CHAPTER V

DISCUSSION

5.1 Root Cause Analysis in Machine Defect

In this research, in order to identify the root causes of the 300 tonnage machine defects in PT. Yoska Prima Inti (PT. YPI), brainstorming, discussion, and field observation have been done together with the expert from PT. Yoska Prima Inti. In the beginning, the machine defects data have been collected from the machine historical data. There were no previous studies related to the machine defect. It merely records about damage report and machine repair. The root causes then are discussed based on the machine defect data with the expert. The method for root cause analysis is Apollo root cause analysis. The tool used in the Apollo root cause analysis is reality charting. The working procedure of the analysis is by defining the problem, determining the causal relationships, identifying effective solutions, and implementing and tracking the solutions.

The inputs for root cause analysis are problem name, problem evidence, and the causes. The causes itself are divided into two causes which are action and condition. As for the action the minimum next causes are 2 causes. There are twelve defects that had been occurred in the past from 2016 until 2018. Based on the root cause analysis, there are several major causes to be found which are aging, over tonnage, no routine maintenance, operator error, and overuse. The risk controls as mitigation plan were created based on the defined major causes. The risk controls consist of conduct material studies for over tonnage, lower tonnage capacity for overuse, create routine maintenance schedule for aging and no routine maintenance, and create good and safe working environment to maintain operator focus for operator error. The previous action taken to take care of the problems are considered as post defect actions and none of the actions are

preventive actions. The risk controls mentioned before were created based on an objective to prevent the occurrence of future machine defects.

In addition to the causes found by the analysis, there is also another cause that affects the occurrence of the defect indirectly. The causes were originated from the other previous causes, such as in no routine maintenance cause, actually there is another cause which make this routine maintenance activity could not be executed yet at the company, even though the company already realize the importance to put routine maintenance in their production activity. It is due to the lack of human resources. The company has very limited machine operators and mechanics. The maintenance for the defects usually carried out by the mechanics. However, the total number of production machines is unequal with the number of the mechanics. In case, if the company apply the routine maintenance using the mechanics as the supervisors then the labor's tasks will be performed by the operators. This condition will reduce the operators' productivity in their main works. On the other hand, if the company hires more mechanics, it will be wasteful of resources because the mechanics working loads are not big enough for the available daily working hours. It will result to the losses in money and time. Due to the limitation of this research, the lack of human resource is ignored. The reason is because the analysis for this cause will be another detailed focus, because the scale for the analysis will affect to the whole production system. Besides, in the current analysis, the risk controls obtained can be implemented as add ins solutions which means, it can be implemented without changing the whole production system. The analysis for the relationship between machine defect with human resources can be used for future topic of research.

5.2 Risk Mitigation

The risk mitigation which is also known as defect mitigation is the calculation of defect reduction. The defect reduction value is obtained for each defect occurs. The total reduction value for each month will be multiplied with defect frequency and result in total monthly defect reduction value. In addition to that the defect residual for each month is obtained from the monthly defect frequency subtracted with total monthly defect reduction value. The highest monthly defect reduction value is 83% found on the April 2018 while the lowest monthly defect residual is 0.67 found on April 2018. Highest

monthly defect reduction value does not always in the same period with lowest monthly defect residual, this condition occurs depend on the value of the defect frequency.

In addition to the risk mitigation, there is a recommended action to be executed, out from the risk controls found based on the root cause analysis. The recommended action should be taken by the company is to conduct seasonal preventive machine defect analysis. It can be done monthly, quarterly, or even yearly. The propose for this action is to create progress report related with the maintenance program within the production. The analysis will be progressive, and it will create progressive historical data which can be very useful to be used for further research related with machine defect. It also can be a supportive point to gain the client's trust and loyalty. The reason is, the client will be assured that the production within the company will less likely face out an operational problem.

In this research, risk mitigation is necessary to be done. There is certain severity level that can occur if the risk is not being mitigated. The severity level can be seen from the defect frequency itself. The more frequent of the defect to occur, indicates that the company condition is more severe. The risk mitigation has a function to reduce the severity of the risk. The improvements made from the risk mitigation process can be seen through the comparison of defect frequency forecasting before and after mitigated. The reason for choosing the forecasted defect as the parameter for the comparison is caused by the fact that the data availability is only for past conditions. As for the comparison, it can be seen that the pre-mitigated defect frequency is 2 occurrences while the after mitigated defect frequency is 1 occurrence.

The improvement made from the solutions is seen from the reduction of the occurrences of the defect frequency. The improvement will affect business process and the production process of the company. The business process that is affected is marketing section. It is by gaining the customer loyalty and trust, while the production process that is being affected is by the productivity level of the company. It can optimize and increase the productivity, by cost and time effectiveness. Zawadzki (2012) stated that, the cost effective means that the 15%-40% of total production cost can be profit and not loss

because the problems are solved and not reoccurring. The time effectiveness means that the production time will not be cut for maintenance caused by the machine defects.

The proposed solutions are able to reduce the defect because they have been consulted to the field's expert, Mr. Arthur. The process of choosing the solutions involved negotiation, consultation, and approval from the expert. It also can effectively reduce the defect which was proven from the comparison of the forecasting before and after the mitigation.

5.3 Machine Defect Forecasting

In this research, the defect forecasting is used to forecast the machine defect occurrences for twelve months ahead. The forecasting is conducted twice, before and after the risk mitigation. The reason is to see the effectiveness of the implementation on the risk control.

The machine defect forecasting before the risk control resulted in the occurrence of two defects each month. On the other hand, the machine defect forecasting after risk control resulted only one defect occurrences each month.

The calculation of risk control implementation effectiveness resulted in the maximum possible defect before mitigation is three until four monthly defects. The 75% DPE for defect before mitigation is one monthly defect. The 85% DPE for defect before mitigation is zero. Meanwhile, the maximum possible defect after mitigation is one until two monthly defects. The 75% DPE for defect after mitigation is zero monthly defect. The 85% DPE for defect after mitigation is zero monthly defect. This results shows that the implementation of risk control with at least 75% effectiveness will be able to eliminate the machine defect on the upcoming period. The defect reductions can be seen from 3 - 4 to 1 - 2 defects for maximum possible defect and one to zero defect for 75% DPE.

Due to the effectiveness for the implementation of this research, it is also recommended to be implemented to another company that faces the similar problems. The effectiveness of the solutions implementation can be seen on the defect reduction of maximum possible defect and 75% effectiveness implementation. This successful level

of implementation can make whichever company to be aware of the benefit in conducting defect of failure researches. The research is not only able to be implemented for machine defect analysis, however, it can be widely implemented. The other possible implementations are in sales failure, supplier failures, distribution failures, and etc.