BEST CONTROL STRUCTURE FOR WATER LEVEL WITH REGULATED DISCHARGE FLOW

A thesis

presented to

the Faculty of Electrical Engineering

at the Universiti Teknologi Mara Malaysia

In Partial Fulfillment

of the Requirements for the Bachelor of Engineering

(HONS) Electronics (Instrumentation)

by

RISZNAFISAH BINTI HARRIS

Zuriati bt Janin, Thesis Supervisor

JULY 2015

ACKNOWLEDGEMENT

First of all, I am very grateful to Allah The Almighty for giving guidance and blessing throughout the process of finishing this thesis. Without His guidance and blessing, I will surely not be able to complete this thesis successfully within the frame time.

I would like to extend my deepest appreciation to my Final Year Project (FYP) supervisor, Mdm Zuriati Janin for her kindness, support, guidance, suggestion and continuous supervision throughout the course of this thesis. All of her valuable advices and moral supports had been a good motivation for me to success in this thesis. I also would like to thank to my dearest family who always with me all the time and finally, millions of thank to friends who helped me in terms of views and ideas for my thesis.

ABSTRACT

This project is to investigate the best control structure and tuning parameters for controlling the water level of the trainer system that located at the DCS laboratory UiTM Shah Alam. In this work, the parameter of the controller is adjusted using Ziegler Nichols tuning method. The best control structure is analysed by considering the rise time, settling time, overshoot and steady state error. The result showed that the water level integrating process can best control using Proportional + Integral + Derivative with parallel structure.

TABLE OF CONTENTS

CHAPTER 1

INTRODUCTION

1.1 PROJECT BACKGROUND

An open loop process can be a self-regulating or a non self-regulating process. This project is a non self-regulating process that is also known as an integrating process. In integrating process, the process keeps changing until process reaches its limit after making an open loop test. This is proved in the result of the open loop test for this project. Water tanks and servo motor have similarity in feedback control purposes, they are both integrating process.

PI and PID controller was used in this project, this is because this controller is a commonly used controller in industrial control system. It is well understood by many operational, technical and maintenance personnel. About 90 to 95% of all control problems are solved by this controller that comes with different forms [1]. However, PID is not always used in the best way in which there is often poorly tuned. In fact, the derivative action is mostly ignored due to the difficulty of tuning three parameters simultaneously. PID is named after its three correcting calculations [2], whose sum constitutes the output of the PID controller

1) Proportional – to handle the immediate error, the error is multiplied by a constant P (proportional) and added to the controlled quantity
2) Integral – the error is integrated (added up) over a period of time. Then, multiplied by a constant I (making an average) and added to the controlled quantity
3) Derivative – the first derivative (the slope of the error) over time is calculated. Then, multiplied by another constant D, and added to the controlled quantity