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Analysis of Effectiveness and Efficiency Machinery Book on Making Packaging Drink Box 350ML

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Abstract: The research objective is to measure the level of efficiency and efficiency of the machine in the process of making 350ml beverage packaging and the use of its causes. Identify and analyze the causes of problems. Low value and efficiency of the manufacturing process on production. Give advice to help companies increase production capacity on 350ml beverage packaging. The results of the analysis obtained an average value of OEE boobts of 23% with an average value of 34% availability, an average value of 49% performance value, and an average value of 98% quality value. From these data the value of OEE is still far from the standard of manufacturing industries in the world by 85%. Factors that influence the low OEE value are a decrease in engine speed (reduce speed) on the engine boobts with a percentage of 18%, while other factors that cause losses are equipment failure by 14%, adjustments and adjustments by 10%, and stopping minor idle by 6%. From the analysis using the Ishikawa diagram it can be seen that determining the decrease in the speed of the engine boobts is the machine itself which engine parts have been stopped.

Key words: box packaging; overall equipment effectiveness; six big losses
JEL codes: D2, D240

1. Introduction

PT. Surya Rengo Containers is a company engaged in the production of cardboard boxes made of paper and has 4 company units spread across Indonesia. PT Surya Rengo Containers is one of the companies included in the printing and packaging industry. PT. Surya Rengo Container manufactures various kinds of packaging boxes such as food/beverages, electronic goods, textile fibers, and others. In the development of the growing packaging industry in Indonesia, PT Surya Rengo Kontainer has developed a special strategy to increase product productivity, quality, and environmentally friendly products. One example is the application of the 3R concept (Recycling, Reuse and Reducing) the use of raw materials and energy in each process. To produce maximum production output, it is necessary to evaluate the production machines that have been carried out effectively, in the sense of being able to improve the effectiveness and efficiency of machines. One tool that has been widely used to measure the level of effectiveness and efficiency of overall plant equipment in the manufacturing industry, is Overall Equipment Effectiveness (OEE). The use of OEE methods in this studio asks for help determining the

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effectiveness and efficiency of the Boobts engine in the production process.

2. Literature Review

2.1 Overall Equipment Effectivenes

According to Hansen R. (2001), states the measurement of OEE as following: “The key in TPM. Simple OEE is measurement. Measurements are important to determine the efficiency of process effectiveness. With the cessation of the OEE engine, it integrates with three key metrics of availability, performance and quality, through OEE you can measure and analyze problems with the engine and provide improvements to improve your manufacturing process and benchmark your progress.”

Overall Equipment Effectiveness (OEE) is a product of operating activities with six big losses in machinery/ equipment. The six factors in six big losses can be grouped into three main components in OEE to be used. In measuring machine/equipment performance, namely, downtime losses, speed losses and defect losses. According to Stamatis D. H. (2010).

2.2 Six Big Losses

Activities and actions taken in TPM not only focus on preventing damage to the machine/equipment and minimizing machine/equipment downtime. However, many factors can cause losses due to low efficiency of the machine/equipment only. The low productivity of machinery / equipment that causes losses for companies is often caused by the use of ineffective and inefficient machines / equipment, there are six factors called six big losses. As for the six losses, namely losses due to equipment damage (equipment failure losses), losses due to installation and adjustment (setup and adjustment losses), losses due to operating without a load or due to stop for a moment (idling and minor stoppages losses), losses due to a decrease in operating speed (reduce speed losses), losses due to defective products (defect in process losses), and losses at the beginning of production (reduce yield losses). This OEE measures whether the production equipment can work normally or not. OEE highlights 6 major losses (the six big losses) cause of production equipment not operating normally (Denso, 2006, p. 6), namely: cause and effect diagrams are often called fishbone diagrams because they are shaped like a fish frame, or Ishikawa diagram because it was first introduced by Prof. Kaoru Ishikawa from the University of Tokyo in 1953 (Gasperz, 2012).

2.3 Research Methods

Quantitative methods are methods that emphasize aspects of measuring objectively the social phenomena. To be able to take measurements, every social phenomenon is translated into components of problems, variables, indicators. Each variable that is determined is measured by using different numerical symbols in accordance with the categories of information associated with these variables. By using these numerical symbols, a quantitative mathematical calculation technique can be performed so as to produce a generally accepted conclusion within a parameter. The main purpose of the method is to explain a problem but produce a generalization. Generalization is a reality that occurs in a reality about a problem. Population is the totality of all possible values, the results of calculations or measurements, quantitatively and qualitatively regarding certain characteristics of all members of a collection that is complete and clearly wants to learn its properties. In this study the population taken is the cause of the instability of the Overal Equipment Effectiveness (OEE) value on the boobts machine. Data collection methods both Primary Data and Secondary Data, and data analysis techniques.

3. Data Procssing and Data Analysis

3.1 Data Processing As Follws:

Table 1 Data on Engine Boobts Downtime

NO	Code Down Time	REMARKS	FREQ. (TIMES)	DURATION (MIN)
1	201	Tidak Ada Order / Beban Kosong	6	1245
2	204	Shalat Jumat	1	45
3	304	Problem Counter	1	40
4	309	Problem Mekanik	5	765
5	401	Cutter Blower Macet	1	10
6	402	Dies Backing	39	355
7	403	Tunggu Forklift	3	40
8	407	Pisau Patah, Ganti	8	175
9	408	Creasing Problem	6	85
10	409	Cari Sheet	1	10
11	410	Sortir Sheet Lengkung/Ngelotok	19	250
12	415	Persiapan	1	15
13	416	Die Cut Problem	8	165
14	421	Jump Up	5	230
			104	**3430**

3.1.1 Setup Time

Setup time is the timeframe calculated from the last time the machine produced quality finished goods to be able to re-produce quality goods at normal speed. Below this is the setup time table at PT. SRC.

Table 2 Boobts Engine Setup Time

No	Tanggal	Setup time		Total setuptime	No	Tanggal	Setup time		Total setup time
		Setting	Cleaning				setting	cleaning	
1	03 juni	20	10	30	10	19	20	10	30
2	05	15	15	30	11	20	0	25	25
3	06	20	10	30	12	21	8	10	18
4	09	20	15	35	13	22	20	10	20
5	10	0	20	20	14	24	0	20	20
6	12	8	15	23	15	25	25	10	35
7	13	10	20	30	16	26	6	15	21
8	15	25	15	40	17	28	0	25	25
9	17	0	25	25	18	29	20	10	30

3.1.2 OEE Calculation

After the availability, performance and quality values are obtained, the OEE value will then be calculated by multiplying these three factors. The formula used to use the average OEE is: OEE = 74% × 32% × 100% = 23%, Furthermore, the calculation of OEE values, it is known that the average OEE value on boobts is still far below the manufacturing industry standard of 85%. And the most significant elements that influence the low OEE value of the boobt machine are the availability value of 34%. Then the next step is to count the 6 biggest losses (Six Big Losses) on the boobts engine. On the OEE value, it can be seen that the lowest value is the availability rate of 34%, therefore tracing elements at the availability rate based on the value of each loss value.

3.1.3 Calculation of losses

The calculation of the value of losses is based on the category of six big losses, each of which has a loss in the three OEE elements. The six losses include equipment failure, setup and adjustment, reduced speed, idle and minor stoppage, scrap, and rewok.

Calculation of Equipment failure Losses are calculated from the ratio of damage to engine repair to total time.

Breakdown Time = 35 minutes; Total Time = 370 minutes

Equipment Failure = (35 minutes) / (370 minutes) × 100% = 9%

Calculation of Setup and Adjustment

Setup and Adjustment losses are calculated from the ratio of preparation time and machine adjustment to total time. Setup time = 30 minutes; Total Time = 370 minutes Setup and Adjustment = (30 minutes) / 370 minutes × 100% = 8%

3.1.4 Reduced Speed Calculation

Reduced speed is a loss due to low operating speed or the actual engine speed below the ideal engine speed. Reduce speed losses are calculated from the ratio of performance losses or speed losses to total time.

Actual available time = 185; Net Production Time = 58;

Total time = 370 = 185 - 58= 127

Reduced speed = 127/370 × 100% = 34%

3.1.5 Calculation of Idle Minor Stoppage

Idiel & minor stoppage are losses that occur while waiting in connection with cleaning due to scrap. Ideal & minor stoppage tagal 3 June 2017 is calculated from the comparison of non productive valuae time with total time.

Non productive velue = 10; Total time = 370

Idle and minor stoppage = 10 minutes / 370 minutes × 100% = 0.03 or 3%

3.1.6 Scrap calculation

Scrap is the time used in product adjustment. Scrap is a loss that results from a decrease in output quality. Scrap is calculated from the ratio of rejection to total time.

Data reject = 55 units; Actual Run rate = (28000 units) / (185 minutes) = 151 units / minute

Scrap = (55 units) / 151 minutes = 0.4 minutes; Scrap Losses = (0.4 minutes) / (370 minutes) = 0,00010

3.1.7 Rework Calculation

Rework is a time loss due to product defects and rework. Rework is calculated from the ratio of rework time to total time.

Rework = (10.0 minutes) / (370 minutes) × 100% = 3%

So it can be concluded that of the six losses that have the main problem is the low value of OEE that is due to the problem at reduced speed. Therefore to find the root cause of the reduced speed, the authors analyze using Ishikawa diagram analysis.

The low speed of the engine boobts from the ideal speed makes the engine performance down (performace loss), this happens because the decline in engine speed due to several factors, one of which is the age of the engine that has long caused frequent brakdowns and no longer standard engine boobts. The average value of reduced speed is 18%.

3.2 Discussion and Analysis

Then the analysis in this study is divided into 2 parts, namely the analysis of each loss value and identifying the root cause of the problem from the value of losses that most significantly affects the low OEE element by using the Ishikawa diagram.

3.2.1 Analysis of the Value of Losses

In calculating OEE values in data processing it is known that the three elements are still far below the standard. To deepen the main problem or the main problem of the three elements, the smallest performance rate value will be discussed at the stage of data analysis two losses consisting of reduced speed and minor idle and stoppage. Reduce speed is associated with low actual speed of the ideal engine speed and idle & minor stoppage losses due to clearing scrap products so that production time is interrupted.

3.2.2 Ishikawa Diagram Analysis

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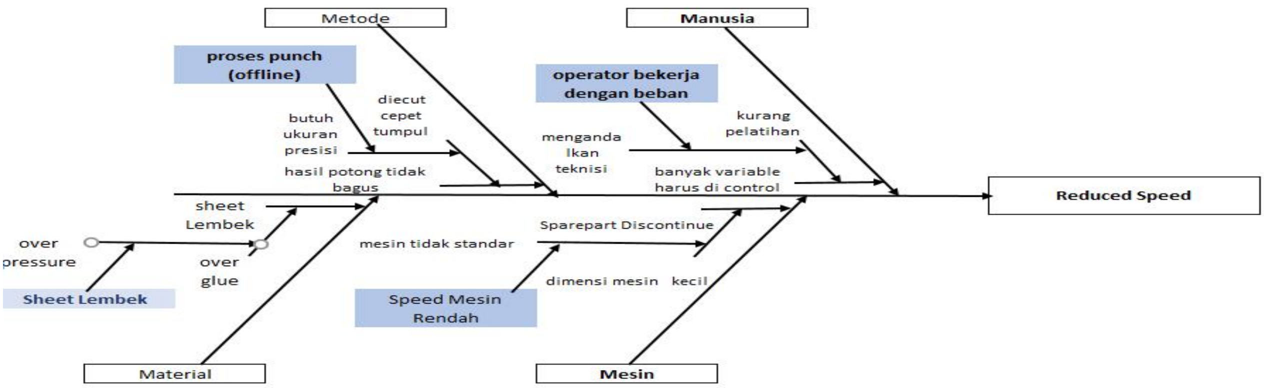

3.2.3 Corrective Action Plan Based on Problem Root

Then an alternative repair solution can be done is by removing the boobts engine in the production process of making 350ml beverage boxes and changing the offline process method to be inline by modifying the TCY engine. The TCY engine modification is by changing the Die cut and Rubber component tools so that it can run in the TCY engine inline process, intallall die cut lock on the TCY engine, and modifying the die cut into 3 outputs because the dimensions on the TCY engine are greater than the boobts engine.

4. Conclusion

After discussing and calculating the Overall Equipment Effectiveness (OEE) value for the boobts machine at PT. Surya Rengo Containers can be concluded as follows:

a) From the discussion and analysis obtained the average value of OEE boobts is 23% with an average availability value of 34%, an average performance value of 49%, and an average quality value of 98%. From these data the value of OEE is still far from the standard of manufacturing industries in the world by 85%.

b) Factors that influence the low OEE value are the reduction in engine speed (reduced speed) on boobts with a percentage of 18%, while other factors that cause losses are equipment failure by 14%, setup and adjustment by 10%, and idle minor stoppage by 6%. From the analysis using the Ishikawa diagram, it can be seen that the problem that affects the decrease in the speed of the engine boobts is the engine itself which has discontinued engine parts.

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