

## CHAPTER I INTRODUCTION

### I.1 Research Background

These days, Green Manufacturing has established become a new vocabulary for professional engineers and manufacturing workers to be an important part in the business world. Green manufacturing is a method for manufacturing that minimizes waste and pollution. These goals are often achieved through product and process design (Thomas, 2001). Green Manufacturing was coined to reflect the new manufacturing paradigm that employs various green strategies and techniques to become more eco-efficient (Deif, 2011).

Industry manufacturing as well is very important to every country's economy. This industry focuses on manufacturing, which is provides added value through the transformation of materials into product. Since 2011, Industry 4.0 has become famous among many companies, research centers, and universities. (Bahrin et al, 2016) defining Industry 4.0 is a new area where the internet of things alongside cyber-physical systems interconnect in a way where the combination of software, sensor, processor and communication technology plays a huge role for making “things” to have the potential to feed information into it and eventually adds value to manufacturing processes. The development of industrial revolution can be seen in the Figure 1.1 below.

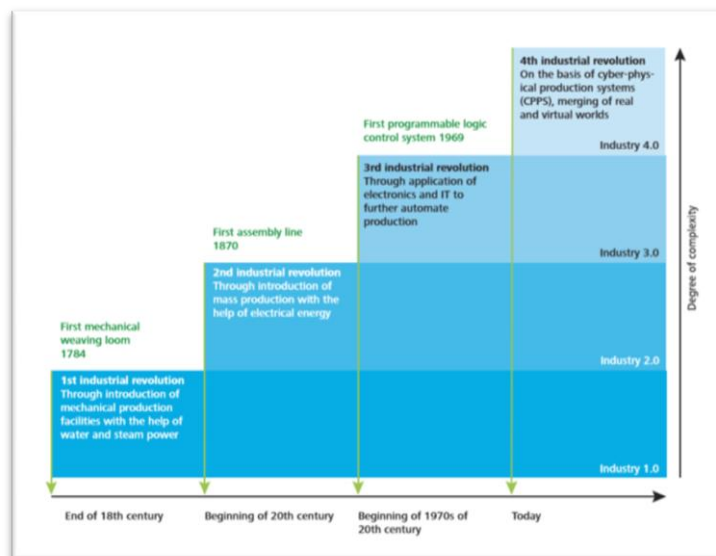


Figure I.1 Development of Industrial revolution  
(Schlaepfer & Koch, 2015)

The continued development of the industrial revolution then the greater energy being used, but instead the availability of energy in the world is actually depleting. Based on the Figure I.2 industry sector become the biggest user of electricity energy, followed by household in the second place, business in the third place and another general sector in the last place. Beside that, the use of electrical energy in the industrial sector continue to increase from year to year as can be seen in the Figure I.3.

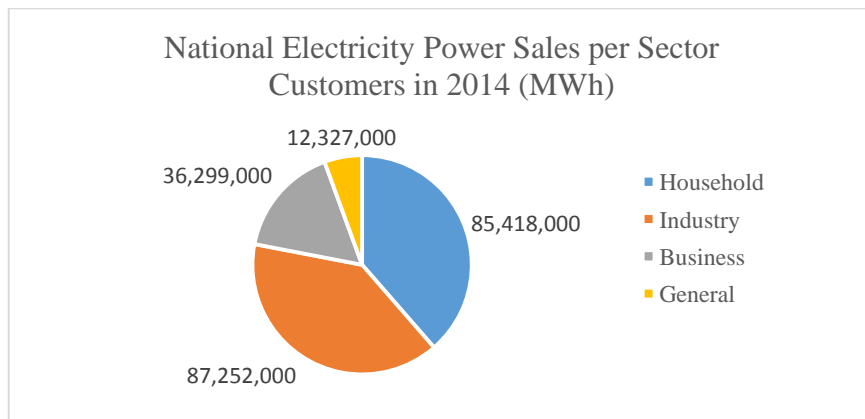


Figure I.2 National Electricity Power Sales per Sector Customers in 2014 (Statistik Ketenagalistrikan, 2014)

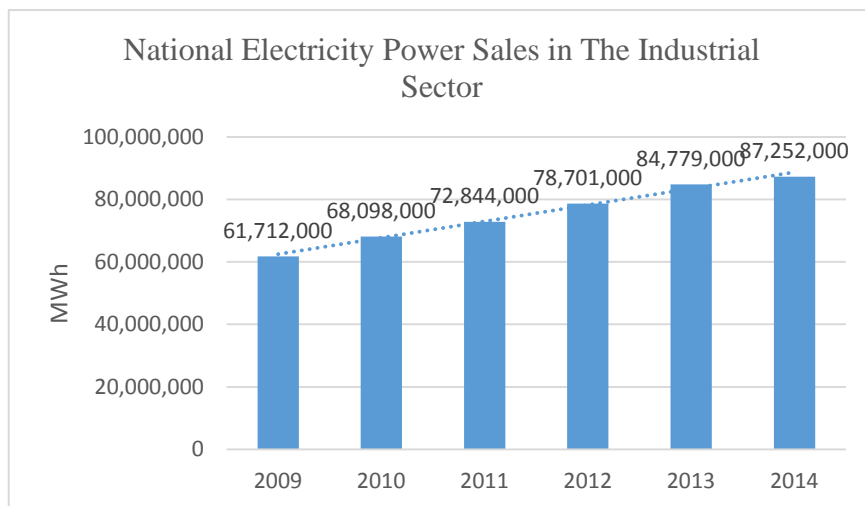


Figure I.3 National Electricity Power Sales in The Industrial Sector (Statistik Ketenagalistrikan, 2014)

PT. Buana Intan Gemilang is one of the textile company in Banjaran, Bandung that produce curtain and prayer rug. PT. Buana Intan Gemilang have several production department, and one of the main part of this company is weaving and

preparation department. Punching machine is one of machine that used in preparation department, the machine has function to make the jacquard card of the curtain and prayer rug on the cardboard to use in the weaving machine. It can be seen Figure I.4 that the use of electricity energy in the weaving and preparation department is stable in every month and more than 25000 KWh of electricity should be issued every month.

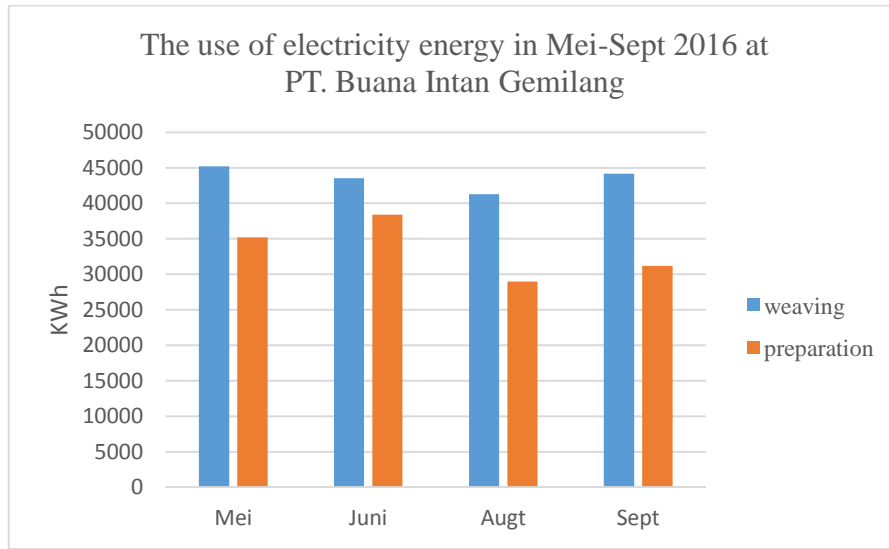


Figure I.4 The use of electricity energy in Mei – Sept 2016 at PT. Buana Intan Gemilang

Punching Machine in PT. Buana Intan Gemilang operate 6 days for a week and 7 hours per day, and usually to make a complete jacquard card of prayer rug the punching machine need 15 until 16 days operation, so this may indicate that flexibility of the machine is very low and the use of electricity energy is huge and classify the company in the stage that is not green enough.

Reducing the energy consumption of electricity will impact to all other manufacturing competitive edges, like flexibility. The concept flexibility in manufacturing has become a key consideration in the design, operation and management of manufacturing system (Sethi & Sethi, 1990). By increasing the flexibility the same as make a better manufacturing system and one way to controll it is by using Automation technique. Automation is the technology which can perform a series of process or procedure automatically without human assistance. It implemented with execute a list program of instruction which

combine by a control system in perform the instruction (Groover, 2001). So hopefully the automation technique can help to make the system of green manufacturing more environmentally friendly in realizing the industry 4.0 especially in PT. Buana Intan Gemilang because being green can give positive impact.

## **I.2 Problem Definition**

1. How to improve the flexibility of punching machine with green manufacturing method?
2. How to decrease the energy consumption and make the company more environmentally friendly using green manufacturing method?

## **I.3 Research Objective**

The objective of this research are:

1. To improve the flexibility of punching machine with green manufacturing method.
2. To decrease the energy consumption and make the company more environmentally friendly using green manufacturing method.

## **I.4 Research Boundaries**

The limitation of this research are:

1. Focus to improve the flexibility and decrease the energy consumption using green manufacturing method.
2. Focus on the punching machine at PT. Buana Intan Gemilang.
3. The energy of punching machine is calculated using ac motor.
4. The existing color of company is find out by questionnaire.

## **I.5 Benefit of Research**

By implementing automation systems for punching machine that have been design, can increase the flexibility of the system, reduce the energy consumption and make the company to become a green manufacturing company.

## **I.6 Writing Systematics**

The systematics of writing in this study are:

<b>Chapter I</b>	<b>Introduction</b> This chapter contains the research background, problem definition, research objectives, research limitations, and the benefits of research.
<b>Chapter II</b>	<b>Literature Review</b> This chapter contains explanations of basic theories which underlying and support the thinking and design of process automation systems of punching machine at PT. Buana Intan Gemilang. The theory used in this research is the theory of industrial revolution 4.0, green manufacturing, and automation.
<b>Chapter III</b>	<b>Research Methodology</b> This chapter describes the steps of research include the formulation of research problems, research systematic that will lead to a final conclusion of the research conducted.
<b>Chapter IV</b>	<b>Collecting and Data Processing</b> This chapter contain the data needs for improve the flexibility of punching machine and decrease the energy consumption using automation system.
<b>Chapter V</b>	<b>System Analysis</b> This chapter contain the analysis of the research which has done from green manufacturing method using automation system design.
<b>Chapter VI</b>	<b>Conclusion and Suggestion</b> This chapter contained the conclusion of green manufacturing method for improve the flexibility of the machine and the suggestion that related to the result of green manufacturing method and automation system.