CHAPTER I

INTRODUCTION

1.1. Background

Recently, in an effort to maintain the existence and develop business in the midst of increasingly fierce competition, a company requires to be able to focus on efforts to improve performance, product quality and efficiency. One of the obstacles that often arises in improving quality and productivity is the failure of the system.

According to Xiuli, et al. (2012) manufacturing defects could emerge during the production process. Some products have unreasonable risk during the production process caused by the employees, facility and technology. Manufacturing defects may be caused by poor standard of raw material or parts, and manufacturing problems. As a result, the product cannot achieve the requirement of product specification, and deviates from the expected goal of product makers.

Purnama, et al. (2018) mentioned quality control plays important role to identify product's quality characteristics, by comparing specifications or requirements and taking appropriate actions for differences between its actual performance with the standard. Right decision analysis on the quality is giving the proper application of methods and tools of the operational management and quality improvement (Simanova, 2015).

Based on the observation and historical data of Gulaku department, there are lot of defects that recorded from one-year production period, which is from the 1st of October 2017 until 30th of September 2018. It is calculated that the sum of the defects for each product type as shown by Figure 1.1.

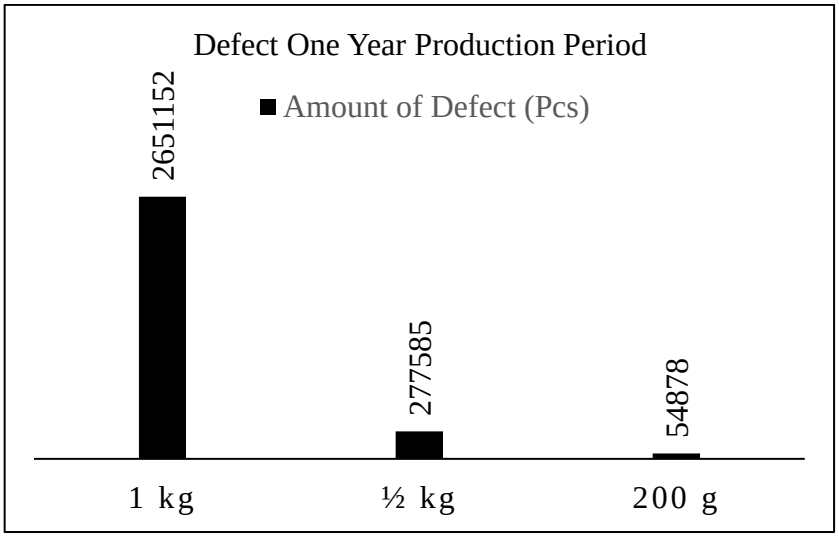

Figure 1.1. Defect One Year Production Period

From defect data above, the highest defect number achieve two million pieces. Therefore, product defect analysis is needed in this research. Manjula, et al. (2016) stated that the advantage of defect analysis is to identify its root cause and to find a solution to the defect, thereby preventing it from propagating into further development stages. One of the product defects in Gulaku department is from the sugar itself. There are blackspots in the sugar that makes the sugar is not clean. It is caused by the insufficient application of quality control in the company.

In order to analyse the failure or product defect, this research applies integration of Fuzzy Analytical Hierarchy Process (Fuzzy AHP) – Failure Mode and Effect Analysis (FMEA) with Six Sigma through phases Define, Measure, Analyse, Improve, Control (DMAIC) to improve quality of product in Gulaku department. This research will be performed by submitting questionnaire and conducting interview with the expert at Gulaku department.

Pugna, et al. (2016) mentioned that Six Sigma is a strong, focused, and highly effective implementation of proven quality principles and techniques. Purnama, et al. (2016) stated that Six Sigma is to analyse the level of product defect and to improve an existing product or process through Define Measure, Analyse, Improve and Control (DMAIC) phases. In Six Sigma, there is metric to indicate the level of quality

performance, which is Defect Per Million Opportunities (DPMO) (Setijono, 2009). In this research, DPMO is to obtain the possibilities number of sugar that experiences defects.

Failure Mode and Effect Analysis (FMEA) is used to identify and assess the risk that turns to be the potential cause of failures (Vitho, et al., 2013). FMEA method is a suitable method to analyse the defect because there are three criteria of FMEA, which are severity, occurrence, and detectability. Each of the criterion has its function to prevent failures.

According to Gungor, et al. (2009), Fuzzy Analytical Hierarchy Process (F-AHP) will be applied to evaluate the best adequate personnel dealing with the rating of both qualitative and quantitative criteria from the AHP. Kaganski, et al. (2018) stated that Fuzzy AHP is an approach for evaluation the relative importance between attributes by means of pairwise comparison and an opportunity to rank metrics. Purnama, et al. (2018) conducted the research about quality improvement and applied Fuzzy AHP method to rank the metrics of attributes, which are severity, occurrence and detectability. Li, et al. (2018) mentioned, Fuzzy AHP can overcome the subjectivity and uncertainty of experts' judgment, which makes the assessment results more objective and realistic.

After applied fuzzy AHP, the next step is to multiply the weight value of Fuzzy AHP with the criteria of FMEA to obtain the Risk Priority Number (RPN). The RPN here is to prioritize recommended actions by ranking the defect from the highest to the lowest value. Therefore, it takes concrete improvements and controls to prevent possibility defect on product.

1.2. Problem Formulation

Based on background of research elaborated above, the problem formulation in this research are:

1. How much is the DPMO Six Sigma value of product defect?
2. How is the risk priority number after being calculated by Fuzzy AHP-FMEA method?

3. What are the suitable improvements for product defect?
4. What are the suitable controls to prevent defect of product?

1.3. Research Objectives

The objectives of this research are:

1. Determining DPMO and Six Sigma value of product defect.
2. Determining risk priority number after being calculated by Fuzzy AHP-FMEA method.
3. Developing suitable improvements to prevent product defect.
4. Developing suitable controls to prevent product defect.

1.4. Research Scope

There are some limitations that existed in this research, mentioned as follows:

1. This research does not consider cost occurred during research activity.
2. Uncertainty condition that occurred during data analysis is not considered.
3. This research is only focused on product defect analysis.
4. Implementation is out of this research scope.
5. This research is conducted in Gulaku departement of PT. Gula Putih Mataram

1.5 Research Benefit

The research benefit is expected to increase the knowledge, particularly in quality control. The other benefit of this research is to enhance the application of quality control in industrial practical problems.