CHAPTER I INTRODUCTION

I.1 Background

The manufacturing industry in Indonesia is one of the fastest growing industries and has great potential. The profits obtained by the company are influenced by how the company can utilize the resources / raw materials that are processed. If there are leftover raw materials that can be used, of course it will be an advantage for the company. this is the reason companies carry out a process that can utilize the remaining raw materials, but in the process there are still risks that cause problems. Risk can be defined as the uncertainty of an event that can have an impact on the achievement of goals (British Standard Institution, 2018). So it is very important for companies to identify risks in each process. It aims to take action, from events that cause disruption to the process, in order to reduce the likelihood of these events occurring and to limit damage and save costs caused by these events (Hopkin, 2017)

PT Toyota Motor Manufacturing Indonesia (TMMIN) is a joint-venture company between Toyota Motor Corporation and PT Astra International which is engaged in manufacturing and also exporter of motor vehicles, engines, components, as well as dies & jigs. Being one of the top manufacturing industries in Indonesia, PT. Toyota Motor Manufacturing Indonesia (TMMIN) certainly has a good work system and management system. However, it is possible that all existing systems / work processes do not need to be improved and no improvements are made. It aims to further facilitate the daily work process, and make the production process more optimal and maximal. to find out the risks that may have a negative impact on the course of the process. In knowing the system / work process is necessary or not given a suggestion, a risk analysis is carried out on the system / process.

One of the process that exist has a risk in department Production Planning and Control (PPC) on the *Plasma Cutting* process. At January-March 2020 there were 29 findings of problems in *Plasma Cutting* process, the findings of this

problem in the time span of January-March 2020 Writers made observations on the process *Plasma Cutting*. Process *Plasma Cutting* is the process of cutting reuse plates, the reuse plates come from the leftover plates from the result of cutting the car body frame, the result of cutting the reuse plate will later be melted down and used as raw material for the manufacture of *engine block* engines. The following are the activities in the process *plasma cutting*.

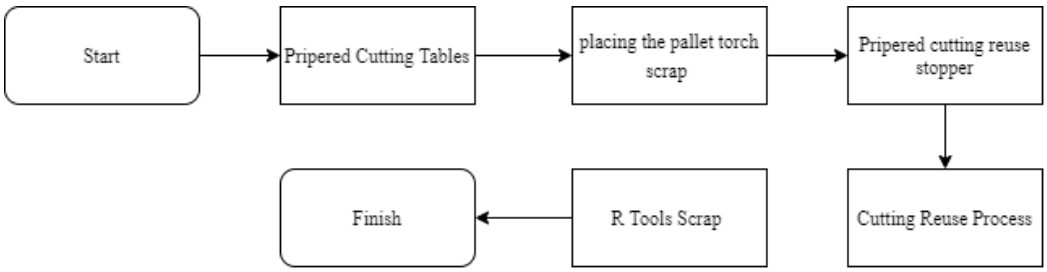

Figure 1. 1 Flow Chart Cutting Plasma Process

Based on Image 1.1 explain the flow of the production process, the process *Plasma Cutting.* Based on the picture above that uses a *Flow Chart*, the process flow described there are several activities. Starting from preparing the cutting table such as placing the table according to the layout, and closing the cutting table with pallet scarp, then placing the pallet torch scrap according to the layout, then preparing the reuse cutting stopper, and then the reuse cutting process, reuse cutting is divided into 2, namely cutting Type 51111.21 and Type 51133.34, and the last activity is 5R Reuse scrap, which is to ensure that there are no potential hazards after the cutting process is complete.

Table 1. 1 Bira problem finding at working process Cutting Plasma January 2020

No	Date	Problem	Countermeasure	PIC
1	03/01/2020	Plasma Torch Cable Broken	Repair (mm)	Aziz
2	08/01/2020	Fire out not maximal	Replace HP Plasma	Aziz
3	09/01/2020	Fire response does not got out (cable torch broken)	Repair (mm)	Aziz
4	14/01/2020	cable is not connected to the pallet future	Repair (mm)	Aziz
5	17/01/2020	Plasma Torch Cable Broken (Cuttine Line stop)	Replace Plasma Torch Cable (mm)	Aziz

6	21/01/2020	Installation of torch is not the maximum (broken)	Repair (mm)	Aziz
7	22/01/2020	Line Stop waiting loading FL 10 minutes	Back up driver MC	Aziz
8	24/01/2020	Plasma Torch Cable Broken	Repair (mm)	Aziz
9	28/01/2020	Plasma TIP Damaged (Fire out not maximum)	Replace Plasma TIP	Aziz

Table 1. 2 Bira problem finding at working process Cutting Plasma February 2020

No	Date	Problem	Countermeasure	PIC
1	05/02/2020	Line Stop waiting pallet C (empty) estimated ± 7 menit	Used pallet backup	Aziz
2	06/02/2020	Plasma Torch cable hit a pallet (broken)	Repair (mm)	Aziz
3	11/02/2020	Plasma TIP Damaged	Replace Plasma TIP	Aziz
4	14/02/2020	Reuse A & B mixed (difficult to trf)	Separated first	Aziz
5	17/02/2020	Plasma Torch Cable Broken	Repair Call (mm)	Aziz
6	19/02/2020	Loading pallet reuse incorrect (driver backup)	Reset	Aziz
7	21/02/2020	Plasma Torch Cable Broken	Repair (mm)	Aziz
8	25/02/2020	Pallet capacity exceeds std (2,5 ton)	Lift pallet FL 3,5	Aziz
9	27/02/2020	Plasma Torch Cable Broken	Repair (mm)	Aziz
10	28/02/2020	Plasma TIP Damaged	Replace Plasma TIP	Aziz

Table 1. 3 Bira problem finding at working process Cutting Plasma March 2020

No	Date	Problem	Countermeasure	PIC
1	09/03/2020	Plasma Torch cable is broken it can't be repaired	Replace Torch Cable (mm)	Aziz
2	10/03/2020	Mass cable is not attached	Mass cable is re-weled to the top of pallet	Aziz
3	14/03/2020	Plasma Torch Cable Broken	Repair (mm)	Aziz
4	16/03/2020	Plasma TIP cannot repaired	Replace Plasma TIP	Aziz
5	18/03/2020	Plasma Torch Cable Broken	Repair (mm)	Aziz
6	24/03/2020	Small plasma Torch Cable Broken	Repair (mm)	Aziz
7	26/03/2020	Long Pallet reuse less advanced	Reset long pallet	Aziz
8	27/03/2020	Plasma Torch Cable Broken	Repair (mm)	Aziz
9	30/03/2020	Plasma TIP wrong order	Exchange TIP to warehouse	Aziz
10	31/03/2020	Plasma TIP cap damaged (hit the pallet)	Replace plasma TIP cap	Aziz

Based on the data in Tables 1.1, 1.2, 1.3. There are 29 problems found in working process *Plasma Cutting* in January, February, March 2020. In the

process, *Plasma Cutting* in fact, it does not always match expectations, based on Figure 1.2 below, the implementation of the target PT. Toyota Motor Manufacturing Indonesia wants there are several aspects that need to be addressed want to achieve.

1. *Spesific* namely reducing the problem of the process *Plasma Cutting*
2. *Measurable* is aunit of case measure, which is a decrease from 29*case* -> 0 *case*.
3. *Achieveable* that is, if the target is reached 100%, the "*Problem* in the process *Plasma Cutting" is* avoided.
4. *Reasonable* namely towards *Zero complain from customer*.

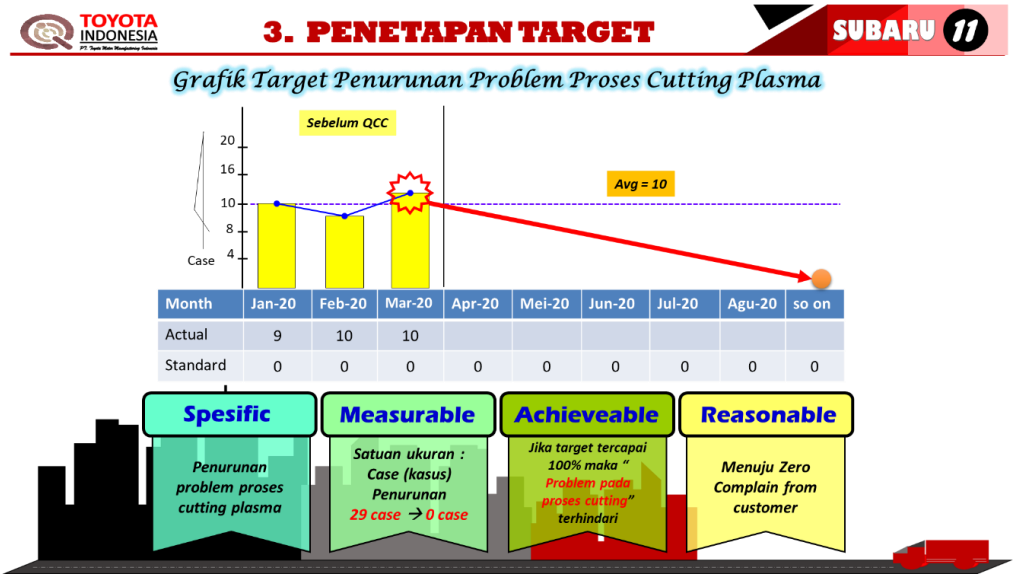

Figure 1. 2 Target Chart of Reduction problem of Plasma Cutting process

During the process *Plasma Cutting* , the company has not identified the impact and root cause of the risk, which will affect the output of the process *Plasma Cutting*. The purpose of identifying these risks is to determine, recognize, and describe risks, which may be able to assist companies in taking preventive actions (ISO 31000, 2018). here are several factors considered in identifying risks in the process, *Plasma Cutting* namely the causes, events, and also the consequences and impacts on the output of the process. To find out how big the impact of the risk is, the risk analysis can understand the nature and characteristics of the risk.

One of the methods used to analyze the risk of failure is *Failure Mode and Effect Analysis* (FMEA). This method can determine the risk rating and can determine the more significant risk which is presented with the *Risk Priority Number* (RPN) value and provides *treatment*. FMEA can be defined as a systematic method to identify and prevent problems the product or process before it happens (McDermott, 2009). Based on the definition above can be concluded that the FMEA has a goal look at the process and product to determine the failure or called *Failure Mode* to identify potential failure modes, effects and emergence detection. Evaluation of FMEA, failure in process *Plasma Cutting* carried out using 3 indicators, which are, assessment and analysis of the impact of risk (*Severity*), assessment and analysis of the causes of risk events (*Occurance*), and assessment and analysis of detection before the occurrence of risk (*Detection*) (McDermott, 2009).

Based on this background, this final project aims to perform risk analysis and treatment using Failure Mode and Effect Analysis (FMEA) at the C*utting Plasma,*and provide draft proposals on the treatment chosen, which aims to reduce the occurrence of these risks in the process *Cutting Plasma*.

I.2 Final Project Problem Formulations

Based on the background described previously, the problem formulations that can be used for this research are:

1. What are *Failure Mode* and causes *Failure Mode* ?
2. What are the effects *Failure Mode* in *Plasma Cutting* Process ?
3. How significant the *Failure Mode* in *Plasma Cutting* Process ?
4. What are the recommendations for proposed action to minimize the event of *Failure Mode* ?

I.3 Final Project Objective

Based on theproblem formulation above, the objective of this final project are :

1. Identifying *Failure Mode* and cuases of *Failure Mode* in *Cutting Plasma*
2. Identifying the effect pf *Failure Mode* in *Plasma Cutting* Process
3. Identify how significant the *Failure Mode* in *Plasma Cutting* Process
4. Provide recommendarions Suggested actions to minimize the event of *Failure Mode*

I.4 Final Project Limitation

The limitations of the final project carried out so that Writers can focus on achieving goals, the limitations of the problem are :

1. This study uses historical data from PT. Toyota Motor Manufacturing Indonesia in a certain time span, namely from January to March 2020
2. Writers did not consider the cost factor for create a proposed design.

I.5 Final Project Benefit

According to the formulation of the problem and the purpose of the final project, this final project has the following benefits::

1. According to the formulation of the problem and the purpose of the final project, this final project has the following benefits:
2. Helping companies reduce the risks that can occur in the Plasma Cutting process.

I.6 Final Project Report Structure

The Followings are the writings system on this research that consist of six chapter with is explanations :

CHAPTER 1 INTRODUCTION
This chapter contains a description of the research background, problem formulation, research objectives, research limitations, research benefits, and writing systematics

CHAPTER II LITERATURE REVIEW

This chapter contains previous research that was used as a reference for conducting this research, literature and also expert opinions regarding concepts relevant to the problems studied.

CHAPTER III RESEARCH METHODOLOGY

This chapter describes the research steps in detail including: the stage of formulating research problems, stages of data collection, identifying data and conducting design, data processing, designing analysis of the results of data processing

CHAPTER IV INTEGRATED SYSTEM DESIGN

This chapter explains regarding the data that has been obtained, including the problem data in January, February, and March. And the data is classified into per-activity problem data in the Plasma Cutting process. Then the *Failure Mode* will look for the *Severity*, *Occurance*, and *Detection*, then the value will be calculated in the RPN and given *Risk Treatment*. *Failure Mode* with the highest RPN value and decision from the result of discussion by the company will be given suggestions for improvement by the *Risk Treatment*.

CHAPTER V RESUKT ANALYSIS AND EVALUATION OF PROPOSED DESIGN

This chapter contains an explanation of the proposal planning for the company based on the results of data processing. Then the Writers conducted an analysis related to the results of the design that had been made.

CHAPTER VI CONCLUSION AND SUGGESTION

This chapter explains the conclusions of the problem solving carried out and the answers to the formulation of the problems in the introduction.