

CHAPTER I INTRODUCTION

I.1 Research Background

The ability of a manufacture to create a production process that is effective and efficient will affect the volume of production, reduce production costs and increase profitability. One of the factors that can influence the effective and the efficient in the production process is the selection of material handling.

Material handling is indispensable in the manufacturing process. Material handling is the function of moving the right material to the right place, at the right time, in the right amount, in sequence, and in the right position or condition to minimize production cost (Meyers, 1993). The selection of material handling is very critical in the process of manufacturing. The selection of unappropriated material handling equipment will disrupt the production process time. Furthermore, the unappropriated of selection the material handling will cause the increasing of the cost. There are four material handling that usually use in the manufacturing (Groover, 2001):

1. Industrial trucks
2. Automated guided vehicles
3. Conveyors
4. Cranes and hoists

Industrial truck is divided into two types: non-powered and powered. The non-powered truck types are often referred to as hand truck because they are pushed or pulled by operator. Usually it is used to move light loads in a manufacture. The advantage of hand truck is low cost. The disadvantages of hand trucks are the quantities of material moved and distances are relatively low. The powered industrial trucks are steered by operator. The operator will drive it manually to move the materials from one place to another place. The common type is used in the manufacturing process and warehouse is forklift truck. Generally, it is used to move the pallet loads and palletized containers in the manufacture or in the warehouse. The advantage of powered industrial truck is medium cost. The disadvantages of these equipment are:

1. usually requires pallet/skid/container
2. requires skilled operator
3. equipment needs maintenance facility
4. capacity of these equipment vary from one ton up to about 60 tons
5. slow travel speed (10-15 km/h)
6. suitable for short hauls (hundreds of meters)

An automated guided vehicle system (AGV) is a battery-powered material handling that uses independently operated, self-propelled vehicles guided along define pathways. AGV usually used to move palled loads in manufacture or warehouse and moving work-in-process along variable routes in low and medium production. The advantages are battery-powered vehicles, flexible routing, and nonobstructive pathways. The disadvantages of AGV is high cost.

Conveyors are used when the material must be moved in relatively large quantities between specific locations over a fixed path. The fix path usually implemented by a track system which may be in-the-floor, above-the-floor, or overhead. The mechanism is contained in fixed path, using chains, belts, and rotating tools. Conveyors are commonly used in automated material transport system in manufacturing plants, warehouse, and distribution centers. The advantages of conveyors are suitable for manufacture with a high volume of production rate. The disadvantages are high cost for installation, high cost for maintenance, the entire production flow will stop if there is a damage on the conveyors.

Cranes are used for horizontal movement of materials in a facility, and hoists are used for vertical lifting. The feature is lift capabilities ranging up to more than 100 tons. Cranes and hoists usually have a fixed pulley, a moveable pulley with a hook or other method of attaching the load and connecting rope or cable. The advantages of this material handling equipment are:

1. It can move a large and heavy items in manufacture, mills, and warehouse
2. Medium hardware costs
3. Suitable for medium volume applications

The disadvantage is cranes and hoists have limited access areas.

In a complex manufacturing process, the use of forklift truck and AGV are preferred, because both of them are highly flexible material handling. The difference between

those are forklift truck is still controlled by human while the AGV is not controlled by human. Work performed by a fork lift truck is susceptible to fatigue and stress due to position or work environment that uncomfortable. Sometimes the uncontrolled maneuver of fork lift truck will cause damage to the product. This accident can happen because of the human error. One of factor that influence human error is physiological factor. Therefore, for security issue AGV has a great advantage compared with a fork lift truck, because AGV is unmanned material handling.

Study about automated guided vehicle in warehousing is quite important in the manufacturing system, because it is expected to face the problem of warehousing in this modern era. Because of that, there should be a study for students, especially industrial engineering, so when they go into world of warehousing they can use their knowledge according to the needs of companies.

Inspira automation is one of the skill development center in Telkom University. This skill development center serve the students to be understand all about the automation things in the manufacturers, such as: automation system of material handling; automatic tools machine; feedback control system; computerized system for data collection, planning and decision-making to support manufacturing activity. To learn the automation system, certainly, need a tool. This skill development center already have a learning tools from Festo-Didactic, PLC OMRON, PLC Siemens, etc. The learning tools from Festo that already owned are: pneumatic, electro-pneumatic, Robotino[®]. But this skill development center still do not have a learning module for learning the automated guided vehicle.

Based on the above issues, in this research will discuss about the simulation of AGV using Robotino[®] in Inspira Automation Telkom University. The simulation is conducted as a material for studying about AGV. The use of Robotino[®] as an AGV because the characteristics of Robotino[®] is similar as an AGV. This robot will be programmed similar with how AGV work. The characteristics of this robot will be designed to carry the product based on its color and put it in a place that have been determined. This robot will follow the pathway when carrying the product.

I.2 Problem Definition

1. How to design a navigation system on Robotino[®] using Robotino[®] View software?
2. How to design a system to take the product that have been sorted by color using Robotino[®] View software?
3. How to design a system for storing product that have been taken from sorting workstation using Robotino[®] View software?
4. How to find optimum speed of Robotino[®] when moving through inductive line?
5. How to transport material from sorting workstation to another workstation?

I.3 Research Objective

1. To design a navigation system on Robotino[®] using Robotino[®] View software
2. To design a system to take the product that have been sorted by color using Robotino[®] View software
3. To design a system for storing product that have been taken from sorting workstation using Robotino[®] View software
4. To find optimum speed of Robotino[®] when moving through inductive line.
5. To transport material from sorting workstation to another workstation is use priority picking.

I.4 Research Boundaries

To obtain the result which do not deviate from the topic discussed, it is necessary to apply some boundary problems. The boundary problems in this research are:

1. Navigation system on Robotino[®] is follow the line
2. Pick up the material using gripper based on its color. The color is red, blue, and yellow
3. Put down the material using gripper to the workstation based on its color. The color is red, blue, and yellow
4. Speed testing is from 100 mm/s until 800 mm/s.
5. Priority picking is used to pick up three materials from each color.

I.5 Benefits of Research

The expected of this research are as follows:

1. As a learning material for student
2. Students can understand how the AGV work
3. Student can understand how Robotino[®] work

I.6 Writing Systematic

Chapter I Introduction

This chapter will explain about the background of the issues raised in the research conducted, problem formulation, research objective, boundary problem, benefit of the research, and systematic of writing.

Chapter II Literature Study

This chapter contains a study of the literature related to the subject matter raised in this study. Like definition of automation, definition of Robotino[®], feature of Robotino[®], hardware of Robotino[®], software of Robotino[®], automated storage and retrieval system, automated guided vehicle.

Chapter III Research Methodology

This chapter will explain about the steps of the research such as: the frameworks to explain the problems that occurred in this research and problem solving systematic which is the step in solving a problem that will generate in a conclusion that answered the purpose of this research

Chapter IV System Design

This chapter will explain about the system that will be designed such as material handling using Robotino[®], scenario process, program, flow chart process, and testing program.

Chapter V Analysis System

This chapter will explain about the result of analysis from the designed system. In this chapter also will explain about the deficiencies of the system.

Chapter VI Conclusion and Suggestion

This chapter will explain about the conclusion from the result obtained in analysis system. Also in this chapter there will be a suggestion for the next research.