CHAPTER I INTRODUCTION

I.1 Background

In this era of globalization, almost all countries in every part of the world races to increase their economic growth by focusing to advance the sectors within the country. Industrial sector is one of of the sectors whose progess is highly monitored and crucial as well. This sector which is known generally as manufacturing sector aims to produce end-user products with value added only from available raw materials. Economists considers that a strong industrial sector is another sign of the country's economy has functioned well and the quality of life is increasing.

Indonesia is not an exception. The industrial sector is one of the most important sector to boost country's growing economy by being the majority of the population's source of living and contributing a bunch of inland revenue quoted from the Directorate General of Taxes under Ministry of Finance Republic of Indonesia which noted that industrial sector becomes the largest contributor for taxes throughout the first semester of 2017 by 30% or reached Rp 571,9 trillion. Therefore, by improving the resource performance in industrial sector will be an effective solution to build Indonesia's economy for the better.

Ceramic industry is a part of downstream industrial sector which is an industry that manufactures semi-finished goods into finished goods so that the product can be directly used by the customer. In this case, the clay will first be processed into ceramics as building materials such as floors and walls to embellish the house. Quoted from Ministry of Industry Republic of Indonesia website, the national ceramic industry has shown a positive performance through sales value which grows up to 15 percent with volume reaching up to 385.402 million m^2 by the end of 2016. According to Airlangga Hartarto as the Minister of Industry Republic of Indonesia, ceramic industry in Indonesia is also one of the reliable industry sectors as the driving force of national industry performance over the last 25 years supported by the availability of raw materials in the form of widepsread natural resources in Indonesia.

PT XYZ is one of ceramic manufacturers in Indonesia. This company which focuses on manufacturing floor tiles has approximately 8000 m^2 of production capacity per day. Ceramics manufacturing system in PT XYZ passes several core processes such as milling to make ceramic tile body, grinding glazes, ceramic tile pressing, incineration process and left with sorting process using sorting spiral to classify which ceramic tiles are up to the company's quality standard for packaging at the end of the line using another machine. With *make to order* as its production strategy, PT XYZ is required to always manufacture products with high-precision quality as well as producing on time by optimizing the existing resources. Therefore, to keep winning the hearts of its customers, every machine working along the production line must have a good and high-reliability performance.

The machine performance can be reviewed from the failure rate occured on it. Figure I.1 shows the historical data of core machine downtime in PT XYZ.

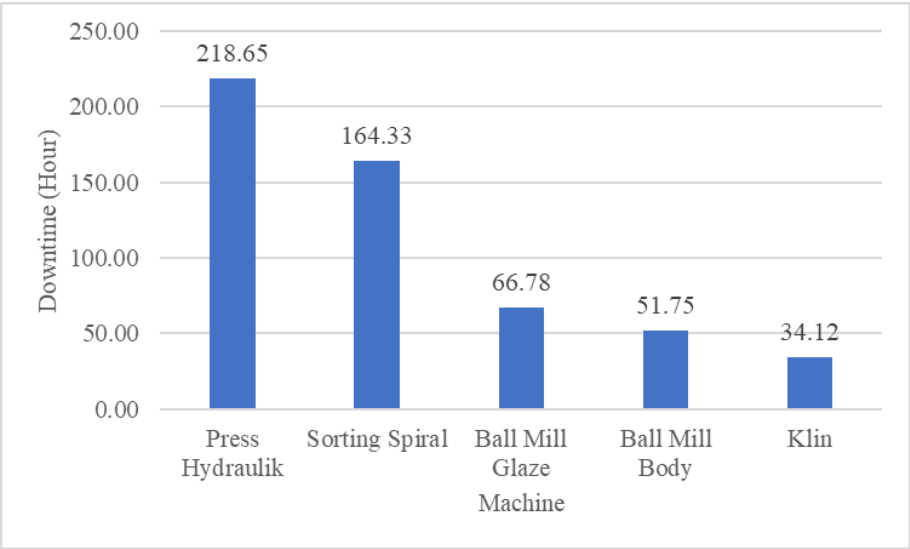

Figure I.1 Machine Down Time Per Hour September 2015 - September 2017

Based on Figure I.1 it is known that the Press Hydraulic Machine has a downtime of 218.65 hours throughout September 2015 to September 2017 which is the highest downtime compared to the other four core machines. Press Hydraulic Machine is used to press the mixture of ceramics into the body before going into the glazing step. Referring to the bar chart above, the downtime occured on Press Hydraulic Machine is relatively low when it is compared with downtime occured on machines

for large-scale companies. Nevertheless, the reliability of this Press Hydraulic Machine should still be improved to obtain better production process and high-quality outputs than before.

One of the factors effecting the reliability of a machine is the maintenance policy applied to the machine. At PT XYZ, the maintenance activies are *preventive maintenance* where the inspection is done every two weeks to know and repair minor damage found, component replacement, and maintenance shutdown where maintenance is done if the machine is not producing anything and *corrective maintenance* where the maintenance is done if the machine is damaged during production process.

Effective and efficient maintenance policy is expected to reduce downtime which will disrupt production process. Machine maintenance should be carried out with appropriate activities and time periods. From the explanation above, the maintenance policy owned by PT XYZ has not reached the optimal level because there are still down times occured that interfere the production process which will also leads to a higher maintenance costs.

One of the methods used to determine maintenance policy is Reliability Centered Maintenance (RCM). As John Moubray (1997) stated on his book, Reliability Centered Maintenance is defined as a process used to determine what must be done to ensure that any physical asset continues to do its required function in its present operating context.

Action needed from RCM method will never go far from the cost occured which means it is important to calculate the cost occured from the machine's reliability problem by using Cost of Unreliability method as well.

Thus, it is required to have a proper maintenance policy along with the cost of unreliability (COUR) when the machine happened to fail while operating so the machine used in ceramic industry will be utilized efficiently and effectively.

I.2 Problem Identification

Based on the background above, the main issues in this research are:

1. How is the optimized preventive maintenance tasks, proper maintenance time interval and maintenance costs for Press Hydraulic Machine's critical subsystems based on RCM result?
2. How much is the Cost of Unreliability for the Press Hydraulic Machine?

I.3 Research Objectives

Based on the problem identification explained, the objectives of this research are:

1. Determining the properly optimized preventive maintenance tasks, proper maintenance time interval and maintenance cost for Press Hydraulic Machine's critical subsystems.
2. Calculating the cost of Cost of Unreliability for Press Hydraulic Machine.

I.4 Research Limitations

Given the limited time and information obtained, the limitation of this research are as follows:

1. The machine which has the highest failure rate will be analyzed.
2. Only critical subsystems of Press Hydraulic Machine will be analyzed based on the result of Risk Matrix.
3. Failure and production history data used are from September 2015 – September 2017.
4. This research is limited to the submission of suggestions, the suggestion implementation on the field will not be included.

I.5 Research Benefits

The benefits of this research are as follows:

1. This study will give the optimized maintenance policy in at factory.
2. Maintenance Department at the factory will obtain the proper time interval for preserving the machine as well.
3. The factory will be able to reduce the maintenance cost in the future by knowing which machines have the most expensive Cost of Unreliability.

I.6 Systematics Writing

The systematics writing of this research is as follows:

Chapter I **Introduction**

This chapter contains a brief explanation of background research, problem identification, the objectives of research, limitation and benefits of the research and its systematics writing.

Chapter II **Literature Review**

This chapter contains relevant literature and theories about the research as well as the result of previous researches. The reference literature and theories used are a little bit about Maintenance Management, Reliability Centered Maintenance (RCM) and Cost of Unreliability (COUR)

Chapter III **Research Methodology**

This chapter describes detailed research steps including: formulating problems and objectives, conducting the data processing then analyzing the results using Reliability Centered Maintenance (RCM) and Cost of Unreliability (COUR)

Chapter IV **Data Collecting and Processing**

This chapter contains all the data needed for data processing using the method of Reliability Centered Maintenance (RCM) and Cost of Unreliability (COUR). The data will be processed for further analysis in the next chapter.

Chapter V **Analysis**

This chapter analyzes processed data collection using both of methods mentioned above.

Chapter VI **Conclusion and Suggestion**

In this chapter, the conclusion and suggestions for the research are explained for the company to examine further research in the future.