INDUSTRIAL INTERNSHIP REPORT

PEMELIHARAAN DAN PERBAIKAN RIPLLE MILL IN PT. KENCANA SAWIT INDONESIA

Submitted as One of the Requirements for Settlement
Industrial Internship Program

By:

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MECHANICAL ENGINEERING VOCATIONAL EDUCATION
FACULTY OF ENGINEERING
UNEVERSITAS NEGERI PADANG
2019

FACULTY APPROVAL

The Report was Submitted as One of the Requirements for Settlement
Industrial Internship Program Faculty of Engineering UNP

Semester……

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*On behalf of Dean of Faculty Engineering
Head of Industrial Relations Unit

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Head of	Industrial Supervisor
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FOREWORD

Alhamdulillaahirabbbil'alamin. Thanks to Allah SWT for all the gifts that are always poured out to the author so that the author can complete the refort Industrial Internship with the title " **PEMELIHARAAN DAN PERBAIKAN RIPLLE MILL IN PT. KENCANA SAWIT INDONESIA** ". Salawat and greetings are always bestowed on the Prophet Muhammad SAW by saying Allahhumaa Sholli'Ala Sayyidina Muhammad, who has brought mankind to the present era with sophisticated and modern science. During the writing of this thesis the author received a lot of guidance, advice, motivation and assistance from various parties, either directly or indirectly. For that, with all humility the writer would like to thank:

7. Parents and families always pray, provide support and encouragement to the author.
8. Mr. Iqbal H Hasibuan as Mill Manager PT.KENCANA SAWIT INDONESIA
9. Mr. Afrisal Awang as Maintenance Supervisor PT.KENCANA SAWIT INDONESIA
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13. Mr Drs. Purwantono, M.Pd. as Lecturer in the Industrial Internship of Universitas Negeri Padang.
14. All parties that the author cannot mention one by one, especially the maintenance staff who have helped completely.

The author hopes that Allah SWT will repay the kindness that the author has received from various parties who have helped me during this Industrial Intership. The author has made every effort to complete this report but if there are still deficiencies or errors, the author hopes that constructive criticism and recommendasion for the improvement of the report in the future.

Finally, I hope this report will provide many benefits for readers in general and for writers in particular.

Padang, July 2019

Arief Wicaksono
Student ID Number: 16067039

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CHAPTER I
INTRODUCTION

A. Background

In this day and age, technology and science have developed rapidly. Competition in the industrial world is so tight that human resources are demanded to become competent, skilled, professional, and knowledgeable individuals. In addition to following lecture materials, laboratories, and practical workshops, students need to carry out insight development activities outside the campus environment. This activity is usually in the form of practical work in an industry in accordance with their respective fields of expertise.

Practical work activities will provide mutual benefits, besides being able to complete their study program, practical work can also be used as an initial experience, training students' skills, attitudes and mindset in acting. Meanwhile, companies can benefit directly by providing programs to solve specific problems that have been realized so far so that this problem can be brought to school / college to be used as research material, thus a more harmonious relationship will occur between the company and school or college.

Industrial Interships are a bridge between industry and educational institutions. Implementation of practical field work for students is very important because it can add insight and knowledge in the industrial world. The implementation of practical field work aims to enable students to understand and become acquainted with the implementation of scientific disciplines in accordance with the study program studied in college. In addition, the implementation of Industrial Interships can also provide input to students in terms of finding, engineering, and developing objects found in the industry, so that later they are expected to be useful for the development of the industry.

One of the institutions where the author combines subject science with the industrial world is PT. Kecana Sawit Indonesia, where the technology available in this company is in line with the development of information technology that is currently developing. The author is assigned to the Bureau of Maintenance of Machinery and Production Processes at the Factory. This factory uses a lot of sophisticated equipment in the production process, one of which is the Ripple Mill.

1. Ripple Mill

In 1979, Pellet Technology Australia PTY LTD developed the use of the ripple mill, which was originally started by breaking down sunflower seeds, cotton seeds and soybeans. The ripple mill consists of two parts, namely the rotating rotor and the stationary plate.

Ripple mill is a tool used in palm oil mills for the processing of the core which functions to break the nut so that the core is released from the shell. In the ripple mill there is a rotor that rotates on the ripple plate at the stationary part. The seeds enter between the rotor and the ripple plate so that they collide and break the shell of the core.

2. Destination

The objectives of this Industrial Intership are as follows:

a. Get to know the machines used in the oil palm processing process.
b. Knowing the function of each machine used.
c. Can explain the working principle of a special Ripple Mill Machine
d. Know the problems with the Ripple Mill and the solutions to solve them.
e. Knowing about Ripple Mill maintenance.

3. Benefits

The benefits of this industrial internship are:

a. For Writers
    1) Can apply the knowledge that has been obtained during lectures in the work environment where street vendors.

2) Comparing the application of knowledge obtained in the form of theory and actual work practices in companies.
3) Expanding and improving the skills and abilities of students in entering the workforce according to their competencies.
4) Learn to socialize quickly to the work environment, both with employees and with assigned tasks.

b. For Companies

1) Support government programs in education to produce quality resources.
2) Participate by providing guidance to students so that they become quality workers.

4. Scope of problem

The issues discussed in this report are limited to "MAINTENANCE OF THE RIPLLE MILL"

5. Place and Time of Implementation

This Job Training is carried out at a factory managed by PT. Indonesian Palm Oil Kencana. The time for implementing this practical work starts from 17 June 2019 to 27 July 2019. The practical field work activities are carried out from Monday to Saturday with working hours from 07.00 to 17.00 WIB.

6. Writing Method

Writing this report uses 3 methods in data collection, namely:

a. Observation Method

This method is done by observing and directly monitoring the events that occur in the field.

b. Interview Method

This method is done by interviewing employees who know more about the data needed to solve the problem.

B. Overview of The Company

Kencana Sawit Indonesia Ltd (KSI) is a foreign investment company (PMA) engaged in the plantation business and oil palm management, originally named Tidar Sungkai Sawit Ltd (TSS), but in accordance with the approval of the Minister of Law and Human Rights of the Republic of Indonesia No. C-147.18.HT.01.04 dated 18 May 2006 Tidar Sungkai Sawit Ltd (TSS) has officially become a KSI Ltd with the same type of activity, location, land use rights area. KSI Ltd started operating since 1994, at which time KSI Ltd was just starting to plant oil palm, and after July 2001 a new palm oil processing factory was established to become CPO with an installed capacity of 45 tons / hour.

In 2018 the age of the oil palm plantation of This KSI Ltd has reached 23 years and the total HGU area is 10,216.10 Ha. KSI Ltdconsists of the following parts:

1. Oil palm plantations covering an area of 7,699.91 hectares
2. Conservation areas (protected areas) covering an area of 1,760.25 hectare.
3. The factory area is 17.40 ha
4. Road / Housing / Drainage 353.88 Ha
5. *Not plantable area* an area of 384.66 hectares

1. Company identity

KSI Ltdhas the following corporate identity:

Company name	: PT Kencana Sawit Indonesia
Type of Legal Entity	: Limited company
Company Address	: Nagari Talao Sungai Kunyit, Kec.Sangir Balai Janggo, Kab. South Solok, Prov. West Sumatra
Address of Head Office Company	: Multivision Tower Lantai 15 Jl. Kuningan Mulia Blok 9B Kel. Guntur, Kec. Setia Budi, South Jakarta 12980

No. Telephone	: 021 29380777
E-mail	: http://wilmar.co.id
Capital Status	: Foreign investment
Business Field / Activity	: Oil Palm Plantation and Mill
SK. Dock. AMDAL	: No.40 / AMDAL / RKL RPL / BA / XII / 1998
Person in Charge of Activities	: Jeprol Osinggang (AGM)

2. Factory Location and Layout

Geographically, the location of KSI Ltd 10,216 Ha of oil palm plantation and processing factory activities is located at positions 10 00 '46 "LS - 10 10' 07" and 1010 24 '27 "BT - 1010 37' 48". This area is at an altitude of 200 - 250 masl with the following limits:

a. In the north with oil palm plantations PTPN VI and SS2 (Incasi Raya).
b. South side with oil palm plantations TKA Ltd and Kenagarian Talao
c. East side with smallholder plantations, protected forests and TKA Ltd
d. To the west with an oil palm plantation, Sumater Jaya Agro Lestari Ltd

In government administration, the activities of KSI Ltd oil palm plantation and processing factory are located in Nagari Talao and Nagari Sungai Kunyit, Sangir Balai Janggo District, South Solok Regency, West Sumatra Province.

3. Vision and mission of the company

The vision and mission of KSI Ltd Palm Oil Mill include:

a. Company Vision

To be the best, admired, and internationally recognized company in the oil palm plantation sector

b. Company Mission

Managing oil palm plantation businesses and quality and environmental sustainability management industries through the

application of the doctrine of "Good Corporate Governance" in order to ensure the interests of all company "stakeholders".

1) Work ethic
2) Discipline
3) Work hard
4) Honest
5) Creative
6) Positive thinking
7) Act fast and precise

4. Organizational structure of the company

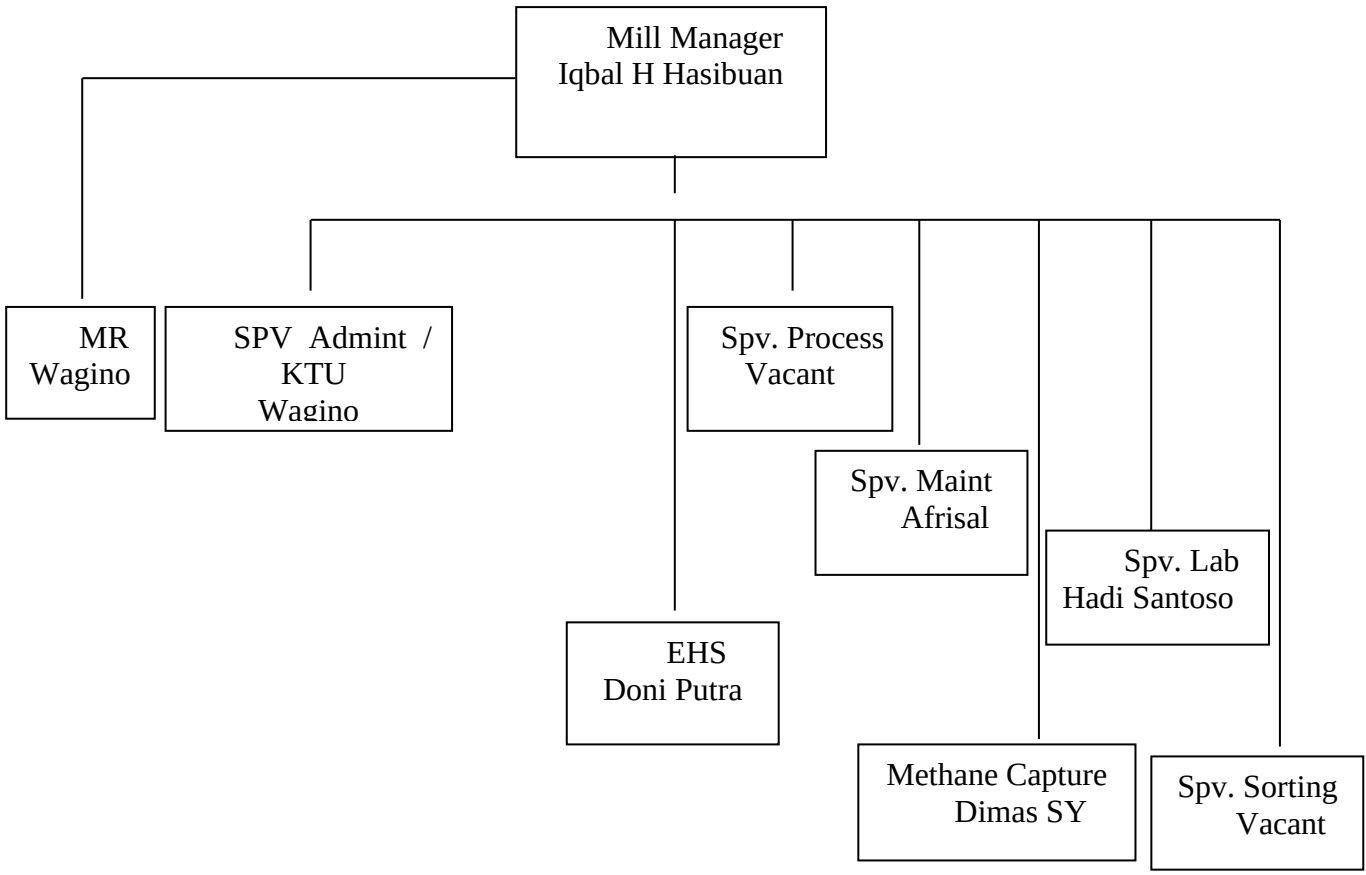

Figure 1.1. Organization Structure of KSI Ltd (Palm Oil Mill)

C. PLI Activities Planning

1. Human Resources

KSI Ltdin 2018 has a workforce of 117 people, from the mill head and all employees with the following details:

a. Mill Head : 1 person
b. Supervisor : 4 people
c. Assistant Supervisior : 4 people
d. Employees / Workers : 107 people
e. Security : 10 people

2. Supporting Facilities and Facilities

The facilities and facilities provided by the Company are:

a. Employee Housing
b. PAUD schools, kindergartens and elementary schools
c. Mosque
d. Islamic Prayer Room
e. BPJS Employment & Health.
f. ATM
g. School Bus, etc.

3. Raw materials, auxiliary materials and products

a. Main Raw Materials

The main raw material used is oil palm fruit Fresh Fruit Bunches (FFB) from the plantations of the company KSI Ltd.

Table 1.1 Amount of FFB Raw Materials at KSI Ltd Production year 2012-2017

Year	Amount of FFB (ton)
2012	240,732,770
2013	184,330,870
2014	164,402,370
2015	169,534,190
2016	176,573,575
2017	171,520,997

Source: KSI Ltd in 2017

b. Supporting material

Supporting materials used at KSI Ltdare:

Table 1.2 Number of Process Support Materials at KSI Ltd Production Year 2012-2016

Type	2012	2013	2014	2015	2016
Calcium Carbonat	35,750	528,850	312,350	290,350	462,700
Salt	6,000	5,900	4,100	3,100	6,200
Soda ash	8,650	11,750	8,600	6,200	6,650
Aluminum Sulfate (alum)	8,750	8,100	8,950	7,500	5,800
Nalco N-19 (2811 pulv)	825	800	650	725	600

Source: KSI Ltdin 2017

b. Product

Products produced by KSI Ltd are as follows:

1) CPO (Crude Palm Oil)
2) Palm Kernel

The following is production data for CPO and Palm Kernel:

Table 1.3 Total Production of CPO and Karnel at KSI Ltd Production Year 2012-2017

Year	CPO	Kernel
2012	48,988,011	11,767,622
2013	39,477,091	9,998,237
2014	35,509,723	9,082,937
2015	36,753,516	9,349,750
2016	34,758,751	9,190,499
2017	33,879,925	8,843,356

Source: PT. KSI 2017

D. PLI Activities Implementation

The processing of KSI Ltd CPO can be seen in the blog diagram below

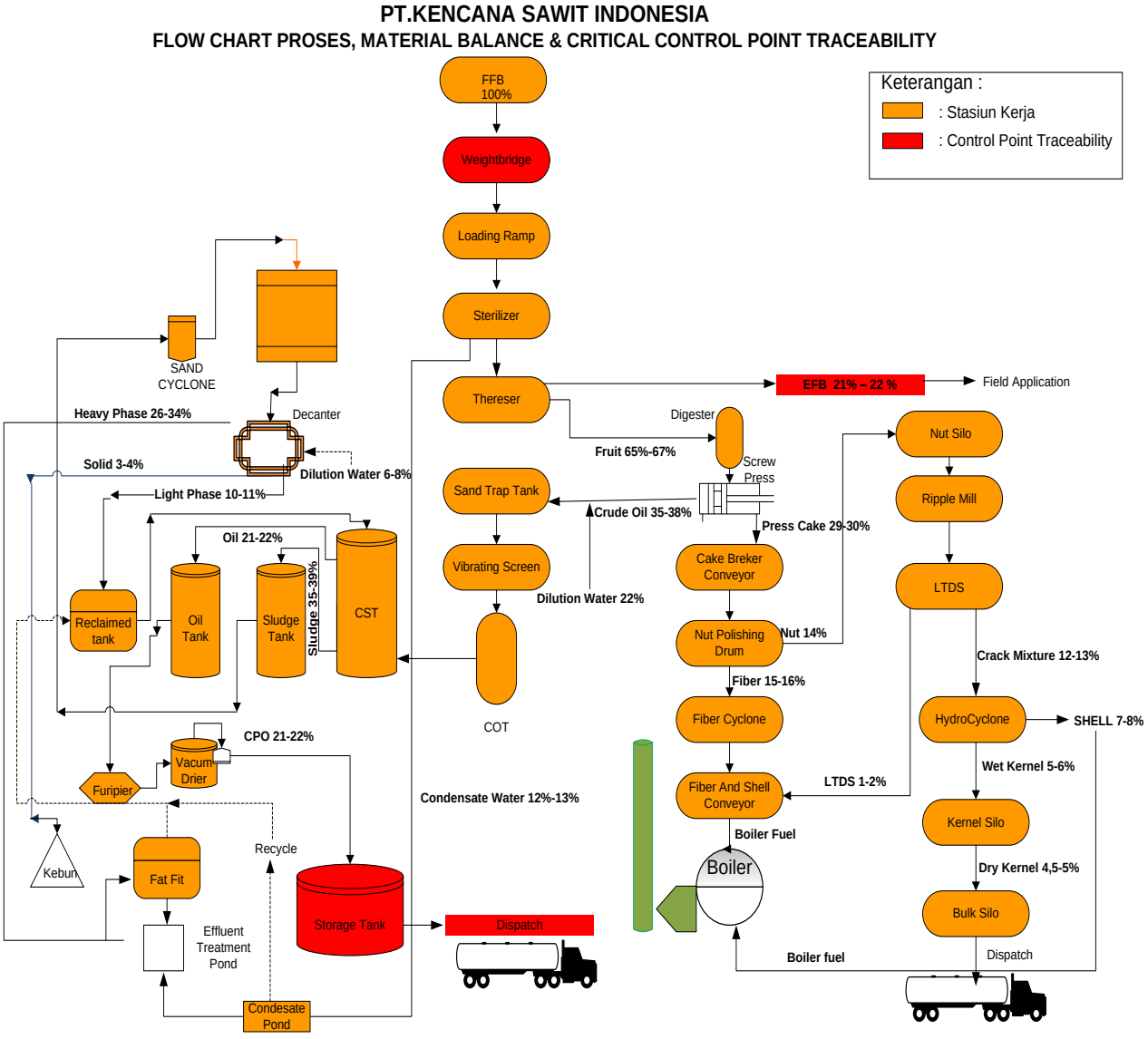

Figure 1.2 CPO Process Diagram Blog at KSI Ltd

CHAPTER II
DISCUSSIONS

A. Palm Oil Processing

KSI Ltd POM (Palm Oil Mill) is a company that processes palm oil FFB (Fresh Fruit Bunches) which produces 2 types of products, namely: CPO (Crude Palm Oil) and Palm Kernel.

The processing of oil palm consists of two processes, namely:

1. The processing of FFB into crude oil (Crude Palm Oil),
2. Core processing (Palm Kernel), and
3. Utilities

B. Processing of FFB (Fresh Fruit Bunches) into CPO (*Crude Palm Oil*).

The stages of the processing of FFB into CPO are as follows:

1. **Fruit Reception Station (Food Reception)**

   After the FFB has been transported from the land, the first station to go through is fruit receiving station, inside the station there are 2 places that must be passed, including:

   a. Weigh Bridge (Weight Bridge)

      The Weigh Bridge is a tool to find out how much the amount is received and the amount spent for a material or material, both incoming FFB, outgoing production, empty bin that comes out and others shown by the weighing tool in kilograms (Kg).

Figure 2.1 Weighbridge

The function of the scale at KSI Ltd is as a tool to determine or weigh production products such as FFB, CPO, Kernel, Empty Shell, Shell, and others.

b. Sorting

Sorting is determining the quality of the FFB that enters the palm oil mill. The function of sorting is to determine the condition of the fruit to be processed so that the quality of the results will be estimated. The fruit received by KSI Ltd POM comes from its own garden. The type of fruit received is generally Tenera. Harvest ripe criteria are very decisive in achieving oil yield and core yield. Sortation also functions to:

1) Separating dirt in the form of garbage, soil, sand, etc.
2) Long stalk FFB is the stalk of the bunch that has a length of more than 2 cm.
3) Separating ripe fruit or according to the criteria for TBS, mengkal and rotten fruit (through ripe).

Figure 2.2 Sorting

2. Loading Ramp

Loading ramp is a place where FFB is poured by a transport truck for a while before being distributed into the lorry, and at the bottom of the ramp lies a door that is driven by an electric motor with a hydraulic system, which will then be distributed into the lorry using an elevator. The function of the loading ramp is:

a. As a temporary storage area for FFB
b. As a place to filter dirt
c. As a place for pouring FFB into the lorry
d. To ensure continuity of processing on the loading ramp using the FIFO (First In First Out) system

Figure 2.3 Loading Ramp

a. Lori

Lori is a container used to load Fresh Fruit Bunches which run on the rail which will then be boiled in a sterillizer. After the lorry is filled, then the lorry will be pulled using Capstan by using wire rope (sling) as a towing rope. At KSI Ltd uses a lorry with the following specifications:

The length of the lorry : 400 cm
The width of the lorry : 250 cm
Lorry capacity : 7.5 Ton

b. Capstand / Winch

Capstand is a tool driven by an electro motor which functions to run or pull a lorry using wire rope.

c. Transfer Carriage

*Transfer Carriage*is a tool used to move the lorry from the filling rail to the sterillizer rail. The Transfer Carriage used at KSI Ltd is a Transfer Carriage with a gear box system. This Transfer Carriage is equipped with an electric motor as driving force which is channeled to the gear box then to the wheels on the Transfer Carriage.

3. Sterilizing Station

At the boiling station, Fresh Fruit Bunches are put into a stew lorry made of metal / steel plates with holes (cage) and immediately put into a sterilizer, namely a boiling vessel that uses pressurized steam.

The boiling process has several functions as follows:

a. To soften the pulp and make it easier to release the fruit from the bunch
b. To reduce water content
c. To facilitate the release of the pulp from the nut
d. To make it easier to remove the shell from the core
e. To inactivate lipase enzymes

KSI Ltd POM has 2 units of stew with a capacity of 45 tons of FFB each with a load of 6 lorries, each lorry has a capacity of 7.5 tons of Fresh Fruit Bunches. In boiling it is known as the system, namely; single peak, double peak and triple peak, which are usually used is a three-peak system (triple peak), because it is most perfect with the first peak pressure of 1.5 bar, the second peak of 2.5 bar and the third peak of 2.9 bar at a temperature of 110-145^{o}C with a boiling time of 90 minutes, while the interval is 60 minutes (the distance between the first stew and the second stew, the time for one cycle to boil the fruit is about 120 minutes.

Figure 2.4 Sterilizing Station

a. Cantilever Rail Bridge

This bridge functions as a place for the lorry to pass when entering or leaving the sterillizer.

Figure 2.5 Cantilever Rail Bridge

4. Tripple Mill Station

At this station, the boiled FFB is poured into the elevator (fruit carrier) into the thresher for further processing. In this process, the FFB that has gone through the boiling process is poured using a tool called the Hoisting Crane. In this process, the pouring of the lorry unit takes 5-10 minutes.

Figure 2.6 Tripple Mill Station

5. Thresher Station (Bantingan)

In the threser machine stage, the fruit that is still attached to the bunch will be separated using the principle of throwing, so that the fruit is released. The purpose of the threser machine is to separate the loose fruit from the bunch stalks. The tool used in this machine is a rotating drum (rotary drum thresher). The result of stripping (threshing) is not always 100%, meaning that there are loose fruits attached to the bunch stalks, this is what is called USB (Unstripped Bunch). At Kencana Sawit Indonesia Ltd Palm Oil Mill, there are 2-line thresher units.

Figure 2.7 Thresher Station (Bantingan)

a. Empty Bunch Conveyor (EBC)

Empty Bunch Conveyor is a tool that functions to carry empty fruit bunches from the thresher to the empty bunch elevators and the empty bunches will be taken to a temporary empty bin storage area before being transported again by truck to the plantation location which is used again as fertilizer.

b. *Bottom Cross Conveyor*

Conveyor this serves as a carrier of boiled loose fruit that leaves the thresher towards the Fruit Elevator.

6. Pressing Station

*Fruit*which has been transported by the fruit elevator using the backet then dropped to the fruit distributing conveyor. Here the fruit will be distributed to each digester.

Figure 2.8 Pressing Station

a. Digester

Digester is a kettle where the mixer uses a knife which serves to crush the fruit so that the pulp (Mesocrap) is separated from the seeds (nut) which will then be pressed to remove the oil from the mesocrap. The functions of the digester are:

1) To remove the pulp from the nut.
2) To crush the fruit so that it is efficient in the pressing process.
3) To increase the temperature of the pulp
4) To release oil cells from fruit flesh cells.
5) To drain some of the oil formed in the digester so as to reduce the pressing volume.

b. Screw Press

Screw Press is a tool used to separate crude oil from the pulp and seeds. This tool is in the form of a tube with holes in which there are two screws at the end of which there is a cone that can move back and forth hydraulically. The factors that affect its performance are as follows:

1) Worm screw press condition
2) Pressure and quality of fruit quality
3) Garbage
4) Press cleanliness
5) Crude oil is obtained and flowed to a clarification station to be purified or purified, while the pulp press is forwarded to the Cake Breaker Conveyor for further processing.

7. Refining Station

The oil that comes from the press station still contains a lot of impurities from the pulp such as mud, water and others. To get oil that meets the standards, it is necessary to purify the oil. This station consists of several processing equipment units to purify production oil, which include:

Figure 2.9 Clarification Station (Purification Station)

a. Sand Trap Tank

Sand Trap Tankis a tool that serves to separate the sand carried in coarse oil. The working principle of the Sand Trap Tank is separation based on specific gravity by means of deposition. The things that need to be considered are:

1) Crude oil temperature 90-95^{o} C.
2) Regular disposal of sand is carried out so that oil is not wasted.

b. Vibrating Screen

Vibrating Screenis a vibrating filter to remove fibers and impurities that are attached to coarse oil. The separated fiber and impurities will be brought directly to the bottom cross conveyor, while the filtered oil goes directly to the crude oil tank. To facilitate filtering, the vibrating filter is doused with hot water.

c. Crude Oil Tank (Crude Oil Tank)

This tank is used to accommodate crude oil that has been filtered on a vibrating screen. From this crude oil tank, crude oil is pumped into a continuous setting tank (CST) using a coarse oil pump. To keep the temperature or heat of the liquid under control at around 90^{o} to 95^{o}C, the addition of heat is given by injecting steam.

d. Continuous Settling Tank (CST)

CST serves as a place for the separation process between pure oil and sludge where the separation process occurs due to differences in density. This tool is in the form of an elongated rectangular tank equipped with several bulkheads to withstand oil retention and its conical base serves to streamline sand deposition. The oil will come out with an over flow system, while the sludge will come out with an under flow system.

1) The over flow system is oil out through a pipe located at the top of the tank. The lighter oil will rise to the surface and enter a pipe with a funnel-shaped head (the same as the one in the sand trap tank) and exit to the oil tank.
2) The under flow system is the sludge out through a pipe located at the bottom of the tank. Then the sludge goes up again and follows the pipe to the sludge tank.

e. Oil Tank

The function of the Clean Oil Tank is as a temporary storage place for oil before it is processed in Alvalafal as well as to deposit the dirt that is still attached to the oil. In a Clean Oil Tank the temperature must be maintained at 80-90oC. So that impurities that can affect the purity of the oil do not accumulate, then blow down regularly. The oil that has been separated in the separation tank, is stored in the heating tank (clean oil tank) and heated again before being further processed in Alvalafal (Oil Purifier). It is arranged to keep this tank full to keep heating at 80^{o}C to 90^{o}C. The heating system is carried out with a steam pipe in the form of a spiral or a steam pipe coil which is fed by steam and at the end of the steam pipe is equipped with a steam trap strainer. This tank is cylindrical with a conical base.

f. Vacum Dryer

This tool consists of a vacuum tube and 3 levels of steam ejector. Oil is sucked into the vacuum tube through the nozzle sprinkler due to the vacuum, and the oil is scattered into the vacuum tube with a temperature of 90 oC to 100 oC. The water vapor that is scattered (sprinkling nozzle) in the vacuum tube is sucked in by ejector 1, then sucked by ejector 2 (into ejector 2), the last remaining vapor is sucked in by ejector 3 and discharged into the atmosphere. The water formed in condensers 1 & 2 is collected directly in the hot water tank under the vacuum dryer (hot well tank) position.

g. Storage Tank

Oil from a vacuum dryer, then pumped into the storage tank (storage tank). This tank is the final storage area for CPO before it is sent to the buyer. In it is injected with steam at a temperature of 50^{o}-60^{o}C which aims to prevent the oil from freezing. Every day there is a quality test, the oil produced from the pulp is in the form of oil called Crude Palm Oil (CPO).

C. Sludge Processing

a. Sludge Tank

Sludge Tankis the tank where the sludge is for a while, before being forwarded to the vibrating screen. In the sludge tank there is also steam inflow. The desired temperature in this sludge tank reaches 90^{o}-95^{o} C, so that the oil particles that are still present in the sludge can be broken so that the oil droplets rise to the surface and the sludge is also resolved to facilitate the process in the slauge saparator. Then the sludge that has come out of the sludge tank will go to the vibrating screen.

b. Vibrating Screen

The function of the vibrating screen is to filter the oil that is still contained in the sludge. The way it works is the same as the previous

vibrating screen. It's just that here using only 1 filter. The sludge will exit and enter the sand cyclone.

c. Sand Cyclone

Sand Cyclone functions as a means of reducing the content of sand in the sludge before it is processed on the sludge separator machine so that the service life of the sludge saparator is longer. This tool works with a centrifugal system where the heavy fraction will drop down while the light fraction comes out from the top.

d. Sludge Buffer Tank

Buffertank serves as a sludge storage tank for bait to the sludge saparator with a capacity of 3 m and a tank plate thickness of 4.5 mm and is equipped with an overflow leading to the sludge tank.

e. Decanter

Decanteris a tool used to separate the oil contained in the sludge from the sludge tank, producing 3 products, namely solid, heavy phase and light phase. Decanter works on the basis of centrifugal force.

f. Reclaimed Tank

Reclaimed Tank it is a reservoir for oil that comes out of the decanter, while the sludge drain tank and recovery tank will then be pumped to CST for reprocessing.

g. Fat Fit

It is a place in the form of a tub which is made on the ground with plastered using cement to accommodate the heavy phase that comes out of the interior as well as the scattered oil. The Fat Fit is equipped with a manual skimmer that will be pumped into the sludge drain tank.

D. Kernel Plant (Seed Processing Station)

1. Cake Breaker Conveyor (CBC)

This tool functions to carry fibers and seeds (cake) and to chop the cake lumps from the press to the depericarper. This conveyor is

equipped with a carrier thread which is designed in the form of pedals which functions as a chopper for cake lumps.

2. **Depericarper**

Depericarperserves to separate the fiber from the nut and carry the fiber to fuel the boiler. The separation was carried out by suction of the fibrecyclone by adjusting the air lock. Suction is carried out with the principle of varying specific gravity where the lightest specific gravity (fibers) will be sucked in by the cyclone fiber, the sucked fibers are immediately brought into boiler fuel, and the heavy specific gravity will fall down and will go directly into the polishing drum.

3. **Nut Polishing Drum**

Polisihing Drumis a tool in the form of a rotating horizontal drum. This tool is equipped with a guide elbow that aims to direct the beans to the end of the drum. The function of the polishing drum is to clean the remaining fibers that enter and adhere to the nut.

4. **Wel Nut Transfer (Destoner)**

Nutwhich has been processed in the Nut Polishing Drum will enter the holes at the end of the Nut Polishing Drum then the Nut will fall to the bottom of the Well Nut Transfer (Destoner). The nuts will be brought to the Nut hopper with the wind suction generated by the blower. The seeds carried by the wel nut transfer will enter the Nut Grinding Drum. The Nut Grinding Drum is directly above the Nut Hopper / Nut Silo which functions to select the seeds that will enter the nut hopper.

5. **Nut Silo**

Nut Silo serves as a temporary storage place for seeds before being put into the ripple mill and as a place for arranging seeds to enter the rippel mill (nut hopper). Cleanliness of the chute in the nut hopper must be considered because it affects the nut silo output. Seeds or nuts are processed according to the rules, the process in the nut silo is used first in frist out (FIFO).

6. Ripple Mill

Ripple Millserves to break down the nut by grinding. The seeds from the nut silo will go into the ripple mill and will be immediately rotated and held with blades.

7. Winnowing I (LTDS I)

Serves to remove fine shells and dust. The winnowing suction is generated by the air lock working with the blower. The smooth shell is immediately brought in to fuel the boiler. Air flow occurs because of the suction from the blower which is driven by an electric motor from winnowing I, the air flow that will go to the blower and previously will go through the cyclone. The cyclone that separates the shell with the carrier air so that the shell fragments carried in the stream will separate from the air and fall down into the air lock and finally fall into the hopper leading to the buildup of boiler fuel.

8. Winnowing II (LTDS)

Winnowing II serves to separate the shell, the intact core and the broken core and carry the shell from the suction to the fuel from the boiler. This is done so that the kernel separation process is more perfect.

9. Claybath

Claybath is a tool to recite the core attached to the shell with a wet system, namely with the help of water media and also using calcium carbonate. In claybath, the core and shell will separate based on differences in density. Separation on claybath using water medium mixed with calcium carbonate.

10. Kernel Silo Dryer

Kernel Silo Dryerserves to reduce the water content contained in the core. Decreasing moisture content in the core is intended to prevent mold during storage. The temperature in the silo kernel ranges from 70^{o}-85^{o} C. This is done so that the drying on the core is perfect to the core. In the kernel silo dryer, the core is dried by blowing hot air from the Steam Heater. Then the blower blows hot air into the silo kernel. The aim is to

dry the kernel that is in the kernel, and to keep the palm kernel from increasing in moisture content.

11. Kernel Storage (Kernel Bin)

The storage tank functions to store the cores before they are sent out for sale. The storage tank is in the form of a large tank equipped with a fan so that moisture that is still contained in the core can escape and does not cause damp conditions in the storage, which in turn cause mold on the palm kernel.

E. Power Plant

1. Boiler

A boiler is a steam-producing pressure vessel in a palm oil mill which is likened to the heart of a factory. This is because the steam produced by the boiler is a potential source of steam energy to drive the turbine and the process requirements required by the factory. Therefore, the stability of the steam pressure in the boiler is a very important factor to consider for the success of the processing process. The fuel used for the boiler is shell and fiber produced by the factory itself.

2. Genset (Generator Set)

The generator is a petroleum-fueled generator. It is needed at the start of the process and also when the power generated by the turbine is not sufficient for the processing process. The generator is also needed to replace the role of the turbine when the factory is not processing.

3. Turbine

The steam turbine includes an energy conversion engine that converts the potential energy of the steam into kinetic energy at the nozzle and then converted into mechanical energy at the turbine blades mounted on the turbine shaft. The mechanical energy generated in the form of a turbine shaft rotation can be directly or with the help of a reduction gear connected to the mechanism that is moved. To produce electrical energy, the mechanism that is moved is the generator shaft.

4. BPV (Break Pressure Valve)

The steam output from the turbine is used for processing, therefore BPV is used to accommodate and distribute steam to each processing station. The steam pressure used in the treatment process is 3 kg / cm2, therefore if the steam at the BPV is less then the steam is sent directly from the main pipe through the by-pass valve.

F. Machinery & Equipment

PT. Kencana Sawit IndonesiaPalm Oil Mill has specifications for tools made from abroad to produce quality products by performing maintenance and checking on tools regularly. The following is a list of machines and equipment used at PTKSI:

Table 2.1 Machinery and Equipment Used in PTKSI Palm Oil Mill

No.	Tool's name	Function
1	Balance	A tool for weighing raw materials entering the factory with a scale of 50 tons.
2	*Loading Ramp*	As a temporary storage place for FFB, as well as a place to put oil palm into a lorry with a storage capacity of 300 tons.
3	Lori	As a container for the fruit to be boiled in a sterilizer with a capacity of 45 tons
4	*Transfer carriage*	Tool for distributing lorries from the fruit filling rail to the sterilizer place.
5	*Sterilizer*	Steam vessel in the form of elongated cylinders with a capacity of 6 lorries. Its function is as a place for boiling Fresh Fruit Bunches (FFB)
6	*Tipler*	A cutting tool and boiled fruit that has come out of the sterilizer to be poured on the bunch conveyor
7	*Bunch conveyor*	Transporting fruit and bunches, for the ethreser to carry.
8	*Threeser*	Its function is to separate the oil palm fronds from the bunches.
9	*Digester*	Serves as a place to knead and crush the palm meat.
10	*Screew Press*	Tool for pumping palm oil so that the palm oil on the pulp is separated.
11	*Crude oil gutter*	Tool for draining coarse oil that comes out of the press into the sand trap tank

12	*Sand trap tank*	Serves as a place to collect dirty oil from the juice.
13	*Vibrating Screen*	Serves to filter mud and dirt carried by crude oil.
14	*Crude oil tank*	Tool for the first oil after being filtered from a vibrating sceen.
15	*Vertical clarifier tank*	Tank that serves to separate oil, sludge, sand and water.
16	*Oil Tank*	Serves as a temporary shelter for crude oil from the Verticalklarifier tank.
17	*Sludge Tank*	Serves as a place to collect dirt from the separation from the Clarifier Tank.
18	*Sludge Separator*	Serves to separate oil, mud, and water based on the specific gravity of each component.
19	*Sludge buffer tank*	Serves to accommodate the sludge from the vibrating screen.
20	*Sludge drain tank*	Serves to accommodate sediment from each of the separation tanks at the clarification station to separate the oil from the dirt.
21	*Hot water tank*	Serves to supply hot water so that the oil does not freeze.
22	*Fat fit*	This tub is used to collect fluids that still contain oil from the clarification ditch, then pump it back into the sludge drain tank.
23	*Recovery*	Is a place in the form of a tub, serves to accommodate water, sand, sludge from the fat pit to be sent to the pond of the wastewater treatment plant (IPAL)
24	*Prurifier*	Serves to separate the water content, dirt from the oil that is inserted from the oil tank so that it produces cleaner oil.
25	*Vacum Dryer*	Serves to reduce and reduce water with a vacuum pump.
26	*Storeg Tank*	Temporary oil reservoirs that are ready to be marketed.
27	*Cake Breaker Conveyor*	Used for and drying slurry (fiber, nuts and other mixtures) from press stations which still contain water.
28	*Defericarfer*	Serves to separate fibers or dregs (vows) from seeds.
29	*Nut polishing drum*	As a place to clean dirt that is still sticky to the seeds.

30	*Wet Nut Conveyor*	A tool that serves to bring the polished nut to thenut transport fan and nut silo.
31	*Nut transfort fan*	Nut conveying device to the nut silo, by sucking it through the nut cyclone
32	*Nut silo*	Clean nut storage for the cracking process.
33	*Ripple Mill*	Serves as a means of breaking the seeds so that the palm kernel is separated from the shell.
34	*Creacked mixture conveyor*	Tool to transfer out the putriple mill to LTDS.
35	*LTDS*	Tool for separating, dust and other light materials from the core
36	*Clybath*	Tool to separate the shell from the core using calcium (CaC03).
37	*Wet Kernel Conveyor*	Tool that serves to transfer the kernel out of the vibrating mesh clybath
38	*Wet Kernel Elevator*	A tool that functions to carry the kernel from the wet kernel conveyor to the kernel silo
39	*Silo Kernel*	Tool for dryingand kernel shelters
40	*Fiber Cyclone*	The shelter of the shell before being passed on as boiler fuel.
41	*Kernel Storage*	Tool storage or hoarding kernel (core) prior to market

Source: PT KencanaSawit Indonesia, 2017

a. Healty safety work

KSI Ltd Palm Oil Mill applies K3 (Occupational Health and Safety) to every employee or worker, in order to protect themselves from unconscious dangers. The following is K3 which is applied at KSI Palm Oil Mill:

Table 2.2 Occupational Health and Safety Systems at KSI Ltd

No.	Occupational Health and Safety System
1	There is a symbol, picture or sentence prohibited in hazardous work areas (related to technical, safety and health considerations)
2	There is a barrier for entering confined spaces, (for example: when there is work in the tank with the main hole open, during breaks and the work has not been completed, it is necessary to provide an entry barrier on the main hole so that no one can enter it)
3	Handrail is available on a ladder, track or platform if it is more than 4 steps, and is available on both sides of a ladder, track or platform that is 2 lanes or on stairs that are used for emergency conditions
4	Work at height (including workers operating on the top of a tank truck or roof of buildings without protective fences)

5	Fire extinguisher checklists in the field are available and updated (sample 5 checklists at different locations / plants)
6	Use a life jacket when working near deep water (2 meters from the end of the jetty)
7	A suitable fire extinguisher is available in each panel room
8	When the driver carries the load lifted by the forklift at the driver's chest level or higher, the forklift must go backwards
9	Maintenance and testing reports of safety and control equipment available and updated (such as bearing temperature monitors, motion alarams, pressure ratios in dust filters and process alarms) (Data: Maintenance reports for safety devices)
10	Carry out maintenance for connection equipment and electrical panels running (sample 3 items from the electrical preventive program and check field conditions)

b. Quality Management System (Optional)

KSI. Ltd Palm Oil Mill has the following quality management standards:

1) ISO 17025-2005
2) ISO 9001: 2008
3) SOP (Standard Operational Procedure) Indonesian Palm Oil Kencana.Ltd
4) Wilmar Group SOP (Standard Operational Procedure)
5) RSPO (Roundtable on Sustainable Palm Oil)
6) ISCC (International Sustainability & Carbon Certification)
7) RFS
8) ISPO (Indonesia Sustainable Palm Oil System)

G. Definition of Ripple Mill

Ripple mill is a tool used in palm oil mills for the processing of the core which functions to break the nut so that the core is released from the shell. In the ripple mill there is a rotor that rotates on the ripple plate at the stationary part. The seeds enter between the rotor and the ripple plate so that they collide and break the shell of the core.

Figure 2.10 Ripple Mill

At PT Kencana Sawit Indonesia, there are 3 Ripple Mill Units used, namely 2 Ripple Mill Units with a capacity of 6-8 tons and 1 Unit Ripple Mill 2.5 Ton.

H. The working principle of the Ripple Mill

Ripple Mill is a means of breaking mechanism by pressing the seeds with a rotor against a serrated wall and causing the seed to burst. The seeds that are inside the tool will experience a high enough impact frequency with both the serrated plate and the rotor so that this piculant frequency can shoot the seeds more easily. To ensure the continuity of incoming seeds and remain balanced with processing capacity, this tool is equipped with a bait regulator and a metal catcher.

The seeds from the nut silo enter the ripple mill to be broken down so that the core separates from the shell. The seeds that enter through the rotor will experience centrifugal force (away from the center of rotation) so that the seeds come out of the rotor and hit hard, causing the shell to break. The separated shell and core are transported by the craked mixture conveyor,

then the mixture is reacted to the elevator and processed for the next process to obtain palm kernel.

I. Ripple Mill Components

The main components of a ripple mill consist of several parts, namely:

1. Rotor

Rotor is a rotating machine part consisting of several component parts, namely as follows:

Figure 2.11 Rotor

2. Axle Rotor

*Rotor axle*is a shaft that is used as a load bearing for other components on the rotor. As a result of the axle rotor rotation, the rotor will rotate, the axle rotor rotation is a result of the motor transmitting its rotation to the axle rotor through the pulley and belt.

Figure 2.12 Rotor Ax

3. **Disc**

Discis one of the rotor components used as the position of the rotor bar. The disc is used as a clamp to the rator bar to keep it in position.

Figure 2.13 Disc

4. **Rotor bar**

Rotor baris a solid shaft that is shaped around the rotor which is used to place the palm kernels into the ripple mill. Furthermore, the rotor brings the seeds to rotate along with the rotor rotation to be broken.

Figure 2.14 Rotor Bar

5. **Ripple Plate**

Ripple plate called the crusher wall. The seeds that are carried around by the rotor will be thrown under pressure against this wall, causing the seeds to split. The ripple plates are serrated against the walls to create pressure on the beans.

Figure 2.15 Ripple Plate

6. **Bearings**

   Bearing in the ripple mill it is used to support the axle rotor is loaded, the force that will be caused by the axle rotor only results in a radial force so that the only radial bearings are two (2) on the two sides of the rotor axle support.

Figure 2.16 Bearings

7. **Ripple side**

   Ripple side is the cover of the ripple mill so that the seeds that enter the ripple mill can come out before it breaks.

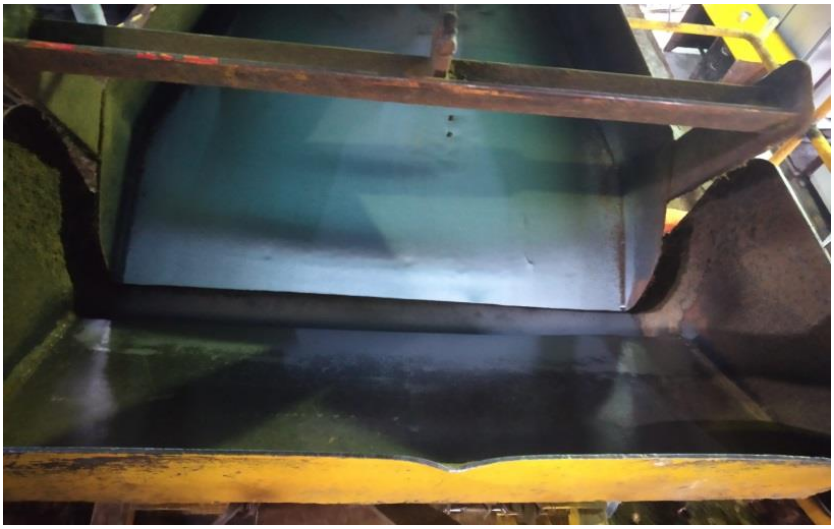

Figure 2.17 Ripple Side

8. Electric motors

Electric motor(activator) functions to convert electrical energy into mechanical energy. In terms of designing a ripple mill machine, the rotation of the electric motor has previously been adjusted accordingly.

Figure 2.18 Electric Motor

9. Bearings

Serves to support the load shaft, so that its rotation or back and forth movement can take place smoothly

Figure 2.19 Bearing

10. Vanbel

Serves to help move the ripple mill using a motor

Figure 2.20 Vanbel

J. Definition of Maintenance

Maintenance is an action that is carried out on a tool or product so that it is not damaged, actions taken include adjustment, lubrication and checking of lubricants. Types of maintenance :

5. Preventive maintenance

Scheduled and planned maintenance. This aims to maintain component function by controlling equipment components and preventing deterioration of tool function.

6. Predictive maintenance

Predictive maintenance of the function of the tool by measuring and evaluating the tool.

7. **Corrective maintenance**

   Maintenance that has been planned is based on the feasibility of a predetermined operating time on the tool. This maintenance aims to restore the function of the tool.

8. **Break down maintenance**

   Maintenance that is not planned in advance, where there is damage to the equipment and to repair it, spare parts, materials, tools and labor must be prepared.

9. **Design out maintenance**

   The maintenance is carried out based on trend analysis of the machine data.

5. **Maintenance (Maintenance)**

   The Big Indonesian Dictionary defines maintenance as safeguarding wealth, especially production equipment so that it is durable and remains in good condition. So the aim of maintaining machines and equipment against damage and failure of machines in production. In general, the word maintenance will not be separated from the work of repairing, dismantling, or checking the machine thoroughly and thoroughly (Maintenance, Repair, and Overhaul - MRO). The maintenance system itself includes the notion of repairing damaged mechanical and or electrical devices.

   Maintenance also means taking routine actions to maintain the device (known as scheduled maintenance) or prevent interruptions (preventive maintenance). Thus MRO can be defined as, "all actions aimed at maintaining or restoring a component or machine in an ideal state in order to carry out its functions according to the needs of the company. Its actions include a combination of all appropriate managerial technical, administrative and supervisory measures."

   Neither machine nor equipment can produce forever, some survive or perform to operational standards. Maintenance requirements are generally also based on real failure predictions or ideal standards.

Every time we fail to perform maintenance activities as requested by the equipment designer, it will shorten the operating life of the equipment. Over the past few years, different approaches to how maintenance can be taken to ensure equipment reach or exceed the company's design life have been developed in industrialized countries. Apart from waiting for an equipment to fail (reactive maintenance), we can take advantage of preventive maintenance, predictive maintenance, or reliability centered maintenance.

6. Maintenance Purpose

Every type of maintenance activity has a purpose. In general, the purpose of doing maintenance is to maintain the condition and / or to repair the machine so that it can function according to business objectives. Accepted conditions are suitable for machines capable of producing products according to standards, namely meeting tolerances of shape, size and function. However, in general the main objectives of maintenance are:

a. Ensuring the optimum availability of the right equipment in order to meet the planned production activities and the production process can obtain maximum investment return.
b. Extend the productive life of a machine at work,
c. Ensuring the availability of all equipment needed in an emergency.
d. Ensuring the safety of all people who are in and use these facilities.

K. Maintenance and repair of the Ripple Mill

The maintenance system in a factory is closely related to the productivity itself, because it is with avaibility (level of readiness). A good machine allows production to run well with this ripple mill machine.

Repair a damaged or problematic ripple mill by replacing the damaged parts by dismantling one by one from start to finish until the ripple mill can be used again.

If there is damage to this machine, the production of palm kernel will

experience a decrease (interference), therefore routine and regular maintenance is the only way for the palm kernel production process to run well. The maintenance and repair of this machine generally aims as follows: Extends the life of these machines; Avoiding distractions from processing; Minimizes repair costs and Improve engine efficiency

L. Parts where frequent breakdowns occur

1. Steel rod

The damage that usually occurs to the steel rod is that there is frequent thirst, so the steel rod must be replaced. The replacement of the stell rod is by removing the rotor from the ripple mill and then replacing the steel rod with a new one. The change of steel rod is usually after 300 hours of ripple mill running. operation.

Figure 2.21 (Steel Rod repair)

2. Vanbel

vanbel that is not suitable for use must be replaced, namely by opening the vanbel from the motorbike and then replacing the vanbel with a new one.

Figure 2.22 (Vanbel Repair)

3. Bearings

Changing the bearing by opening the bolt on the bearing housing, then opening the bearing adapter then removing the bearing and bearing housing that is attached to the axle / shaft. Then removing the bearing from the bearing housing then replacing the bearing with a new one.

Figure 2.23 (Bearing Repair)

4. motorcycle

Replacing the motor in the ripple mill by turning off the program in the ripple mill. Then replacing the motor with a motor that can be used. The role of the motor ripple mill is very important, because the motor is the driving machine of the ripple mill, if the motor is damaged then the ripple mill cannot function.

Figure 2.24 (Motor Repair)

5. Causes of Damage to the Ripple Mill

There are several causes of damage to the Ripple Mill;

a. Operator

The operator is also one of the causes of damage to the ripple mill, because when the ripple mill is operated the operator is not in a position to observe the ripple mill operating normally or not.

b. Foreign object

Foreign objects carried over from the harvest location are also among the causes of damage to the ripple mill, such as stones, wood, scrap metal, and so on.

c. Fruit

Fruit can also cause damage, such as dura fruit where this fruit has a thick shell, causing damage to processing machines.

d. Material Quality

The quality of the material that is not good can be the cause of the short service life.

CHAPTER VI
CONCLUSION

A. Conclusion

1. The speed at which the motor ripple mill rotates greatly determines the results of breaking and separating the shell and carnel.
2. The thickness of the shells on the karnel greatly affects the shell breaking process
3. Ripple Mill is a palm oil processing machine that functions to break and separate the oil palm shell from its core

B. Advice

1. In order to get better results, the discipline of the workforce must be considered, and the operation of the equipment is in accordance with the specified factory SOPs.
2. It is better if supervision is carried out before the process, the process is carried out properly and thoroughly. So that the desired goals can be achieved perfectly.

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Format Nilai Akhir PLI

Isikan Nomor Seksi mata kuliah				
7	0	0	7	5

DAFTAR NILAI MAHASISWA
MATA KULIAH PENGALAMAN LAPANGAN INDUSTRI
SEMESTER ....Januari - Juli.....

Nama Dosen Pembimbing: Drs. Purwantono, M.Pd
Jurusan : Pend. Teknik mesin

No.	Nama Mahasiswa	NIM/TM	Nilai Supervisor	Nilai Dosen Pembimbing	Total (Nilai Akhir Dan Huruf)
	Arief wicaksono	16067039	80	90	85 / A

Padang, 07 - 06 - 2020
Dosen Pembimbing,

(Drs. Purwantono, M.Pd)
NIP: 19630804 198602 1 002

-Nilai Supervisor dan Nilai Dosen Pembimbing di ambil dari format yang khusus untuk itu.
-**Nilai Akhir** adalah Nilai Rata- Rata dari jumlah Nilai Supervisor dan Dosen Pembimbing (*dalam bentuk Angka dan Huruf)*

LEMBARAN PENILAIAN DOSEN PEMBIMBING TERHADAP MAHASISWA PLI

Nama Mahasiswa (Praktekan) : Arief wicaksono NIM. 16067039
Jurusan : pendidikan teknik mesin
Judul laporan : .....
Nama perusahaan/industri : PT. kencana sawit Indonesia
Jadwal kegiatan : .....s.d.....
Nama dosen pembimbing : Drs. Purwantono.

Ketentuan:

1. Sasaran penilaian adalah kemampuan mahasiswa menghasilkan laporan PLI yang sesuai dengan persyaratan yang ditetapkan pada bagian penulisan laporan.
2. Kualitas fisik buku laporan dan faktor lain yang tidak menggambarkan kemampuan mahasiswa menulis laporan tidak termasuk komponen yang dinilai, tetapi di tuntut sebagai persyaratan pengeluaran nilai PLI.
3. Penilaian dilakukan secara menyeluruh dalam arti harus dipisah menurut isi laporan.

Pelaksanaan: Skor atau biji nilai diperoleh dari pengisian kolom *range penilaian* berikut:

ASPEK YANG DINILAI	RANGE PENILAIAN					
	Mengulang <65	Cukup Baik (65-69)	Baik (70-74)	Baik Sekali (75-79)	Sangat Baik Sekali (80-84)	Dengan Pujian (85-100)
1. Penggunaan kaidah penulisan karya ilmiah di dalam bahasa Indonesia						95
2. Kemampuan menyerap dan menginterprestasikan informasi ide petunjuk yang diberikan oleh dosen pembimbing						90
3. Kemampuan mengemukakan dan mempertahankan ide secara sistematis selama melakukan konsultasi laporan PLI dengan dosen pembimbing.						95
4. Kemampuan menentukan sendiri kejanggalan yang terdapat pada tulisan (Isi laporan).						85
5. Inisiatif mengemukakan dan melengkapi data/informasi yang diperlukan.						85
Jumlah Skor	=	=	=	=	=	450
Total skor (jumlahkan semua *Jumlah Skor*) =						450

BIJI NILAI Dosen Pembimbing = $\frac{\text{Total Skor}}{5} = \frac{450}{5} = 90$

Catatan:

1. Isilah kolom penilaian dalam bentuk *angka* sesuai dengan *range penilaian.*
2. Lembaran penilaian ini harus diserahkan ke Kantor Unit Hubungan Industri (UHI) bersama Laporan Akhir PLI (sesudah diisi oleh Dosen Pembimbing)

Padang, 07 - 06 - 2020
Dosen pembimbing

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