INDUSTRIAL TRAINING FIELD REPORT

NAME	NUR ADLEENA BT KHAIRUL NIZAM
PROGRAMME	DIPLOMA IN CHEMICAL ENGINEERING
ID	2018659102
LI DURATION	22 MARCH 2021 TO 15 JULY 2021

SUPERVISOR	MOHD ADZIM WAZAN BIN APIT APANDI
COMPANY ADDRESS :	PUSAT TEKNOLOGI KILANG SAWIT (POMTEC), P.O. BOX 5, KM 16 JALAN LABU, 71900 LABU, NEGERI SEMBILAN, MALAYSIA

TABLE OF CONTENTS

1.0 INTRODUCTION

My industrial training takes place at the Sime Darby Labu Palm oil mill in Labu, Negeri Sembilan. During my industrial training, I was supervised by Sir Adzim Wazan Bin Apit Apandi, the mill's senior assistant manager. He is really helpful, and I had a pleasant time working under his supervision.

Throughout my industrial training, I learned about the process flow and machinery involved in the processing of fresh fruit bunch to produce Crude palm oil (CPO) and Palm Kernel. I was also given the opportunity to learn about the laboratory testing that takes place at this palm oil mill.

2.0 CONTENT

2.1 ORGANIZATION CHART AND HISTORY OF THE COMPANY

2.1.1 HISTORY OF THE COMPANY

Sime Darby Plantation has its roots in the nineteenth century, when pioneering English planters developed rubber plantations in Malaya. Among those pioneers were Alexander Guthrie, Daniel and Smith Harrison, Joseph Crosfield, William Sime, and Henry d'Esterre and Herbert Mitford Darby, who founded three great companies (Kumpulan Guthrie Berhad, Golden Hope Plantations Berhad, and Sime Darby Berhad) that merged in 2007 to form the Sime Darby Group.

Sime Darby Plantation (SDP) was founded as the Sime Darby Group's plantation and agri-business arm in 2007, representing one of the Group's five main Divisions and it is involved in the following:

- Oil palm plantation
- Agribusiness and Food
- Research and Development.

For more than a decade, SDP has evolved from a fully integrated global plantation company to the world's largest oil palm plantation company (by planted area) and the world's largest producer of Certified Sustainable Palm Oil (CSPO). Sime Darby Plantation is one of the world's largest palm oil producers, producing approximately 2.3 million tonnes of crude palm oil (CPO) annually.

Upstream operations include oil palm plantation development, oil palm cultivation, estate management, and milling of fresh fruit bunches (FFB) for CPO and CPKO. The total landbank is currently 860,454 hectares, of which:

a. Malaysia: 349,374 hectares
b. Indonesia: 294,862 hectares
c. Liberia: 220,000 hectares

Sime Darby Plantation has 58 Strategic Operating Units (SOUs) in all three countries, comprising 205 estates with a total planted hectarage of 534,245 ha, 59 mills, and 14 refineries and crushing plants.

The Labu Palm Oil Mill is located within the Labu Estate, which is located at Pusat Teknologi Kilang Sawit (POMTEC), 71900 Labu, Negeri Sembilan, Malaysia.

Labu Estate and New Labu Estate are the supplying base estates for the mill.

Labu Estate, located in the Malaysian state of Negeri Sembilan's Labu district, is divided into two divisions.

a) Ampar Tenang Division

b) Labu Division

It began as a rubber and tea plantation in the 1930s and is now entirely planted with oil palm.

The Seremban-Nilai Highway separates New Labu Estate from Labu Estate in the same area. It consists of two divisions:

a) New Labu Division

b) Kirby Division

2.1.2 ORGANIZATION CHART

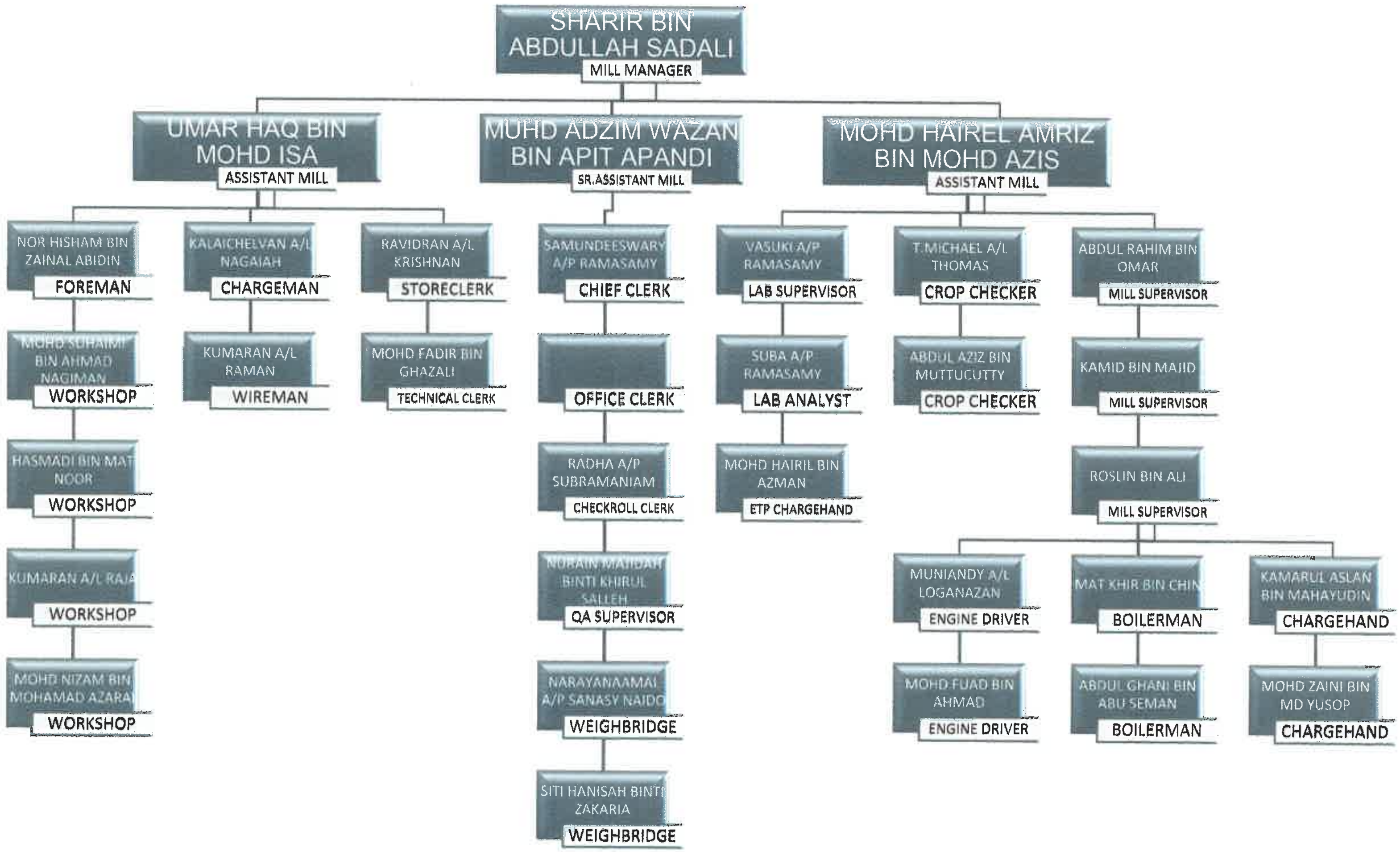


Figure 1 Labu Palm Oil Mill Organization Chart

2.2 PROCESS FLOW

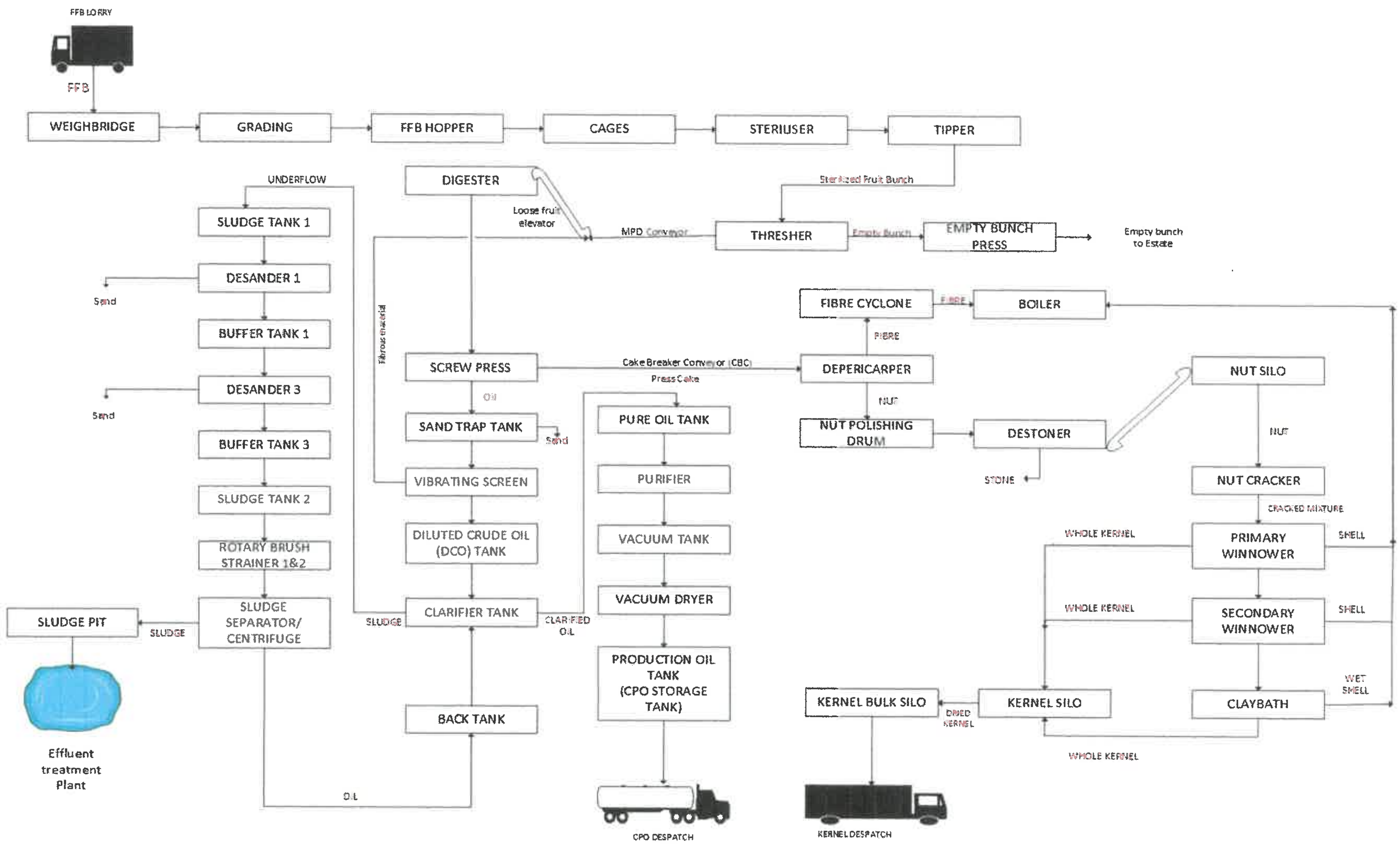


Figure 2 Process Flow Diagram

2.2.1 RECEPTION STATION

The Fresh Fruit Bunch (FFB) is delivered to a mill in trucks or trailers. They will be weighed over a weighbridge before entering the mill.

All FFB received at the mill will be issued a weighbridge ticket and delivery note that includes transport references such as transport instruction, lorry number, driver's name, and identification details. Because the weighbridge system is computerized, the weighbridge clerk cannot change the information once it has been keyed in.

The procedures is applied to the reception of fresh fruit bunches (FFB), the despatch of Crude Palm Oil (CPO), the despatch of kernels, and the despatch of EFB.

FFB truck on the weighbridge

2.2.2 FRUIT HANDLING STATION

The grading will be done when the vehicle arrives at the loading ramp. Fifty samples of FFB will be chosen at random from the FFB tractor or trailer. The sampled bunches will be assessed, graded, and recorded. The mill should grade 30% of the FFB that it receives.

Because all of the FFB comes from Sime Darby's oil palm estates, if there is an excess of low-quality FFB, such as unripe, rotten, long stalks, and empty fruit bunches, the grading record will be sent to the estates as feedback.

FFB lorry unloading the fruit

Assessing Crop Quality

Ripeness

1. **Unripe Bunch**
    - 0 Detached fruitlets
    - Retted- Unripe Bunch that are kept and left for several days after harvested before sending to the mill
2. **Under Ripe**
    - 1 to 9 fresh socket from fully developed fruit
3. **Ripe Bunch**
    - More than 10 sockets from fully developed fruits
4. **Over Ripe**
    - More than 50% of fruitlets detached from the whole bunch
    - At least 10% fruitlets still attached to the bunch
    - No penalty for over ripe bunch
5. **Empty Bunch**
    - More than 90% fruitlets detached from the whole bunch.

Long stalk

More than 5 cm in length measured from the bunch shoulder

Freshness

1. Same Day – harvest and send on the same day

2. Overnight – harvest and send the next day
3. Old crop – harvest and sent after two days

Rodent

Bunch with 20 or more fruitlets nibbled (possibly by rats or squirrels)

The purpose of FFB grading is to evaluate crop quality and calculate the OER deduction. The FFB Grading System automatically calculates the OER deduction. The system calculates the OER for each supplier at the end of the month using the OER deduction.

Benefits:

- To improve the quality of FFBs supplied to the mill
- To improve the production quality of Crude Palm Oil (CPO)
- To improve the efficiency of Oil Extraction Rate (OER) and Kernel Extraction Rate (KER) at the mill.
- To provide an independent assessment of FFB quality to contributing estates/suppliers.

In Labu Palm oil Mill, **Mobile FFB Grading System (MFFBGS)** is applied.

The Mobile FFB Grading System is designed to assist the Quality Assessor in carrying out the FFB Grading activities and to speed the recording process so that all interested parties can take action faster.

Tablets are used to enter data and view reports. The tablets are linked to the ramp's WIFI equipment, which are managed by the GSC-IT Network Team. The mobile application is currently being developed on the Android platform.

Loading Ramp

The FFB will be placed into the cages through the use of the hydraulic operating door once the fruit has been graded. The door's hydraulic cylinder is manually operated by operating the directional valve with a mechanical lever.

The loading ramp is built using a sliding technique that allows the FFB to flow from a higher to a lower position before being collected in one section and transferred to the cages through hydraulically operated doors. The loading ramp utilizes a sliding approach in which the FFB is slid into the cage by gravity.

Side and top view of the loading ramp

The cage that has been loaded with FFB on the door ramp will be transported to the sterilizer. The cage will be manually pulled by a capstan and pull ropes. One cages could transport 5 tons of FFB.

Operator pulling the cages into the sterilizer

2.2.3 STERILISATION STATION

Sterilization makes the fruits' lipases inactive and prevents the formation of free fatty acids (FFA). Additionally, steam sterilizing the Fresh Fruit Bunches (FFB) makes separating the fruits from the bunches easier. It also softens the fruit mesocarp, enabling better digestion and oil release, and conditions nuts, preventing kernel breakage.

Steam is injected directly into the FFB during sterilization to both heat it and remove air. This method removes external impurities while softening and detaching the fruits from FFB, separating the kernels from the shells, and deactivating the enzymes that cause free fatty acid formation.

This mill has two sterilizers in total. The working pressure of the sterilizer is 42 psi. One cycle takes about 90-97 minutes. The time, however, varies according to the quality of the FFB and the pressure of the boiler's available steam. If the boiler is unable to provide enough steam pressure, the sterilizing time will be extended. The sterilizer can process up to six cages at the same time. Each cage can hold up to 5 tons of FFB. When there are unstripped bunches and hard bunches, it indicates that the sterilization is not complete, extra sterilizing time should be given for the following batch of sterilization to ensure that the bunches are entirely sterilized.

Horizontal Sterilizer

Triple peak sterilizing is utilized in the sterilization process at Sime Darby Labu Palm oil mill. During the first peak, steam flows into the sterilizer until the vessel pressure reaches approximately 25 psi (P1). After that, the steam inlet valve is closed, and the condensate and steam exhaust valves are opened, allowing the pressure to drop to atmospheric pressure. After that, the exhaust valve is closed again, and the steam inlet valve is opened. After 2 minutes of blowdown (P4), close the condensate valve and allow the pressure to increase to 35 psi (P2). To allow the pressure to drop to atmospheric pressure, the steam inlet valve is closed again, and the condensate and exhaust valves are opened. The procedure is repeated, this time allowing the pressure to rise to 40 psi (P3). When the first sterilizer has completed its holding phase (T4), the second steriliser will be ready to begin the first peak.

Screen Showing the Sterilization Process (Pressure and Time)

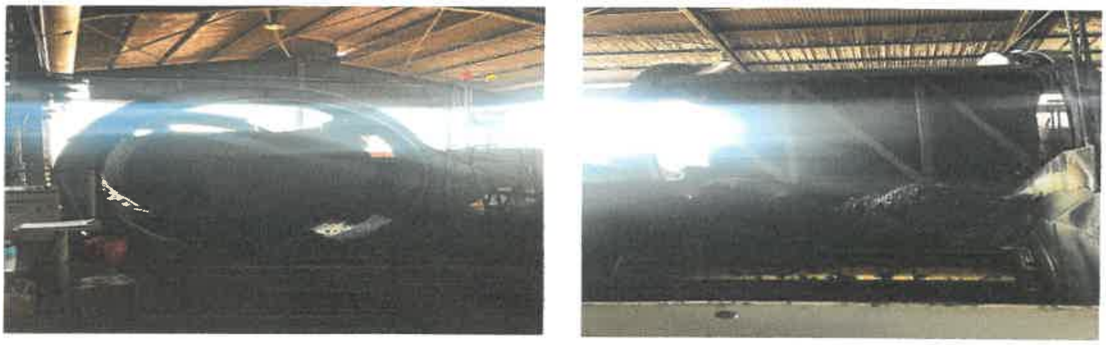
When the cycle is over, the light will turn on. If there is no more steam coming out of the bleeding valve, it implies the sterilizer's steam has been drained and it is safe to open.

Cages Inside the sterilizer

2.2.4 THRESHING STATION

Following sterilization, the sterilized fruits are stripped and separated from the bunch stalk in a rotary drum thresher. The process of separating sterilized fruits from bunch stalks is called as threshing. The sterilized Fresh Fruit Bunch (FFB) are fed into a rotating drum, which rotates to remove the fruits from the bunch.

After sterilization, the cages are transported to a Tipper, which is used to empty the cages by rotating 180 degrees and tipping the sterilized fruit out of the cage to transfer it to the thresher machine.



Tipper

The Rotating Drum Thresher is made up of a rotating horizontal cylindrical drum. The sterilized bunch is continuously fed in at one end, while the stalks are continuously fed out at the other. The drum's surface is made up of tee bars that run parallel to the cylinder's axis and are spaced far enough apart to allow the fruit to escape while preventing the stalk from passing through between them. After passing through the tee-bars, the loose fruit falls into the screw conveyor. The bunch is then lifted and lowered again, and the process is repeated until all of the fruits have been removed and the stalk will go to the end of the drum and dropped out. The thresher in this mill operates at a speed of 26 revolutions per minute.

Empty Bunch Press

2.2.5 PRESS STATION

After stripping, the fruits are heated in a digester to separate the mesocarp from the nuts.

Digesters

When the fruit is removed from the thresher, it falls into the conveyor and is transported to the bucket elevator. The bucket elevator then lifts the fruits to the top conveyor. The fruits will be transferred to each digester through the conveyor. When the first digester opening is entirely covered with fruits, the fruits on the conveyor will bypass the first digester and continue to the next digester, and so on.

The fruits are rotated, which causes the mesocarp to separate from the nuts. As the digested fruit is removed, the digester is refilled with freshly stripped fruit. There are five stirring arm pairs, each with a long and short arm. The stirring arms must be long enough to prevent dry material from accumulating on the digester wall. An expeller arm pushes the fruit out of the digester's closing chute at the bottom. The function of the stirring arms is to move the fruit, keeping it from lumping up at one location, to push the fruit downward to create pressure on the fruit surface, and to crush the fruit so that it may be pressed more readily later.

It is necessary to keep the digester at least three-quarters full. This is necessary to apply enough force to the fruits to allow the mesocarp to separate from the nut. The digester is kept at a temperature of 90-95 degrees Celsius. Labu mill has three digesters. The digested fruits will be fed into a screw press, which will compress the digested mash and squeeze off the oil

Digesters

Screw Press

Palm oil is extracted from oil palm fruits that have been digested in the digester by the press machine. The screw press is located directly beneath the digester. Labu mill has three screw press. The fruit is moved outward by a screw press, held in place by a press cage, and pressed on by a hydraulic press inside the press machine. The load on the press machine must be adjusted such that the maximum amount of oil is pushed out while minimizing kernel breakage.

A pipe positioned above the press transports hot water to the press cage. The flow of hot water into the press facilitates the flow of the oil pressed from the fibre. Too much water will reduce the performance of the cake breaker conveyor and add weight to it. The water must be managed such that the oil in the gutter retains a water percentage of 20 to 25%.

Screw Press

2.2.6 CLARIFICATION STATION

Crude oil from a screw press flows through an oil gutter and then directed to a sand trap tank, which is expected to trap (reduce) as much sand in the crude oil as possible before being delivered to the vibrating screen.

Sand Trap Tank

The purpose of this sand trap tank is to decrease the amount of sand in the oil that is discharged to the vibrating screen, thereby protecting the vibrating screen from coarse sand friction, which can cause screen wear.

Crude oil from pressing flows through the oil gutter and into the sand trap tank, where material with a higher density (sand) settles and will be drained. This equipment operates on the principle of gravity, which causes solids to precipitate. The lighter-density material (crude oil) will rise up and out through the overflow pipe to the vibrating screen.

Sand Trap Tank

Vibrating Screen

The vibrating screen is a machine that filters oil and sludge by separating impurities, dirt, and fibres that the sand trap did not separate. A vibrating screen is used before the diluted crude oil tank. The vibrating screen used in this mill is a Sweco vibro energy separator. Mesh sizes ranging from 20 to 40 per inch are used on the vibrating screen. The separated fibre, dirt, and pollutants will be returned into the digester in order to recover the oil. The crude oil and sludge will be pumped into the Diluted Crude Oil (DCO) tank.



Vibrating Screen

Diluted Crude Oil Tank

A diluted crude oil tank contains crude oil before it is transferred to a vertical clarifier. Pumps will pump the oil from the crude oil tank to the vertical clarifier, and the pump is triggered by a float, so that when the oil in the crude oil tank reaches a certain height, the pump will start running. To keep the oil and sludge from solidifying, steam will be pumped in to keep the temperature at 90 degrees Celsius.

Diluted Crude Oil Tank

Oil Room

The purposes of crude oil clarification are to ensure effective separation of pure oil from crude oil and maximum recovery of pure oil with the least amount of oil loss.

Vertical Clarifier

The clarifier is a huge vertical tank with a conical bottom. In the tank's center is an inlet line for the diluted crude oil (DCO). A vertical clarifier's objective is to separate oil, water, and sludge using gravity while minimizing oil loss in the sludge underflow The oil with the lowest density will be on the top layer, water with specific gravity = 1 will be in the middle layer, and sludge with density more than 1 will be at the bottom layer.

The oil accumulates to a relatively high depth of pure oil and continuously exits the tank through an adjustable oil skimmer. The sludge builds at the bottom of the tank and rises upward through a pipeline. The underflow pipe's discharge is set slightly lower than the set oil skimmer level.

Near the bottom of the clarifier, there is a pair of arms. The arm's job is to agitate the sludge, which aids in the separation of oil particles that have been trapped in the sludge. The arm is moving at a slow pace. The Clarifier tank also has a steam heating coil to raise the temperature of the sludge and oil in the tank. The temperature of the clarification tank content is controlled at around 90-95 degrees Celsius to enhance oil separation.

Clarifier Tank

Oil Flow

Pure Oil Tank

A pure oil tank stores and heats pure palm oil before delivering it to a vacuum drier. A closed heating coil is inserted in the tank to maintain the temperature of the oil.

Pure Oil Tank

Purifier

The crude palm oil from the pure oil tank will then be processed to remove contaminants using the purifier. Centrifugal force causes the lighter components (clean oil) to flow inwards and the water and impurities to flow outwards.

Purifier

Vacuum Dryer

To remove moisture from crude palm oil, vacuum dryers are utilized. The oil must be dried to a final moisture content of less than 0.20 percent as the final step in the oil recovery process. The oil will then be moved to an oil storage tank, and the procedure will be completed for the oil. The flow meter reading of the oil will be recorded to determine how much oil is being supplied to the storage tank

Vacuum Dryer

Storage Tank

The dried oil is transferred to a storage tank for storage before despatch. Because the oxidation rate of the oil increases with storage temperature, the oil is kept at 50°C using steam-heating coils to prevent solidification.

Storage Tank

Sludge Flow

Sludge Tank

Before the sludge is delivered to the desander, it is received and stored in the sludge tank with some oil that is still stuck with the sludge.

Sludge Tank

Desander

The desander's purpose is to separate the sand from the sludge prior to centrifugal separation. The desander consists of a pump and a stainless steel cyclone with a waste receiver attached beneath it. The sludge contains a significant amount of fine sand. It will cause rapid abrasive wear to the nozzle in the centrifuge stork if it is not removed.

The desander process at this mill is a two-stage desanding method. The sludge will be processed using the first stage desander, which will remove some of the sand. The sludge will then be put into a buffer tank and routed to a second stage desander to remove any remaining sand. The sludge will return to another buffer tank before being send to the rotary brush strainer for more sand filtering.

Desander 1 and 2

Rotary Brush Strainer

The rotary brush strainer is made up of a series of moving rotary brushes placed in a cylindrical body. It is used to remove heavy, abrasive particles from sludge before it enters the sludge centrifuge to protect it from erosion.

Rotary Brush Strainer

Sludge Centrifuge

The sludge centrifuge function separates the oil from the sludge in order to recover the oil losses in the sludge. The sludge will be discharged to the sludge pit and the recovered oil will be pumped back into the back tank. The mill has three stork centrifuges in total.

Sludge Centrifuge/Separator

Sludge Pit

Back Tank

2.2.7 KERNEL PLANT

Before separation, the screw press cake have hardened into a dense, well-compressed lump that needed to be broken up. The cake breaker conveyor is utilised to move the fibre and nut from the press to the depericarper , It also helps to loosen the press cake so that the nuts can be separated from the fibre. If the fibre and nut are not separated, the fibre will follow the nut to the drum, potentially jamming the machine.

Cake Breaker Conveyor

The cake breaker coveyor transports the press cake to a vertical column (depericarper) where air is directed to elevate the fibre to the fibre cyclone, where it will be used as a fuel for the boiler and separated from the nuts. The nuts will then be delivered to the bottom of the depericarper, where stalk pieces will be removed.

Depericarper and Polishing Drum

Fibre Cyclone

Polishing Drum

Before sending the nut to the nut silo, a destoner is used to separate the stone, steel, screw, and other impurities present in the nut.

Destoner

The nut from the nut polishing drum is transported to the nut silo through the use of the nut elevator; the nut silo is a vertical steam heating tank that holds polished nuts before they are sent to the nutcracker (ripple mill); the nutcracker (ripple mill) is located beneath the nut silo. The main purpose of the nut silo is to reduce the moisture of the nut by allowing it to dry in the nut silo before going to the ripple mill.

The ripple mill is a machine that cracks the nut in order to separate the kernel and shell. The nuts are fed into the ripple mill from the top, and as the rotor rotates, they are crushed and fractured against the rotor rods and stator. The cracking efficiency is expected to approach 98%. The quantity of broken kernels is always tracked because it contributes to kernel losses.

Nut silo and Nutcracker

Winnowing Column

The winnowing column separates the shell from the kernel using air current. The movement of air will blow open the shell, which holds some of the fibre in the mixture, and the kernel will fall to the conveyor. For more efficient kernel and shell separation, the Labu mill's winnowing column comprises two phases. The first stage is removing the fine fibre and shell fragments, while the second stage entails removing the shell and broken nut.


Primary and Secondary Winnower

Claybath

The clay bath's function is to separate the shell and kernel from the cracked mixture. The clay bath theory is based on 1.07 kernel specific gravity and 1.17 shell specific gravity. The kernels will float in a clay bath containing 1.12 specific gravity, while the shells will sink. After separation, the kernel and shell are washed in clean water to remove any clay residue that has remained to them.



Claybath

Kernel Silo

The kernel elevator transfers kernels from the wet and dry separation to the drying silo. Kernels must be dried to less than 7% moisture content. This is due to the fact that damp kernel rots quickly. The kernel silo will blow hot air into the kernel silo during the drying process. To heat the air, steam will be circulated through the system. The heated air is maintained at a temperature of 70 degrees Celsius. To complete the drying process, the kernel must be kept in the silo for at least 4 hours.

Kernel Silo

Kernel Bunker

The kernel will be transferred from the kernel silo to the kernel bunker after drying. Kernel bunker moisture should be kept below 6-7%, and admixture should be kept below 5-6%. The first in, first out system is utilised to preserve kernel quality and condition.

2.2.8 BOILER STATION

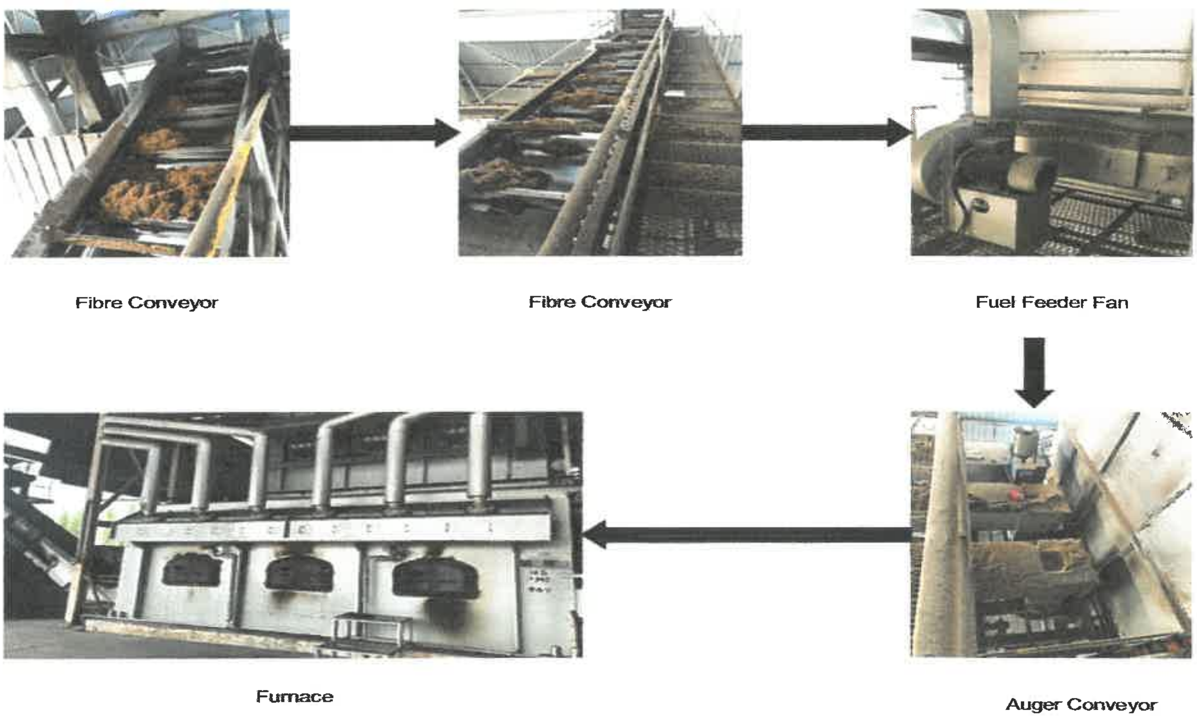
A boiler is a closed vessel that heats water or another fluid under pressure. The boiler is the most important section of the mill because it is the primary source of steam and aids in the operation of the turbine in the engine room.

The mill's boiler is that of the water tube type. Water tube Boiler is a type of boiler that generates steam by circulating water through tubes that are exposed to a heat source Water travels through the tubes and is heated externally by the fire. The fuel in the furnace is consumed to heat the water in the steam-generating tube. The water from the water drum will be heated in the mud drum. To generate steam, water tubes are lined up against the furnace's wall. After that, the heated water rises to the steam drum. The capacity of the boiler is 25 tons/hrs.

Fibre flow to the boiler

The fibre will enter the boiler as a fuel supply through a conveyor, the fibre will enter the auger conveyor and will be pushed to enter the furnace by using the fuel feeder fan.

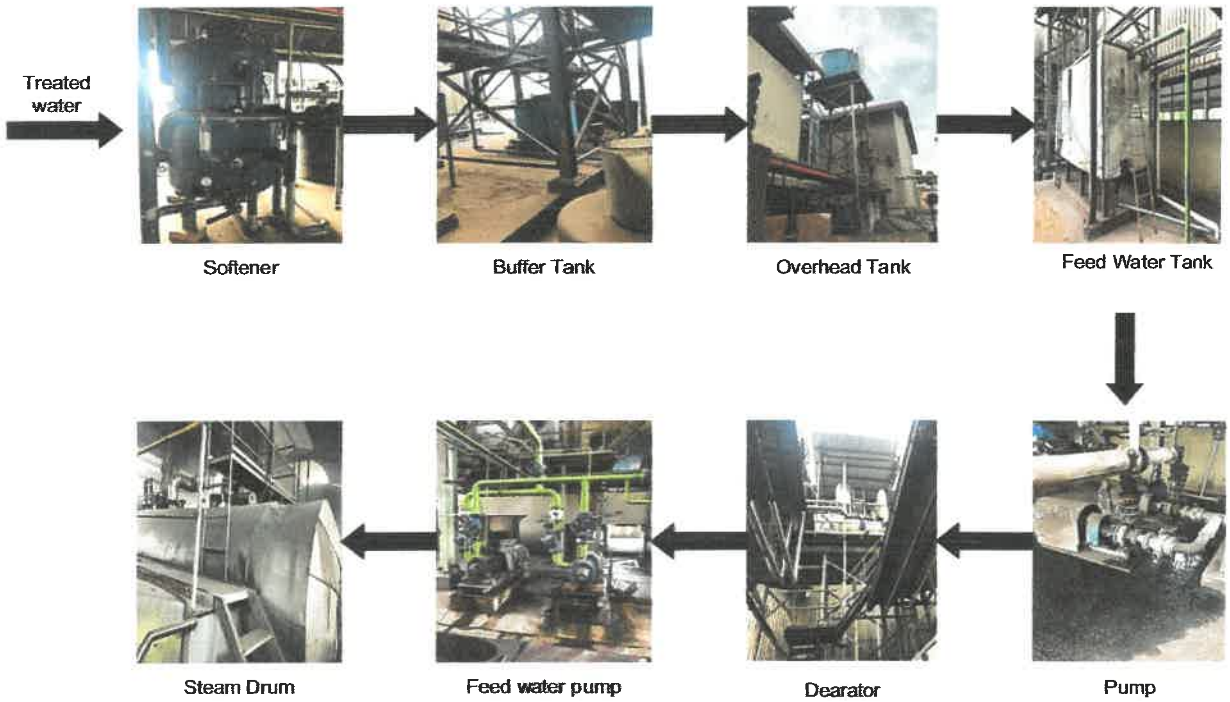
<u>**Fibre Flow**</u>



Water flow to the boiler

Water from the storage tank (from water treatment) Will be pumped into the softener tank and then goes to the buffer tank before being pumped again to the overhead tank, From the overhead tank, the water will go to the feed water tank where the water will then be pumped to the deaerator. From the deaerator, the water from the deaerator will go to the feed water pump and will be pumped out to the steam drum.

Water Flow



13 Important Fittings in a boiler.

13 Important Fittings in a boiler.

1.Safety valve
Automatically opens when the pressure increases past the preset pressure.
(22 and 23 bar)- 2 units

2.Main stop valve
Supply the generated steam to the turbine

3.Gauge Glass
Allows the maintenance person to monitor the required water level in the boiler.

4.Low water level alarm
Low water level alarms are required to shut down the boiler in the event of a lack of water in the boiler. A low level may be caused by a feedwater shortage in the feed tank.

5.Feed check valve
- To allow the feed water to pass/enters into the boiler.
- To prevent the backflow of water from the boiler.

6.Feed pump
Boiler feedwater pumps transport water into boilers using high pressure.

7.Pressure Gauge
A pressure gauge is used to indicate the steam pressure of the boiler.

8.Manufacturing Plate & 9.Registration Plate
Keep a record of the boiler's specifications, such as working pressure, testing pressure, operating temperature, design code, and date of manufacture.

10.Inspector test pressure gauge

11.Fusible plug
Protect the boiler from damage due to overheating of boiler tubes by low water level.

12.Blowdown Valve
Boiler blowdown is the removal of water from a boiler. Its purpose is to control boiler water parameters within prescribed limits to minimize scale, corrosion, carryover, and other specific problems.

13.Low water fuel cut out

Shut off the fuel or source of heat when the water drops below a predetermined, safe operating level.

Boiler Water Treatment

Chemical used for boiler water treatment and its function

- **N 8507 → pH booster (pH Adjustment)**

- To prevent corrosion and scale.

- **19 Pulv → Oxygen Scavenger**

- To control oxygen pitting corrosion

- **N 22312 → Anti-scalant (Scale Inhibitor)**

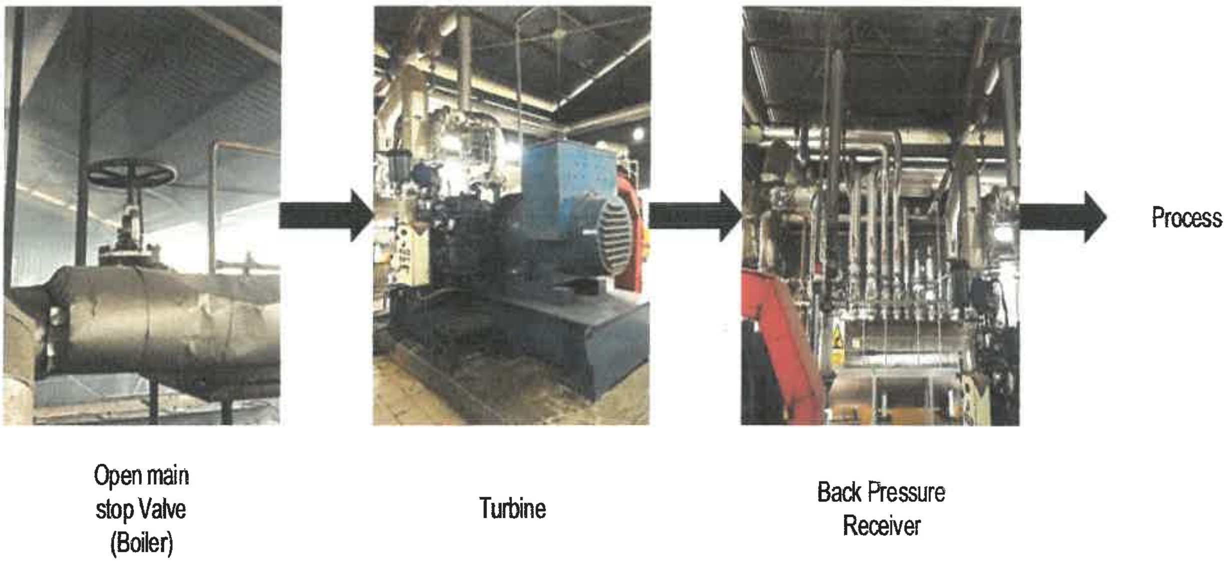
- To control scale which can further reduce the heat transfer efficiency and damage the system.

Boiler Water Control Parameter	
Boiler Water pH	10 to 11.5
Boiler Water TDS	< 2000ppm
Boiler Water P-Alkalinity	350 to 800 ppm
Boiler Water Sulfite (SO3)	30 to 80 ppm
Boiler Water Polymer	> 150ppm
Boiler Water Hardness	< 20 ppm
Boiler Water Chloride	500 to 800 ppm
Feed Water M Alkalinity	50 to 100ppm
Feed Water hardness	0 ppm

Boiler Water Chemical Tank

2.2.9 ENGINE ROOM

Turbines are machines that generate power using a steam generator. The turbine operates at high pressure and speed. When the boiler begins to generate sufficient steam pressure, the turbine will begin to operate. The steam produced by the boiler is not always consistent; at times, the steam pressure falls below the required steam pressure. If the turbine is operating at inadequate steam pressure, the revolving turbine will suck up water from the boiler alongside the steam. This might cause damage to the turbine blades. In that case, a power supply from TNB will be activated to reduce the load on the turbine.



Engine Room Process Flow

2.2.10 WATER TREATMENT PLANT

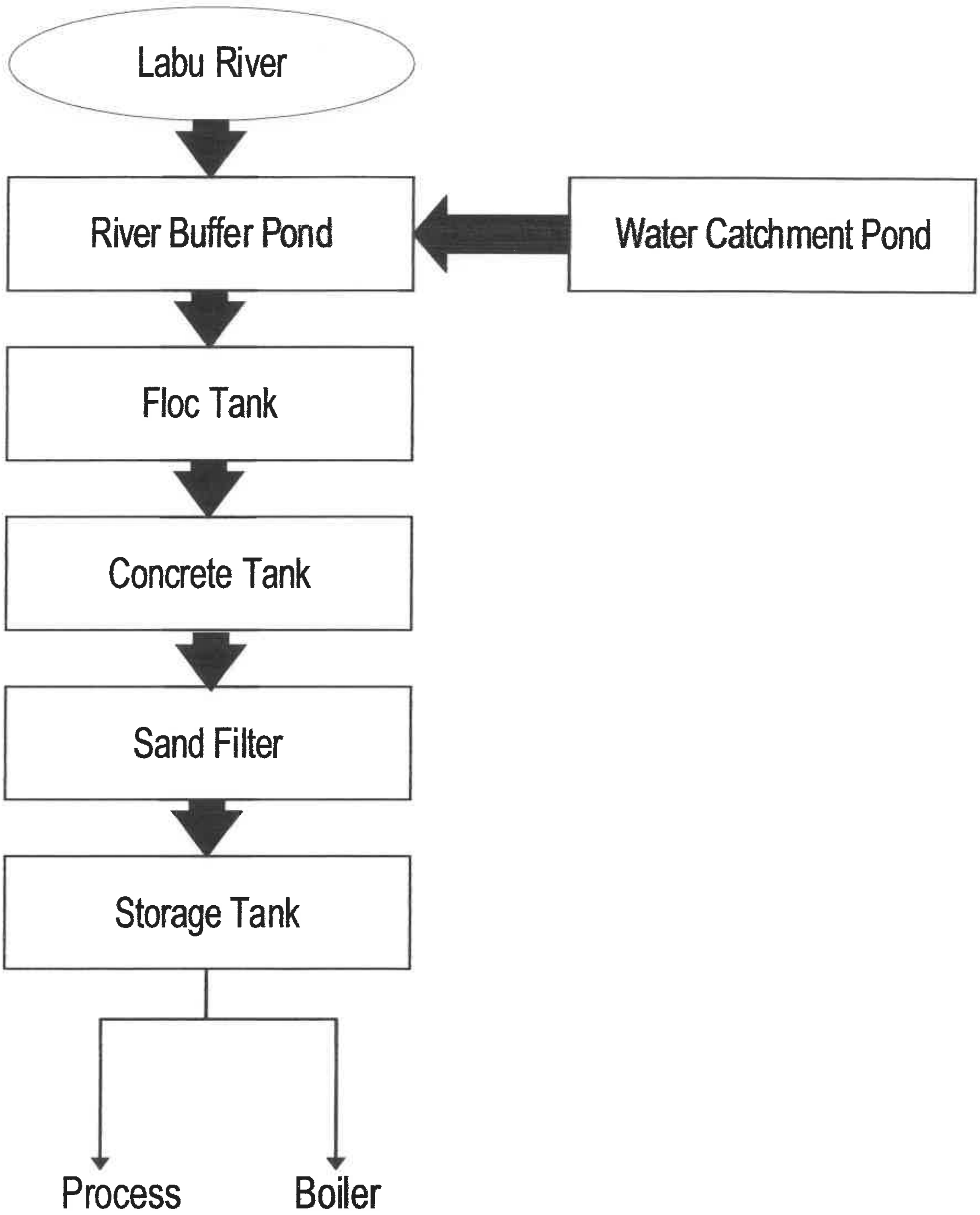
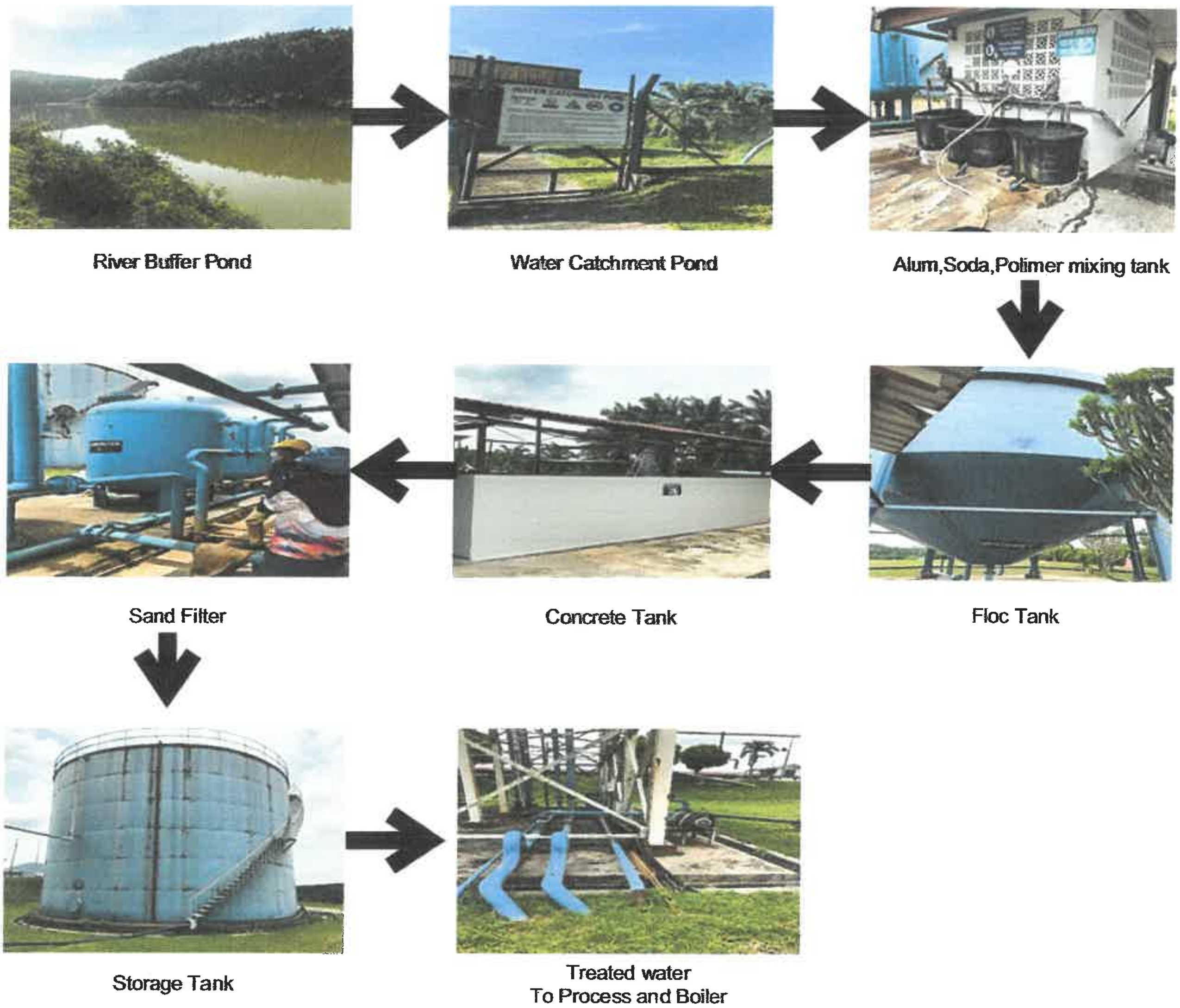
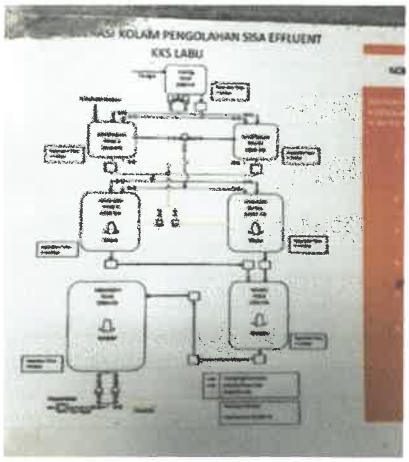


Figure 3 Water Treatment Plant Process Flow



Water Treatment Plant Process Flow

2.2.11 EFFLUENT TREATMENT PLANT



The mill's effluent is treated using a pond system. The Labu Palm Oil Mill effluent treatment plant has a total of seven ponds, which are as follows:

1. **One unit of Cooling pond**

Cooling Pond

2. **Two units of acidification pond**

Acidification Pond 1

Acidification Pond 2

3. Two units of anaerobic pond

Anaerobic Pond 1

1. Collect about 1 kg of pressed empty bunches. → 2. Immediately chopped the Empty bunches to about 1 inch thick using a sharp knife → 3. Place the chopped empty bunches inside a polythene bag.

Testing Method:

1. At the end of the process, Bulking and quartering will be done on the 2 hourly chopped samples to obtain 500 grams of sample. → 2. The 500 grams sample is finely chopped using a sharp knife to about 1 cm in length → 3. The finely chopped sample will be placed into a polythene bag labeled with the date. → 4. The polythene bag will be sent to the laboratory for oil loss testing using the NIR machine.

Test 2: ***<u>Test on Empty Bunch</u>***

(This test is done only when the empty bunch press is under maintenance.)

Sampling frequency: Every 2 hours

Sampling Point: Sample are taken from the empty bunch conveyor

Testing Method:

1. At the end of the process, Bulking and quartering will be done on the 2 hourly chopped samples to obtain 500 grams of sample. → 2. The 500 grams sample is finely chopped using a sharp knife to about 1 cm in length → 3. The finely chopped sample will be placed into a polythene bag labeled with the date. → 4. The polythene bag will be sent to the laboratory for oil loss testing using the NIR machine.

Test 3: ***<u>Presscake Test</u>***

Objective: To asses presscake composition

Sampling frequency: 1 kg sample every 2 hours

Sampling Point: The sample is taken in equal parts from three corners of the press screw outlet cones

Testing Frequency: Once Every day

Testing Method:

1. At the end of the process, Bulking and quartering will be done on the 2 hourly presscake samples to obtain 1 kilogram of the sample.
2. Weight the sample to the nearest gram
3. Do sorting (separate) the component on the press cake:
   - Fibre, whole nuts **(W2)**
   - Broken nuts, Broken kernel, Whole kernel, Loose Shell **(W3)**
   - Stone **(W4)**
4. Weight each of the separated components separately and calculate the whole nut and broken nut.
5. The fibre after sorting will be quartered down to 250 grams
6. The fibre will be Chopped using the copper and will be placed in a sealed polythene bag.
7. The polythene bag will be sent to the laboratory for oil loss testing using the NIR machine.

Calculation:

$$\% \textbf{ Whole Nut} = \frac{W2 + W3}{(W1 - W4)} \times 100$$

$$\% \textbf{ Broken Nut} = \frac{W3}{(W2 + W3)} \times 100$$

Test 4: Kernel In Cyclone Fibre

Objective:

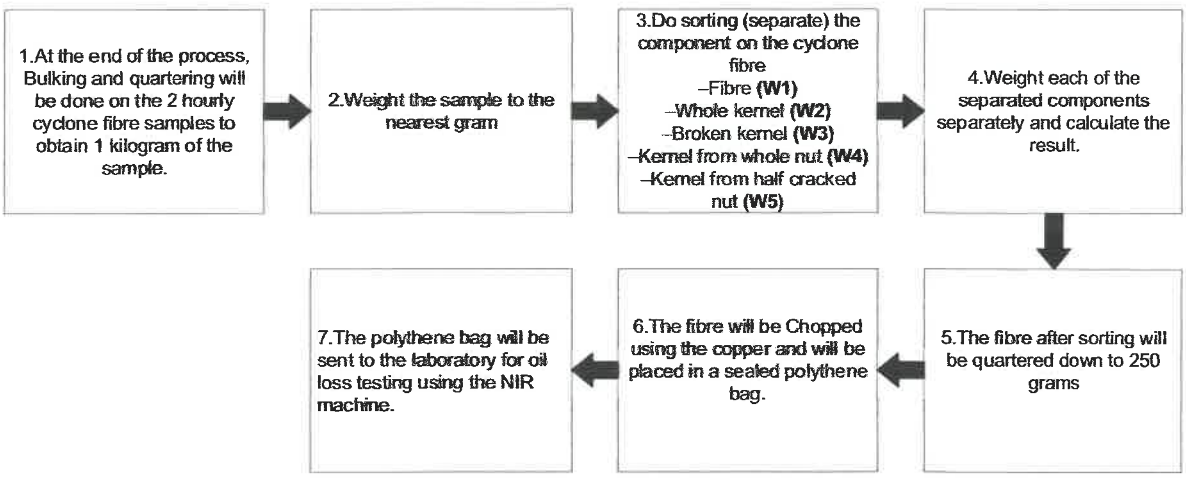
1. To control fibre and nut separation
2. To quantify kernel losses in Cyclone Fibre

Sampling frequency: 1 kg sample every 2 hours using a hand scoop.

Sampling Point: Cyclone fibre sampling point

Testing Frequency: Once Every day

Testing Method:



Calculation:

a. $\% \textbf{ Whole Kernel} = \frac{W2}{W1} \times 100$

b. $\% \textbf{ Broken Kernel} = \frac{W3}{W1} \times 100$

c. $\% \textbf{ Kernel from Whole Nut} = \frac{W4}{W1} \times 100$

d. $\% \textbf{ Kernel from Half} - \textbf{Cracked Nut} = \frac{W5}{W1} \times 100$

e. $\% \textbf{ Total Kernel loss in fibre} = \frac{W2+W3+W4+W5}{W1} \times 100$

Test 5: <u>Cracked Mixture Test</u>

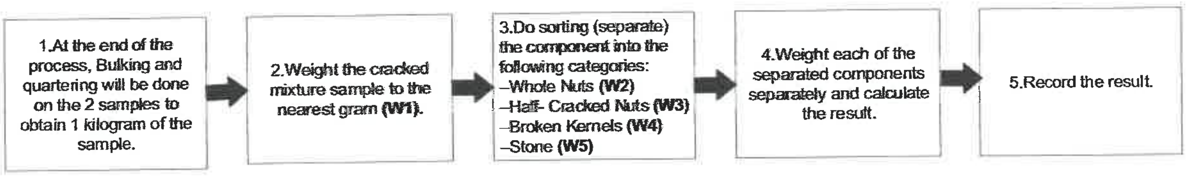
Objective: To asses efficiency of nut cracking.

Sampling frequency: 1 kg sample every 2 hours using a hand scoop.

Sampling Point: Nutcracker outlet

Testing Frequency: Once Every day

Testing Method:



Calculation:

a. $\% \textbf{ Whole Nut} = \frac{W2}{(W1-W5)} \times 100$

b. $\% \textbf{ Half} - \textbf{Cracked Nut} = \frac{W3}{(W1-W5)} \times 100$

c. $\% \textbf{ Cracking efficiency of each cracker} = \frac{100-(W2+W3)}{(W1-W5)} \times 100$

d. $\% \textbf{ Broken Kernel} = \frac{W4}{(W1-W5)} \times 100$

Test 6: <u>Kernel in Claybath Shell</u>

Objective: To quantify kernel loss in the claybath shell.

Sampling frequency: 1 kg sample every 2 hours using a hand scoop.

Sampling Point: Claybath shell Discharge chute

Testing Frequency: Once Every day

Testing Method:

1. At the end of the process, Bulking and quartering will be done on the samples to obtain 1 kilogram of the sample

→ 2. Weight the sample to the nearest gram **(W1)**.

→ 3. Do sorting (separate) the component into the following categories:
-Stone **(W2)**
-Whole Kernel **(W3)**
-Broken Kernel **(W4)**
-Kernel from whole nut **(W5)**
-Kernel from half cracked nut **(W6)**

→ 4. Weight each of the separated components separately and calculate the result.

→ 5. Record the result.

Calculation:

a. $\% \textbf{ Whole Kernel} = \frac{W3}{(W1-W2)} \times 100$

b. $\% \textbf{ Broken Kernel} = \frac{W4}{(W1-W2)} \times 100$

c. $\% \textbf{ Kernel from Whole Nut} = \frac{W5}{(W1-W2)} \times 100$

d. $\% \textbf{ Kernel from Half} - \textbf{cracked Nut} = \frac{W6}{(W1-W2)} \times 100$

e. $\%$ **Total Kernel loss in fibre** $= \frac{(W3+W4+W5+W6)}{(W1-W2)} \times 100$

Test 7: <u>Kernel in Claybath Kernel (Admixture and Broken Kernel content)</u>

Objective: To asses the quality of claybath kernel.

Sampling frequency: 1 kg sample every 2 hours using a hand scoop.

Sampling Point: Claybath Kernel Discharge chute

Testing Frequency: Once Every day

Testing Method:



Testing Frequency: Once Every day

Testing Method:

1. At the end of the process, Bulking and quartering will be done on the 2 samples to obtain 1 kilogram of the sample.

2. Weight the sample to the nearest gram **(W1)**.

3. Do sorting on the sample and weight to the nearest gram
–Whole Kernel **(W2)**
–Broken Kernel **(W3)**

4. Carefully crack the uncracked nuts so that the kernel will be kept in its original form and weight to the nearest gram
–Kernel from whole nut **(W4)**
–Kernel from half cracked nut **(W5)**

5. Weight each of the separated components separately and calculate the result.

6. Record the result.

Calculation:

a. $\%\ \textbf{Whole Kernel} = \frac{W2}{W1} \times 100$

b. $\%\ \textbf{Broken Kernel} = \frac{W3}{W1} \times 100$

c. $\%\ \textbf{Kernel from Whole Nut} = \frac{W4}{W1} \times 100$

d. $\%\ \textbf{Kernel from Half} - \textbf{cracked Nut} = \frac{W5}{W1} \times 100$

e. $\%\ \textbf{Total Kernel loss in Shell} = \frac{(W2+W3+W4+W5)}{W1} \times 100$

Test 9: <u>Production Kernel (Admixture and Broken Kernel Test)</u>

Objective: To assess the quality of production kernel.

Sampling frequency: 1 kg sample every 2 hours using a hand scoop.

Sampling Point: ex- kernel silo



Testing Frequency: Once Every day

Testing Method:

1. At the end of the process, Bulking and quartering will be done on the 2 samples to obtain 1 kilogram of the sample.
2. Weight the sample to the nearest gram **(W1)**. The foreign matter such as dirt, fibre and stones is removed and separated
3. Do sorting (separate) the component into the following categories:
   - Whole Kernel
   - Broken Kernel
   - Half cracked nut
   - Whole nut
   - Loose shells
   - Debris and Stones
4. Carefully crack the whole nuts and the half-cracked nuts so that the kernel will be kept in its original form.
5. Weight the shell separately by the following categories:
   - Loose Shells and Debris **(W2)**
   - Shell from whole nuts **(W3)**
   - Shell from half cracked nuts **(W4)**
   - Stones **(W5)**
   - Weight the Broken kernel **(W6)** and keep the whole kernel for moisture testing.
6. Weight each of the separated components separately and calculate the result.
7. Record the result.

Calculation:

a. $\textbf{\% Loose Shell and Debris} = \frac{W2}{W1} \times 100$

b. $\%\textbf{Shell from Whole Nut} = \frac{W3}{W1} \times 100$

c. $\%\textbf{ Shell from Half} - \textbf{Cracked Nut} = \frac{W4}{W1} \times 100$

d. $\%\textbf{ Stone} = \frac{W5}{W1} \times 100$

e. $\%\textbf{ Broken Kernel} = \frac{W6}{W1} \times 100$

f. $\%\textbf{ Total Admixture Content} = \frac{(W2+W3+W4+W5)}{W1} \times \mathbf{100}$

Test 10: <u>Moisture in Production Kernel</u>

Objective: To assess the efficiency of kernel drying and quality of production kernel

Sampling frequency: 1 kg sample every 2 hours using a hand scoop.

Sampling Point: ex- kernel silo

Testing Frequency: Once Every day

Testing Method:

1. Select 50 whole kernel from the sample randomly.
2. Grind the kernel using the chopper.
3. Weight a clean petri dish.
4. Place the chopped kernel by spreading it evenly inside the clean petri dish and record the weight.
5. Place the chopped kernel + Petri Dish into the oven at 103 for 4 hours.
6. After 4 hours, remove the dish from the oven and place the dish in the desiccator for about 30 minutes to allow it to cool down thoroughly.
7. Weigh the cooled chopped kernel + Petri Dish, record the readings and calculate the results.
8. Record the result.

Calculation:

$$\% \textbf{ Moisture} = \frac{\text{Weight of the petri dish+chopped kernel before drying (gram)} - \text{Weight of the petri dish+chopped kernel after drying}}{\text{Weight of the petri dish+chopped kernel before drying (gram)} - \text{Weight of the petri dish (gram)}} \times 100$$

Test 11: Crude Oil Composition

Objective: To help control water additions so that clarification condition are optimized

Sampling frequency: 200 ml sample every 2 hours

Sampling Point: Diluted crude oil tank

Testing Frequency: Once every 2 hours

Testing Method:

1. Pour the sample into the 10 ml centrifuge tube. → 2. Centrifuge the crude oil for one minute → 3. Record the volume of :
   - –Sample **(W1)**
   - –Oil Layer **(W2)**
   - –Water Layer **(W3)**

Calculation:

a. $\% \textbf{ Oil in Crude Oil} = \frac{W2}{W1} \times 100$

b. $\% \textbf{ Water In Crude Oil} = \frac{W3}{W1} \times 100$

Test 12: __Sludge Ex-Clarification Tank (Underflow)__

Objective: To help control Clarification and oil loss in sludge ex-separator

Sampling frequency: 200 ml sample every 2 hours

Sampling Point: Sludge pipe at clarification tank

Testing Frequency: Once every 2 hours

Testing Method:

1. Shake the sludge sample vigorously and Pour the sample into the 10 ml centrifuge tube.

2.Centrifuge the crude oil for one minute

3.Record the volume of:
–Sludge **(W1)**
–Oil Layer **(W2)**

Calculation:

$$\textbf{\% Oil in Sludge Ex} - \textbf{Clarification tank} = \frac{W2}{W1} \times 100$$

Test 13: __Oil Before Purifier__

Objective: To assess purifier efficiency.

Sampling frequency: 200 ml sample every 2 hours

Sampling Point: Before Purifier

Testing Frequency: Once everyday

Testing Method:

1. Do bulking on the sample.	→	2. Perform the standard **moisture** and **dirt** test on the bulked oil before purifier sample.

Test 14: <u>Oil After Purifier</u>

Objective: To assess purifier efficiency and oil quality.

Sampling frequency: 200 ml sample every 2 hours using a plastic bottle.

Sampling Point: Purifier sampling point.

Testing Frequency: Once everyday

Testing Method:

1. Do bulking on the sample.	→	2. Perform the standard **moisture** and **dirt** test on the bulked oil after purifier sample.

1. Do bulking on the sample.
2. Perform the standard **moisture** and **dirt** test on the bulked oil after purifier sample.

Test 15: <u>Production Oil</u>

Objective: To assess production oil quality.

Sampling frequency: 200 ml sample every 2 hours

Sampling Point: Production Oil sampling Point (After Vacuum Drier)

Testing Frequency: Once everyday

Testing Method:

1. Do bulking on the sample.

→

2. Perform the standard **moisture, dirt, FFA** and **DOBI test** on the bulked Production Oil sample.

Test 16: Oil from Storage Tank

Objective: To assess FFA changes in storage oil.

Sampling frequency: 200 ml sample every 2 hours

Sampling Point: Storage tank

Testing Frequency: Once every morning before the production starts.

Sampling Method:

1. Sampling is carried out using the Sampling Vessel (500 ml capacity)

→

2. Sample is taken from the Top, middle of the tank and the bottom of the tank.

→

3.Mix the sample thoroughly and transfer the sample to the plastic bottle.

Testing Method:

1. Do bulking on the sample.

→

2. Perform the standard **moisture, dirt, FFA** and **DOBI test** on the bulked Storage Tank Oil sample.

Test 17: Sludge Ex- Centrifuge

Objective: To quantify oil loss in sludge ex- centrifuge

Testing Frequency: Once everyday

Testing Method:

1. Do bulking on the sample.	→	2. The sample will be sent to the laboratory for oil loss testing using the NIR machine.

Test 19: Sterilizer Condensate

Objective: To quantify oil loss in sterilizer condensate.

Sampling frequency: 200 ml sample every 2 hours

Sampling Point: Sterilizer condensate sampling point (Before Cooling Pond)

Testing Frequency: Once everyday

Testing Method:

1. Do bulking on the sample.	→	2. The sample will be sent to the laboratory for oil loss testing using the NIR machine.

Test 20: Oil from Despatch Tank

Objective: To assess dispatched oil quality.

Sampling frequency: 200 ml sample from each dispatch tank.

Sampling Point: 1st manhole of the tanker.

Testing Frequency: Once every morning before the production starts.

Sampling Method:

1. Sampling is carried out using the Sampling Vessel (500 ml capacity)	→	2. Mix the sample thoroughly and transfer the sample to the plastic bottle.

Testing Method:

1. Perform the standard **moisture, dirt, FFA** and **DOBI test** on the bulked Storage tank oil sample immediately after sampling for the first two tankers.
   - If FFA is 4.5% and above
   - If DOBI is below 2.50

   FFA and Dobi test need to be carried out on all subsequent tankers.

Test 21: <u>Kernel from Despatch Lorry</u>

Objective: To assess dispatched Kernel quality.

Sampling frequency: For every Despatch Lorry

Sampling Point: Samples are drawn from every despatch lorry.

Testing Frequency: For every Despatch Lorry

Sampling Method:

1. Sampling is carried out using the Sampling probe

2. Sample are drawn randomly from 8 points (1/2 kg for each point)
3. Do bulking and quartering on the sample to get four composite sample of about 1 kg for each sample.

4. Packed and seal the sample in a dry clean polythene bags.

5. The sample must be properly labeled as below:
   - Vehicle Number
   - Buyer
   - Date of Despatch
   - Name of Driver
   - Signature of Driver
   - % Admixture and Moisture

Testing Method:

1. Perform the standard **admixture** and **moisture test.**

- One sample is tested immediately
- The second should be kept for minimum 7 days.
- The two remaining sample are given to the buyer.

Test 22: ***<u>MPD Analysis</u>***

Mass passing to digester (MPD) is the whole sterilized fruit and thrash that leaves the thresher to be transported to the digester.

MPD Analysis Provides:

1. Quantitative data for use in mill process control, to improve extraction efficiency.
2. Quantitative data on bunch composition for use in estate management

Sampling point: MPD conveyor bottom chute

Testing Method:

1. Take 1 kg of MPD sample from the MPD conveyor
2. Sort the sample into

Middle Fruit

Inner Fruit

Outer Fruit

Stone

Trash

Underdeveloped Fruit

3. Weight each of the fruit components, thrash, and stones separately, and record the readings
4. Squeeze the fruits for the Outer, Inner, and middle fruits and separate the nuts from the mesocarp

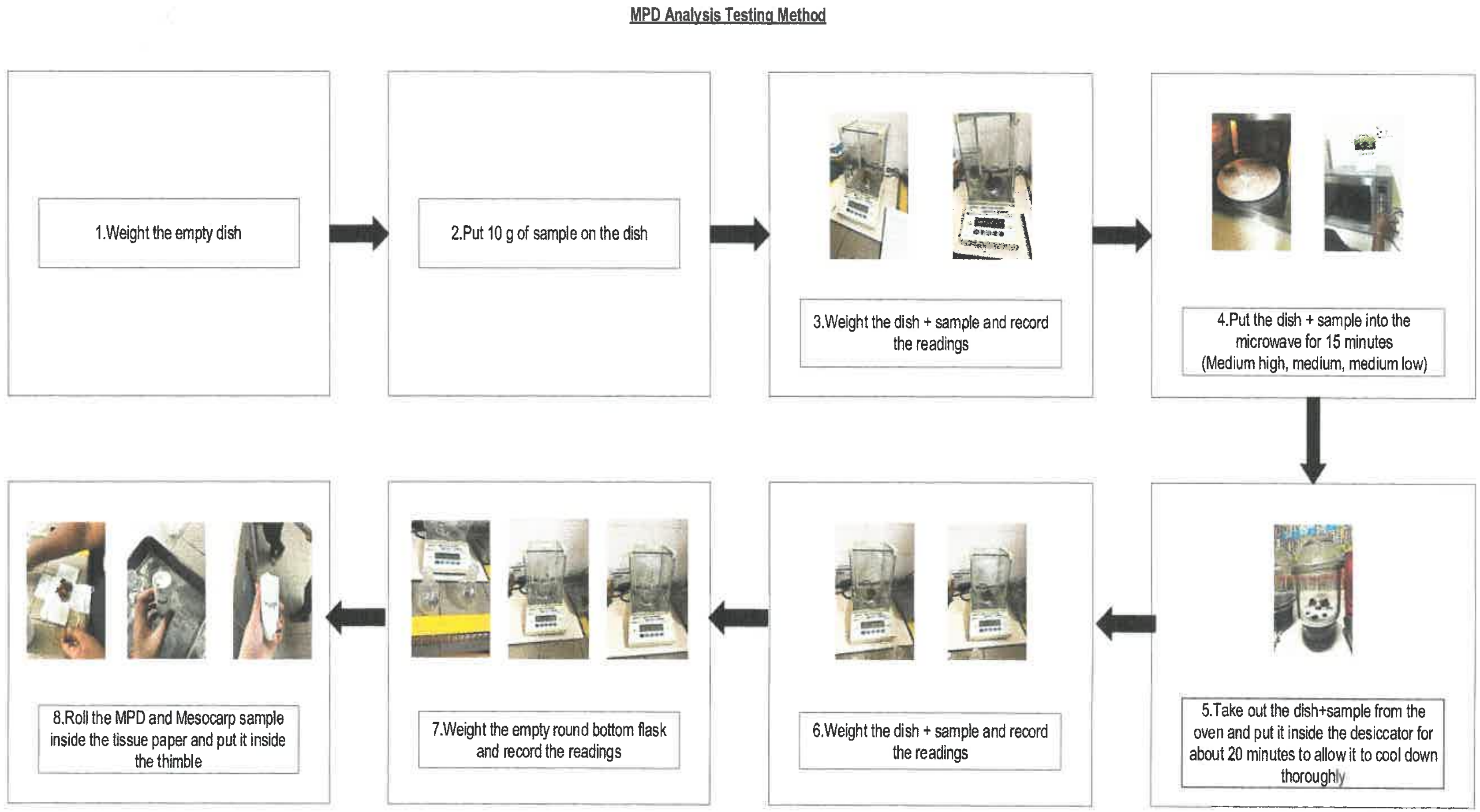
5. Weight the nut and the mesocarp for each fruit component separately.
6. Throw out the nuts and mix all the mesocarp of the outer, inner, and middle mesocarp with trash and underdeveloped.
7. Do bulking on the mixed sample and take 250 g of sample

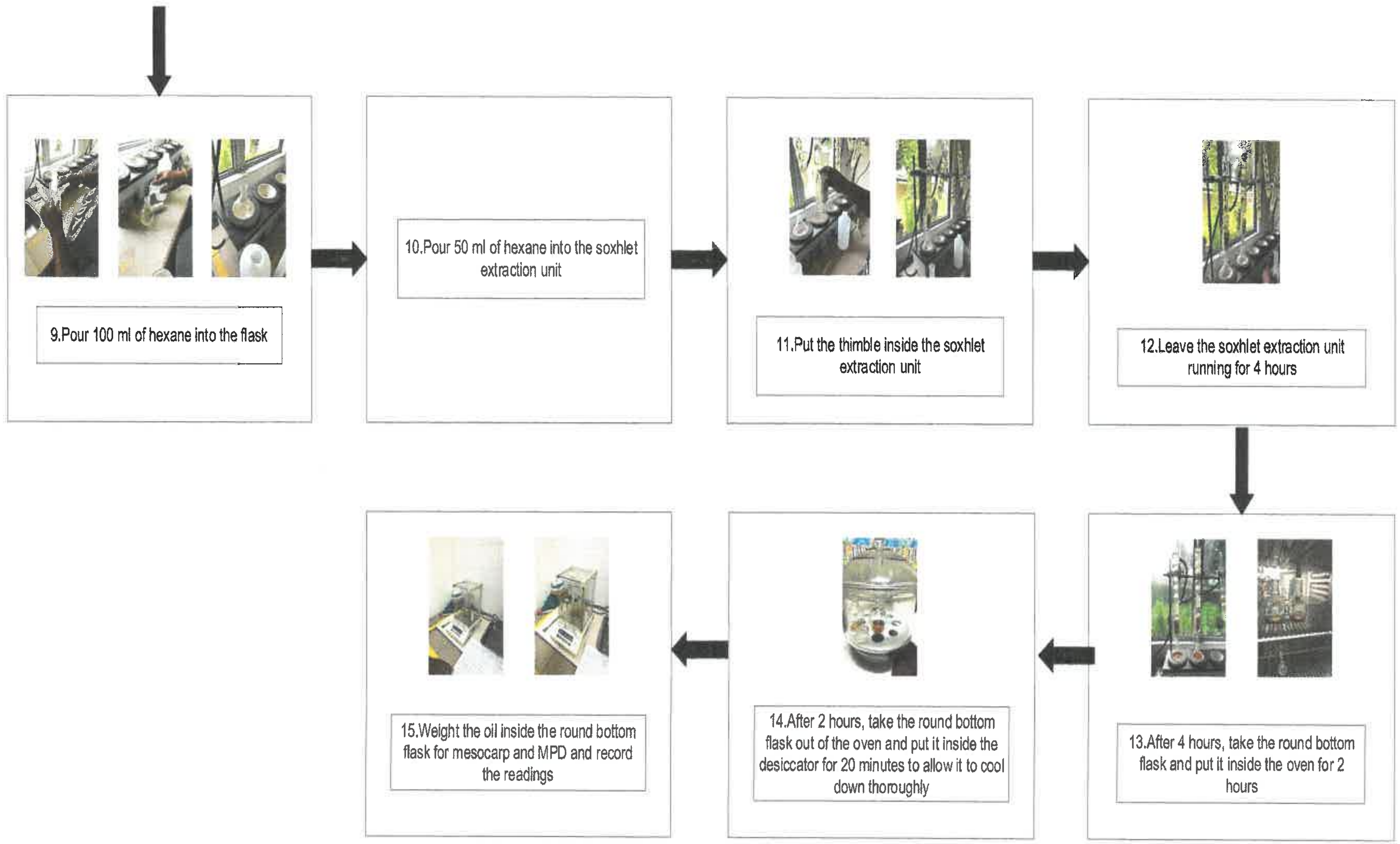
8. Take the 250 g of the mixed sample to the lab to do the MPD oil analysis.

Test 23: <u>MPD Oil Analysis</u>

a. Oil in mesocarp (fibre)

b. Oil in MPD (all)




9.Pour 100 ml of hexane into the flask
10.Pour 50 ml of hexane into the soxhlet extraction unit
11.Put the thimble inside the soxhlet extraction unit
12.Leave the soxhlet extraction unit running for 4 hours
13.After 4 hours, take the round bottom flask and put it inside the oven for 2 hours
14.After 2 hours, take the round bottom flask out of the oven and put it inside the desiccator for 20 minutes to allow it to cool down thoroughly
15.Weight the oil inside the round bottom flask for mesocarp and MPD and record the readings

Testing Frequency: Once a month

Testing Method:

NUT AND KERNEL HISTOGRAM TESTING METHOD

1.Do bulking and quartering on the nut sample to obtain 250 gram sample

→

2.From the 250 gram sample, take out all the whole nuts

→

3.Measure the nut size using the nut sizing plate

→

4.Weigh the nut for each sizes separately using the electronic balance

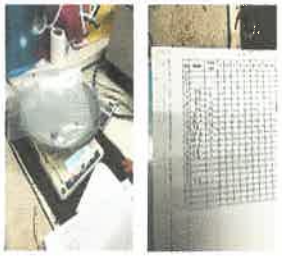
↓

5.After nut sizing is completed, crack the nut carefully (to not break the kernel)

→

6.Measure the sizes of the kernel using the sizing plate

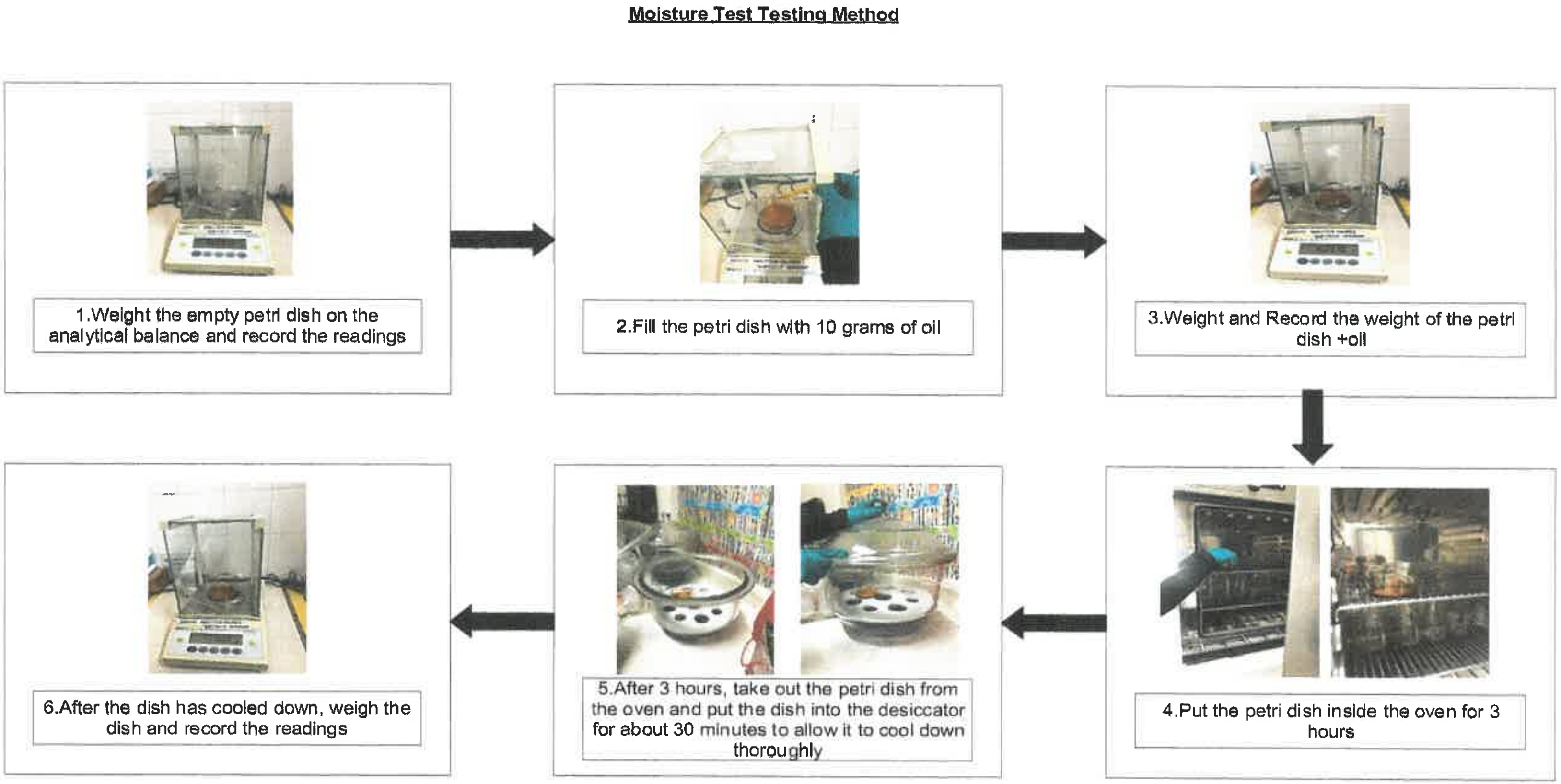
→



7.Once the kernel sizing is completed, weigh the kernel according to its sizes separately.

Test: <u>Moisture test</u>

Testing Method:

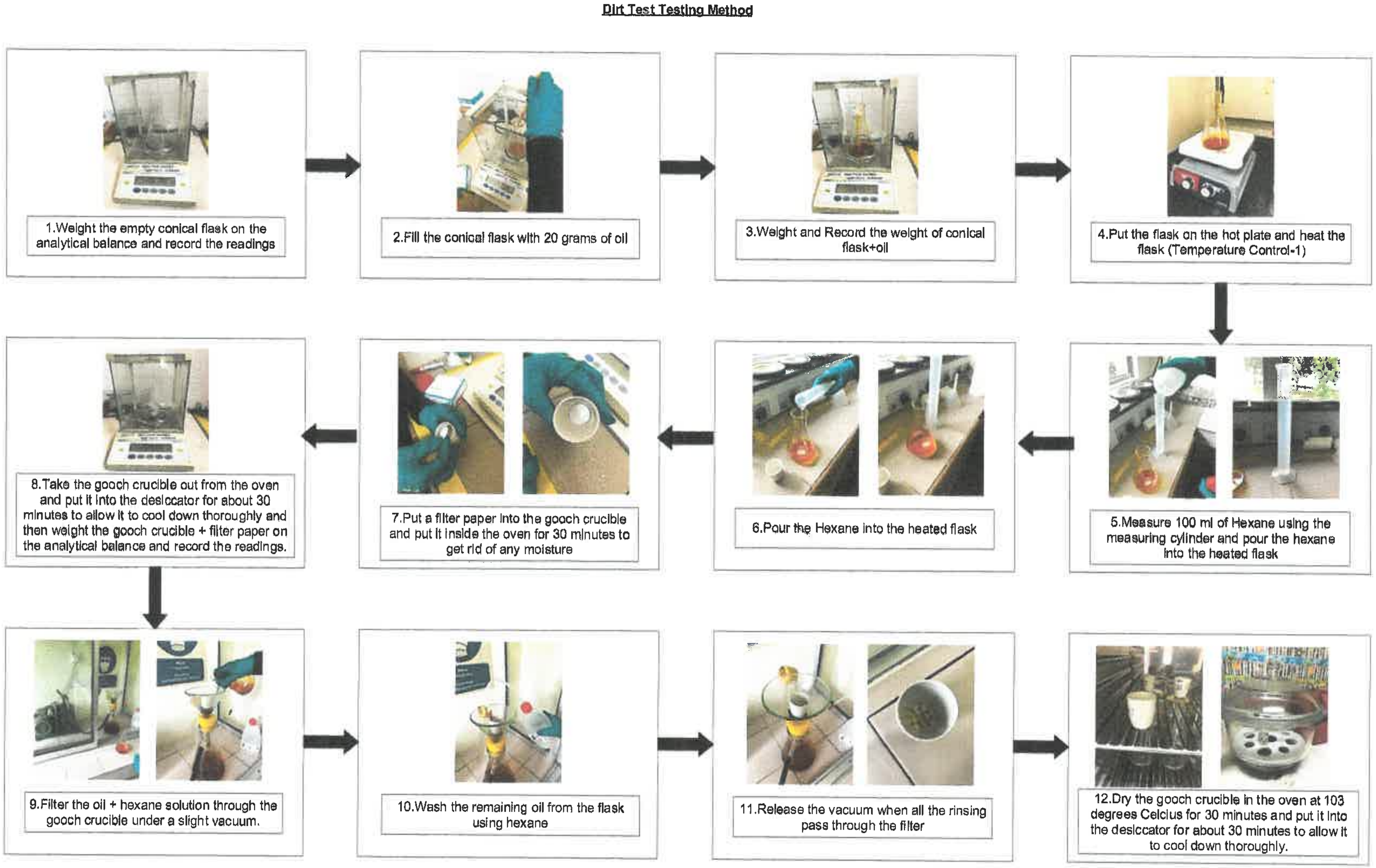


Calculate the moisture using the formula below

$$\textbf{Moisture} = \frac{(\text{Weight after Oven}) - (\text{Crucible} + \text{Oil})}{(\text{Crucible} + \text{Oil}) - \text{Crucible}} \times 10$$

Test: ***Dirt test***

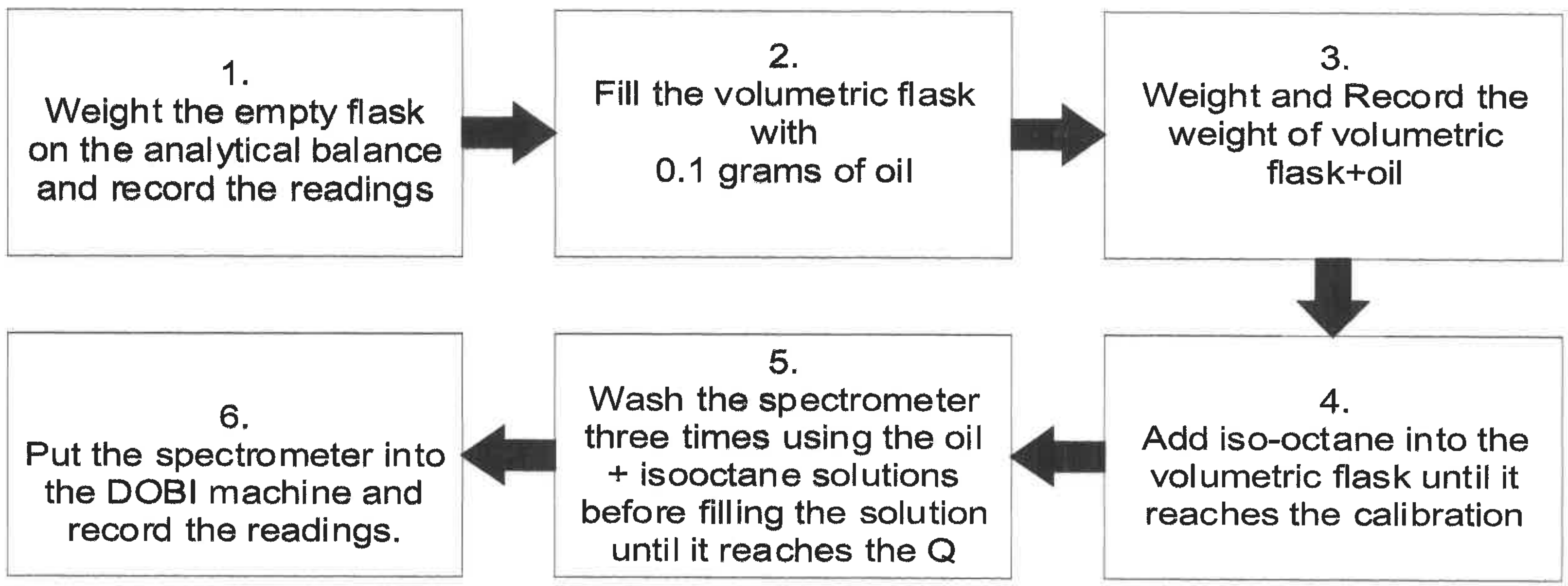
Testing Method:



Weight the dried gooch crucible and calculate using the formula below

$$\textbf{Dirt} = \frac{(\text{Filter} + \text{Dirt}) - (\text{Filter without Dirt})}{(\text{Conical} + \text{Oil}) - (\text{Conical without Oil})} \times 100$$

Test: <u>Deterioration of bleach ability index (DOBI) test</u>



Test 2: <u>Sulfite (SO_3) Test</u>

Test on: Boiler Water

Testing Method:

Sulfite (SO_3) Test

1.Pour 50 ml of sample into the beaker

2.Add 4 ml of Sulphuric Acid 6.5%

3.Add one spoon of Iodine Indicator

4.Titrate with Potassium Iodate Titrant = Q ml

5.The Sample will turn from (Colourless to blue)

Test 3: <u>Total Hardness Test</u>

Test on: Boiler Water, Feed Water, Softener Water.

Testing Method:

1. Pour 50 ml of water sample into the measuring cylinder

2. Add 2 ml of H2

3. Add one shake of H3 (If the sample turns blue right away, the total hardness=0) But if the sample tums purple after adding H3, continue the steps,

4. Titrate with H1 = Q ml

5. The Sample will turn from purple to dark blue

Total Hardness (ppm) = 20×Q

Test 4: Total Dissolved Solids (TDS) Test

Test for: Boiler Water, Feed Water, Softener Water.

Testing Method:

Total Dissolved Solids (TDS) Test

1.Pour 50 ml of the water sample into a beaker

→

2.Add TDS-1

→

3.Colour Changes from (Pink to colourless)

→

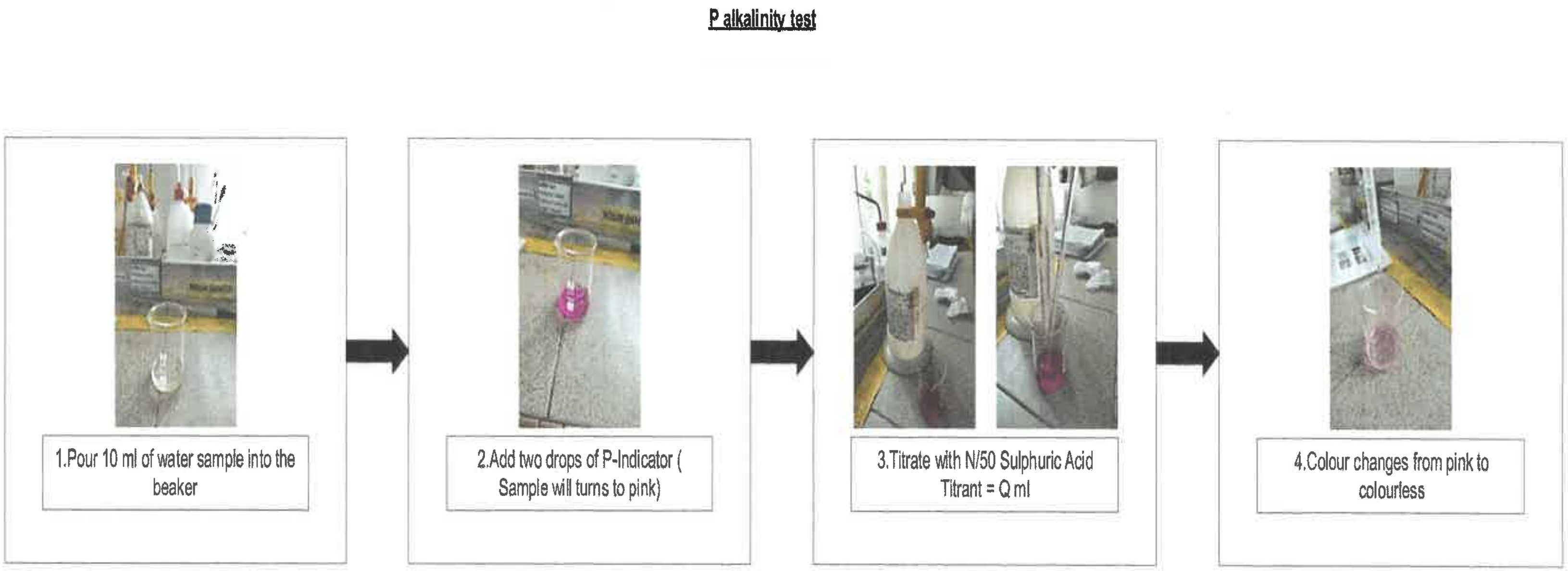
4.Measure the conductivity of the sample using the TDS meter

TDS (ppm)= Conductivity x 0.7

Test 5: P alkalinity test

Test for: Boiler Water.

Testing Method:

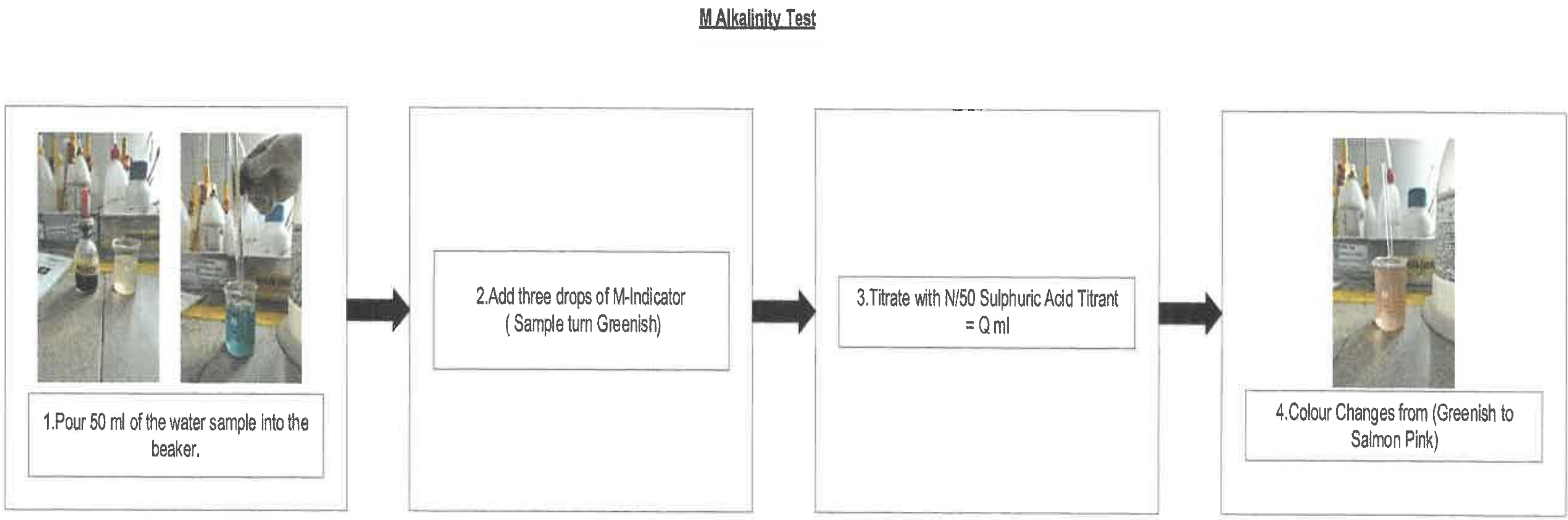


P alk (ppm) = 100 x Q

Test 6: <u>M Alkalinity Test</u>

Test for: Boiler Water.

Testing Method:



M alk (ppm) = 20 x Q

Test 8: <u>Total Transport plus Table (TTP) test</u>

Test for: Boiler Water.

Testing Method:

<u>Total Transport plus Table (TTP) test</u>

1.Add 5 ml of water sample

2.Add distilled water until calibration line.

3.Add 5 ml of PA1 and PA2 into the measuring cylinder.

4.Add the PA1+PA2 solution into the (Sample + Distilled Water)

5.Cap the cylinder and shake three times then wait for 10 minutes

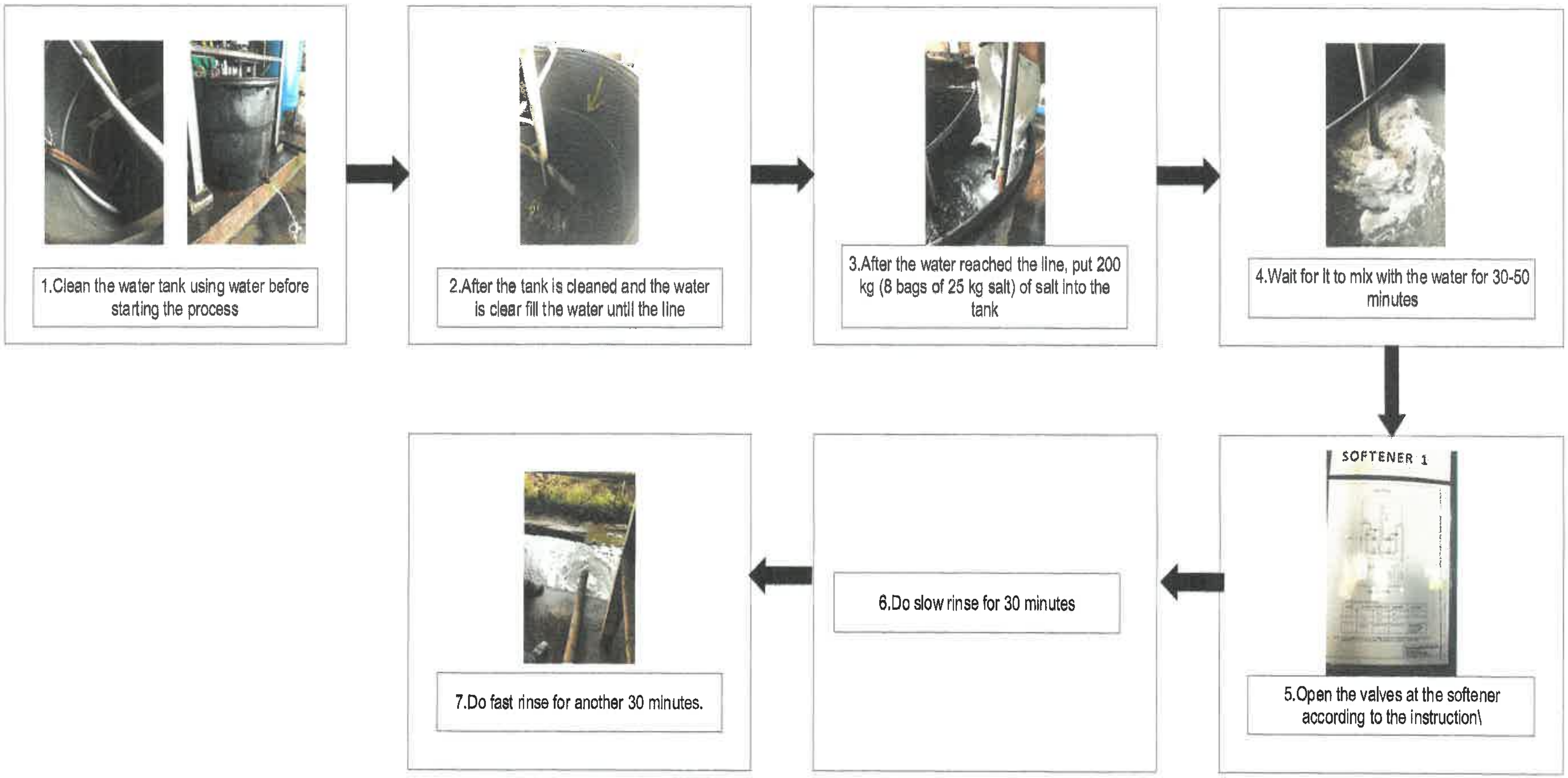
Dipstick units	Sample size (ml) 15	7.5
16.0	100	200
15.5	108	216
15.0	116	232
14.5	124	248
14.0	132	264
13.5	142	284
13.0	150	300
12.5	158	316
12.0	168	336
11.5	176	352
11.0	184	368
10.5	192	384
10.0	200	400

6.Convert dipsticks unit to ppm using the table as a guide.

Softener Regeneration

Method:

Softener Regeneration



2.3 BRIEF DAILY/WEEKLY ACTIVITY

2.3.1 *WEEK 1*

MONDAY (22/3/2021) - FRIDAY (26/3/2021)

My first day began with a morning briefing with the mill's management team, staff, and workers. My supervisor, Sir Adzim, then assigned me my first assignment, which was to learn about the mill's process flow. Then I went to the mill and took a tour to understand the process flow. On Tuesday, I walked around the mill to learn about the process flow, visited the fruit handling station, sterilizing station, press station, and oil room. On Wednesday, I went to review the assignment with my supervisor, who corrected what I got wrong and explained things to me that I didn't understand. He also instructed me to continue my task by going to the kernel plant next to learn about the process flow, and he assigned me a new task to learn about the machinery's functions. On Thursday, I went to the kernel plant to learn about the process flow. Later that day, a visitor from the Malaysian Palm Oil Board arrived with their practical students to give them a tour of the mill; we joined the tour and learned more about the mill. On Friday, I went to the oil room to learn about the process flow. I also went to see Mr. Rahim, the mill supervisor and asked him to teach me how the mill's machinery worked.

With MPOB Internship student

2.3.2 *WEEK 2*

MONDAY (29/3/2021)- FRIDAY (2/4/2021)

On Monday, I went to the engine room where Mr. Muniyandi, the Engine Driver showed me the engine room start-up process, He also guided us to do the startup process of the turbine by myself for us to learn the flow. On Tuesday, I attended a morning briefing at 8:00 a.m with the shift B process Team conducted by Mr. Kamid and Mr. Kamarul.On the same day, I also Attended the Mill's Safety Meeting where the mill manager, assistant engineer, and the OSH committee also attended. On Wednesday, I went to the engine room and try starting up the turbine in the engine room with the guidance of Mr.Muniyandi, the engine driver. On the same day, I went to see Mr. Kamarul, the shift B chargehand to ask about the functions of the machine inside the mill. (Digester, Screw Press, Thresher, and the vibrating screen). On Thursday, I went to the boiler room to learn the process flow from Mr.Ghani, The boilerman in charge. Where I learned the process flow, 13 important fittings in the boiler, The chemical used & its functions, He also showed me the equipment involved for the fiber flow and the water flow. I also went to the water treatment plant and learned about the process flow of the water treatment plant. On Friday, I went to the water treatment plant to learn more about the process flow, I Went to see the water catchment pond and the river buffer pond and Measured the distance between the chemical injection points of each chemical before entering the floc tank.

Safety Meeting

2.3.3 *WEEK 3*

MONDAY (5/4/2021) - FRIDAY (9/4/2021)

On Monday, I Went to the CPO tank to see how ullage was done, I also learned how the storage tank could maintain the temperature of the CPO inside of it. On Tuesday, I went to see the CPO dispatch process and I went around the mill to learn more about the machine (operating pressure/ temperature. On Wednesday, I went to the river buffer pond and the water catchment pond to show fellow internship students who have not seen the pump house yet because he was absent. The same evening, I Attended the SOU meeting (April) with the visit of the Regional general manager and Regional chief engineer. On Thursday, I went to the water treatment plant to watch how the operator combined the chemical (alum, soda, and polymer) for the water treatment process. I attended the second SOU meeting on Friday, where the estates and mill discussed plans to improve their performance. On the same day, Ms. Esparie, the Lab Sorter, showed us how to do the nut histogram (learned how to measure the nut and kernel) and Sir Adzim, my supervisor, gave me a new task, which was to begin learning the analysis within the lab starting in week 4.

SOU Meeting

2.3.4 *WEEK 4*

MONDAY (12/4/2021)- FRIDAY (16/4/2021)

On Monday, I began my new task, which was to learn all of the laboratory's analysis. I asked Ms. Vasuki, the lab supervisor, to brief us on all of the lab's analyses, and she briefly summarised the lab's analysis methods and asked us to learn more by referring to the LAB SOP file. I also observed the lab analyst do the dirt test. On Tuesday, I followed the sampler, Mr. Sahabudin, inside the mill two hours after the process started. I also learned how to determine kernel losses by looking for broken kernels in the primary and secondary winnower samples.On Wednesday, I tried collecting the sample with supervision and guidance from the sampler. I also went to see the kernel despatch process and on the same day, I watched how the lab sorter did the bulking and sorting for the kernel despatch sample. On Thursday, I Did kernel losses for the primary and secondary winnower samples with the guidance of the lab sorter. I followed the sampler, Mr. Basir to collect the boiler water sample. On the same evening, I met with people from Nalco Chemical (they did the water test) and asked questions about the chemical used, and watched how they did their testing. On Friday, The sampler, Basir showed us how to do the jar test for the raw water to adjust the chemical used for the plant. Watched and learned the bulking and sorting method for the press cake sample.

Morning Briefing

Nalco Chemical Representatives

2.3.5 *WEEK 5*

MONDAY (19/4/2021)- FRIDAY (23/4/2021)

The lab analyst, Ms. Suba showed us how to do the FFA, Moisture, Dirt, and Dobi test. Then, I followed the despatch boy, Dayvin to see how the oil dispatch process was done. On the same day, Nalco Chemical Visited the mill where they did the training for the boiler water chemical used and its functions. They also did the jar test and tested the water from the boiler and the water treatment plant. On Tuesday, The lab sorter, Ms.Esparie showed us how loose fruit analysis was done. On Wednesday, I Did the nut histogram with the guidance of Ms. Esparie, the lab sorter. On the same day, The Regional Chief Engineer visited the mill where he goes for a tour around the mill with the mill manager and the engineer where we followed them around.The RCE gave us a task, which was to learn the SOP for the fruit grading from the QI. On Thursday, I went out with Mr. Roslin and Ms. Ain to buy the things needed for the Bubur Lambuk event that will be held that weekend. On Friday, I went to the fruit handling station to meet the Crop checker and learned the types of fruit and how they graded the fruits. The quality assessor also explained the grading SOP to us.

Briefing with the mill management team, staffs and workers.

Boiler Water Training with Nalco Chemical

Regional Chief Engineer Visit

2.3.6 *WEEK 6*

MONDAY (26/4/2021) - FRIDAY (30/4/2021)

On Monday, I did the MPD analysis with the guidance of the lab sorter where we took the fruits from the conveyor and separated the fruit components. On Tuesday, I tried to do the FFA, moisture, and dirt test on our own with the guidance of the lab analyst.On Wednesday, SORA which is the audit team visited the mill, so we followed them around to learn. They timed the time taken for each sample bulking and sorting process. The sorter also makes an extra sample for them to do their analysis (Press cake, EFB, Primary and Secondary Winnower, and production kernel). I also did kernel losses for primary and secondary winnower and also production kernel inside the mini-lab. On Thursday, I Visited the effluent treatment plant and learned about the effluent pond process flow from the ETP chargehand, Mr. Hairil. On Friday, I did the FFA, dirt, moisture, and DOBI test for the production oil with the guidance of the lab analyst.

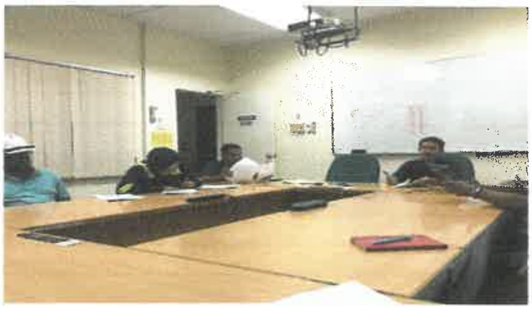
SORA Visit

2.3.7 *WEEK 7*

MONDAY (3/5/2021) - FRIDAY (7/5/2021)

On Monday, I Followed the sampler to take the water sample for boiler water (boiler water, feed tank water, softener). The water treatment operator also showed me how to do the boiler water test. On Tuesday, I took the timing for sample bulking and sorting for press cake, clay bath kernel, and nutcracker sample. On Wednesday, The Lab analyst showed me how to do the MPD oil analysis for oil in MPD and oil in Mesocarp. On Thursday, I went with the sampler to take the hourly sample inside the mill. I also did crosscheck for the sample taken. On Friday, I started a new task given by the supervisor, which is to do the broken nut analysis and oil loss test using the NIR for the press cake sample. On Friday, I Did the broken nut analysis and oils loss test for the 6/5 sample and in the evening, I attended the SOU meeting with the SOU 13 members.

Broken Nut Analysis and Oil Loss Test



SOU 13 Meeting

2.3.8 *WEEK 8*

(10/5/2021) - (14/5/2021)

I did broken nut analysis and oils loss test for 8/5 sample, 10/5 sample. On Wednesday, I went around the office to help the office clerk do some work since many of the people in the office already took their EID leaves. I also Gather and organized the data for the broken nut and oil loss analysis together with fellow internship students. On Thursday and Friday, I had my Eid holiday.

2.3.9 *WEEK 9*

(17/5/2021) - (21/5/2021)

I helped the laboratory with file organization (they organized the file in order and standardize the file in the lab using the same color), I labeled and arranged the file according to the instruction. I also continue to do broken nut analysis and oil loss tests for 17/5, 18/5, 19/5, 20/5 press cake samples. I also learned how the softener regeneration is done on Thursday by watching the operator in charge.

2.3.10 *WEEK 10*

(24/5/2021) - (28/5/2021)

I continue to do broken nut analysis and oil loss tests for 22/5, 24/5,25/5 press cake samples. On Thursday I have to do the swab test (PCR test) because I am one of the close contacts of the person that has been confirmed to be covid 19 positive and went back home right after taking the swab test. On Friday, I had to continue Self-quarantine at home.

2.3.11 *WEEK 11*

(31/5/2021) - (4/6/2021)

On Monday, I Took the second swab test (PCR) and then went back home right after taking the swab test and continue Self-quarantine at home to wait for the swab test result to come out. My First day of WFH started on the Second day of MCO where I continued working on my logbook.

2.3.12 *WEEK 12- WEEK 17*

(8/6/2021)- (15/7/2021)

I Continued Working from home (WFH), where my task is to learn about The equipment theoretically and record what I learned in Microsoft One Note. I also did the work instruction/description for several types of machinery involved in the process such as sterilizer, storage tank, and more.

2.4 DESCRIPTION OF TASK ASSIGNED

2.4.1 *Task 1*

Duration: 1 week

The task given by the supervisor is to

1. Learn the process flow of the palm oil mill.

2. Learn what the mill produces (products).

3. Present what I have learnt to the supervisor.

Because this was my first task, the supervisor advised that I study the overall process first. The task was completed by going around the mill and learning the processes at each station, from the Reception Station to the Kernel Recovery station. I asked questions to the operators at each station, and they taught me about what they were doing and how they did their jobs. After three days, I checked the task with my supervisor to ask him about things I did not understand, and he corrected stuff I got wrong or misinterpreted. I continued the task and after a week, I presented the work to him with the help of a block diagram I had prepared. After the first week task was finished, the supervisor then gave me my second task.

2.4.2 *Task 2*

Duration: 2 Weeks

1. Learn the function of the machinery involved in the milling process
2. List the number(unit) of equipment and machinery involved in the process.(The supervisor said I can ask the Mill Supervisor in charge for things that I)
3. Learn the process flow of the boiler room
4. Learn the process flow of the engine room
5. Learn the process flow of the water treatment plant

2.4.3 *Task 3*

Duration: 4 weeks

Task:

1. Learn all the analysis done by the lab and the mini lab
2. Learn the sampling method

2.4.4 *Task 4*

Duration: 3 weeks

1. Do broken nut analysis on press cake sample
2. Do oil loss analysis using the NIR machine

2.4.5 *Task 5*

Duration: 6 weeks

Work from Home (WFH)

1. Learn the working principle, function and features of the machinery involve in the palm oil milling process
2. Did the work instruction/work description for the machinery.

3.0 CONCLUSION

To conclude, throughout my industrial training at Labu Palm Oil Mill, I was able to gain experience in a real-world working environment.

I also got to learn things that I had learned theoretically during my elective subject, which is Oleo chemical technology and Palm Oil manufacturing, in practice, so that I could understand better by seeing all the processes in real life and seeing the connection between theoretical learning and practical work. This furthermore enhances my understanding of the subject and piques my interest in it.

Aside from that, I learned how to work in a team and build strong relationships with other employees because I had to communicate with the operator and employees every day to learn the working procedure throughout the task provided.

4.0 REFERENCE

1. History. Sime Darby Plantation. (n.d.). https://www.simedarbyplantation.com/corporate/history/2000--2099.
2. Palm oil. (n.d.). https://lipidlibrary.aocs.org/edible-oil-processing/palm-oil.
3. Unknown. (n.d.). Depericarping station / nut and kernel plant. http://limyihang.blogspot.com/2015/10/depericarping-station-nut-and-kernel.html.
4. https://www.rspo.org/uploads/default/pnc/Labu_Oil_Mill_ASA_03_signed_by_SOU_13_JO_MY_03222-MY_SOU_13_Labu_GP_7003A-RSPO_PC-01_approved.pdf