jam}{ton} x\ 8\ Ton}{741\ Jam}\ x\ 100\% = 0{,}04\%$$

Bulan Oktober 2024 (*Rework Losses6*):

$$Rework\ Losess6 = \frac{Ideal\ cycle\ x\ Rework6}{Loading\ time6}\ x\ 100\%$$

$$= \frac{0{,}04\frac{Jam}{ton} x\ 9\ Ton}{717\ Jam}\ x\ 100\% = 0{,}05\%$$

Bulan November 2024 (*Rework Losses7*):

$$Rework\ Losess7 = \frac{Ideal\ cycle\ x\ Rework7}{Loading\ time7}\ x\ 100\%$$

$$= \frac{0{,}04\frac{Jam}{ton} x\ 5\ Ton}{720\ Jam}\ x\ 100\% = 0{,}03\%$$

Bulan Desember 2024 (*Rework Losses8*):

$$Rework\ Losess8 = \frac{Ideal\ cycle\ x\ Rework8}{Loading\ time8}\ x\ 100\%$$

$$= \frac{0{,}04\frac{Jam}{ton} x\ 10\ Ton}{717\ Jam}\ x\ 100\% = 0{,}04\%$$

Bulan Januari 2025 (*Rework Losses9*):

$$Rework\ Losess9 = \frac{Ideal\ cycle\ x\ Rework9}{Loading\ time9}\ x\ 100\%$$

$$= \frac{0{,}04\frac{Jam}{ton}\, x\, 10\, Ton}{741\, Jam}\, x\, 100\% = 0{,}05\%$$

Bulan Februari 2025 (*Rework Losses10*):

$$Rework\ Losess10 = \frac{Ideal\ cycle\ x\ Rework10}{Loading\ time10}\, x\, 100\%$$

$$= \frac{0{,}04\frac{Jam}{ton}\, x\, 9\, Ton}{648\, Jam}\, x\, 100\% = 0{,}06\%$$

Bulan Maret 2025 (*Rework Losses11*):

$$Rework\ Losess11 = \frac{Ideal\ cycle\ x\ Rework11}{Loading\ time11}\, x\, 100\%$$

$$= \frac{0{,}04\frac{Jam}{ton}\, x\, 7\, Ton}{741\, Jam}\, x\, 100\% = 0{,}04\%$$

Bulan April 2025 (*Rework Losses12*):

$$Rework\ Losess12 = \frac{Ideal\ cycle\ x\ Rework12}{Loading\ time12}\, x\, 100\%$$

$$= \frac{0{,}04\frac{Jam}{ton}\, x\, 10\, Ton}{717\, Jam}\, x\, 100\% = 0{,}06\%$$