UNIVERSITI TEKNIKAL MALAYSIA MELAKA

DEVELOPMENT OF IOT BASED ON MONITORING AND CONTROL SYSTEM FOR LIFECYCLE MANAGEMENT

This report is submitted in accordance with the requirement of the Universiti Teknikal Malaysia Melaka (UTeM) for the Bachelor of Electronic Engineering Technology (Industrial Electronic) with Honours.

by

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TECHNOLOGY

2019

UNIVERSITI TEKNIKAL MALAYSIA MELAKA

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APPROVAL

This report is submitted to the Faculty of Electrical and Electronic Engineering Technology of Universiti Teknikal Malaysia Melaka (UTeM) as a partial fulfilment of the requirements for the degree of Bachelor of Electronic Engineering Technology (Industrial Electronic) with Honours. The member of the supervisory is as follow:

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ABSTRAK

MAP-200 adalah siri sistem pengendalian terdiri daripada tujuh (7) sistem latihan bebas dan berbeza. Projek ini hanya memberi tumpuan kepada MAP-204 salah satu mesin siri MAP-200. MAP-204 adalah peranti pengendalian litar linear mendatar dengan alat pengangkat luaran. Pada hari-hari awal, hardwired digunakan untuk menyambungkan keseluruhan panel kawalan. Kerja keras ini boleh menyebabkan sambungan yang salah jika orang itu tidak membuat pemeriksaan berganda sebelum menghidupkan bekalan dan juga boleh menaikkan kos untuk menggantikan komponen baru. Selain itu, tenaga kerja diperlukan kerana mesin berfungsi dengan manual menggunakan butang panel kawalan dan perlu memantau komponen jika ia mencapai had. Banyak tenaga kerja diperlukan di stesen kerja. Selain itu, keperluan Internet Perkara (IoT) telah menjadi popular sejak revolusi Industri 4.0 telah diperkenalkan. Hampir semuanya perlu ditingkatkan untuk mencapai keperluan 4.0 Perindustrian. Tujuan utama projek ini adalah untuk membangunkan sistem IoT (Internet of Thing) yang boleh memantau dan mengawal MAP-204. Antara muka mesin manusia (HMI) akan digunakan untuk memudahkan penyambungan sistem kawalan yang keras. Kawalan penyeliaan dan pemerolehan data (SCADA) akan dibangunkan untuk mempermudahkan pengguna untuk memantau dan mengawal proses mesin. Hasilnya difokuskan pada pengembangan HMI, SCADA dan IoT untuk sistem pemantauan dan pengendalian untuk MAP-204.

ABSTRACT

MAP-200 is a handling system series consists of seven (7) independent and different training systems. This project only focus on MAP-204 one of the MAP-200 series machine. MAP-204 is a horizontal roto-linear handling device with external gripper. In early days, the hardwired are used to connect the entire control panel. This hardwired may cause a wrong connection if the person did not do a double checking before turn on the supply and also can increase the cost for replace the new component. Other than that, manpower is required as the machine works manually used the control panel button and need to monitor the component if it reaches the limit. A lot of manpower is needed at the workstation. Besides that, the need of Internet of Things (IoT) has become popular since the Industry 4.0 revolution been introduced. Almost everything needs to be upgrade to reach the Industrial 4.0 requirements. The main purpose of this project is to develop an IoT (Internet of Thing) system that can monitor and control the MAP-204. The human machine interface (HMI) will be use to simplify the hardwired connection of control system. The supervisory control and data acquisition (SCADA) will be develop for simplify the user to monitor and control the process of the machine. The result focused on develops HMI, SCADA and IoT for monitoring and control system for MAP-204.

DEDICATION

To my beloved parents, lectures, my friends and who have involve direct or indirectly with me throughout my final year project.

ACKNOWLEDGEMENTS

My deepest gratitude goes to Allah SWT for giving me strength to complete this project. I would like to acknowledge my supervisor, Mr. Tg. Mohd Faisal bin Tenkgu Wook and my co-supervisor Mr. Ahmad Nizam bin Mohd Jahari @ Johari for the time, advices and guidance in order to complete this final year project report. Without them, my report writing would be improper and not achieve the criteria for report writing. Last but not least, I would like to thank my parents and my friends who support me with spirituality and information during the whole process of my final year project. Finally, I would like to thank all who have involved direct or indirectly and those who have lent their hands also support throughout my final year project journey.

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LIST OF ABBREVIATIONS

HMI	-	Human Machine Interface
GUI	-	Graphical User Interface
IoT	-	Internet of Things
PLC	-	Programmable Logic Controller
SCADA	-	Supervisory Control and Data Acquisition

CHAPTER 1

INTRODUCTION

1.0 Introduction

This chapter will describe about the introduction of MAP-204, the project objective and scope of project.

1.1 Background

MAP-200 is a handling system series consists of seven (7) independent and different training systems. A simple assembly process which reproducing subset of more complex process being carries out by MAP-201, MAP-202, MAP-203 and MAP-204. This project only focuses on the station MAP204 from the overall MAP-200 series. MAP-204 is a horizontal roto-linear handling device with external gripper.

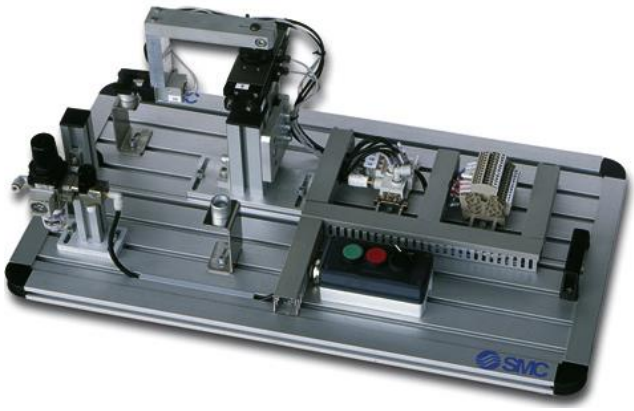

Figure 1.1: MAP-204

1.2 Project Objective

The main purpose of this project is to develop an IoT (Internet of Thing) system that can monitor and control the MAP-204. The human machine interface (HMI) will be use to simplify the hardwired connection of control system. The supervisory control and data acquisition (SCADA) will be develop for simplify the user to monitor and control the process of the machine.

Objectives:

1. To develop an IoT based on monitoring and control system.
2. To develop a monitoring and control system using supervisory control and data acquisition (SCADA) system and human machine interface (HMI).

1.3 Scope of Project

The scope of the project consists of all the concern part in order to achieve the objective of the project:

i) Familiarization of the MAP-204 and Programmable Logic Controller (PLC)

In this project, it will focus more on the MAP-204. The functionality of the operation system needs to be explored for smoothen the ongoing project outcome. Furthermore, a study on the Programmable Logic Controller (PLC) is needed as the MAP-204 used PLC for program the control system.

ii) Develop a human machine interface (HMI)

A layout display will be design using suitable software which is compatible with the Human Machine Interface (HMI).

iii) Develop a supervisory control and data acquisition (SCADA)

A supervisory control and data acquisition (SCADA) system will be develop and a suitable software for the SCADA system will be selected by doing research.

iv) Develop an Internet of Things (IoT)

An Internet of Things (IoT) will be develop using a suitable component. A research by related journal will be done for select a suitable IoT component for this project.

1.4 Problem Statement

In early days, the hardwired are used to connect the entire control panel. This hardwired may cause a wrong connection if the person did not do a double checking before turn on the supply and also can increase the cost for replace the new component. Other than that, manpower is required as the machine works manually used the control panel button and need to monitor the component if it reaches the limit. A lot of manpower is needed at the workstation. Besides that, the need of Internet of Things (IoT) has become popular since the Industry 4.0 revolution been introduced. Almost everything needs to be upgrade to reach the Industrial 4.0 requirements.

1.5 Significance of Study

The purpose of this project is to replace the manual switches with the HMI. Reduced the manpower at the workstation by develop SCADA for monitoring and control system. Also monitor and control the system process using IoT.

CHAPTER 2

LITERATURE REVIEW

2.0 Introduction

This chapter presents literature review on the development of Internet of Things (IoT) based on monitoring and control system. A related journal and other developments based on the MAP-204 with a similar purpose where it aims to upgrade the system.

2.1 MAP-200: Handling System

(SMC, 2019) MAP-200 has a series of optional that overall consist of seven parts of independent and different training systems.

Table 2.2: Type and Function of MAP

Type of MAP	Function
MAP-201	Part feeder with Detector and Ejector for Incorrect parts
MAP-202	Vacuum Held Handling Device with Two Shafts
MAP-203	Vertical Revolving Handling Device with Internal Gripper
MAP-204	Horizontal Roto-linear Handling Device with External Gripper
MAP-205	The Integrated Solution: Assembly Mini cell
MAP-206	Handling Device Using Electric Actuators
MAP-207	Handling Device for Parts Classification

2.1.1 MAP-201: Part Feeder with Detector and Ejector for Incorrect Parts

(SMC, 2019) The column called a gravity feeder house. Each part has a non-symmetrical housing and ejected by a pneumatic cylinder. The orientation is verified using a cylinder with a plunger. The oval section will move the base to the final position and if it not met the requirements of the orientation it is rejected via the evacuation ramp.

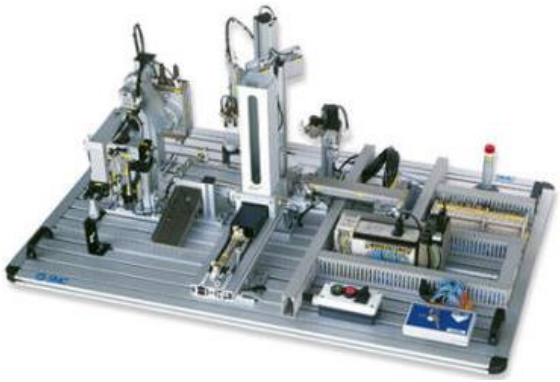

Figure 2.1: MAP-201

2.1.2 MAP-202: Vacuum Held Handling Device with Two Shafts

(SMC, 2019) MAP-202 performs a pick and place movements of a part using vacuum gripper. Two shafts which move from one to another position used a Cartesian handling device and holding it with a set of three vacuum pads.

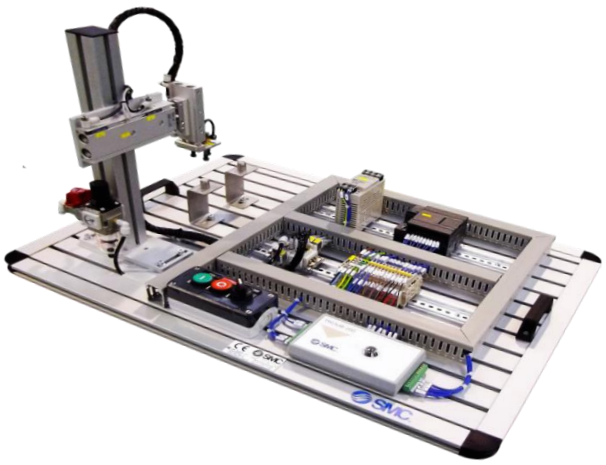

Figure 2.2: MAP-202

2.1.3 MAP-203: Vertical Revolving Handling Device with Internal Gripper

(SMC, 2019) MAP-203 uses a rotating manipulator fitted with internal gripper which moves the bearing from one to another position.

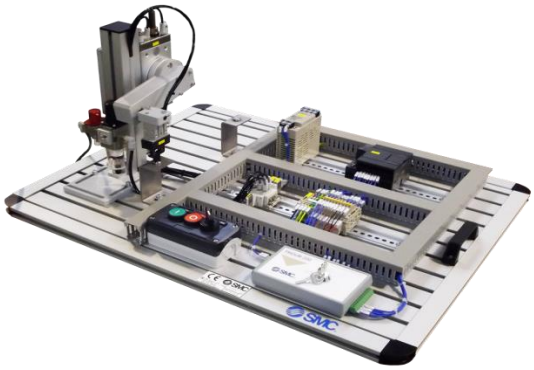

Figure 2.3: MAP-203

2.1.4 MAP-204: Horizontal Roto-Linear Handling Device with External Gripper

(SMC, 2019) MAP-204 uses a roto-linear manipulator fitted with an external gripper for transfer shaft from one to another position.

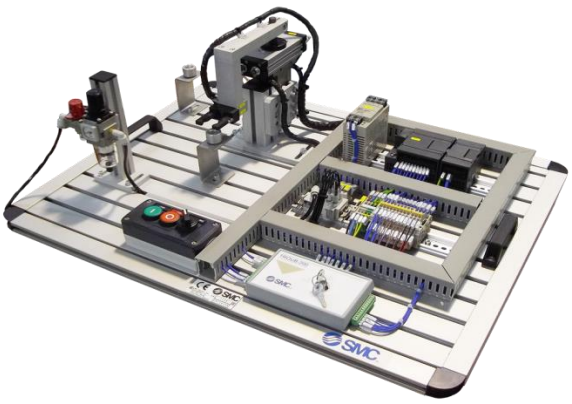

Figure 2.4: MAP-204

2.1.5 MAP-205: The Integrated Solution: Assembly Mini cell

(SMC, 2019) MAP-205 is an integrated assembly mini cell forming of four systems (MAP-201, MAP-202, MAP-203 and MAP204) and it carries out the complete assembly and disassembly process.

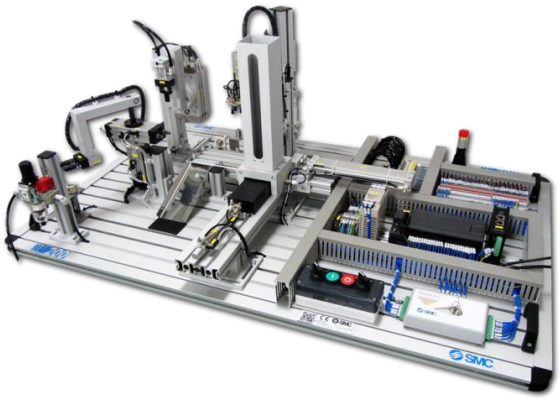

Figure 2.5: MAP-205

2.1.6 MAP-206: Handling Device Using Electric Actuators

(SMC, 2019) MAP-206 can perform different handling operation by using 3 electrical Cartesian axes and two of it is servo controller

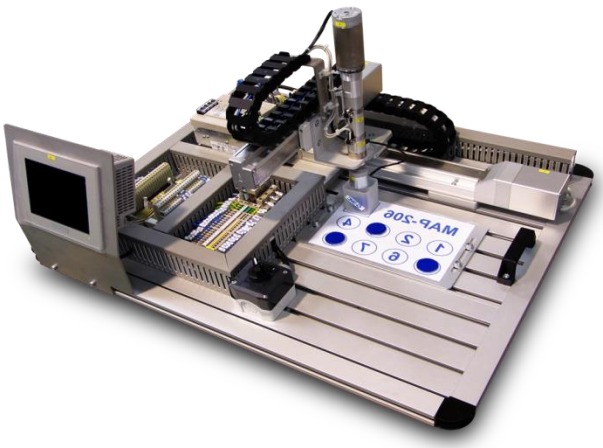

Figure 2.6: MAP-206

2.1.7 MAP-207: Handling Device for Parts Classification

(SMC, 2019) It performs an automated process of classification and rejection of components made of various materials and sizes.

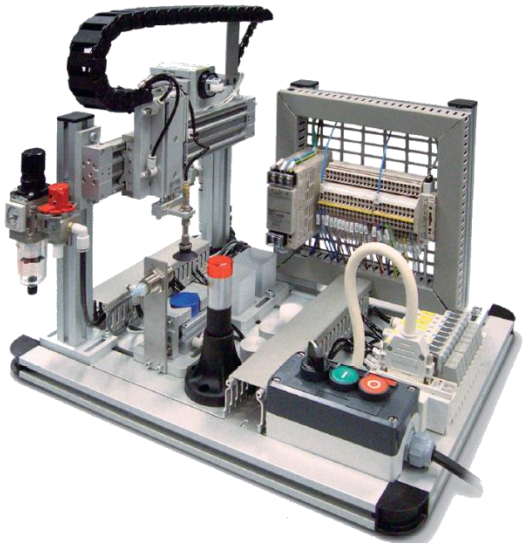

Figure 2.7: MAP-207