The Extent of Damage Identification Method Using Extrusion Machine Overall Equipment Effectiveness (OEE) in PT. XYZ

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Abstract. PT. XYZ was a company that has been producing many different type of a pipe, the PVC (Poly Vinyl Chlorida) pipe, the HDPE (High Density Polyethylene) pipe and the gutters pipe that used for clean water irrigation, the pipe installation of housing complex, the industrial waste disposal, for reservoirs and telecommunication. The process of making a pipe is often hampered on an extrusive engine because it used during 24 hours a day and the maintenance schedule of the machine has not been applied regularly. We need to do identification about the damages of exstrusive machine with a Total Productive Maintenance using the Overall Equipments Effectiveness (OEE) method. From the research, it can be seen that the set up time to an extrusive machine still took a long time and the production volume of the machine was still low. The effectiveness of the performance from extrusive machine also have not been able to achieve the OEE's standard that was 88 % .

Keywords: **Workload; Hearth Rate; Oxygen Consumption.**

1 Introduction

PT. XYZ is a company that engaged in industry product pipeline. Types of pipes produced variety, namely pipe PVC (Poly Vinyl Chlorida), HDPE (High Density Polythylene) drains and pipes. The company produces PVC and HDPE pipe products used for irrigation water supply pipe installation, housing, waste disposal, industrial reservoirs and telecommunications. The resulting product was marketed in two categories namely the products needed for the local needs and the products are made in accordance with the order.

On pipe-making process often constrained in the extrusion machine. The cause of the damage to this engine because the engine is used for 24 hours per day as well as engine maintenance schedules that have yet to apply it regularly. The damage component damage is common on electrical parts. Disorders of the extrution machine is causing the production process may be halted because the machine is functioning as plastic seed mixture printers have been melted down.

Fix the issue then identification of the extent of the damage to be done the engine happens with Total Productive Maintenance method using Equipments Overall Effectiveness (OEE). OEE is the ratio of Total Productive Maintenance (TPM) to plan the timing of the production (based on OEE factor to graph representation). Type of calculation makes the OEE is a simple test. In practice, it is generally the acceptance world-class goals for each factor is certainly different from each other. For example, a company uses the six sigma quality control, then in the level of quality achieved 99.9%. World studies indicate the average level of production floor in the OEE is 60%. The object of increased productivity is minimizing inputs and maximizes output. Inputs include manpower, machines and materials, while the output consists of Production (P), (Q), Cost (C), (D) the Delivery, Safety Health and Enviroment (S), and Morale (M).

To implement the Overall Equipment Effectiveness (OEE), TPM is working to eliminate "6 big losses" (the Six Big Losses) which is a major obstacle to getting the effectiveness of equipment is down time: equipment failure; the lighting and setup, speed losses: a state of idle and termination; the reduction of speed, deffect i.e.: disability due process; reduction in production caused the initial lighting of the machine until a stable production. This method of seeing how much time it takes to repair the damage, loss of time to produce, and the time used to produce effectively in a certain period so that in the end it can be known how percent effectiveness of machine in doing his job.

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2 Methodology

The methodology used to solve the problem above is as follows:

2.1 Research field

Route the direct observation against the Ministry of production companies and conduct interviews with labor and the parties who could provide information related to matters relating to the production process.

2.2 Utilizing historical data

Recording and studying files relating to the topic of research.

2.3 The study of librarianship

Conduct a study of the concepts that support the resolution of the problem.

2.4 Processing data

Done using the method of Overall Equipment Effectiveness on a machine making pipes.

2.5 The analysis and Evaluation

After processing the data, the next step is to do an analysis of the results of the data processing is then performed the evaluation in order to be given recommendations for improvement

2.6 Conclusions and Suggestions

Based on data processing and the discussion is done then it can be taken up the conclusions and suggestions regarding the problems examined.

Measurement of the effectiveness of using the machine Overall Equipment Effectiveness (OEE) in this extrusion machine required report data production and delay the extrusion machine for a month. The data are grouped over several categories as follows data delay extrusion machine that grouped over several categories, namely:

1. Speed losses i.e. machine or set of machines do not work optimally because of factors that caused interference from another machine so that effect directly against the extrusion machine.
2. Set up time i.e. the time it takes to do the initial adaptations resulting from the process of repair or replacement of the part.
3. Breakdown i.e. events that result in a machine that's supposed to do production should stalled caused damage to part of the machine.
4. Planned maintenance that is time for planned care company party in anticipation of the prevention of damage to the machines after such period operated non-stop.
5. Downtime losses due to external factors, namely the suspension of the supply of the materials of manufacture of the pipe and the order came that result in process is stopped until the ingredients and order there.

3 Result and Discussion

3.1 Ideal Cycle Time

Length of time the machine to process the product. The installed capacity of the machine in a day is 2100 kg of material produced / day which can be processed by extrusion machine. Then we can calculate the ideal cycle time as follows:

Ideal cycle time = 24 hours / 2100 kg = 0.011 hours / kg

3.2 Availability

Availability is the ratio of operation time machine downtime by eliminating the against the loading time. Formula to calculate availability ratio is:

$$\text{Availability} = \frac{\text{Operation Time}}{\text{Loading Time}} \text{ x } 100\ \%$$

Availability results can be seen in Table 1

Table 1. Availability of Extrusion Machine

Loading Time (hours)	Total Down Time (hours)	Operation Time (hours)	Availability (%)
138,0	11,83	126,17	91,43
137,7	11,86	125,84	91,39
138,4	11,00	127,40	92,05
138,2	11,30	126,90	91,82

Based on the results of the data processing, the retrieved value of availability per week tends to be the same i.e. This 91.39% to 92.05%. These results show that the value of availability is still above standard that is of 90%. Of the four values of availability, on the third week the highest availability value; i.e. 92.05%, this is because the total downtime of third week in the appeal of a smaller value of total downtime in other weeks so that the value of the operation time Sunday to third most higher than the other week

3.3 Performance Efficiency

Performance efficiency at the mills pipeline is by looking at how large the capacity of material processed per hour compared with the installed capacity at the factory. The formula used is as follows:

$$\text{Performance Efficiency} = \frac{\text{Processed Amount x Ideal cycle time}}{\text{Operation time}} \text{ x } 100\%$$

The results of the calculation of the performance efficiency can be seen in Table 2.

Table 2. Performance Efficiency

Total Production (kg)	Idle Cycle Time (hours/kg)	Operation Time (hours)	Performance (%)
9653	0,011	126,17	87,44
10034	0,011	125,84	91,13
9258	0,011	127,4	83,05
9577	0,011	126,9	86,25

Based on the results of processing, it can be seen that the percentage of performance efficiency of extrusion machine for observations was 83.05% range up to 91.13%, this indicates that the performance efficiency is still below the standard of 95% IE.

3.4 Rate of Quality Product

Rate of quality product is a good product ratio is produced according to the specifications of the product quality. On the machine ekstrusikemampuan machine mengekstrui for raw materials in the unit of time. Formula to calculate the rate of quality product is:

$$\text{Rate of quality product} = \frac{\text{Process amount} - \text{Deffect amount}}{\text{Process amount}}$$

The results of calculation of the rate of quality product can be seen in Table 3.

Table 3. Rate of Extrusion Machine Product Quality

Total Production (kg)	Defect (kg)	Rate of Quality Product (%)
9653	1530	84,15
10034	2967	70,43
9258	1254	86,45
9577	1476	84,59

Based on the results of processing, rate of quality product is among the highest in the third week of IE of 86.45% and the lowest is in the second week of IE of 70.43%. This is due to the number of products in the third week disability amount less than the other week, while on Sunday second happens otherwise. This value indicates that the rate of quality still under standard that is 99.9%.

3.5 Overall Equipment Effectiveness (OEE)

After the value of availability, performance, and efficeiency rate of quality product in the extrusion machine is obtained, then proceeded by calculating the Overall Equipment Effectiveness (OEE). The formula for calculating the OEE is:

OEE (%)
= Availability (%) x Performance Efficiency (%) x Quality Rate (%)

The OEE calculation results for the month can be seen in Table 4.

Table 4. Rate of Extrusion Machine Product Quality

Availability (%)	Total Production (kg)	Performance (%)	Rate of Quality Product (%)	OEE (%)
91,43	9653	87,44	84,15	67,27
91,39	10034	91,13	70,43	58,65
92,05	9258	83,05	86,45	66,09
91,82	9577	86,25	84,59	66,99

The results of the processing of data for the calculation of the value of the Overall Equipment Effectiveness (OEE) on extrusion machine shows the average value of OEE peresentasi during the month of April 2017 starting from the first week to week four: 67.27%, 58.65%, 66.09%, and 66.09%. The OEE value obtained from the calculation result shows are still far below the standard of the OEE is good for a machine that is 88%.

4 Conclusion

From the results of observation and data processing that is carried out against extrusion PT. XYZ, the following conclusions can be drawn that set up time machine for extrusion is quite long and the amount of production machines is also still low, then extrusion machine performance effectiveness has not yet been able to achieve a standard number OEE is 88%.

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