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Analysis Of Overall Equipment Effectiveness (Oee) In Determining Productivity In Semi Automatic Semi Solid Filling Machines At PT X.

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ABSTRACT

One of the manufacturing industries such as the cosmetics manufacturing industry still have tight and competitive competitiveness. The tight competition forces employers or management to continue to try to improve competitiveness. In the current era of globalization, so that the company can survive in competition, the company must be able to manage its resources such as humans, machines or other supporting facilities, as the conditions in question are ready to use to carry out its production operations, both accuracy, ability or its capacity. This study discusses the analysis of Overall Equipment Effectiveness (OEE) on a semi-automatic filling machine semi-solid at PT.X with the aim to provide input to the problems faced by the OEE calculation analysis and reveal the root cause of the problem. This study determines what efforts are made to increase the OEE value by using Fishbone, Failure Mode and Effect Analysis (FMEA) and how it is implemented. In this research, the results of the average calculation for July-September 2018 obtained availability values of 74.24%, performance rates of 54.53%, quality rates of 81.52% and OEE 30.56%. The value of Failure Mode and Effect Analysis (FMEA) obtained the highest value found in Equipment Failure Losses (RPN = 80), Defect losses (RPN = 64) and Idling and minor stoppage (RPN = 60). From the results of these losses found the root of the problem which causes the value of the percentage loss. The level of risk from the root cause of the performance of semi-solid semi-automatic filling machines is the standard replacement of unsuitable spare parts and no buffer stock. Lack of operator awareness and maintenance parts so autonomous maintenance must be improved again.

1. INTRODUCTION

One of the manufacturing industries, such as the cosmetic manufacturing industry, still has a tight and competitive edge. Intense competition forces entrepreneurs or management to continuously strive to increase this competitiveness. In the current era of globalization, in order for the company to survive in competition, the company must be able to manage its own resources such as humans, machines or other supporting facilities, as the condition in question is a ready-to-use condition to carry out its production operations, both accuracy, capability or capacity.

When viewed from the perspective of consumer interests, it is very profitable, because consumers have various alternatives in meeting the need for goods and services. Consumers certainly choose goods or services that are considered to be of higher quality at relatively lower prices. Meanwhile, from the producer side, especially Indonesian producers, this era of globalization can be a threat, especially for foreign products which are more expensive due to the effect of high import duties.

TPM has an important role in increasing production performance and product quality in a company. The main goal of TPM is to achieve zero breakdown and zero defects. TPM is a structured, equipment-oriented continuous improvement process that seeks to optimize production effectiveness by identifying and eliminating equipment losses and production efficiency losses throughout the life cycle of a production system through the active participation of team-based employees at all levels of the operational hierarchy. One of the performance measurement methods that is widely used and able to overcome machine/equipment problems is overall Equipment Effectiveness (OEE). OEE is defined as a measure to evaluate the effectiveness of equipment that seeks to identify production losses and other indirect and hidden cost losses that have a major contribution to the total cost of production. This measurement method consists of three main factors that are interconnected, namely availability, performance and quality. This method is the main part of the maintenance or maintenance system that is widely implemented by companies in Japan. This maintenance activity involves all parties in a company to be able to work together in eliminating break downs, reducing down time, maximizing utility, production activities and the quality of the products produced.

PT. X is one of the national cosmetic manufacturing industries. PT. X focuses on high output results so that sales are also high. At first it went well, because the production machines were in pretty good condition. However, over time, according to data obtained from the maintenance and production departments, various problems have arisen such as higher product reject rates, high machine breakdown, non-standard machine setup times, decreased delivery times and so on which greatly disrupts production. which results in a reduction in quality.

2. METHOD

Based on the types of problems studied, the techniques and tools used, the approach used in this research is descriptive quantitative and this type of research is a case study supported by a survey that collects data on factors related to research variables.

3. RESULTS AND DISCUSSION

A. Calculation analysis of OEE values

1) Measuring the value of the Availability Ratio

Table 1 Availability Rate Data

Month	*Standar Time Available* (minute)	*Planned Downtime* (minute)	*Loading Time* (minute)	*Set Up Time* (minute)	*Unschedule Downtime* (minute)*)*	% *Availability*
July	8760	420	8340	1660	847	69.94 %
August	6720	540	6180	1160	472	73.59 %
September	5670	815	5490	815	328	79.18 %
		Rata-rata				**74.24**

2) Performance efficiency value measurement

Table 2 Performance efficiency Data

Month	Production Amount (Pcs)	*Operation Time* (minute)	*Cycle Time* (minute)	% *Performance*
July	42.798	5.833	0.2	61.14 %
August	29.851	4.548	0.2	54.70 %
September	20.315	4.347	0.2	38.94 %
		Rata-rata		**51.59**

3) The value of the Quality Rate Measurement

Table 3 Quality Data

Month	Production Amount (Pcs)	*Defect Amount* (pcs)	% *Quality*

July	42.798	9.027	78.91 %
August	29.851	5.177	82.66 %
September	20.315	3.453	83.00 %
		Rata-rata	**81.52**

4) **Total OEE Value Measurement**

Table 4 The Calculation Results of the OEE value

Month	% *Availability*	% *Performance*	% *Quality*	OEE
July	69.94 %	61.14 %	78.91 %	33.70 %
August	73.59 %	54.70 %	82.66 %	33.30 %
September	79.18 %	38.94 %	83.00 %	25.60 %
Avarage	74.24 %	51.59 %	81.52 %	30.87 %

B. Analysis of the calculation of six big losses

1) Downtime Losses

a. Equipment Failure Losses

Table 5 Equipment failure losses Calculation

Month	Numbers of Day	Loading Time (Minute)	Downtime (Minute)	Downtime (%)
July	17	8340	2507	30.06
August	13	6180	1632	26.41
September	9	5490	1143	20.82

b. Setup and Adjustment Losses

Table 6 Setup and Adjustment Losses Calculation

Month	Numbers of Day	Loading Time (Minute)	Setup (Minute)	Losses (%)
July	17	8340	210	2.52
August	13	6180	260	4.21
September	9	5490	135	2.50

2) Speed Losses

a. Idle and Minor Stoppage Losses

Table 7 Idling and Minor Stoppage Losses Calculation

Month	Numbers of Day	Loading Time (Minute)	Non Productive Time (Minute)	Idling minor losses (%)
July	17	8340	501	6.01
August	13	6180	326	5.28
September	9	5490	229	4.17

b. Reduce Speed Losses

Table 8 Reduce Speed Calculation

Month	Numbers of Day	Loading Time (Minute)	Ideal Cycletime (Minute)	Production Total (unit)	Ideal Production Time (minute)	Operation Time (minute)	Losses (%)

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July	17	8340	0.2	42.798	8559.6	5833	-32.69
August	13	6180	0.2	29.851	5970.2	4548	-23.01
Septembe r	9	5490	0.2	20.315	4063	4347	5.17

3) Quality Losses

a. **Defect Losses**

Table 9 Defect Losses Calculation

Month	Numbers of Day	Loading Time (Minute)	Ideal Cycletime (Minute)	Production Total (unit)	Defect (unit)	Losses (%)
July	17	8340	0.2	45.987	9027	21.65
August	13	6180	0.2	29.851	5177	16.75
September	9	5490	0.2	20.315	3.453	12.58

C. Pareto Diagram Analysis

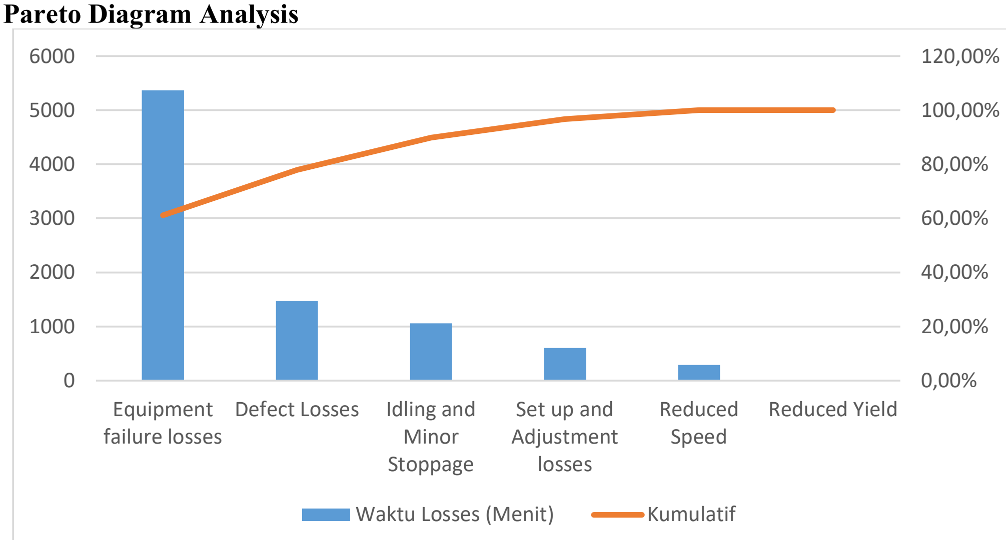
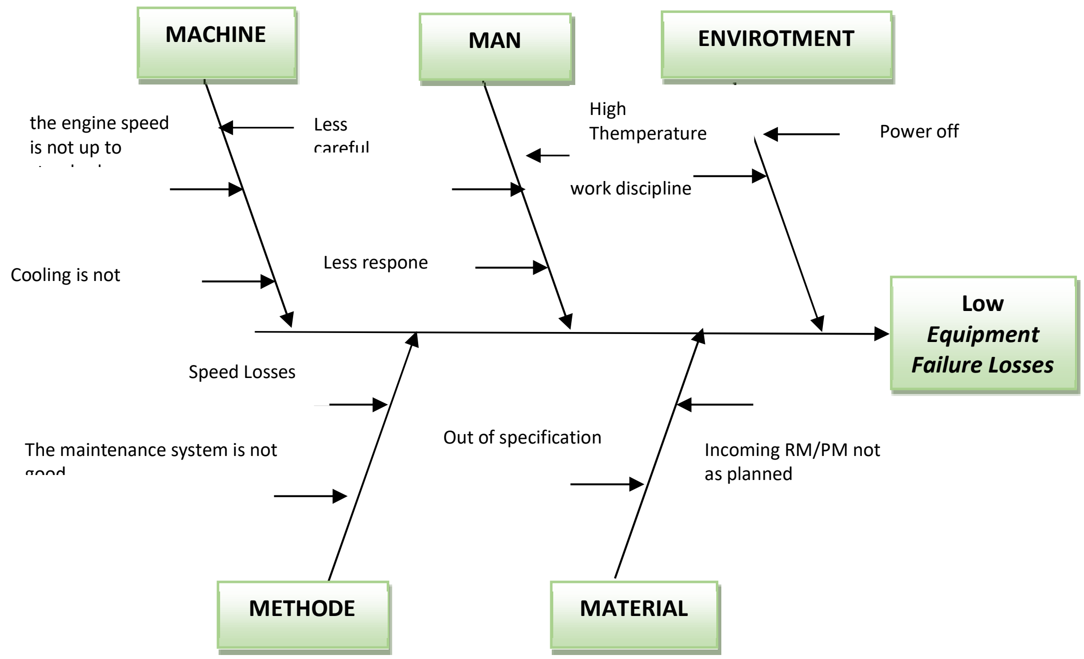


Figure 1. Pareto Percentage Chart of Six Big Losses Factors

D. Failure Mode and Effect Analysis (FMEA)

Based on the results of the Failure Mode and Effect Analysis (FMEA) analysis, it was obtained various problems and consequences caused by the machine, the highest value was obtained in Equipment Failure Losses (RPN = 80), Defect losses (RPN = 64) and Idling and minor stoppage (RPN = 60).

E. Cause and Effect Diagram Analysis (Fish Bone)



A. Implementation Analysis

After the implementation mentioned above, it can be seen the results of observations of the new availability, performance and quality product values.

Table 16 The New Value of OEE

Days To-	% *Availability*	% *Performance*	% *Quality*	OEE
1	77.45 %	70.61 %	88.32 %	48.30 %
2	79.41 %	62.37 %	92.31 %	45.72 %
3	78.43 %	66.44 %	90.22 %	47.01 %

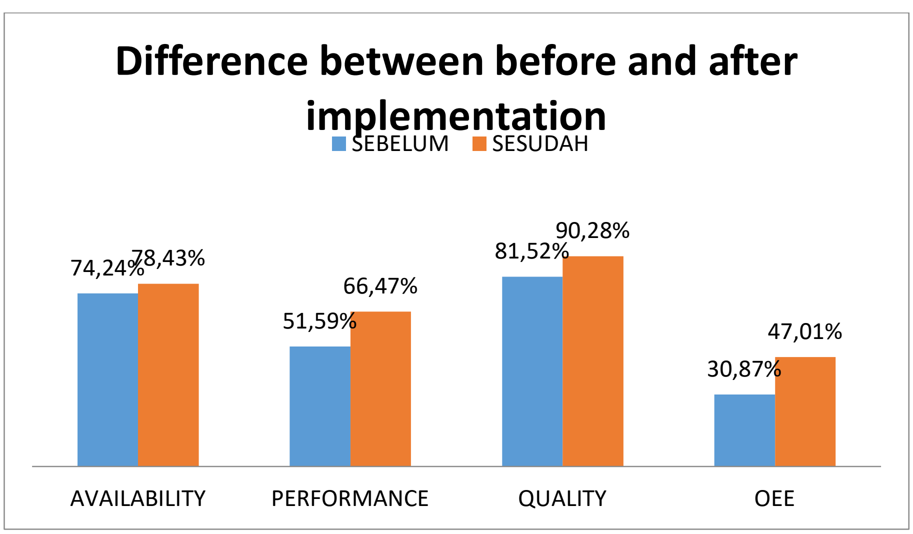


Figure 2. Histogram Before and After Implementation

From these data a histogram can be made between before implementation and after implementation where the results can show that there is an increase in the availability, performance and quality values so that the results of the OEE value also increase even though it is still below the standard OEE value set by the Japan Institute of Plant Maintenance (JIPM), namely > 85%.

4. CONCLUSION

The results of calculations that have been carried out on average from July to September 2018 obtained an availability value of 74.24%, a performance rate of 54.53% and a quality rate of 81.52%. From these results it can be seen that the semi-automatic semi-solid machine is still not optimal in carrying out production so that with the time and capacity available, it cannot produce good quality.

The average result of the calculation of Overall Equipment Effectiveness is 30.56%. This value is still far below the OEE standard set by the Japan Institute of Plant Maintenance (JIPM), which is 85%. Even though the availability and quality rates are quite high, the performance rate is still lacking, so the OEE value is low.

The biggest losses that cause the low OEE value are equipment failure losses with a value of 61.13%.

Based on the results of the Failure Mode and Effect Analysis (FMEA) analysis, various problems and consequences are obtained by the machine, the highest value is obtained for Equipment Failure Losses (RPN = 80), Defect losses (RPN = 64) and Idling and minor stoppage (RPN = 60).

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