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Identification of Screw Press Machine Damage Using Failure Mode and Effect Analysis Method in PT. Socfindo Seunagan

Sarbeni[a,1,*], Arie Saputra[b,2]

[a,b] Universitas Teuku Umar, Alue Peunyareng streets, Ujong Tanoh Darat, 23681, Indonesia
[1] *sarbeniwoyls@gmail.com*;* [2] *ariesaputra@utu.ac.id*

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ABSTRACT

The palm oil mill (PKS) is a place that serves as a place to process fresh fruit bunches (FFB) of palm oil into crude palm oil (CPO), palm kernels (kernels), fiber and palm shells. The processing of palm fruit into palm oil is carried out using production machines, one of which is a Screw Press machine [1]. In a factory, there are usually problems, one of which is at the Screw Press engine station. The Screw Press machine is one of the most important machines in palm oil mills. This study aims to identify damage and failures that occur in screw press machines. This study uses the failure mode and effect analysis (FMEA) method, which is to find out or observe the level of failure and damage that occurs in the screw press machine so that it can minimize failures / damage that occur. Based on the results of the study, there were 9 failures and risks that occurred in the screw press machine components, with the highest Risk Priority Number found in the Special Bearing components with a value of 144. While the lowest value is in the Spur Gear component, which is with a value of 24. From these results, it can be concluded that the Special Bearing component is a priority / priority for repairs.

I. Introduction

PT. Socfindo is one of the palm oil mills in Aceh province. The palm oil mill (PKS) is a place that serves as a place to process fresh fruit bunches (FFB) of palm oil into crude palm oil (CPO), palm kernels (kernels), fiber and palm shells. The processing of palm fruit into palm oil is carried out using production machines, one of which is a Screw Press machine [1]. In a factory, there are usually problems, one of which is at the Screw Press engine station.

The Screw Press Machine is one of the very important machines where this machine is critical, because if the screw press machine is damaged, it will result in a halt in the production process of the factory [2]. Screw press is a very important tool in palm oil mills, because if this screw press has problems, the processing of CPO oil press is disrupted and results in less CPO oil yield and the separation of shells and fiber is not optimal [3].

FMEA (Failure Mode and Effect Analysis) is a method used to define, identify, and eliminate defects and problems in the production process both known and potential problems in the system [4].

Failure Mode and Effect Analysis (FMEA) is structured based on the function of the components which can then determine the various causes of the failure that caused the failure and the impact resulting from the failure. Then determine the order of RPN (Risk Priority Number) values from the highest to the lowest. The highest RPN value can be interpreted to mean that the component requires immediate handling [5].

Based on the results of previous research by "Pasaribu" [6] with the title "Maintenance Analysis of Screw Press Machines in Palm Oil Mills with Failure Mode and Effect Analysis (FMEA) Method at PT. XYZ" i.e. The maintenance used for the screw press machine at PT XYZ is predictive maintenance. The reliability of the components on the screw press machine at PT XYZ using the failure mode and effect analysis (FMEA) method is known that the screw press machine components still do not meet the operating requirements because the risk priority number (RPN)

value is above 400, the highest average RPN value of the machine from the components of each screw press machine, namely the screw press filter 216, the lowest availability of each screw press machine component is known by namely the spur gear box component experiencing Wear and tear with a value of RPN 27 and with a repair time of 0.1 hours and availability of 2.314405889. This study aims to identify the damage that occurs to the work station of the screw press machine.

II. The Proposed Method

This research was conducted at the screw press station, in this study it was conducted to identify damage that occurred to the Screw Press station. PT. Socfindo Seunagan operates in the Aceh region, Nagan Raya Regency which is a company engaged in the palm oil industry. This study was identified using the Failure Mode Effect and Analysis (FMEA) method. The FMEA method is carried out to find damage components in the screw press machine, namely by identifying the machine, then determining the screw press station by determining the risk priority number (RPN) value. Researchers conducted this study from July 27 to January 27, 2023. Data processing using Microsoft Excel and represented in the form of processing results and then generating conclusions.

III. FMEA METHOD DATA ANALYSIS

FMEA is a method that can systematically and structurally analyze and identify the consequences of system or process failures, as well as reduce or analyze the chances of failure [7]. FMEA provides three criteria for each problem that occurs, namely the Severity, Occurrence, and Detection criteria, these three criteria then form the so-called Risk Priority Number (RPN), namely with the formulation SxOxD = RPN, where the higher the RPN, the higher the impact of the problem on the quality of the product or process so that the handler must be moved [8].

1. *Severity*

Severity is a rating that indicates the degree of seriousness of the effects of a failure mode. The criteria for determining the severity value in the following table:

Table 1. *Severity*

Effect	***Criterion***	***Rating***
Maximum Severity	Downtime increases significantly, Product performance is greatly decreased, Consumers are very dissatisfied	10
Exterem severity	Failures that occur are likely to pose a hazard, occupational safety must be observed	9
Very high severity	Downtime increases significantly and has an impact on finances, the product cannot be used but is safe, Consumers are very dissatisfied	8
High severity	Downtime increases significantly, Product performance is greatly decreased, Consumers are very dissatisfied	7
Severe	Smooth production is disrupted, Production is running but performance is declining, Consumers are dissatisfied	6
Moderate	Influence seen through the production process Performance will slowly decrease dissatisfied customers	5
Minor	Smooth production likely to be disrupted Consumers are aware of the small influence on the product Smooth production is likely to be disrupted Consumers are aware of the small influence on the product	4
Slight	Users may be aware of the influence on the product but the effect is very small (Process and consumer)	3
Very slight	No effect on the smooth running of production has no significant effect on the product	2
None	Realized by the operator is not realized by the consumer	1

2. *Occurrence*

Occurrence is the possibility that the cause will occur and result in a form of failure during machine use. The criteria for determining the value of Occurence in the following table:

Table 2. *Occurrence*

Occurrence	***Criterion***	***Rating***
Extremely unlikely	Failure is highly unlikely	1
Remote Likelihood	Possible failures are rare	2
Very low likelihood	Very few failures possible	3
low likelihood	Little possible failures	4
Moderately low likelihood	Moderate probability of failure	5
Medium likelihood	Fairly high probability of failure	6
Moderately High likelihood	High Probability of failure rate	7
High Likelihood	The probability of failure rates is very high	8
Very High likelihood	Failure possible	9
Extremely unlikely	Failure is almost certain	10

3. *Detection*

Detection is a measurement of the ability to control or control failures that can occur. The criteria for determining the detection value are shown in the following table:

Table 3. Detection

Detection	***Criterion***	***Rangking***
Extremely likely	Control will be required to be aware of defects	1
Very high likelihood	Control is needed to detect failures	2
High likelihood	Control has high effectiveness for detecting	3
Moderately high likelihood	The control has a rather high effectiveness for detecting	4
Medium likelihood	Control has moderate effectiveness for detecting	5
Moderately low likelihood	The control has a rather low effectiveness for detecting	6
Low likelihood	Low probability of detection	7
Very low likelihood	The probability of being detected is very low	8
Remote likelihood	Control has little effect on detecting defects	9
Extremely unlikely	The control will not be able to detect defects	10

IV. Results and Discussion

In screw press machines, risk identification is determined based on data collection in the field related to the causal factors and damage to screw press components. The following can be seen a table of causes and damage to the screw press machine.

Table 4. Component Demage to the *Screw Press* Machine

No	***Defective Components***	***Damage***
1	Special Bearing	Cracking
2	Bearing	Broken
3	Worm Screw	Wear
4	Press Cage	Wear
5	Drive Shaft	Break
6	Electric Motor	Overcurrent
7	Spur Gear	Wear
8	Speed Reducer	Crack
9	Oil Seal	Broken

Based on the identification results, there are 9 components that have been damaged in the Screw Press machine.

A. Risk Priority Number

The risk priority calculation is done to find the Risk Priority Number (RPN) value that has the greatest risk. In calculating RPN first determine the value of Severity, Occurrence and Detection. Here is a table of calculations based on existing data as follows:

Table 5. Riks Priority Number

No	Defective Componente	S	O	D	RPN
1	Special Bearing	6	6	4	144
2	Bearing	5	5	4	100
3	Worm Screw	6	6	3	108
4	Press Cage	6	3	3	54
5	Drive Shaft	4	4	4	64
6	Electric Motor	3	4	3	36
7	Spur Gear	3	4	2	24
8	Speed Reducer	5	5	2	50
9	Oil Seal	3	6	3	54

Source : Data Processing Results Using FMEA Method

Based on the results above, a graph of the Risk Priority Number (RPN) assessment results on the screw press machine components is shown in figure 1.

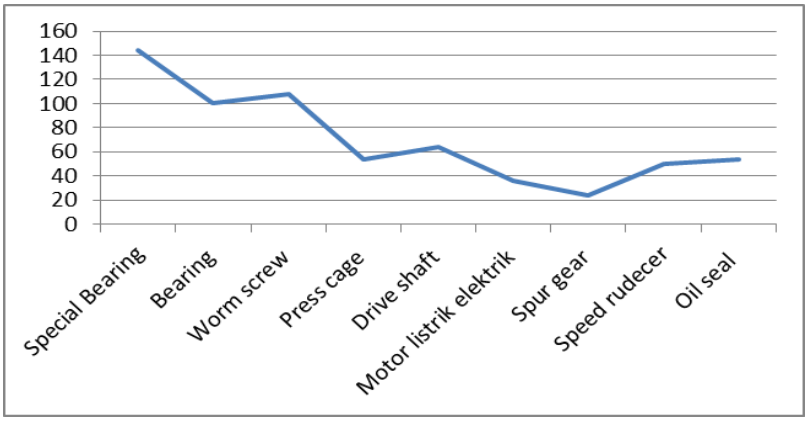

Fig. 1. RPN value on Screw Press machine

Based on the graph obtained, it can be seen that the highest RPN value is in the first component, namely the Special Bearing of 144, and the smallest value with RPN 24, namely the Spur Gear component.

V. Conclusion

Screw Press Machine there are 9 risks of failure that occur based on the results of the Risk Event. Risk Priority Number from the calculation of Severity, Occurrence, and Detection obtained the highest value of RPN in the Special Bearing component with a value of 144. While the lowest value is in the Spur Gear component, which is with a value of 24. From these results, it can be concluded that the Special Bearing component is a priority / priority for repairs.

VI. Suggestion

Based on the results of the study, for identification at the screw press station, researchers have several suggestions, namely as follows:

1. Of the 9 components that have been analyzed with failure mode and effect analysis, it can be recommended that major damage occurs to special bearing components. With that, thecompany must carry out regular maintenance of the protection hut components.
2. Provide special scheduling of the screw press machine to carry out maintenance on the screw press machine, especially on the parts with the highest RPN value.

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