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Maintenance Analysis of Ripple Mill Machine Using PERT Method at PT Ujong Neubok Dalam

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ABSTRACT

The purpose of this research is to control time and to anticipate the completion time of maintenance so that it is not late at PT Ujong Neubok Dalam (UND), and also to improve the implementation of maintenance both as cleaning, lubrication and as periodic checks. In carrying out its production, the company has various machine variations, one of which is the Ripple mill machine. In carrying out ripple mill machine maintenance using the PERT treatment method. The PERT method, or project evaluation and review technique, is a management science model for project planning and execution. The results showed that scheduling on a ripple mill machine was 23 hours or 95.49 % of the normal time. With a very high duration of performance, the greater the possibility of damage occurring, from the analysis that has been carried out, to minimize the damage that occurs to the ripple mill machine, the thing that must be done is to check the ripple mill machine every hour to ensure that there is no damage that can cause the ripple machine mill stopped working. When repairing a Ripple mill machine there are several components that must be provided such as Lubricants, Bearings, V-belt-SPB 2630Lw, Ripple Plate, Pully B3x5, Space Ring, Rotor axle, and 4mm MH360 Welding Wire. As for the work steps, the maintenance starts with checking the axle rotor and immediately following the other components. This maintenance is carried out every 3 months, except for the Ripple Plate and Pully B3x5, because these 2 components are replaced once every 6 months.

I. Introduction

PT. Ujong Neubok Dalam (UND) is a company engaged in the National Private Large Plantation (PBSN) sub-sector of plantations and palm oil processing whose main product is Crude Palm Oil (CPO) which is exported [1] . During the processing of palm oil there are several stages that must be passed, one of which is the ripple mill machine [2] . The ripple mill machine has a function as a means of breaking or separating the palm shells from the kernels of palm kernels by utilizing the centrifugal force of the ripple mill machine, causing the palm kernels to come out of the rotor and slam so hard that the shells break [3] . Figure 1 shows a picture of a ripple mill machine.

Damage to the ripple mill machine is due to certain factors, including the type of palm oil which has a thick skin, and the nut is filled beyond the filling limit, so that the rotor and serrated plate become worn out, this can cause the ripple plate to become blunt and the rotor rod to become

bent and renders nut splitting ineffective. Another factor that causes the ripple mill machine to be damaged is due to excessive machine operation and exceeding the usage time limit recommended by the manufacturer [3] . Damage to the ripple mill machine fails 13 times a year. Damage like this is dominated by damage to the ripple mill rotor and ripple plate [4] .

Fig. 1. Ripple Mill Machine

The operating schedule for the ripple mill machine is around 24 hours/day if there is no damage. The ripple mill machine plays an important role in the processing of oil palm nuts and shells [5] . With long enough operation, damage often occurs to the ripple mill machine, so it is necessary to maintain it. ripple mill machine [3] . Maintenance activities on the ripple mill machine are carried out regularly and in accordance with work procedures or SOPs, with the aim of preventing damage that can cause the ripple mill machine to stop working [6] . The condition of the Ripple mill which works almost 24 hours is prone to damage so that it has an impact on the performance and productivity of the company [7] .

II. Research Methods

This research was conducted at PT. Ujong Neubok Dalam (UND) and carried out within 4 months. This study used the PERT (Project Evaluation and Review Technique) method. The PERT method is a management science model that is used to carry out project planning and also for project control [8] . The PERT method is used to minimize delays, or those that can disrupt and cause conflicts in the production process, then this method is used to coordinate and synchronize parts of the entire work and to speed up the completion of a project. The PERT method is carried out by planning a schedule, so that work is completed and the time is right [9] . Judging from its function, the PERT method is a good approach to completing projects in industry, so that maintenance can be completed on time.

By applying the PERT method, it is hoped that it will be able to determine a realistic completion time according to the ripple mill machine maintenance work schedule [10] . According to Render and Jay, the use of the PERT method can be done based on three time perspectives for each task, namely time for optimism, time for pessimism, and time for realistic. The expected result of using the PERT method is to reach a certain level where time is an important basis for completing a project. Figure 2 shows the specifications of the ripple mill machine used at PT. UND. The specifications for the ripple mill machine can be seen in Table 1.

Table 1. Ripple mill machine specifications

Brand	**KEWCRACER**
Model	KCM 6T
Capacity	6 Tons
round	1080rpm
Phase	3 Phases
Amount	4 Units

Fig. 2. Ripple Mill Machine Specifications

III. Results and Discussion

Prior to conducting a maintenance analysis on a ripple mill, additional data collection is required. Scheduling data and maintenance cost data are data that are needed and have been collected by researchers to carry out calculations in this study. Because some manufacturing processes use machines, this is the object of study. can be seen in table 2.

Table 2. PT.GMP-POM Production Operation Work Time

Time	Information	Rental Time (Hours)
08.00-09.00	Equipment check	1.0
09.00-14.00	Production operation	5.0
12.00-13.00	Rest	-
14.00-00.00	Production operation	9.0
	Total	15

Fig. 3. Ripple mill machine rotor axle inspection process

From the results of interviews with employees while in the field, there are several items that are the object of research at the kernel station, one of which is the Ripple mill machine. Ripple mill machine is a tool used by sawmills to remove shells from sawdust. The ripple mill machine maintenance schedule data can be seen in Table 3.

Table 3. Ripple Mill Machine Maintenance Schedule

No	Items	Treatment Schedule	Substitution Schedule
1	*axles*	every day	Replaced if damaged
2	*Ripple plate pipe*	every day	Replaced if damaged
3	*Bearings*	every day	Replacement every 3 months
4	*V-Belts*	every day	Replacement every 3 months

Table 3 shows the component maintenance schedule on the ripple mill machine that is given lubrication, namely the bearings and the V-belt every 3 months. Rotor axles and ripple plate pipes are inspected every day and replacement is only done if the component is damaged. Figure 3 shows the process of inspecting the rotor axle of a ripple mill machine. Material requirements for component maintenance on ripple mill machines are shown in table 4.

Table 4. Material Requirements for Ripple Mill Maintenance

No	Replacement of Ripple Mill Machine Components	Treatment Schedule	
		3 months	6 months
1	Lubricants	2 kgs	8 kgs
2	*Bearings*	2 pieces	8 pcs
3	*V-Belt SPB* 2630 Lw	3 pieces	12 pcs
4	*Ripple plates*		1 set
5	*Pully B3x5*		1 set
6	*Spaces ring*	3 pieces	12 pcs
7	*axles*	50 btg	200 btg
8	Welding wire MH 360 4 mm	40 kgs	160 kgs
9	Bolt	40 pieces	160 pieces

Table 5. Maintenance Activities on *Ripple Mill Machines*

Activity	Treatment Activity
A	Check the *rotor axle pipe*
B	Remove the tube from the worn *rotor axle*
C	*Rotor axle* inspection every 3 months
D	Making serrations on the ripple plate wall
E	Perform welding to attach the cleats to the *ripple plate wall*
F	Check the lubrication check surface on *the bearing*
G	Cleaning of dirty lubricating oil is done once a week
H	Provide lubricating oil on *the bearings*
I	Making a new *V-Belt* or replacing an old *V-Belt*
J	Trials

Based on the results of table 4. Maintenance activities are used in determining the ripple mill critical path for critical correction on the ripple mill, when repairing a ripple mill machine, there are several components that must be provided. such as 2 kg of lubricant, 2 bearings, 3 V belts-SPB 2630Lw, Ripple plates, B3x5 pulleys, 3 space rings, 50 rod axles, 4mm MH360 welding wire and 40 bolts. This component is replaced every 3 months and for Ripple plates and B3x5 pulleys, 1 set is replaced every 6 months. for his maintenance activities, there are several steps that must be done. first check the rotor axle pipe if there is damage directly replaced, then replace the damaged or worn rotor axle pipe, inspection of the axle rotor is carried out every day and for the ripple plate,

serrations must be made on the ripple plate wall. after making the cleats, welding must be done to attach the cleats to the ripple plate wall, after welding, continue by checking the surface of the lubricant on the bearings, if the lubricating oil is dirty, it must be replaced, the inspection is carried out every day and must be replaced once a week. to replace bearings, it is required to apply lubricating oil with the aim that the bearings do not wear out quickly while working and lastly, tighten the V-belt bolts or replace a new V-belt, when it can wear out on the V-belt. after all components have been checked, continue with trials to ensure the machine is working properly and is back to normal. The steps for maintaining a ripple mill machine can be seen in table 5.

IV. Conclusion

Based on the results of the ripple mill machine maintenance analysis by analyzing the PERT method, it can be done by accelerating the duration of the project by accelerating workers who are on the critical path. Time duration the optimal operating time for a palm oil mill is 23 hours, with a normal time of 30 hours. During that time, it is the optimal time after being accelerated by the PERT method. The opportunity for a ripple mill machine maintenance project can be carried out with a duration of 23 hours. This means that it has a success rate of 95.49 %. With this time the treatment has enough opportunities to be completed with sufficient duration of time. When repairing a Ripple mill machine there are several components that must be provided such as Lubricants, Bearings, V-belt-SPB 2630Lw, Ripple Plate, Pully B3x5, Space Ring, Rotor axle, and 4mm MH360 Welding Wire. As for the work steps, the maintenance starts with checking the axle rotor and immediately following the other components. This maintenance is carried out every 3 months, except for the Ripple Plate and Pully B3x5, because these 2 components are replaced once every 6 months.

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