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Work Process Of Threshing FFB In Palm Oil Management at PTPN IV Dolok Sinumbah

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Abstract

This research aims For Seeing the Work Process of Threshing Tbs in Management Coconut Palm Oil at PTPN IV Dolok Sinumbah. Coconut palm oil is one of the product the main one that has market share, This is very important for economy Indonesia.Indonesia moment This The world's largest CPO producer Benefits of oil palm oil crude palm oil (CPO) and oil Palm Kernel (PK) amount a lot. a lot of CPO used as material standard industry like butter, soap, cosmetics, textiles, biodiesel and others. If you see request oil world palm oil, of course There is request towards him. every the year will increase along with growth amount world population. Data obtained from results observation during Work practice is Capacity from PKS PTPN IV DOLOK SINUMBAH is 30 tons/hour and processes Fresh Fruit Bunches (FFB) into Crude Palm Oil (CPO) and Palm Kernel. Work practices that we have learned, especially at the thresher 2 hoist crane station used in each processing, each with a capacity of 5 tons. The thresher rpm speed from the data we obtained namely at rpm 22-23 rpm, so that loose can separated from the bunch..

Keywords: Work Process, Threshing of Fresh Fruit Bunches, Coconut Palm oil

INTRODUCTION

Coconut palm oil is one of the product the main one that has market share, This is very important for economy Indonesia.Indonesia moment This The world's largest CPO producer Benefits of oil palm oil crude palm oil (CPO) and oil Palm Kernel (PK) amount a lot (Guillaume et al., 2016). a lot of CPO used as material standard industry like butter, soap, cosmetics, textiles, biodiesel and others. If you see request oil world palm oil, of course There is request towards him. every the year will increase along with growth amount world population (Mahidin et al., 2020).

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Estimation request product coconut oil price palm oil will still tall in time close (Simarmata et al., 2017). Opportunity business plant coconut palm oil and its products are very promising in planning use land agriculture and development factory coconut palm oil.Climate tropical and rainfall Rain Enough For allows tree coconut palm oil grow with good in the area the (de Souza et al., 2023).

Factory processing coconut PTPN IV DOLOK SINUMBAH oil palm. Machine main have capacity work 30 tons/ hour.Quality The oil produced is greatly influenced by the TBS, the process processed in the factory processing so that increase CPO (Crude Palm Oil) quality palm oil raw) produced from TBS (Sato et al., 2017). In developing the potential it has with knowing the CPO (Crude Palm Oil) production process (Dissanayaka & Bandara, 2020). Therefore That yes take action specific For deepening the CPO (Crude Palm Oil) production process on site (Yahya et al., 2020). Activities This will can done delivered through Practice Work Field (PKL) for delving into the end-to-end process of CPO (Crude Palm Oil) production. Courses taught just a series activity procedure learning in the form of documents, information and explanations without There is experience direct about what and how activity Actually taking place in the field. Therefore that, it is necessary to have PKL which aims to For increase knowledge, experience and image Student about What the reality of the world of work (Nelson et al., 2021). With existence Practice Work This field (PKL) expected in the future can Graduate of Bachelor of Engineering HKBP Nomensen University Machine Pematangsiantar capable compete globally in Jobs.

COMPANY OVERVIEW

Company History

Dolok Sinumbah Plantation is one of the plantations at PT.Perkebunan Nusantara IV which was founded during the Dutch colonial era in 1928 called "NV.Handle Veronigging Amsterdam (NV.HVA)" which is engaged in the business of cultivating oil palm plants (Adu et al., 2022).

Dolok Sinumbah Plantation is located in Simalungun Regency, Hutabayu Raja District, which consists of 5 (five) Afdeling where the Afdeling I, II, III areas are in Dolok Sinumbah Village and Afdeling IV, V are in Mancuk Village. The topography of the land is generally flat, slightly wavy and hilly with the type of soil Podsolic Brown Yellow (PCK) and Podsolic Brown (PC) and the average land height is from 70 m - 150 m above sea level.

Company Labor and Working Hours

PKSPTPN IV DOLOK SINUMBAH is less more than 343 workers consisting of from worker field, workers administration and workers laboratory (Pradiko et al., 2025). Agar company can walk

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with Good in carry out task use reach purpose, required arrangement time good job (Zuraidah, 2019).

PROBLEM SOLVING DISCUSSION

Processing of Fresh Fruit Bunches (FFB) into CPO

The stages of the TBS (Fruit Bunch) processing process are as follows. Fresh Fruit) into CPO (Cleaved Palm Oil) as following :

Station Scales

Bridge counterweight (weight bridge) is tools used For weigh heavy from A truck in condition empty and loaded trucks. Bridge This has 2 paths scales (Pakdeechot et al., 2020). First line used For measure weight of CPO and compost produced by the company, while track scales second used For weighing incoming fresh fruit bunches to PKS PTPN IV DOLOK SINUMBAH (Wae-hayee et al., 2022). Operation of each bridge balance performed by an operator from in room weighing. For count heavy net (Netto) TBS, bridge moreover formerly measure heavy dirty truck (Gross). When in the measurement process gross, scale operator check the Cover Letter, TBS source and certification status fruit and give form weighing as well as heavy gross to driver truck, truck brought to station sorting. After the TBS is unloaded at the station sorting, bridge balance return weigh heavy empty truck (tarra). Net then can obtained with use calculation as following For weighing of CPO, PK and compost, tanks / trucks empty weighed moreover previously on the bridge weigh For measured heavy truck empty (Tarra) before directed to CPO, PK or dispatch point compost (Hamzah et al., 2019).

Station Sorting

Sorting done For inspect quality incoming fruit to At the PTPN IV DOLOK SINUMBAH PKS, FFB is sorted based on Porla of the TBS. The quality of the TBS is something size very important quality Because influence from the extraction process oil and quality from results oil. TBS with optimum maturity will produce maximum oil (Tan et al., 2021).

Loading Ramp Station

Finished fruit dissorted will entered to in the loading ramp. The function from the loading ramp is as place TBS storage for a number of moment before done processing as well as For make things easier entry of TBS into in the lorry (Harimisa et al., 2021). Loading ramp is buildings made of from steel plate, with slope around 28 degrees consisting of from several gates. The number of

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gates that exist about 20 pieces, with capacity capacity of 700 tons. Each gate opened with using a hydraulic handle operated by an operator (Kwong, 2021).



Figure 1. Sterilizing Station

Penembahan Station (Tressing Station)

threshing station is functioning station For separate barondolan fruit from the sign. How it works at the station This assisted of ` some equipment that is :

Hoisting Crane

The lorry containing the sterilized fresh fruit bunches (FFB) will be lifted by a hoisting crane to the hopper. When the lorry reaches the hopper, the hoisting crane will rotate the lorry 360°. so that the FFB in the lorry will fall into the hopper. In the hopper, the FFB will be held by the Auto-feeder, which will move to feed the FFB into the Thresher at a predetermined time. P TPN IV DOLOK SINUMBAH has 2 hoisting cranes with a lifting capacity of 5 tons each (Judijanto, 2025).



Figure 2. Hoisting crane

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A thresher separates fruit from its bunches by slamming the fresh fruit bunches (FFB) into the thresher drum. This thresher consists of a long, cylindrical drum that rotates horizontally at a rotational speed of 21-22 rpm. The drum is designed with a grid that functions to pass the fruit bunches through. This thresher has a capacity of 30 tons/hour (Roswaldy, 2025). The threshing station consists of several parts of the tool or machine and in the process of operation are closely related to each other (Khurshid et al., 2022).

Station Compression (Pressing Station)

Station compression (Pressing) which aims For emit oil contained within meat fruit.

Digester

Digester is working For chopping incoming lumps with use rotating blades. Parts from the digester, namely drum cylinder as receptacle fruit, electric motor as drive, knife as mixer and separator between Nut and Fiber. Enumeration loose the will separate Fiber and Nuts that will produce oil. So that can make things easier in the pressing process. How to Work from tool This that is knives consisting of from knife stirrer and knife made thrower crossed One each other and spinning on an axis so that meat fruit broken and detached from the seeds (Enh et al., 2025).

Screw Press (Presser)

The results of the calculation will enter into the screw press. The screw press is used For extracting the oil contained in the mesocarp of TBS with method pressed (press). This tool consists of from 4 units with capacity 10-12 tons/hour (Toumbourou & Dressler, 2021). Principle Work from the screw press, namely emphasis to fruit that has been stirred in the digester so that squeezed with pressure of 45 - 60 kg/cm2 and emits the next oil will enter to Oil Gutter (Hilwan & Santosa, 2019). Incoming oil to in the next Oil Gutter will given = Condensate water from the Dilution Water Tank for expedite the way oil results the feeling that will streamed to the sand trap tark. While Nut and Fiber from the screw press is distributed to station depericarping through the Cake Breaker Conveyor (CBC) due to the presence of a Worm Screw for separated between Nui and Fibre (Pamungkas, 2024). There is also something called with the Hydraulic Cone used For pumping the Screw Press at the time do pressing. Screw Press cleaned a week very with using Nuts for emit all fiber and then Main Screw check can be done doneAfter pass station compression furthermore results compression will shared to two station that is oil raw will enter to station clarification while Press Cake will processed at the station depericarping (Bremer et al., 2022).

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Clarification Station

Clarification process is stages processing of fresh fruit bunches (FFB) with the aim of For get oil in condition pure in accordance with applicable standards, namely max water content 0.20%, water content maximum impurities 0.02%, and levels free fatty acids (ALB) max 3.5% and min Doby content 2.50%. Oil coming out from machine pressing contains water, mud and materials others. Oil the filtered and collected in the tank, then cleared For separate the still water contained inside it (Tarigan & Purwanggono, 2022).

UNDERSTANDING THRESSING

The thresher functions to separate the fruit from the bunch by slamming the fresh fruit bunches (FFB) into the thresher drum. This thresher is a long cylindrical drum that rotates horizontally at a rotational speed of 21-22 rpm. The drum is designed with grids that function to pass the fruit bunches. This thresher has a capacity of 30 tons/hour. The threshing station consists of several parts of the tool or machine and in the operational process is closely related to each other. PKS **PTPN IV DOLOK SINUMBAH** has 2 (two) threshers that can separate loose fruit from sign as many as 12 lorries /hour with respective capacities lorry 2.5 tons of fresh fruit bunches are expected capable achieve production targets 30 tons/hour fresh fruit bunch processing.

PURPOSE OF ADDITION

The threshing station consists of several pieces of equipment or machinery, and their operation is closely interconnected. The design intent and purpose of this station are as follows:

1. For release fruit (fresh fruit bunches that have been boiled) with the bunch with system slam.
2. For guard stability / equality in a way continuous so that capacity Fresh Fruit Bunch processing can achieved in accordance design factory with hoist cycle operation, auto feeder rpm and proper supervision.
3. Maintain optimal oil loss and kernel loss maybe to be below the target/parameters that have been set agreed company.
4. So, capacity design just no Enough For get the above objectives without unity system operation correct tools at the station This and support from stations other.

The result of the process at this station is to separate the loose fruit (*cook fruitless*) from the bunch by several slamming it on the thresher drum. The loose fruit (*cook fruitless*) is taken to the press station by *fruit elevator* or *conveyor* for extraction, then the empty bunches (empty bunches/jjk) are taken to a temporary storage location (*empty bunch area*) outside the Palm Oil

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Mill and used as fertilizer. Threshing Station is One design with a simple system, but not lost importance For bridge continuity and success of the fresh fruit bunch (FFB) processing process at the factory Coconut Palm oil (MCCARTHY & ZEN, 2009).

System Addition

System additions used by the Factory Coconut The palm oil mill (PKS) of PTPN IV DOLOK SINUMBAH is a tippler. In principle, the tippler system is simpler in terms of construction, operation, and maintenance, and is less expensive. It also requires fewer workers than a hoist crane system. Tippler is as hoist crane replacement for reverse lorry, only just capacity the lorry used is 5 tons of Fresh Fruit Bunches. Use reversal This is For pouring lorry for cooking fruit bunch to be transported with cook fruit bunch scraper towards on the thresher drum. Then fed direct drum stripper (Pasaribu & Vanclay, 2021).

A common obstacle that disrupts its operation is when the tipper is used to reverse the lorry. If the scraper doesn't dump the cooked fruit slowly, it can pile up, overloading the scraper and causing frequent chain breaks.

THRESHER PARTS

The thresher is the main purpose of this station, namely the process of breaking the cooked fruit bunches by throwing them, where the cooked fruitless bunches are brought to the press station and the empty bunches are taken out of the Palm Oil Mill (empty bunch area).

The body consists of plates and is equipped with with doors hinged. These hinged doors are used as

1. Direct loose fruit those. fall appropriate to the below conveyor and carried to the digester through several conveyors and fruit elevators.
2. Make it easy inspection as well as maintenance of drum stripper and below conveyor.
3. Make it easy activity body cleaning in, hanger bushing and drum steripper grid from bunch fibers and object disturbing stranger smoothness operational.

This drum is the main tool for removing loose fruit from the bunch. The thresher drum is threshed by a rotating drum shaft, causing the stripper plate to slam 6 to 7 times its optimal height. The standard operating procedure (SOP) for thresher failure is a maximum of 5%. Failures above this threshold require inspections of the boiling station, threshing equipment, and the quality of the fresh fruit bunches themselves.

On the drum thresher is installed plate functional stripper lifting the cooked fruit bunch for the throwing process. Principle installation of this stripper is as following :

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1. The angle/tilt of the throwing plate is usually 7 ° to 15 °.
2. The length is ± 2000 mm.
3. The height is 4500 ± mm average diameter of the cooked fruit bunch.
4. The number follows the number of columns, usually there are 3 columns and each column is fitted with a stripper in a spiral shape pointing outwards.
5. The effect of the distance between throwers and the shelling process on the fresh fruit bunches:

1. Distance between 180º thrower, where time the bunch is thrown direct carried by the thrower other so that long tail No There is time rolling on the drum
2. Distance between 90º thrower, where at the time the bunch is thrown and falls have time rolling on the drum then carried by the thrower other.
3. Distance between 120º thrower, where at the time the bunch is thrown fall have time A little rolling Then direct transported thrower other.

Installation The ideal distance between the grid plates on the drum is usually 40 mm to 50 mm. The distance between the drum grids is controlled in a way periodic For monitor existence narrowing, stretching and damage (fracture) so that long tail No followed to press station.

For get maximum threshing on the thresher drum, then drum rotation must be taken into account usually 21 to 22 rpm. If the rpm is not balanced with amount feeding from the auto feeder, for example, the rpm is too high slow or too fast, then matter This result in losses, such as following (Zulqarnain et al., 2021):

1. Rpm too fast result more capacity /throughput achieved but the loss of loose beans (oil and kernel) will be tall although treatment sterilizer Already good, because time shelling not optimal.
2. Rpm too slow result time shelling too long so that tend causes high oil loss in empty bunch stalk, even can cause congestion and wear on equipment more fast (Apriyanto et al., 2021).

THRESSING OPERATING STANDARDS

BEFORE STARTING OPERATION

1. Check leakage floor and body welds are not happen.
2. Check sprocket/chain wear, make sure No slip occurs so that the rpm stable.
3. Lubrication of the gear box, chain and electro motor bearings is sufficient.
4. Clean up auto feeder spokes and hopper floor each end of process.
5. Make sure auto feeder spokes no something is broken or change when Already worn out.
6. Check cable electrical installation and panels installed Good (Hutami et al., 2023).

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OPERATING PROCEDURE

1. The Hoisting crane pouring interval must be continuous with the calculation = 60 minutes : (30 tons/hour : 2.5 tons/lorry) = 5 minutes. The Hoisting crane operator must have a certificate from the Department of Manpower. The Hoisting crane must be inspected once a year by the Department of Manpower (IPNKK).
2. The feeder setting for the Thresher must be stable (continuous). This is very important when adjusting the variator gear.
3. The Thresher rpm is set at ±23. The larger the bunch, the faster the rotation.
4. Clean the drum grid before processing so that the loose fruit that has been separated from the empty bunch quickly falls to the bottom of the fruit conveyor.
5. Taking samples for analysis every 2 hours of 5 empty bunches that come out of the Thresher drum (Sodri & Septriana, 2022).

AFTER OPERATION

1. Body cleaning every day, sides door from dirt sticky oil and rubbish that accumulates on the thresher conveyor.
2. Check obstructed sides long tail small or and objects foreign.
3. Check the sides are stretched, narrowed and broken, if There is immediately repaired.
4. Check for cracked welds on the body and drum, such as on the hinges doors, strippers, drum spokes and others, if There is immediately repaired.
5. Do lubrication bering enough bering. Check cable electrical installation and panels installed good

CONCLUSION

Data obtained from results observation during Work practice is :

1. Capacity from PKS PTPN IV DOLOK SINUMBAH is 30 tons/hour and processes Fresh Fruit Bunches (FFB) into Crude Palm Oil (CPO) and Palm Kernel.
2. At work practices that we have learned, especially at the thresher 2 hoist crane station used in each processing, each capacity of 5 tons.
3. Thresher rpm speed from the data we obtained namely at rpm 22-23 rpm, so that loose can separated from the bunch.

SUGGESTION

As for the suggestions that the compiler convey to party industry is as following :

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1. For maintain and improve trust consumers, then expected PT still maintain standard quality that has been determined by the company.
2. It is hoped that PT PN IV DOLOK SINUMBAH in term long No only produce oil half So but can produce oil So.

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