

CHAPTER I INTRODUCTION

I.1 Background

The growth of world technology is growing rapidly from day to day. The growth of this technology has reached the smart factory which known as industrial revolution 4.0. The world's industrial and manufacture is preparing for the industry revolution 4.0 which in general, the industry revolution 4.0 integrates the online world with production line in the industry, where all the production process operate with internet as the main support. According Indonesian Minister of Industry, Airlangga Hartarto, “now the automotive industry is already using robotic in the operation. They have also used internet of things infrastructure to operate. In the future, the service sector and the others can also use data or artificial intelligence” (Endarwati, 2017).

The growth of this technology effect to increase competition in the manufacture sector in Indonesian. With this competition, industrial manufacture is prosecuted to can supply customer demand and customer satisfaction to stay survive, among others reach production target which is appropriate demand, good product quality and lower price than competitor (Morriss, 1995). The competition can be seen on the Figure I.1 which present that number of large and medium manufacture industry companies in Indonesian from year 2010 – 2015 always increases.

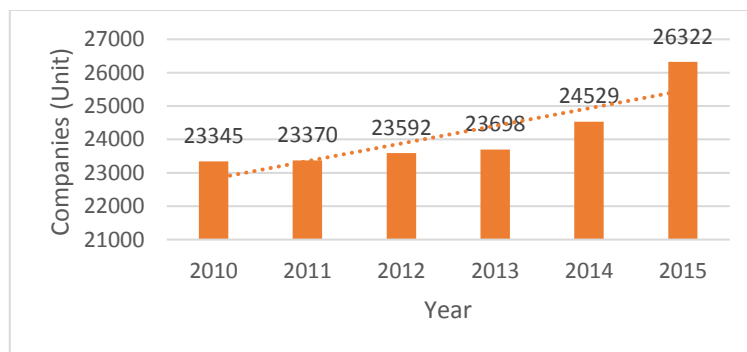


Figure I.1 Number of Large and Medium Manufacture Industry Companies in Indonesian from Year 2010 - 2015 (Badan Pusat Statistik, Perkembangan Indeks Produksi Industri Manufaktur Besar dan Sedang 2015 – 2017, 2017)

Tea is one of the plantation commodities which has a strategic role in the economy of Indonesian. Besides oil and gas, tea also one of the Indonesian export commodities which are quite important as producer of foreign exchange. According BPS, tea production in Indonesian in 2016 reach 124.16 thousand ton. West Java Province is the largest tea producer province in Indonesian with number of production reach 76.25 thousand ton (Badan Pusat Statistik, Statistik Teh Indonesia 2016, 2017). On Figure I.2 shows that total weight of tea export from 2013 – 2016 trend to decrease ranged between 6.27 percent until 17.11 percent or ranged 10.05 percent per year.

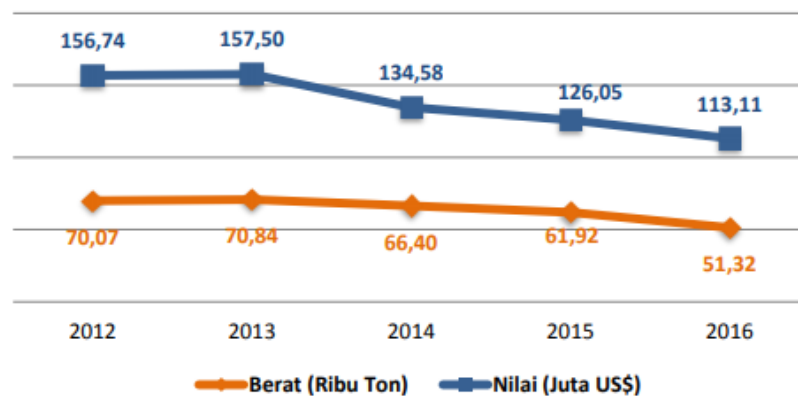


Figure I.2 Growth of Tea Weight and Value Export from year 2012 - 2016 (Badan Pusat Statistik, Statistik Teh Indonesia 2016, 2017)

PT. Perkebunan Nusantara VIII Ciater is part of PT. Perkebunan Nusantara VIII (Persero) state property which is located in Ciater village, Cagak Street Sub-Regency, Subang Regency, West Java which have wide plantation areal reach 3.24 ha. On Figure I.3 is the PTPN VIII Ciater factory, where focus on processing orthodox black tea. On processing to make orthodox black tea, generally there are five process that are (1) withering, (2) grinding, (3) oxidation, (4) drying, (5) sorting, (6) packaging.

In oxidation and drying process are a very important process in production orthodox black tea, because the purpose of oxidation process is to change polyphenol become compounds that form characteristics and the character of black tea that will determine the character of steeping water (strength, colour, quality, and briskness), and the

purpose of drying process is to stop the oxidation process, reduce water content, sterilize tea, give black color to the appearance of tea, prolong tea shelf life, and make it easy to sorting process (PT. Perkebunan Nusantara VIII, 2008).



Figure I.3 PTPN VIII Ciater Factory

Dry production is the tea processing stage from grinding until packaging process. On Figure I.4 show that the attainment of dry production in 2017, can be seen all the production on January until December can not reach RKAP of PTPN VIII Ciater. This is one of the impact of the production does not reach is declining number of tea export.

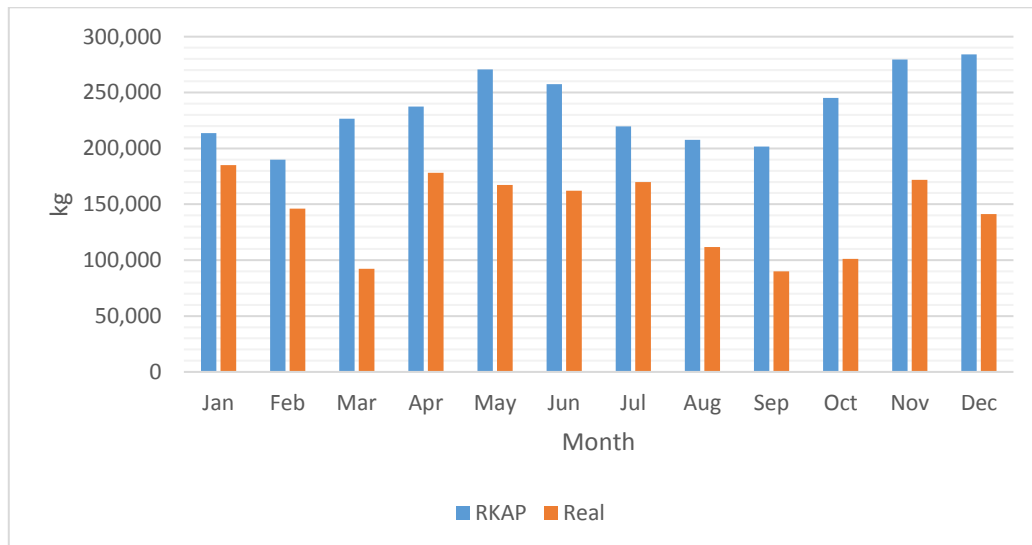


Figure I.4 Attainment of Dry Process in 2017 (PT. Perkebunan Nusantara VIII Ciater, 2017)

Currently PTPN VIII Ciater in the process to production tea still implement mechanical systems, this matter can cause human error factor which impact on inconsistent tea quality (Atmaja, 2009). From the result of observation at PTPN VIII Ciater, on oxidation workstation, thermometer dry and wet are not noticed, can be seen on Figure I.5 where the thermometer dry and wet do not feasible to be used, so the operator does not know exactly when the exhaust fan and air humidifier should be switched on to make the temperature and humidity room in oxidation still optimum.



Figure I.5 Thermometer Dry and Wet on Oxidation Workstation

Based on SOP in PTPN VIII, the optimum temperature room is 16 – 26 degrees celcius and humidity room is 90 – 95 percent, it is very influential on the quality of tea in this oxidation process (PT. Perkebunan Nusantara VIII, 2008). The operator also does not implement the SOP in the oxidation process, which where in implementation operator directly move tea to the next process before the time of oxidation process finish.

On environmental conditions of drying workstation like high temperature around 29 – 30 °C and noise around 75 – 80 db, it is not good environmental conditions, so can cause physical fatigue (Ngizudin, 2015). On Figure I.6 show that lots of tea powder which is scattered out from the drying machine, it is can cause air pollution. Jobs which are always related with dust pollutants, sooner or later will suffer a variety of disorders in the operator's body commonly known by the name of pneumoconiosis and which is

disturbed among others lungs function (Roslan, 2000). Besides can cause respiratory health problems, the tea powder which go out of the drying machine also will become a defect, it is can cause to reduce the production.



Figure I.6 Enviromental Conditions on Drying Workstation

Based on the problems on oxidation and drying workstation, one of ways to improve the systems is by implementing automation systems. By implement automation systems, there are several reasons for one system to be automated and thus they are, increase in labor productivity, reduce labor cost, mitigation of the effect of labor shortages, reduction or in some case elimination routines of manual and clerical task, improvement of worker's safety, improvement of production quality, reduction of manufacturing lead time, accomplishment process that cannot be done manually, and avoidance of high cost not to be automated (Groover, 2001).

According The Instrumentation System and Automation Society (ISA), SCADA is the technology which make it easy for users to get data from one or more of several remote facilities and or send some supervision intructions to some of facilities and doing monitoring and controlling process remotely. The use of SCADA allows the process of monitoring and controlling can be monitored and executed without must to visit the plant (Boyer, 2004).

Therefore, with implement automation systems based on SCADA systems and android control at PTPN VIII Ciater can help the operator to control and monitor the plant without come to the production floor in realtime, can improve productivity so can reach

RKAP PTPN VIII Ciater, and can repair human error problems so can improve the consistent tea quality .

I.2 Problem Formulation

According to the background, the problem formulation is how to design and simulation of mini plant based on SCADA systems and android control on oxidation and drying workstation of orthodox black tea using on-off control method at PTPN VIII Ciater?

I.3 Research Objectives

The objective of this research is to design and simulation of mini plant based on SCADA systems and android control on oxidation and drying workstation of orthodox black tea using on-off control method at PTPN VIII Ciater.

I.4 Research Boundaries

The research boundaries are:

1. Design HMI using software Wonderware InTouch 10.1
2. Design PLC using software TIA Portal V12
3. Design database using software Microsoft Access
4. PLC which used is PLC Siemens S7 1200 CPU 1212C AC/DC/Rly
5. Communication HMI to PLC using software system management console DASSIDirect
6. Communication android to HMI using software TOP Server 6 with MQTT Client
7. Communication between PLC to another PLC and PLC to PC using LAN
8. Android only can control the mini plant
9. LED is used to representative of all the machine that the machine is operating
10. Only simulated two machine drying on drying workstation
11. The mini plant scenario based on SOP PTPN VIII Ciater but the process time of oxidation and drying is not based on SOP PTPN VIII Ciater

I.5 Research Benefit

The benefits of this research are:

1. Know the whole production systems of orthodox black tea at PTPN VIII Ciater, especially on oxidation and drying workstation
2. Mini plant can be used as a teaching automation systems tool
3. Mini plant can be used as a research tool to make automation systems at PTPN VIII Ciater
4. Know hardware and software needed to make automation systems

I.6 Research Writing Systematics

Chapter I Introduction

This chapter explain about what the background of the problem that we will analyze, the problem formulation, research objective, research limitation, and also research benefit.

Chapter II Literature Review

This chapter contains about any basic theory which used to support the system thinking to design and simulation of mini plant based on SCADA systems and android control on oxidation and drying workstation of orthodox black tea using on-off control method at PTPN VIII Ciater.

Chapter III Research Method

This chapter contains about conceptual model which represented on concise and structured the whole of research object so that to obtain the output which suit the research objective, and there is systematic problem solving which represent the steps which is done to solve the problems.

Chapter IV System Design and Data Processing

This chapter contains about data collection which is needed to design and simulation of mini plant based on SCADA systems and android control on oxidation and drying workstation of orthodox black tea using

on-off control method at PTPN VIII Ciater. The data is obtained from observation to PTPN VIII Ciater Factory, and the next will be processed to design and simulation of mini plant based on SCADA systems and android control on oxidation and drying workstation of orthodox black tea using on-off control method at PTPN VIII Ciater.

Chapter V System Design Analysis

This chapter contains about analysis from the system that has been suggested that is analysis of design and simulation of mini plant based on SCADA systems and android control on oxidation and drying workstation of orthodox black tea using on-off control method at PTPN VIII Ciater.

Chapter VI Conclusion and Suggestion

This chapter contains about conclusion from design and simulation of mini plant based on SCADA systems and android control on oxidation and drying workstation of orthodox black tea using on-off control method at PTPN VIII Ciater, and give the suggestion to the next researchers which is related with systems that has been suggested.