# CHAPTER I INTRODUCTION

## I.1 Research Background

Indonesia's industry sector is one of highly contributed sector for the economy than other sectors so that is has considered to be backbone of the national economy. The growth of developing industry sector will perform a high impact such as reinforce national economic stability, increase in export performance, and boost the developing of modernization technology. Textile and Textile Product Industry Sector (TPT) is one of Indonesia's oldest industries sector which has massive and promising market prospective that is able to fulfill the domestic and overseas demand for clothing (Ragimun, 2010). With particular result, Indonesia's Textile and Textile Product Industry Sector has been successfully being the fifth ranked exporter country in the world that contribute to Indonesia's economic development (Perindustrian, 2015). It is can be seen from Gross Domestic Product (GDP) that become the fourth greatest contributor which is 9% in non-oil and gas manufacturing with growth value of 4% on average per year in 2008-2013 (Damayanti, 2014). Based on result of Table I.1, it is able to analyze that result of export volume in the past three years show positive trend. The volume of exported product of TPT is increased by 5% from 2013 to 2014 and also 7% increased from 2014 to 2015. According to Analyst of Economic Indonesia of Mandiri Bank, one of the factor that influence the increase in export volume of Indonesian textile industry is due to the influence of the global economic condition, especially the United States and Europe as the largest consumer market with percentage of 31% and 16% respectively (Ramdani, 2014). Until 2014, the realization of investment in Indonesia's textile industry reached Rp 9.53 trillion, or grew 9.4% from previous year. Accumulation from 2009 to the third Quarter of 2014 shows *Penanaman Modal Dalam Negeri* (PMDN) increased by 33.6% or Rp 11.8 trillion, while *Penanaman Modal Asing* (PMA) increased up to 36.4%, or Rp 23.2 trillion (BKPM, 2016).

Table I.1 Export Volume Non-Oil Industry Data TPT (BI, 2016)

| **Year** | **2013** | **2014** | **2015** |
|---|---|---|---|
| **Export Volume (Ribu Ton)** | 2.109 | 2.213 | 2.388 |

Some of local textile and garment industry try to intensify the productivity for fulfilling the market demand. PT. Buana Intan Gemilang (PT. BIG) is one of local company in textiles and texile product sector (TPT) which manufactures three type commodities such as greige fabric, sajadah fabric, and curtains. In order to manufacture those fabric, they produce some supporting tools in which is used for creating the pattern called jacquard textile card or pattern card. Jacquard card is one of a series of perforated cards which has many holes that control the manipulation of the warp threads and determine the mechanism the incitrate pattern woven on the material based on the card (Moelino, 2015). The following Figure I.1 represents the demand of pattern at PT. BIG each month undergo positive growth from May. In recent year, pattern orders are increasing up to 90 new patterns and varies. The highest pattern demand is occurred in November. Highest percentage of increasing demand is reached in June, which increased by 33% from May and for the following month, it the growth of demand is increase by 11% on average.

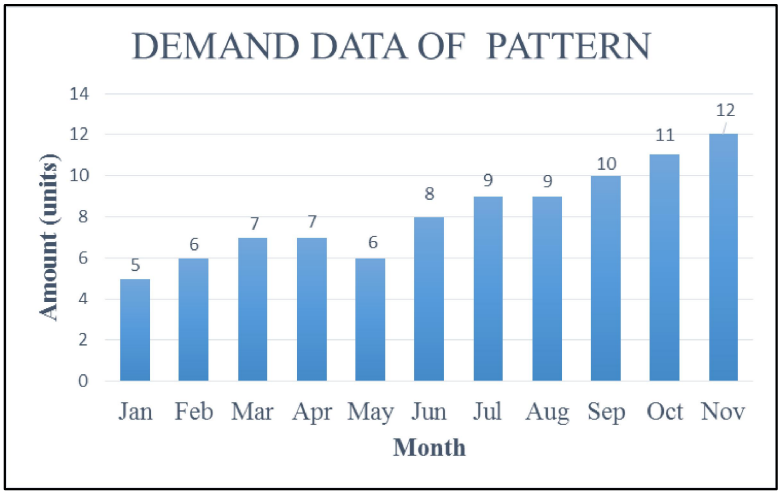


Figure I.1 Pattern Demand (PT. BIG, 2016)

Based on demand on May until November which occurs to be increasing, performance and productivity of operator and production machine needed to run effectively. However, target required up to 300 units of jacquard textile card (PT. BIG, 2016). In general, Indonesia textile and garment industry is still facing many big challenge which related with production and productivity, it said that the old usage of machinery and still no development of technology. Around 80% the machinery which used in industry is over than 20 years. The lifetime of old

machineries is tend to cause inefficiency on production (Suryawati, 2009). The following Figure I.2 depicts the existing machinery in PT. BIG, which is jacquard card punching machine.

Figure I.2 Punching Machine Existing (PT. BIG, 2016)

The machining process which used in jacquard textiles card is assembled-punching machine. Punching process is the operation where a part is removed from sheet material by forcing a shaped punch through the sheet and into a shaped die then it will produce the scrap of workpiece (Mott, 2004). This machine is still need operator to operate. Operator needed along the process of putting the card in and out repeatedly. Operator is main asset on company because their duty as support system in production process (Fauzan, 2015). But in production process done by operator, human factor such as fatigue cannot be avoided.

Therefore, one of method which can be done to improve productivity of the production process is by applying the whole of automated system on punching machine. Automation technology is one of technology which process or procedure is performed without direct involvement of human assistance and also it is decreasing the repeated activity. Workers do not actively participate in the process except to make adjustment in the equipment settings. Thus, automated system is applied in industry sector to improve accuracy, utility machine, and process productivity that noted as increasing in amount and the product quality (Groover, 2008). Based on Table I.2 depicts the observing data of punching machine workstation. Internal problem that appeared in this workstation is caused by delay time. Delay time is obstacles or inefficiency of an activity in one process involve

the delay and waiting (Baroto, 2002). The production process sequence is still performed by manual and repeatedly causing inconsistent of production cycle time and decline operator's productivity, so the capacity for a month is not fulfilled, and so does the demand.

Table I.2 Observing Existing Production Data (PT. BIG, 2016)

| PARAMETER | NUMBER |
|---|---|
| Working Hours | 8 hours/shift |
| Cycle Time Production | 95 seconds/unit |
| Average Production | 230 units/shift |
| Target Level | 300 units/shift |
| Labour Required | 1 operator/shift |
| Cost of Labour | Rp 55.000/shift |

In existing condition, the machine is able to manufacture card as much as 230 jacquard card/day, whereas existing condition of company with work hour is eight hours a day will not fulfill the production capacity target on jacquard card (can be seen on Appendix), unless with some additional operators, work shift, and work hour. For more detail of data observing can be seen in Appendix A. Based on the problem above, the improvement which company can do is modify the machine using automated system on punching machine in order to operator does not repeat the activity in taking card on before and after card punching process. Therefore, the reduction of the operator is one of the solutions to improve the efficiency of corporate expenditures. Reason for automation system is expected in whole system of punching machine is to reach the optimum production capacity and reducing production cycle time.

According to Nadya Zikra (2013) to know every requirements of automated system the User Requirement Specification (URS) is needed as the first phase in designing the system for defining detailed of process description and required equipment at manufacture industry. Therefore, by using this method, it provides an introduction system requirement and is the first of the various activities involved in the development of the control of process industries. According to Amalia Syafitri

(2015), after describing series of design, the analysis of hardware equipment is done which will used in control philosophy, it defines basic information for interprets the control system. Using automated technology, productivity and also product quality of one company can be improved.

As the rapid development of automation technology, widespread knowledge, and to perform an automated system on production machineries, varies model machine design and effective automation system is needed. Those things could happen because modernization of technology is running by computer era which is able to provide sophisticated analysis requirement and current model design. URS is the first and crucial phase for designing automated system because it can be used to establish the quality and right control system development (Chlique & Guegen, 2002). There are many advantages example of applying its application on production machine in company such as reducing cycle time, improve the goods quality, decreasing workload of operator, and etc.

Therefore, automated system is applied using programming model along with information and user requirement specification to support the design is proven efficient and running well as previous research done by (Fauzan dan Syafitri, 2015). With the machine modification, the company does not spend a huge investment to build a new machine and will increase the utility machine. The expected reason is able to reduce workload of operator and running the process without direct human assistance except the setting up. The chosen method used for support the automation system control and process description to increase production capacity and optimizing production cycle time by design the machine design and developing automated system of punching machine in mechanical and electrical aspects. According to the research problem, this study will be focused on Automation System Design for Jacquard Textile Card on Punching Machine Using User Requirement Spesification (URS) Method.

## I.2 Problem Statement

According to this background, problem statement of this research which conducted at PT. Buana Intan Gemilang is how to design automation system for jacquard card

punching machine by using User Requirement Spesification (URS) method in order to reduce cycle time based on improvement automation system?

## 1.3 Research Objective

The objective of this research is design automation system for jacquard card punching machine by using User Requirement Spesification (URS) method in order to reduce cycle time based on improvement automation system.

## 1.4 Research Limitation

The limitations of this research are:

1. The research use process time and existing card-hole program system.
2. The machine punching is existing
3. The system does not discuss the quality of product.
4. Do not consider energy usage in this process.
5. A model is created to verify the improvement automation system.

## 1.5 Research Benefits

By implementing improvement automation system for this research follows are:

1. Increasing and applying knowledge of engineering, especially in product development, mechanical engineering, automation system, material and the benefits of automation and CAD (Computer Aided Design) software.
2. PT. Buana Intan Gemilang is able to be implemented this research for increasing production capacity by decreasing cycle time and minimize labour as an operator.
3. Being as reference toward college-student as well as the company major in textile industry which related with punching machine developed system.

## 1.6 Writing Systematics

This research study has systematics of writing which are:

**Chapter I Introduction**

This chapter contains the research background, problem definition, research objectives, research limitations, and the benefits of research.

**Chapter II Literature Review**

This chapter contains the clarification of basic theories which underlying and support the thinking and design of process. On the other hand, there are several previous reseacth that study that discussed in this research. Literature review discuss the automation system and design of punching machine at PT. Buana Intan Gemilang. Some theories used in this research are automation system basic theories, machine design theories, and user requirement specification

**Chapter III Research Method**

This chapter discusses and describes the steps that conducted in the reseacrh of detailing involve system think framework for explaining the formulation of research problems, initialization phase and acquired data, research systematic which is finalization phase in problem and establish the final conclusion of the research conducted.

**Chapter IV System Design**

This chapter contains the data needed to establish an automated system design and model machine design then be proceed into the creation process of automation system and User Requirement Specification (URS)

**Chapter V System Design Analysis**

This chapter contains the analysis of the created system design of automated system and User Requirement Spesification (URS) that includes process description, control philosophy, and whole system.

**Chapter VI Conclusion and Suggestion**

This chapter contains the conclusion of the created automated system for whole punching process and the suggestion that related to the result of proposed system